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Attorney Docket DX-3 (#90545)

CERTIFICATE OF MAILING

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Date: November 15, 2004

Sean Mellino

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:

Application Serial No. 75/701,707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette at Page TM 400 on May 9, 2000

DURAMAX MARINE, LLC	)	
	)	
Opposer,	)	
	)	
v.	)	Opposition No. 119,899
	)	
R.W. FERNSTRUM & COMPANY,	)	
	)	
Applicant	)	

Commissioner for Trademarks
P.O. Box 1451
Alexandria, VA 22313-1451

OPPOSER'S NOTICE OF FILING THE TESTIMONY DEPOSITION OF MICHAEL W. BRAKEY PURSUANT TO 37 C.F.R. § 2.125(c)

Opposer, Duramax Marine, LLC, by its attorneys, herewith files the certified transcript of the testimony deposition of Michael W. Brakey taken in connection with this proceeding on April 22, 2004, along with Opposer's Exhibit Nos. 1 through 17, pursuant to Trademark Rule 2.123, 37 C.F.R. § 2.123. This transcript has been certified by the officer taking the deposition and it and the exhibits have been prepared for filing pursuant to Trademark Rule 2.123(f), 37 C.F.R. § 2.123(f).

11-19-2004
U.S. Patent & TMOfc/TM Mail Rcpt Dt. #72

Respectfully submitted,

Date: November 15, 2004

By: _____
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Counsel for Opposer
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DPH/sm

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing "OPPOSER'S NOTICE OF FILING THE TESTIMONY DEPOSITION OF MICHAEL W. BRAKEY PURSUANT TO 37 C.F.R. § 2.125(c)" was served via first class, postage prepaid, U.S. mail upon:

Samuel D. Littlepage, Esq.
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Washington, D.C. 20036-3506

ATTORNEYS FOR APPLICANT

Date: November 15, 2004

By: _____
D. Peter Hochberg

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:
Application Serial No. 75/701/707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette
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DURAMAX MARINE, LLC,
Opposer,
vs.
R.W. FERNSTRUM & COMPANY,
Applicant.

Case No.
91119899

- - - - -

Deposition of MICHAEL W. BRAKEY, called for examination under the Applicable Rules of Federal Civil Procedure, taken before me, Lorraine J. Klodnick, a Registered Professional Reporter and a Notary Public in and for the State of Ohio, pursuant to notice and stipulations of counsel, at the offices of D. Peter Hochberg Co., LPA, The Baker Building, 1940 East 6th Street, Cleveland, Ohio, on Thursday, April 22, 2004, at 10:01 o'clock a.m.

- - - - -

1 MICHAEL W. BRAKEY, of lawful age,
2 called for examination, as provided by the
3 Federal Rules of Civil Procedure, being by me
4 first duly sworn, as hereinafter certified,
5 deposed and said as follows:
6 EXAMINATION OF MICHAEL W. BRAKEY
7 BY MR. HOCHBERG:
8 Q. My name is Peter Hochberg. I'll be
9 conducting this portion of the deposition.
10 Assisting me will be Sean Mellino and the
11 adversary is Marc Bergsman.
12 Mr. Brakey, I'm going to show you a
13 paper, ask you if you're familiar with it. If
14 you would read what the caption is.
15 A. Opposer's Notice Testimony of
16 Deposition.
17 Q. You said you were appearing here
18 because of this notice of deposition?
19 A. That's correct.
20 MR. HOCHBERG: Will you please mark
21 this as Exhibit 1?
22 - - - - -
23 (Thereupon, Brakey Deposition
24 Exhibits 1 and 2 were marked for
25 purposes of identification.)

1 everything that we say is clearly set forth.
2 If you do not understand any of my questions,
3 please let me know and I will try to express
4 them so you understand them.
5 A. I've seen this before.
6 Q. What is this document you're
7 looking at?
8 A. This is miscellaneous design class
9 40, it was published 1999, May 10th. It is to
10 the commissioner --
11 MR. BERGSMAN: Objection. I
12 believe that you asked a question. You didn't
13 ask him to read the document, but you asked him
14 to identify the document.
15 Q. Do you know what this entire
16 document is?
17 A. It is an application to the
18 commissioner of patents on keel cooler design.
19 Q. It's for the commissioner of
20 patents and trademark. This is a trademark
21 application. Just to shorten this a little
22 bit, this thing is what we call in this now
23 business a file wrapper or file history of this
24 trademark application.
25 MR. BERGSMAN: Objection.

1 bottom of the pages.
2 A. Okay.
3 Q. Who is the power of attorney too?
4 MR. BERGSMAN: I'm going to object
5 to this question, perhaps this whole line of
6 questioning on the grounds that there's been no
7 foundation that the witness has firsthand
8 knowledge about the matter on which he's being
9 asked to testify.
10 Q. Are you familiar with the subject
11 matter of this trademark opposition?
12 A. Yes, I am.
13 Q. What is the trademark that is
14 involved in the opposition?
15 A. It's an issue related to image of a
16 heat exchanger, specifically a keel cooler.
17 Q. Have you reviewed parts of this
18 file wrapper previously, Exhibit 2?
19 A. Yes, I have.
20 Q. And what I just showed you now was
21 the power of attorney. You've identified it.
22 I'm asking you who was the power of attorney
23 to?
24 A. It's to Marc A. Bergsman and Samuel
25 D. Littlepage.

1 the brace, so nine --
2 Q. You said a brace, can you define
3 what you mean by a brace?
4 A. Okay. There's nine dimples on
5 here, so what we have here is keel cooler that
6 has ten tubes --
7 MR. BERGSMAN: Objection.
8 MR. HOCHBERG: You're objecting to
9 his answer or my question?
10 MR. BERGSMAN: I'm objecting to the
11 question because as it gets to it, this kind of
12 question seems to be asking for expert
13 testimony, because this is --
14 MR. HOCHBERG: You're right. Let
15 me --
16 MR. BERGSMAN: I object to Mr.
17 Brakey giving any testimony that might -- let
18 me finish my objection -- that might be
19 considered expert testimony. We specifically
20 asked in interrogatory number 7 that DuraMax
21 identify all expert witnesses whom it expects
22 to give testimony on its behalf in this
23 proceeding to state the substance of the facts
24 and opinions to which each expert is expected
25 to testify, and to provide a summary of the

1 quickly. At least my questions went too
2 quickly.
3 BY MR. HOCHBERG:
4 Q. Mr. Brakey, will you please give us
5 your name and address to begin with?
6 A. Michael Waldo Brakey, 3309
7 Glencairn Road, Shaker Heights, Ohio, 44122.
8 Q. Can you give us your education,
9 say, starting with high school and continuing?
10 A. Okay. Received my high school
11 degree from Gray New Gloucester High School in
12 Maine.
13 Went on to get an engineering
14 physics degree from the University of Maine
15 Orono. My minor specialty was heat transfer
16 and fluid mechanics. Graduated from there in
17 December 75. Went on to get an MBA from
18 Baldwin Wallace, graduated in 1988.
19 I'm sorry, what else was requested?
20 Q. That's it. Just your education to
21 that point.
22 Then what is your work experience
23 after you got out of college, during college
24 and up to the present time.
25 A. During college my background was

1 Radiator on keel coolers in prior lawsuits.
2 That was completed in May of 99 when I left
3 Johnson Rubber and started my own company as
4 president of Brakey Consulting, Inc. DuraMax
5 Marine is still one of my clients as well as
6 Johnson Rubber and I have 17 other corporate
7 clients.
8 Q. Can you give us your familiarity
9 with keel coolers?
10 A. Over a span of between 1977 through
11 the present I have been involved in all forms
12 of heat exchanges and specifically have been
13 considered an authority on keel coolers. I
14 have done work related to all the major parties
15 that are involved with this particular kind of
16 cooler, the one piece rectangular shape
17 parallel tube heat exchanger. I'm probably one
18 of the most knowledgeable on this product.
19 Q. Have you had experience in the
20 field with keel coolers?
21 A. Yes, I have. I have installed keel
22 coolers all over the United States and Japan.
23 I for a number of years was the gentleman that
24 would go out into the field when problems arose
25 related to heat exchangers and was also

1 in our research and design of the heat
2 exchangers.
3 Q. You mentioned the demountable keel
4 cooler. What is a demountable keel cooler?
5 A. It was a cooler that came out I
6 believe it was in the 70s prior to my starting
7 with DuraMax Marine. It is a system that is
8 comprised of two headers that can be
9 disassembled and you have tubes anywhere from 3
10 feet in length to 20 feet in one foot
11 increments, anywhere from four tubes to 24
12 tubes under standard conditions. They can be
13 assembled out in the field underneath the hull
14 of vessels. They're usually for the same
15 heating requirements as the Fernstrum cooler
16 would, typically due to the basic structure and
17 design would be twice as large as the Fernstrum
18 cooler I see here.
19 Q. You worked for DuraMax Marine from
20 when to when?
21 A. I worked from 1977, December of 77
22 to the spring of 1982 where I was directly
23 their chief engineer.
24 Q. Now, we return to Exhibit Number 2,
25 which is the file wrapper for the trademark in

1 without mentioning names of companies, just in
2 general terms what that is?
3 A. In general terms this would look to
4 me to be Dura cooler --
5 Q. Without mentioning names.
6 A. I'm sorry. This looks to be a keel
7 cooler that's a ten tube, probably something
8 less than 63 inches in length.
9 MR. BERGSMAN: Objection. It's
10 getting into expert testimony. He's getting
11 into specifics. Again, specialized knowledge,
12 technical knowledge or scientific knowledge
13 constitutes expert testimony. No experts were
14 identified. We're prejudiced by this.
15 MR. HOCHBERG: I'm not accepting
16 his objection.
17 MR. BERGSMAN: Excuse me, then may
18 I have a continuing objection to any testimony
19 that could purportedly be scientific testimony,
20 technical testimony or based on specialized
21 knowledge, so I don't have to continue making
22 the same objection to every question?
23 MR. HOCHBERG: The problem I have
24 with that, you used the word purportedly,
25 because what you may purport to be scientific

1 your objection.
2 BY MR. HOCHBERG:
3 Q. Again, just tell us in general
4 terms what this unit is?
5 A. With this image I see here of the
6 keel cooler, it's all welded together.
7 MR. BERGSMAN: Objection. Again,
8 that's testimony that's based on scientific,
9 technical or specialized knowledge. Moreover,
10 there's no -- I don't think there's any
11 foundation that's been laid for him to testify
12 as to how it was constructed.
13 Q. Actually, the question you answered
14 wasn't exactly my initial question.
15 My question is why is this called a
16 one piece keel cooler.
17 A. Because when it is installed, it is
18 a one piece that will be --
19 MR. BERGSMAN: Objection.
20 Scientific. Technical. Specialized knowledge.
21 Calls for expert testimony.
22 Q. Page 70. I'm going to show you the
23 first page of this trademark application. You
24 see the page number at the bottom?
25 A. Yes, sir. Page 0066.

1 that he's ever seen them before, that he knows
2 whether they've ever been used before. He has
3 no knowledge, no foundation has been laid --
4 MR. HOCHBERG: The witness just
5 testified he read the application, he read into
6 the record these are three specimens, now he's
7 going to identify the specimens. If you're
8 going to object to every single question that I
9 ask, this deposition is going to take days.
10 MR. BERGSMAN: So be it.
11 BY MR. HOCHBERG:
12 Q. Can you identify these three
13 documents?
14 MR. BERGSMAN: Again, objection.
15 No proper foundation.
16 A. They're images of a keel cooler.
17 Q. I just ask you to read this last
18 paragraph to yourself again.
19 A. Read it to myself?
20 Q. Read it out loud if you want.
21 A. The mark is used in advertising and
22 promotional materials and three (3) specimens
23 showing the mark as actually used in trade
24 magazines are presented herewidth.
25 Q. Can we identify these documents?

1 goes over to expert testimony and that -- I
2 object to it because no expert testimony, no
3 expert witnesses have been identified.
4 MR. HOCHBERG: What I'm asking him
5 does not ask for any kind of expert testimony.
6 It's just asking what kind of depiction is
7 shown on these three specimens.
8 MR. BERGSMAN: You can ask him what
9 kind of depiction is shown, but that's not the
10 question you asked him.
11 BY MR. HOCHBERG:
12 Q. What kind of depiction is shown on
13 these three specimens on pages 707 and 71?
14 A. I see an image of a keel cooler.
15 Q. What, a blueprint to you?
16 MR. BERGSMAN: Objection. Calling
17 for an expert opinion.
18 Q. Can you tell me what you see in
19 this picture on page 70? I'm pointing out a
20 picture of a keel cooler.
21 A. I see an assembly that has washers,
22 gaskets --
23 MR. BERGSMAN: Objection. That's
24 definitely getting into expert testimony. It's
25 well beyond anything of the general, somebody

1 answers it that gives -- calls for expert
2 testimony.
3 MR. BERGSMAN: You can ask him what
4 he sees, but you can't ask him anything about
5 how it's made or --
6 MR. HOCHBERG: That wasn't my
7 question. My question is what's the depiction.
8 MR. BERGSMAN: What's the
9 depiction? Ask him what the depiction is.
10 MR. HOCHBERG: I did ask him that.
11 A. The depiction is of a heat
12 exchanger that has multiple rectangular tubes
13 in paralegal with inlet outlet nozzles.
14 Q. What kind of a view is that?
15 A. That's a isometric view.
16 Q. You said isometric?
17 A. Isometric, to scale.
18 MR. BERGSMAN: Objection. Getting
19 into expert testimony, expert or specialized
20 knowledge. That moves it into the realm of
21 expert testimony. I object to that.
22 MR. HOCHBERG: Okay.
23 Q. Can you compare what's the picture
24 on page 0070 to the trademark picture, which is
25 on page 0069? Are they the same or are they

1 compare to the side panel on 0070?
2 A. One we have here is an outside tube
3 that transcends across both headers.
4 MR. BERGSMAN: Objection. That's
5 now getting into technical or expert
6 specialized knowledge, so it becomes expert
7 testimony and I have to object. No expert
8 witnesses were identified in this case.
9 MR. HOCHBERG: We'll continue.
10 Pages 0072 through 0074, I'll ask you to
11 identify -- just read the heading.
12 A. All right, sir. On 0072 I see, A
13 proper response to this office action must be
14 received within six months from the date of
15 this action in order to avoid abandonment.
16 Q. Would you read the first paragraph,
17 first sentence in the next two paragraphs?
18 There's a lot of cases there. I'm going to ask
19 you not to read the cases, but just the
20 beginning of the sentences.
21 A. Okay. I'm sorry, you're saying
22 start where? Right here? The examining
23 attorney refuses registration on the principal
24 registrar under trademark at section yaddah,
25 yaddah, yaddah on the ground that the proposed

1 Next paragraph --
2 Q. How far did you read?
3 A. I just read to this.
4 Q. Do you agree or disagree with what
5 was said in that paragraph?
6 MR. BERGSMAN: Objection. Calls
7 for expert or specialized knowledge about
8 trademark law. This witness hasn't been
9 identified as an expert witness and no
10 foundation has been laid that the witness is
11 qualified to testify about trademark law.
12 MR. HOCHBERG: The office action
13 just makes a statement of fact.
14 MR. BERGSMAN: The office action is
15 of record in the opposition. So --
16 MR. HOCHBERG: Why don't you read
17 the next paragraph also.
18 A. It is extremely dubious whether any
19 among the relevant buying public will perceive
20 the proposed mark as a service mark.
21 Applicants, specimens make it appear as if the
22 term grid cooler is the trademark for the goods
23 and that the pejorial representation on the
24 promotional piece is a picture of a grid
25 cooler.

1 appears to be just that, a picture of the
2 goods. The trademark for the goods appear to
3 be a grid cooler and the picture or drawing is
4 just a picture of a grid cooler and not a
5 symbol of the custom manufacturing services.
6 Q. Okay. Following one sentence after
7 that?
8 A. The examining attorney will
9 reconsider this refusal if the applicant
10 submits a substitute specimen showing uses as a
11 service mark. The applicant must verify with
12 an affidavit or declaration under 37 CFR,
13 section 220 that the substitute specimen was in
14 use in commerce at least as early as the filing
15 date of the applications.
16 Q. Next thing I'm going to give you
17 are pages 75 to 81. Can you just read what
18 you'll be testifying to next?
19 A. Amendment.
20 Q. I'm going to ask you questions
21 about this amendment?
22 A. All right, sir.
23 Q. Will you start reading where it
24 says title, read into that, start reading that
25 portion. Pay attention, understand what you're

1 these pages. The pages I'm giving you now,
2 this is called Exhibit 1, can you tell me what
3 Exhibit 1 is?
4 A. Survey research studies report,
5 survey of the secondary, meaning of the shape
6 and appearance of the Fernstrum keel cooler
7 tubing, September 1998, Sorensen Marketing
8 Management Corporation.
9 Q. Do you know when this application
10 was filed? I'm going to show you the cover
11 letter. The cover sheet for the application.
12 A. May 10th --
13 MR. BERGSMAN: Objection. He's
14 simply reading from the application. He should
15 be testifying from his own personal knowledge.
16 MR. HOCHBERG: That's true. I'm
17 setting up a background for him to testify.
18 MR. BERGSMAN: This is in the
19 record. You don't have to do that.
20 MR. HOCHBERG: I have to do that so
21 the deponent will understand what I'm asking
22 him.
23 MR. BERGSMAN: Ask him his question
24 again. I object to the answer. He wasn't
25 testifying from his own personal knowledge. He

1 You can ask him questions. He can answer your
2 questions.
3 BY MR. HOCHBERG:
4 Q. Will you look through the survey to
5 find out the area that the survey was taken?
6 You have to actually look at the exhibit.
7 MR. BERGSMAN: Objection. You're
8 asking the witness to testify about the survey.
9 The witness hasn't been -- no foundation has
10 been laid that this witness is an expert
11 testimony on a survey. So there's no
12 foundation for him to testify about the survey.
13 MR. HOCHBERG: You don't know what
14 the question is.
15 MR. BERGSMAN: You just asked him
16 to find -- asked him, you said find the survey,
17 the part in the survey that talks about where
18 it was taken. Now you're asking him questions
19 about the survey. I'm objecting. No
20 foundation has been laid he has personal
21 knowledge about this survey. No foundation has
22 been laid that he has any expertise in the
23 survey and in fact I think you're starting to
24 get into some specialized technical knowledge
25 making him an expert witness, so I'm going to

1 A. You wanted me to read the paragraph
2 that involves it?
3 Q. Just where they identify --
4 A. The resulting database listed
5 nearly 200 such companies in five states, i.e.,
6 Alabama, Florida, Louisiana, Mississippi and
7 Texas.
8 MR. BERGSMAN: I'm going to object
9 to this testimony because the witness isn't
10 testifying about his own personal knowledge.
11 All he's doing is reading the survey. I'm
12 objecting. I believe that this is improper
13 testimony. It's not his own personal
14 knowledge.
15 Federal rule 602, federal rule of
16 evidence, provides that a witness can testify
17 only to matters to which he has personal or
18 firsthand knowledge. That's the source of my
19 objection here. The witness isn't testifying
20 to things about which he has personal or
21 firsthand knowledge. You're simply having him
22 read from the survey, which is already in
23 evidence.
24 MR. HOCHBERG: Except as you will
25 find out, he does have firsthand knowledge

1 A. This?
2 Q. Yes.
3 A. A set of three four-color
4 photographs of the unlabeled Fernstrum keel
5 cooler tubing from different angles were
6 produced in accordance with Dr. Sorensen's
7 specifications. The three photographs appended
8 collectively hereto as Exhibit C were referred
9 to in question 1 which reads in part, please
10 look at these photographs taken from different
11 angles of the same keel cooler one by one as I
12 hand each to you and then lay them down in
13 front of you. Look at these photographs --
14 look these photographs over as you would if you
15 were examining them in a catalog or brochure.
16 Q. I'm handing you Bates page numbers
17 0109, 0110, 0111, 0112, 0113. I'll ask you if
18 you can examine those.
19 Now, can you describe what those
20 pictures show on pages 0111, 0112 and 0113.
21 A. These are photographs of
22 rectangular tubes in parallel with each other,
23 eight tubes here, looks like Bates number
24 0112 -- it's hard to tell from this photocopy.
25 Looks like you're looking directly down. If I

1 A. Yes. I'm trying to recall in that
2 I was at the courts when the survey was
3 discussed down in New Orleans and I'm just
4 trying to recall if that's what I'm recalling,
5 the discussion and detailed information on
6 percentages and so forth that were discussed at
7 the Louisiana court or if I read specifically
8 the survey itself. Because it was in the
9 courts where it was discussed about the 150
10 survey customers, how 57 percent of them
11 recognized the coolers as Fernstrums. There
12 was a lot of discussion there.
13 There was some stuff I've read in
14 bits and pieces over the years based on an East
15 Park Radiator case, so I don't know if I recall
16 reading the entire survey study itself or just
17 knowing bits and pieces and the facts related
18 to it.
19 Q. Looking at those three Bates
20 numbers 0111, 0112 and 0113, can you testify as
21 to the similarities or differences between
22 those pictures and the trademark that's being
23 opposed, I'm going to show you that right now,
24 as page 0069?
25 A. Could you repeat the question?

1 entire assembly, heads and tubes, in a one
2 piece system or unit.
3 Q. When you say heads and tubes, what
4 do you mean?
5 MR. BERGSMAN: Objection. Now it's
6 getting into technical specialized knowledge.
7 So he's beginning to testify as an expert
8 witness and I object to --
9 Q. You're saying a person that
10 testifies that a keel cooler has a head, that's
11 expert testimony?
12 MR. BERGSMAN: Yes. He's breaking
13 down the drawing. He's dissecting it. Now, if
14 he's going to do that, that's going to take
15 specialized knowledge. That's going to take
16 technical knowledge. It's going to take
17 scientific knowledge. This is not something
18 that is just based on perception and --
19 Q. Based just on perception?
20 A. Yes.
21 Q. If you just look at figures 0111,
22 0112 and 0113 and compare them to the picture
23 on 0069, which is the trademark application,
24 just tell me by your perception what the
25 differences are between them, if there are

1 closely, you can't tell if they -- if they're
2 hollowed out or whatever, but you can just see
3 the rectangular dimensions of them side by
4 side.
5 Q. How do you know they're tubes?
6 A. I could have easily said bars.
7 Excuse me. I have no way of looking inside of
8 them, just as I don't have any way of looking
9 inside of this right now.
10 Q. Do you think that anyone who is
11 shown these pictures of 0111 through 0113 would
12 at all, would or would not relate them to the
13 picture of 0069 trademark application?
14 MR. BERGSMAN: Objection. First of
15 all, it's getting to be expert testimony.
16 Second, it's also asking him about the validity
17 of the survey. So he's asking expert testimony
18 about the validity of the survey and a
19 foundation hasn't been laid for the witness to
20 testify as to the foundation or to the validity
21 of a survey. He's not been identified as an
22 expert. It's expert testimony. And there's no
23 firsthand knowledge the witness has a
24 background in the social sciences to be able to
25 make this kinds of testimony.

1 - - - - -

2 (Discussion off record.)

3 BY MR. HOCHBERG:

4 Q. I'm going to show you right now

5 Exhibit 3, which is the file wrapper for serial

6 number 75/382,250.

7 A. Okay.

8 Q. Are you familiar with this file

9 wrapper?

10 A. Yes, I am.

11 Q. This Exhibit 3 does not have Bates

12 numbers on it. I'm going to identify what I'm

13 showing you. First, I'm going to give you the

14 trademark application itself and I'm just for

15 the record going to identify what this

16 includes.

17 MR. BERGSMAN: Objection. You

18 can't testify.

19 MR. HOCHBERG: Okay.

20 MR. BERGSMAN: As to what's going

21 on.

22 MR. HOCHBERG: I was trying to

23 speed this up. If you want to do it that way,

24 that's fine.

25 BY MR. HOCHBERG:

1 firsthand knowledge. He's reading from the
2 application file.
3 MR. HOCHBERG: No one can testify
4 what a trademark application was unless they
5 read it.
6 Q. Now, next to last paragraph -- why
7 don't we finish this first. Page 2, why don't
8 you read the title of that page?
9 A. Power of attorney.
10 Q. I'm not going to inquire about
11 that. What is page 3? What's the caption of
12 that page?
13 A. Declaration.
14 MR. HOCHBERG: Off the record.
15 (Discussion off record.)
16 Q. I'm referring now to the drawing of
17 the application, which I believe is page 4 of
18 the trademark application, and can you describe
19 that?
20 A. I believe so. In this trademark
21 application, which also -- this trademark
22 application's focus was on the grid like tubes
23 in parallel. It was a case that this is what
24 the initial trademark was supposed to be
25 related to --

1 to testify on this matter.
2 MR. HOCHBERG: I'm not asking for
3 any kind of expert opinion. I'm just asking
4 what the picture shows. He said he used the
5 word focus. I'm asking what he meant by the
6 word focus. The rest of it apparently is not
7 focused and I'm asking what he meant by that.
8 A. When I indicated focused, it's this
9 drawing has asked you specifically to focus on
10 the tubes in the drawing.
11 Q. You said focus. What did you mean
12 by that?
13 A. The surface of the ten rectangular
14 tubes.
15 Q. The word focus, why do you use the
16 word focus?
17 MR. BERGSMAN: Objection. Question
18 has been asked and answered.
19 MR. HOCHBERG: Question has not
20 been answered because I'm asking what the word
21 focus was. He's saying it's focused --
22 MR. BERGSMAN: I'm sorry, you asked
23 the question, the witness answered your
24 question. Apparently you weren't happy with
25 the answer --

1 Asked and answered.
2 A. The drawing has been set up to
3 highlight specifically the tubes. The dotted
4 lines de-emphasizes the headers and the tubes
5 on the side. It's trying to draw your
6 attention to the surface.
7 MR. BERGSMAN: I object to this
8 testimony. The witness is not an expert in
9 trademark practice and procedure so he does not
10 have the competency to testify about this
11 drawing and what the drawing means.
12 MR. HOCHBERG: I didn't ask him
13 what it meant. Basically what he testified to
14 was there were dotted lines and there were
15 solid lines. That's essentially what he said.
16 This is going to take all weekend.
17 MR. BERGSMAN: Counselor, this is a
18 trial testimony deposition. I have -- it's not
19 like a deposition. I have to object to each
20 and every improper question, the improper
21 foundation, otherwise, I'll be waiving it
22 because I'm going to reassert these objections
23 in the brief.
24 Q. Let's go to the next page. I'm
25 turning this over to the page following the

1 it that way.
2 Q. Can you compare the drawing, which
3 was page 4 or 5, with the photographs and
4 keeping the next to last paragraph in mind on
5 the trademark application, can you relate the
6 drawing to those photographs and tell me if you
7 don't understand what I'm asking you?
8 A. Please repeat the question one more
9 time.
10 Q. What I'm asking you to do is I
11 guess let me state it a little differently.
12 Why do you think they filed the drawing as well
13 as the photographs with this trademark
14 application?
15 MR. BERGSMAN: Objection. Asking
16 the witness to give an opinion gets into expert
17 testimony and there have been no expert
18 witnesses identified, so I'm going to object on
19 the grounds you're asking for expert testimony
20 which hasn't been identified and, second, this
21 witness has not been identified as a witness
22 with knowledge about trademark practice and
23 procedure. So there's been no foundation for
24 him to answer your question.
25 Q. Why don't you read this paragraph

1 testimony regarding both technical and
2 scientific matter regarding the keel cooler,
3 the drawings, and what's before him, and you're
4 also asking him to perhaps give expert
5 testimony on trademark practice and procedure.
6 No foundation has been laid.
7 MR. HOCHBERG: What's the technical
8 part I asked him about?
9 MR. BERGSMAN: You're asking him
10 about the relationship.
11 MR. HOCHBERG: I didn't say
12 technical relationship.
13 MR. BERGSMAN: It's pretty vague
14 and ambiguous, so I have to object because I'm
15 not sure what you're asking him.
16 BY MR. HOCHBERG:
17 Q. Viewing the photographs on one hand
18 and considering the drawing on the other hand,
19 what does the drawing depict with respect to
20 the photographs, if anything?
21 MR. BERGSMAN: Objection. You're
22 asking him to give technical testimony about a
23 trademark drawing and the components of a
24 trademark application and the witness hasn't
25 been -- there's no foundation to show this

1 application and the drawing of the application?
2 A. I did not see any difference. The
3 photograph shows ten tube systems, the
4 trademark shows ten tube, the brackets, the
5 headers. The only thing that cannot be told
6 from the trademark versus the photograph, and
7 it may be due to coloring, is the rubber
8 gasket. Other than that, they're identical.
9 MR. BERGSMAN: I also object to
10 that because he's describing technical
11 specifications or technical components, rubber
12 gasket, which you can't tell from the
13 photographs, so I'm objecting to the testimony.
14 It's getting into technical or expert testimony
15 and he hasn't been -- there's no expert
16 witnesses that have been identified.
17 MR. HOCHBERG: I think that the
18 witness said that they were identical except
19 for the fact that one had a gasket. You
20 objected to the entire question because of the
21 word gasket? Or you just objecting to the
22 gasket?
23 MR. BERGSMAN: I'm objecting to the
24 entire answer. I'm objecting to part of the
25 answer. Whatever it is, I'm going to be

1 A. Yes, I am.
2 Q. Can you tell me what that exhibit
3 is?
4 A. It's an advertisement brochure for
5 Fernstrum, the grid cooler.
6 Q. And how would you identify that
7 document?
8 A. As Exhibit 4, you mean catalog 970?
9 Q. Right. And what is shown on the
10 cover page of that exhibit?
11 MR. BERGSMAN: I'm going to object
12 because I don't believe this document has been
13 properly authenticated.
14 Q. Do you know where this exhibit came
15 from?
16 A. I believe this exhibit came from
17 Mr. Lockhart, a photocopy of the brochure he
18 had from Fernstrum.
19 Q. And what does the cover page say
20 for the source of it?
21 A. It says it comes from R.W.
22 Fernstrum & Company, Menominee, Michigan.
23 Q. Can you describe what's in the
24 document?
25 A. Yes. This document is a document

1 requiring specialized knowledge and requiring
2 technical knowledge. I'm objecting on the
3 grounds you're asking about expert witness and
4 you're asking him questions that are -- the
5 foundation hasn't been laid.
6 Q. What kind of image do you think
7 that is?
8 MR. BERGSMAN: Objection.
9 Q. You can answer the question.
10 A. It's an image of a Fernstrum keel
11 cooler.
12 Q. What kind of an image?
13 MR. BERGSMAN: Objection. Asked
14 and answered.
15 MR. HOCHBERG: I never asked him
16 what kind of an image it was.
17 A. It looks like it could have been
18 drawn from a photograph that was laid out with
19 a black background. With the fine thread work
20 and so forth, I would say it's a photograph.
21 Q. I'm now taking serial 75/701,707,
22 Exhibit 2, I'd like to ask you to compare the
23 drawing from trademark application to the
24 subject of the present opposition with that
25 photograph.

1 because I've forgotten what the question was
2 myself.
3 During your work at DuraMax Marine,
4 were you familiar with Fernstrum's numbering
5 system for their models.
6 A. Yes, I was.
7 Q. Can you tell me what the model
8 number is for first for Exhibit 4?
9 A. That would be a D for the family,
10 it's two and a half --
11 MR. BERGSMAN: Objection. This is
12 asking for technical specialized information,
13 so this is expert testimony. I'm objecting to
14 the expert testimony.
15 MR. HOCHBERG: You're objecting to
16 the D so far?
17 MR. BERGSMAN: I'm objecting to
18 this entire line of questioning. You haven't
19 identified any expert witnesses and now you're
20 asking him to testify about technical or
21 specialized information. That is precluded
22 under the Federal Rules of Evidence 701.
23 MR. HOCHBERG: The notice of
24 testimony specifically refers to his
25 background, which he's already testified to at

1 information as evidence in its behalf.
2 I would site you to Presto Products
3 versus Nice-Pak Products, 9 USP Q2nd, at page
4 1896, note 5, TTAB case, 1988.
5 And I will also refer you to the
6 board's February 15th, 2003 order where the
7 board stated, quote, the parties are advised if
8 proper discoverable matter is withheld from the
9 requesting party the responding party will be
10 precluded from relying upon such information
11 and from adducing testimony with regard thereto
12 during its testimony, period, end quote.
13 Now, the failure to identify expert
14 witnesses makes this testimony unfairly
15 prejudicial, federal rule of evidence 403. If
16 this proffered testimony is supposed to be
17 essential to DuraMax, then that's at odds with
18 the fact that you filed the motion for summary
19 judgment and you didn't -- claiming there was a
20 genuine issue of material fact and then you
21 didn't even have a declaration from Mr. Brakey.
22 If on the other hand you're arguing
23 Mr. Brakey's testimony is essential, it
24 underscores how critical it is for DuraMax to
25 have timely supplemented its response and to

1 seems that you went out of your way to make our
2 lives difficult in going through this
3 opposition.
4 BY MR. HOCHBERG:
5 Q. In this exhibit are the pages that
6 were supplied to us by Fernstrum --
7 MR. BERGSMAN: Objection. This is
8 your testimony. You're not a witness.
9 MR. HOCHBERG: I'm identifying what
10 the exhibit is.
11 MR. BERGSMAN: You give the witness
12 the exhibit and have him identify it.
13 MR. HOCHBERG: Let me tell you
14 where my sentence was going before you object
15 so quickly. This has probably a hundred and
16 some odd pages. I don't know whether I should
17 make each one of them a separate exhibit or
18 whether I should make them -- make each one an
19 individual exhibit or the whole thing here one
20 exhibit number. It seems that's going to be
21 kind of unwieldy to make them -- give them each
22 separate exhibits, but I'll be happy to do it
23 if you want. These are documents you had
24 supplied to us.
25 MR. BERGSMAN: Again, objection.

1 question for you. Are you going to ask the
2 witness to testify about these documents?
3 MR. HOCHBERG: Yes, I am.
4 MR. BERGSMAN: Okay. Perhaps you
5 better mark each one of them individually.
6 - - - - -
7 (Thereupon, Brakey Deposition
8 Exhibit 5 was marked for purposes of
9 identification.)
10 - - - - -
11 Q. I'm going to give you Exhibit 5/A,
12 ask if you can identify that?
13 A. Yes, a keel cooler with a globe in
14 the background.
15 Q. That's a bad photocopy. Can you
16 identify 5/B?
17 A. I'm seeing a portion of a keel
18 cooler with a grid cooler through it, and then
19 the tail end of the keel cooler.
20 MR. BERGSMAN: I object to this
21 line of questioning. I don't believe the
22 proper foundation has been laid for the witness
23 to identify the exhibit.
24 Q. Mr. Brakey have you viewed these --
25 I'm going to give the exhibit to you right now,

1 do you do that in your regular line of work?
2 A. No.
3 Q. Did you ever do it in your regular
4 line of work?
5 A. Yes.
6 Q. When did you do it in your regular
7 line of work?
8 A. It would have been between 1977 and
9 probably 1999, 2000.
10 Q. So are you familiar with the type
11 of brochures or the type of literature you're
12 looking at right now?
13 A. Yes, I am.
14 Q. Why don't you continue going
15 through.
16 Can you state what kind of
17 documents these are you've just reviewed.
18 A. They're a wide range of documents.
19 Anything from advertising to some are related
20 to installation brochures discussing the merits
21 of the coolers, its advantages, and also things
22 related to troubleshooting should problems
23 arise.
24 Q. I'm going to give you Exhibit 5/C.
25 MR. BERGSMAN: May I have a

1 Q. Can you identify that?
2 A. Yes. This is an image of a
3 Fernstrum keel cooler and except for the
4 isometric now liens to the left as opposed to
5 the right, it would appear to be the same
6 image.
7 Q. Exhibit 5/E, I ask you to tell me
8 whether there are any images that relate to the
9 trademark under opposition?
10 A. I see one. There's several images
11 on here. The one that looks identical for as
12 good of copy as it is would be in the upper
13 left-hand corner.
14 Q. Can you tell me whether there is --
15 can you identify this document 5/F?
16 A. Could you explain what you mean by
17 identify this?
18 Q. Why don't you look the document
19 over carefully, let me know what you think the
20 source of the document was and what the
21 document shows.
22 MR. BERGSMAN: Objection. Compound
23 question.
24 Q. Okay. Tell me what the source of
25 the document is.

1 September 17, 1975.
2 Q. Does it have anything to do with
3 the trademark on that letter?
4 A. Yes. From what I can see, this one
5 here, it's a poor copy, but it looks like it's
6 identical to the trademark in the right-hand
7 corner. I don't see studs there, so --
8 Q. To the extent that you can, can you
9 identify this document, 5/H?
10 A. I see a page that has -- it appears
11 to be identical, two identical images of the
12 trademark.
13 Q. How does this compare to the
14 application, trademark application under
15 opposition?
16 A. The telltale sign of the bracket in
17 the middle, it's identical to trademark.
18 Q. Exhibit 5/I, can you identify --
19 A. Exhibit 5/I, I think shouldn't it
20 be multiple pages?
21 Q. Exhibit 5/I has two pages, Bates
22 0208 and 0209. Look at that carefully, tell me
23 what it is, what the date of it is?
24 A. Fernstrum flanges.
25 Q. My question was what is the

1 A. Okay. At that point in time it's
2 flange bulletin 460 from June 1974.
3 Q. Exhibit 5/J, can you identify that?
4 A. Yes. It's a decal from Fernstrum &
5 Company and it's got their well known keel
6 cooler plus the globe in the background. The
7 cooler in front of the globe, if it was by
8 itself, would have been identical to what's in
9 the trademark.
10 Q. Okay. Can you identify that?
11 MR. BERGSMAN: What are you
12 pointing to?
13 Q. Excuse me, Exhibit 5/K.
14 A. Yes. Again, it's something
15 Fernstrum is well known for, that is the keel
16 cooler, which though its darkened in is
17 identical to the trademark with the globe
18 behind it.
19 Q. Why did you say they were well
20 known for it?
21 A. When I first started working in the
22 marine field, we didn't deem Fernstrum our
23 competitor, it was Channel Steel. We were just
24 familiar with the globe and the cooler over
25 time. I don't remember how far back I remember

1 precisely so it wouldn't be like any other
2 document?
3 A. Yes. This grid cooler installation
4 instruction brochure is installation bulletin
5 120.
6 Q. Is there a date on that?
7 A. If there is, it will be at the end.
8 This comes from the 70s, but I don't see any
9 date on it.
10 Q. Okay. Can you look through that
11 document and see if there's anything that looks
12 like the trademark under opposition?
13 A. The only place within this document
14 where you have a good perspective and image of
15 coolers that have not been recessed or
16 obstructed in some way would be on the first
17 page where encapsulated to the upper left-hand
18 corner it shows the Fernstrum trademark. They
19 show an image of the cooler that's identical to
20 the trademark.
21 Q. I'll give you 5/M. Could you look
22 that over carefully, identify the document if
23 you can?
24 A. This is an application document,
25 but if there was a date and time it's been

(Discussion off record.)

MR. HOCHBERG: Let's break and we'll come back here at 1:30.

(Lunch recess taken at 12:40 p.m.)

- - - - -

1 the public. If I recall correctly, often times
2 it was just a single page general literature.
3 Q. Have you seen that document in the
4 past?
5 A. Yeah.
6 Q. Is it anything relating to
7 trademark picture, the trademark in the
8 opposition shown on that sheet?
9 A. Yes, towards lower center of the
10 page there's the emblem I've commented before
11 that shows the globe with the Fernstrum keel
12 cooler on top it. The cooler is one that looks
13 to me identical to the image seen in the
14 trademark.
15 Q. Can you identify 5/P?
16 A. Yes, installation application form
17 140. This one is slightly different from the
18 others, installation application, because this
19 has parts of it that describe shrouds,
20 protective shrouds that will go around the heat
21 exchangers, but on the upper front page
22 right-hand side. There's the image again that
23 I see of the Fernstrum keel cooler that's
24 identical to the one in the trademark.
25 Q. Have you seen this document in the

1 more comprehensive installation and maintenance
2 form, and on the first page it shows the globe
3 of the earth with the Fernstrum cooler in the
4 forefront, sharp image there, and that looks to
5 be identical to what was seen in the trademark
6 in the key characteristics and if I look at the
7 last page, it's just a slightly smaller image
8 of the same that was seen on the front. It's
9 got the globe and the ten tube keel cooler.
10 Q. Have you seen this document in the
11 past?
12 A. Yes, I have.
13 Q. When would you have seen it in the
14 past?
15 A. This would have probably been in
16 the mid 80s. I would be guessing on that.
17 They had slowly made some changes over time.
18 Every couple of years they make some minor
19 modifications to it, as I recall correctly. As
20 I said, this one seems to be a combination of
21 some of the earlier tubes what I call kaizan,
22 Japanese term.
23 Q. How do you spell kaizan?
24 A. I can't spell worth beans.
25 Q. This is Exhibit 5/R. Can you

1 I'm thinking of the original.
2 Q. You said blue oceans?
3 A. This globe, if I recall from what
4 I've seen in the past, in color it was a pretty
5 nice picture.
6 Q. When you say nice, are you
7 referring to the --
8 A. The keel cooler itself. It's quite
9 sharp here. You can see a lot of specific
10 features of it. It's a ten tube.
11 As I look through it, we see that
12 same cooler image now in the same -- close to
13 the same angle as seen in the trademark on, I
14 don't know what page that is --.
15 Q. Refer to the Bates number?
16 A. Bates number 0258. That's an
17 excellent likeness, very close to what's on the
18 trademark. And if I look at page -- yeah,
19 there it is. Page 0260, again, you'll see the
20 image that's shown in the trademark on another
21 page here.
22 Q. What page are you looking at right
23 now?
24 A. I believe it's 0260.
25 Q. And you say -- what kind of an

1 headers as well as the tubes as opposed to the
2 earlier application that just focused on the
3 grid-like tubes themselves.
4 Q. I want the record to be clear
5 because this is just a testimony record. I'm
6 going to give you Exhibit 27 and Exhibit 3, ask
7 you to identify which document you're referring
8 to.
9 A. Okay.
10 Q. This is Exhibit 3. This I'm
11 handing you right now is Exhibit 2. I'm just
12 asking which document you're referring to.
13 A. I was referring to this is Exhibit
14 2 here, you're stating? This is Exhibit 2.
15 This is the one that I'm mentioning.
16 Q. Why don't you read the serial
17 number of Exhibit 2.
18 A. 75/701,707.
19 Q. I don't know if I asked you, have
20 you seen Exhibit 5/R?
21 A. Yes, I have.
22 Q. I'm now going to give you Exhibit
23 5/S, ask first if you would identify that
24 document?
25 A. This is a Fernstrum grid cooler

1 Fernstrum keel cooler in the same angle as what
2 was seen on trademark in Exhibit 2, though this
3 isn't a very good copy, so I can't tell for
4 sure if that center plate is in there. If it
5 is, it would probably be identical.
6 If we look at the ensuing page,
7 0266, it looks the same except from a different
8 angle turned about 90 degrees, but it's a poor
9 copy here. So it's hard to get specific on
10 that. And the box cooler is something that's
11 not related to the trademark seen in Exhibit 2.
12 MR. BERGSMAN: What you're holding
13 in your hand is the last page of S.
14 MR. HOCHBERG: As Mr. Bergsman
15 pointed out, I made a mistake and did not give
16 you the last page of Exhibit 5/S. I'll just
17 ask if you can identify that and also see if
18 you can recognize the date on that.
19 A. It's cut off. This could be 1994
20 or could be 1984.
21 Q. Have you seen that -- Exhibit 5/S
22 before?
23 A. I've seen these images before. And
24 like many of these at this time period, they
25 have the globe on the end, which was also seen

1 before and this is a document that was supplied
2 to us by Fernstrum and I'm asking him to the
3 extent that he can, if he can identify the
4 document.
5 MR. BERGSMAN: That's fine. I'm
6 objecting on the grounds there's -- the witness
7 is not testifying from his own personal
8 knowledge and that there's no foundation that's
9 been laid that he knows what this document is.
10 BY MR. HOCHBERG:
11 Q. Have you seen documents like this
12 in the past?
13 A. Yes, I have.
14 Q. During what period of time would
15 you have seen them?
16 A. I was looking closely at documents
17 between 1977 and 2000 on a regular basis. It's
18 just I don't necessarily recall every document,
19 just bits and pieces, because some of them are
20 comprised of different images from one piece of
21 literature to the next. I recognize the keel
22 cooler on it and two of the vessels. But
23 again, one of my problems is the copy is so
24 poor, it's hard to be certain.
25 Q. I'll give you Exhibit 5/U. If you

1 Q. How about the one below it?
2 A. One of these I've seen multiple
3 times. The one to the far left, I can't
4 recognize it. Part of it, again, is due to the
5 quality of the photocopy. But on each one
6 they've done an excellent job of displaying the
7 heat exchanger, the keel cooler. Fernstrum,
8 again, with a single bracket.
9 Q. This is Exhibit 5/W. Can you
10 identify what is on that document?
11 A. National Fisherman and let's see if
12 there's a date on this. I do not see a date on
13 this.
14 Q. Are you familiar with the upper
15 image on Exhibit 5/W?
16 A. Yes. It was a good advertisement.
17 Q. When did you see that image?
18 A. I've seen it multiple times over
19 time. I can't be specific when or where.
20 Q. Well, on this exhibit, upper
21 portion of it, you said it stated National
22 Fisherman?
23 A. Newspaper.
24 Q. Are there other terms in that
25 portion of the document, of Exhibit 5/W?

1 Q. What portion of Exhibit 5/W is the
2 Workboat magazine?
3 A. Workboat magazine, this is located
4 in the lower corner. As I'm seeing from this,
5 it's probably indicating the display size will
6 be 4 and nine-sixteenths width by two and
7 five-sixteenths by height.
8 Q. Have you seen that image before?
9 A. I have not seen this setup, no.
10 Q. I'm talking about the words
11 National Fisherman or Workboat. I'm talking
12 about what's in the frame, have you seen those
13 before?
14 A. I've seen the dice and a cooler
15 presented in such literature. So yes.
16 Q. Can you identify what's shown on
17 Exhibit 5/X?
18 A. This is Workboat, March, April
19 publication, and showing advertisements from
20 Fernstrum. In it we see again the popular
21 image of the Fernstrum keel cooler, the one
22 single bracket, in both cases at an angle about
23 90 degrees reverse of what was seen in
24 trademark Exhibit 2.
25 As we've seen before, there's the

1 A. I'm not familiar with this one.
2 Q. I give you 5/Z. Can you identify
3 what's on this exhibit?
4 A. I have seen a lot of images and
5 brochures and advertising like this, but
6 specifically due to the quality of this, I
7 could see the Fernstrum keel cooler, that is
8 still sharp enough to see. That's a ten tube
9 system. But it's hard for me to see anything
10 other than -- there's that paddle boat again.
11 A lot of them are just kind of a play on
12 pictures being moved around.
13 Q. My question was have you seen the
14 content within the outer frame of Exhibit 5/Z
15 in the past?
16 A. This one, I would say if I had in
17 the past it had been fleeting because it's also
18 talking about its 5000 series aluminum
19 rectangular tubing. It's just except for
20 seeing the keel cooler image, the quality of
21 the photocopies are such that I'm just familiar
22 with the advertisements and the terminology
23 used in there, but it's really hard, except for
24 the paddle boat, to get a handle on what the
25 actual images are.

1 long time ago on tendering.
2 Q. 5/AA, I ask if you can identify
3 that document?
4 A. Same concept, Why gamble with
5 dependability, Passenger Vessel News magazine.
6 This display was 7 inches wide by four and
7 five-eighths inches high.
8 Q. Have you seen that image within
9 that frame in the past?
10 A. This one I have not seen in the
11 past.
12 Q. If you look at that carefully, see
13 if you can identify that?
14 A. This is from National Fisherman.
15 The vessel is the Sea Capture. Though I'm
16 familiar with National Fisherman, I believe
17 some publications I've done in the past on keel
18 coolers was in that.
19 Q. You have to look carefully because
20 it's not a very good image. Is there a picture
21 of the --
22 A. There's a picture in there, but
23 unfortunately the quality of the image is so
24 poor it looks like grooves of tubes, but it's a
25 really poor image, so I'm afraid I can't speak

1 Otherwise, it's an excellent replica of it.
2 Q. This now is Exhibit 5/AE. Why
3 don't you take a careful look at this, because
4 it's a fairly long document. Bates numbers
5 0283 through 0344. Can you identify that?
6 A. I recognize specific images in it.
7 I recognize the title of it. I know bits and
8 pieces in it, but until today I've not seen
9 this document before.
10 Q. What kind of a document is it?
11 A. It's a general brochure document, I
12 think one that was done pretty well, giving
13 history, sales. Quite a bit of this I've not
14 seen before.
15 Q. Look at the document carefully.
16 A. Okay. With respect to the keel
17 coolers and so forth --.
18 Q. My question is asking you to
19 identify what the document is.
20 MR. BERGSMAN: Objection. The
21 witness has answered your question. He's
22 identified it to the best of his ability. You
23 didn't like the answer, now you're asking him
24 more questions.
25 MR. HOCHBERG: I think the real

1 website.
2 Q. Have you looked at the website in
3 the past?
4 A. Not in recent years. In fact, I
5 don't know, I do not think I have looked at the
6 Fernstrum website. If I have, I don't recall
7 it.
8 Q. Maybe the best thing to do is to
9 show you the website. If you see the original,
10 you can tell us whether you've seen it or not.
11 MR. BERGSMAN: Objection. The
12 witness has testified --
13 MR. HOCHBERG: The witness has
14 testified he can't remember whether he saw it
15 or not. I'm suggesting or then maybe if he saw
16 the -- saw it on the website it would refresh
17 his memory as to whether he's seen it or not.
18 The document that we have is a rather faded
19 image. In fact, it was not apparent to him it
20 was a website until he looked at it very
21 carefully.
22 MR. BERGSMAN: Actually, the
23 testimony will show that the witness thought
24 that this was a brochure and that he didn't
25 identify it as a website until you continually

1 A. Alaska Fisherman's newspaper which
2 shows the Fernstrum keel cooler, the same one
3 that's seen in the trademark. Again, quality
4 of image is such that I couldn't say if --
5 except for the fact that I've seen a lot of
6 advertisements with boats on them, I have not
7 followed or examined Alaska Fisherman's
8 newspaper so I would not have seen this before.
9 Q. You never looked at Alaska
10 Fisherman?
11 A. Correct.
12 Q. Have you seen that image before, if
13 you can remember?
14 A. I've seen the keel coolers multiple
15 times. I've seen vessels going through water,
16 but this specific advertisement and a lot of
17 them look familiar. Without a name or a good
18 copy of the image, I can't be certain.
19 Q. I'll give you Exhibit 5/G. I'll
20 give you Exhibit 5/AG. I'll ask first if you
21 can identify this document?
22 A. From Pacific Fishing magazine, from
23 5-91. Again, showing the Fernstrum keel cooler
24 with the 90 degree different angle. Here the
25 vessels are quite familiar, but again, they

1 Fernstrum container or box. I'm only
2 speculating. The key thing is this literature
3 is from Fernstrum and it again shows the ten
4 tube, make certain of that. The strap has nine
5 dimples on it. It is the Fernstrum keel cooler
6 in both cases. These may be two different
7 items altogether, by the way, on one page.
8 Q. Let's look at the upper item first.
9 I may have missed what you just testified to.
10 How would you describe the upper image on the
11 Exhibit 5/A?
12 A. It's almost like a little card.
13 It's displaying the Fernstrum cooler that.
14 Q. Why do you think it's a card?
15 A. I seem to recall there were some
16 times in the past where they might have a
17 little piece of paper or something that could
18 have been submitted into the packaging or
19 whatnot. It just is another reminder of what
20 the product is, who it's from.
21 Q. How about the lower part of Exhibit
22 5/AH?
23 A. Can't tell for certain. It's just,
24 again, literature. To me it looks like we have
25 two different items photocopied on one page.

1 the things I've seen would have been over the
2 time period, okay, when -- I'd say going
3 through a tremendous amount of information in
4 literature, especially around 1998, 1999,
5 hundreds of documents and pieces of information
6 as I worked on behalf of East Park Radiator and
7 on behalf of DuraMax Marine.
8 Q. I'll show you Exhibit 5/AI. Would
9 you describe what this document shows?
10 A. Maritime Directory magazine showing
11 Fernstrum keel cooler and seems to be a ten
12 tube system again.
13 Q. Have you seen what's shown in
14 Exhibit 5/AI in the past?
15 A. Only in passing probably looking
16 through a lot of literature. I do not directly
17 remember seeing this in Maritime Directory
18 magazine.
19 Q. Have you read Maritime Directory
20 magazine in the past?
21 A. Looked at a lot of magazines. I
22 can't specifically recall Maritime.
23 Q. This is 5/AJ. Can you review that
24 document?
25 A. Yes. Again, it appears to be an

1 small advertisement for a Fernstrum keel
2 cooler.
3 Q. Does it show the trademark -- image
4 in the --
5 A. Shows an image in the same profile
6 as what's seen in Exhibit 2 -- I see the
7 bracket in the middle, but it's really a
8 bleached out copy.
9 Q. You said PSGA. Do you know what
10 that means?
11 A. No, I'm not familiar with that. I
12 don't think it's -- at first I was thinking
13 golf, but you won't find keel coolers on the
14 golf course.
15 Q. Have you sign that advertisement
16 previously?
17 A. I've seen terminology like this
18 before, but if this is associated with PSGA, I
19 could probably say I haven't seen this before.
20 Q. Then my question was not whether
21 you saw it in PSGA, my question was have you
22 ever seen the advertisement before?
23 A. I've seen this format and setup
24 before, yes. Although I will say that it's a
25 much better quality, what I see out there in

1 only be speculating where it was.
2 Q. I understand. I'm not asking you
3 where it was, I'm just asking what it is.
4 A. It is an advertisement --
5 Q. How about --
6 A. -- for the Fernstrum keel cooler.
7 Like many of the others, it's an advertisement
8 of keel coolers, most dependable fresh water
9 available.
10 Q. Have you seen either or both of
11 these ads previously?
12 A. I have seen these advertisements in
13 the past for both fresh water and saltwater.
14 Q. This is Exhibit 5/AN. Can you
15 identify what's on that Exhibit 5/AN?
16 A. Okay. There's actually appears to
17 be two advertisements here. One is an
18 advertisement from an Alaska Fisherman's
19 Journal newspapers, and it shows a Fernstrum
20 keel cooler, again, single bracket. Its angle
21 is about 90 degrees off from Exhibit 2. It's
22 advertising several vessels there, Miss Melody,
23 Sharon Ann, and the Evanick, E N A N I C K,
24 literature advertising those vessels that have
25 this kind of product on the vessel.

1 advertisement. It's poor quality, but again,
2 it looks to be identical to what is seen in
3 Exhibit 2 of the trademark.
4 This is an advertisement, again,
5 showing how the grid cooler as it states here
6 is the simplest and most dependable form of
7 fresh water available by Fernstrum.
8 Q. I'm going to show you Exhibit 5/AO.
9 Can you identify what's on Exhibit 5/AO?
10 A. Appears we have either one or two
11 advertisements, again, from Fernstrum grid
12 cooler similar to other advertisements. The
13 image in the upper section shows the Fernstrum.
14 It appears to be the ten tube cooler. Almost
15 the identical arrangement as seen in the
16 trademark on Exhibit 2.
17 And if I look at the bottom, this
18 appears to be another advertisement. The
19 Fernstrum grid cooler is the simplest and most
20 dependable form of fresh water cooling
21 available, a similar advertisement or
22 information. And this is a better rendition of
23 the keel cooler. It's about twice as large as
24 the one seen in the upper image. And as I look
25 at this, yes, this one is a good rendition,

1 A. Just on the surface of the tubes at
2 top.
3 Q. What is that shading for?
4 A. It would almost appear that in the
5 original copies this could have been a
6 photograph or a picture, and it's just --
7 MR. BERGSMAN: Objection. The
8 witness is not testifying from personal
9 knowledge. He's sitting here just speculating.
10 He's spitballing. So there is simply just he's
11 not testifying from firsthand knowledge. This
12 is objectionable testimony.
13 As a matter of fact, I'm objecting
14 to the whole line of testimony as a waste of
15 time and needless presentation of cumulative
16 evidence. You're not asking the witness any
17 questions. All he's doing is just looking at
18 documents and telling you what he sees. You
19 don't need to have a witness do that.
20 MR. HOCHBERG: You have objected
21 before to the fact that these things are not
22 authenticated. The witness has spent years in
23 this business. He's looked at these
24 advertisements for years. He's testifying that
25 he's familiar with these documents.

1 A. I see shading that if a number of
2 photocopies were made it would be in the same
3 pattern as what we saw on 5/AO. I see the
4 shading on the front of the header, I see the
5 black rubber gasket and as I look --
6 MR. BERGSMAN: Objection. You
7 don't know that's a rubber gasket. If you do,
8 then you're testifying expert testimony.
9 A. Okay. And I see the sweep of
10 shading in the same locations at the top of the
11 tubes before the bracket and I see similar
12 shadings after the bracket and the same
13 locations as seen between Exhibit 4 and Exhibit
14 5/AO.
15 Q. What is that shading?
16 A. That shading would be coming from
17 light on a photograph.
18 MR. BERGSMAN: Objection. There's
19 just no way that the witness has that kind of
20 knowledge. So he's not testifying from
21 personal knowledge. Again, let me reiterate, I
22 object to this whole line of questioning as a
23 waste of time and needless presentation of
24 cumulative evidence.
25 Q. I'm going to give you 5/AP. Look

1 (Recess had.)
2 - - - - -
3 (Thereupon, Brakey Deposition
4 Exhibit 6 was marked for purposes of
5 identification.)
6 - - - - -
7 BY MR. HOCHBERG:
8 Q. I'm going to give you Exhibit 6.
9 First, I'm going to ask you to look it over,
10 ask you to describe what it is.
11 A. Exhibit 6 is associated with United
12 States patent office. It's the patent related
13 to the Fernstrum keel cooler from August 14,
14 1945.
15 Q. Can you identify the patent number?
16 A. It's patent number 2382218.
17 Q. Are you familiar with this patent?
18 A. Yes, I've seen it many times.
19 Q. Have you read the patent?
20 A. In the past, yes, I have.
21 Q. How does that patent relate to --
22 let me rephrase the question?
23 What does that patent disclose,
24 just in brief terms?
25 MR. BERGSMAN: Objection. Now

1 Q. Okay.
2 MR. BERGSMAN: Objection. I don't
3 believe that the witness is testifying from his
4 personal knowledge. It appears that he's just
5 reading the patent.
6 Q. Are you familiar with that patent?
7 A. This one escapes my memory.
8 - - - - -
9 (Thereupon, Brakey Deposition
10 Exhibit 8 was marked for purposes of
11 identification.)
12 - - - - -
13 BY MR. HOCHBERG:
14 Q. I'm going to try to refresh your
15 memory. Can you identify Exhibit 8?
16 A. United States patent number
17 6,575,227 B1. June 10th, 2003.
18 Q. Who are the inventors on the
19 patent?
20 A. This would be Jeff Leeson, Eric
21 Peoples and Michael W. Brakey.
22 Q. Who is?
23 A. Myself.
24 Q. If you look at the cover page, you
25 will see in the upper left-hand corner, the

1 appearance what the figure is on the cover page
2 of Exhibit 7 with the trademark of Exhibit 2?
3 A. Okay.
4 Q. Let me show you Exhibit 2.
5 A. All right, sir.
6 Q. Specifically, I'm going to get page
7 0069.
8 A. Okay.
9 Q. Now --
10 A. These are almost identical in every
11 way except for the fact that this shows an
12 intermediate strut which --
13 Q. When you say this?
14 A. This bracket seen in the center.
15 Q. Of which exhibit?
16 A. What exhibit was this one? Exhibit
17 7. With the exception of that, and the fact
18 the patent is much more defined in the way of
19 lines on the nipples and so forth, they're both
20 square headers, rectangular tubes and parallel
21 with an intermediate support bracket in the
22 center.
23 Q. You have been involved with other
24 litigation involving R.W. Fernstrum & Company,
25 is that correct?

1 was attempting to get a trademark on a surface
2 of the Fernstrum tubes referenced that first,
3 was it Exhibit 3?
4 Q. Let me show you Exhibit 3. Let me
5 give you Exhibit 3. You can identify.
6 A. All right.
7 MR. BERGSMAN: Objection. This
8 testimony has nothing to do with this case at
9 hand. Therefore, it is a needless waste of
10 time. We're not seeking to register this
11 trademark for a product configuration. We're
12 seeking to register a two dimensional design
13 for a service. So all this testimony about
14 what went on in the litigation is irrelevant,
15 immaterial and a needless waste of time.
16 MR. HOCHBERG: You do not know
17 where the questions are going, so I suspect I
18 intend that your objection is premature at
19 least.
20 Q. Why don't you continue your
21 testimony.
22 A. All right. In this case a
23 marketing study was done --
24 Q. No, you're jumping ahead now. The
25 question I asked you was how you were involved

1 Exhibit 3 up so he can be sure he's talking
2 about the right exhibit. That's the only
3 reason I brought it up. I'm not asking him to
4 testify about Exhibit 3.
5 BY MR. HOCHBERG:
6 Q. I'm putting in front of you the
7 trademark application just so you'll be aware
8 what you're talking about, what you're
9 testifying about. Now, was there litigation
10 that was involved in this testimony that you're
11 giving now?
12 A. Yes.
13 Q. Where was this litigation?
14 A. It was down in New Orleans, before
15 Judge Lemmon.
16 Q. And can you very, very quickly
17 summarize what happened in that litigation,
18 just briefly, because I'm not really asking you
19 about the litigation.
20 A. For registration it was important
21 to show that the surface in question performed
22 no function, no service with respect to the
23 product.
24 Q. Which service are you talking
25 about?

1 irrelevant, immaterial and a needless and total
2 waste of time.
3 MR. HOCHBERG: Okay. Again, you're
4 making your objection before you know where my
5 questions are heading. The question I asked
6 him was just to briefly summarize what his --.
7 MR. BERGSMAN: That testimony is
8 objectionable.
9 MR. HOCHBERG: I didn't finish my
10 statement. He was just explaining his presence
11 at the litigation and if he can continue it,
12 it's going to be very short. My real question
13 is going to follow.
14 MR. BERGSMAN: Then ask your real
15 question.
16 MR. HOCHBERG: I still think the
17 record would be better if he explains quickly
18 why he was there.
19 MR. BERGSMAN: He explained. He
20 was an expert witness.
21 MR. HOCHBERG: He did not answer my
22 question fully. I'm going to continue to ask
23 you to explain what your role was at the
24 litigation in New Orleans.
25 BY MR. HOCHBERG:

1 personal knowledge. He doesn't know what was
2 the basis or speculation or foundation for
3 either East Park Radiator or for Fernstrum in
4 filing their suits.
5 MR. HOCHBERG: That was not my
6 question.
7 BY MR. HOCHBERG:
8 Q. My question was just as an observer
9 of that trial, what happened during the trial?
10 Can you tell me what happened in the hearing
11 that you attended?
12 A. I believe so.
13 MR. BERGSMAN: Can we have a
14 continuing objection?
15 MR. HOCHBERG: You can continue the
16 objection. The witness hasn't answered yet.
17 MR. BERGSMAN: I object to the
18 question. The question is improper. It's
19 eliciting improper testimony. I want a
20 continuing objection so we can move on. Do I
21 have a continuing objection?
22 MR. HOCHBERG: You can keep
23 objecting as long as you want.
24 MR. BERGSMAN: Okay.
25 A. The key element was for the upper

1 MR. BERGSMAN: Yes, he's rendering
2 legal opinion. It's expert testimony. It's a
3 legal opinion. He hasn't been qualified as an
4 expert in the law and this is, therefore,
5 expert opinion and it is objectionable because
6 it is giving technical evidence. He's giving
7 specialized testimony.
8 MR. HOCHBERG: That is incorrect
9 because all he testified to was that the judge,
10 it was in open court, judge said that the two
11 parties should try to settle the case.
12 MR. BERGSMAN: Are you testifying
13 now, counselor?
14 MR. HOCHBERG: No. You said that
15 we're trying to get all this other testimony
16 into this case, and all I'm saying is that he
17 is testifying so far that he heard in open
18 court Judge Lemmon said they should try to
19 settle the case.
20 MR. BERGSMAN: That's not what he
21 testified to. That's what you're testifying
22 to.
23 MR. HOCHBERG: Can you read back if
24 possible what Mr. Brakey's last testimony was?
25 (Record read.)

1 the three dimensional keel cooler. You seem to
2 think I am, but that's not where I'm heading.
3 MR. BERGSMAN: I don't care where
4 you're heading. Each question has to be
5 proper. Each one of your questions is
6 objectionable.
7 - - - - -
8 (Thereupon, Brakey Deposition
9 Exhibit 9 was marked for purposes of
10 identification.)
11 - - - - -
12 BY MR. HOCHBERG:
13 Q. I'm going to show you Exhibit 9.
14 I'll ask if you can look at this document, tell
15 me first whether you've seen it before?
16 A. Yes, I have.
17 Q. I'm going to turn to page -- the
18 last page of Exhibit 4 and ask you how is it
19 marked?
20 A. It's marked as confidential by Mike
21 Brakey on May 5th, 1999. It simply says,
22 illustration of proposed header chamfer,
23 configuration for two and a half inch tall
24 rectangular tube.
25 Q. Did you make the drawing that's

1 there's actually a couple of dates on it. We
2 have July 16th, 99, James A. Dicks signed off
3 on it, Paul Fernstrum signed off on it and Paul
4 Miller, Jr., president of DuraMax, signed off
5 on it July 29th, 1999.
6 Q. Will you look at the last page of
7 that document?
8 A. Yes.
9 Q. Can you identify that page?
10 A. Yes. That is again the
11 illustration of a proposed header chamfer
12 configuration that I designed on May 5th, 1999.
13 Q. I'm going to give you back Exhibit
14 9, ask you to compare the last two pages of
15 Exhibit 9 and Exhibit 10.
16 A. We have identical copies of my
17 work.
18 Q. Just to be complete with this, can
19 you tell me the date on Exhibit 9 and the civil
20 action number that appears on that document?
21 A. The date is May 11th, 1999. And
22 the civil action number is 97-3598 C4/W,
23 97-3974.
24 Q. Can you tell me who put the date on
25 there?

1 that earlier drawing or exhibit. We had done
2 an extended amount of research over time
3 through flow simulations and then by putting in
4 a research facility to where we could compare
5 different coolers of many models under
6 identical parameters. And based on that, we
7 reviewed pressure drops, heat transfer, flow
8 characteristics and the results indicated there
9 were many benefits --
10 MR. BERGSMAN: Objection. He's now
11 talking again about doing testing and we
12 specifically asked for documents about testing
13 and none were produced. So this is getting
14 into, one, he can't testify about evidence that
15 hasn't been produced; second, it's getting into
16 expert testimony because he's talking about
17 tests that he ran, scientific and technical
18 tests. I'm objecting to this testimony on the
19 ground that it is expert testimony and that we
20 asked for documents regarding competitive
21 research and investigations and you
22 indicated -- that would be document request
23 number 35 and your response to that was that
24 none exist.
25 MR. HOCHBERG: Your objection is

1 determine the results of best by test.
2 Q. During your testimony were you
3 cross-examined?
4 A. Yes, I was.
5 Q. Do you remember who the judge was
6 at the hearing?
7 A. I've seen his name in the past, but
8 no, I can't recall at this time.
9 Q. What happened at the conclusion of
10 your testimony? Let me be more specific. What
11 did the judge do at the conclusion of your
12 testimony?
13 A. He found in favor of DuraMax
14 Marine.
15 Q. How do you know that?
16 A. Two things. One was he read his
17 comments at the end of the case, and two, I've
18 seen the written document by the judge.
19 MR. HOCHBERG: I'd like to ask you
20 to mark this as Exhibit 11.
21 - - - - -
22 (Thereupon, Brakey Deposition
23 Exhibit 11 was marked for purposes
24 of identification.)
25 - - - - -

1 that document request number 35 of competitive
2 research and none of that was -- no test
3 results were produced and that's the basis of
4 this decision.
5 So I object to the admissibility of
6 this document.
7 MR. HOCHBERG: You just referred to
8 something 35.
9 MR. BERGSMAN: Document request
10 number --
11 MR. HOCHBERG: Is that in the
12 present opposition or earlier litigation?
13 MR. BERGSMAN: In this opposition.
14 MR. HOCHBERG: Why do you think
15 that Mr. Brakey is going to be testifying about
16 tests?
17 MR. BERGSMAN: I'm not objecting to
18 his testimony at this point because he hasn't
19 testified. I'm objecting to this document
20 because the document -- it documents the first
21 tests that have been run and refers to
22 testimony by Mr. Brakey that he testified to at
23 the hearing.
24 A. Okay. I've scanned over it.
25 Q. Are there differences between what

1 of identification.)
2 - - - - -
3 BY MR. HOCHBERG:
4 Q. I'm going to show you Exhibit 12,
5 ask you if you can identify that?
6 A. Yes, I can.
7 Q. What is that?
8 A. That would be either a Dura cooler
9 or an East Park Radiator system because this
10 has a beveled header on it.
11 Q. Just by looking -- let me go back.
12 Is that an accurate depiction of those two keel
13 coolers you just mentioned?
14 A. With respect to the bevel for a
15 DuraMax cooler, yes. I have not seen any East
16 Park Radiator coolers recently to know if their
17 angle is the same, but they do have a bevel on
18 it.
19 Q. Just by looking at this, can you
20 give me just an approximation of the portion of
21 what you're looking at, which is beveled? In
22 other words, what portion of the surface area
23 is beveled compared to the entire visible
24 surface area of Exhibit 11?
25 A. Okay. This is an isometric. It

1 distinguish a Dura cooler from a Fernstrum in
2 this image, and that would be on this
3 particular design here you can see the curved
4 header.
5 Q. Where is the design on Exhibit 13?
6 A. I'm not sure I follow you.
7 Q. Where on Exhibit 13 -- there's
8 different images on that --
9 A. That would be on the image seen on
10 the left-hand column within the print. As you
11 look at other images on here, it would be
12 extremely difficult to tell from any of the
13 other images.
14 Q. My question really went to the
15 image you just testified about.
16 A. All right.
17 Q. So just to repeat, where on Exhibit
18 11, don't mark it, where is it?
19 A. If you look --
20 Q. Let me finish my question. Where
21 is it on Exhibit 13? Where is it located on
22 Exhibit 13?
23 A. The bevel is located on the front
24 portion of the heat exchanger or keel cooler
25 side --

1 expert, I wouldn't be paying attention to that
2 as much as the tubes since that's pretty much
3 the focus of a keel cooler. Long rectangular
4 tubes and parallel.
5 (Record read.)
6 MR. BERGSMAN: Objection. I do
7 have to object to that question because he's
8 not testifying from personal experience.
9 MR. HOCHBERG: He testified that he
10 regularly reviewed Workboat magazine --
11 MR. BERGSMAN: You didn't ask him
12 what his opinion was. You asked him about the
13 opinions of others. So that's objectionable.
14 There's no foundation for him to have knowledge
15 about the testimony of other people.
16 MR. HOCHBERG: That wasn't my
17 question. Can you read my question back?
18 (Record read.)
19 BY MR. HOCHBERG:
20 Q. Let me ask the question a little
21 differently. If you were reading Workboat
22 magazine as you had in the past, would the
23 presence of a bevel on Exhibit 5/T be readily
24 apparent to you?
25 A. It would have to be an excellent

1 competition is doing.
2 Q. During that period of time, in
3 other words -- let me retract that question.
4 When did you start doing work on
5 one piece keel coolers.
6 A. I believe I started doing work on
7 one piece keel coolers back in 1995, 1996.
8 Q. So from 1975 until 1995, when you
9 reviewed the Workboat -- when you, I guess,
10 reviewed Workboat magazine, would you have
11 noticed a bevel on a keel cooler?
12 A. No.
13 - - - - -
14 (Thereupon, Brakey Deposition
15 Exhibit 14 was marked for purposes
16 of identification.)
17 - - - - -
18 BY MR. HOCHBERG:
19 Q. I'm going to give you Exhibit 14.
20 Can you review Exhibit 14?
21 A. Okay.
22 Q. Have you seen Exhibit 14
23 previously?
24 A. Yes, I have.
25 Q. Can you identify what Exhibit 14

1 Exhibit 15 --
2 A. Okay.
3 Q. -- I'll ask if you can review that?
4 A. All right.
5 Q. First, I'd like to ask whether you
6 have seen that document before?
7 A. Yes, I've seen this before.
8 Q. Can you identify it?
9 A. It's a Fernstrum grid cooler,
10 another advertisement from the International
11 Workboat Show. It's got a small advertisement
12 towards the base. It shows three keel coolers
13 on it.
14 Q. What's the date of that document?
15 A. This is December 2003.
16 Q. Now, if you look at the -- first of
17 all, do any of those keel coolers which are
18 shown there, are any of them similar or are
19 they -- any of them similar to the trademark
20 which is the subject of Exhibit 2?
21 A. They're all at least similar to a
22 certain degree in that the bulk of each cooler
23 has the rectangular tubes in parallel, but
24 there is one with the globe behind it with a
25 single brace that would be identical except for

1 grid cooler, in addition is showing six
2 different vessels here.
3 Q. Have you seen that advertisement
4 before?
5 A. I don't recognize some of these
6 vessels, so I would not have seen this specific
7 advertisement before.
8 Q. Is there an image of a keel cooler
9 shown in that exhibit?
10 A. Yes, there is.
11 Q. Now, if a bevel were to appear in
12 that image would it be apparent to you?
13 MR. BERGSMAN: Objection. It
14 assumes facts not in evidence.
15 Q. I asked whether if there was -- if
16 there was a bevel there, would you be able to
17 see it?
18 A. The image here is actually a little
19 confusing because with the globe behind it on
20 this particular picture, it almost appears to
21 give some curvature to the base of the header.
22 I almost have to take -- do a double-take to
23 make certain that is not a bevel. It's how the
24 eye plays with lines there. So the bottom
25 line, yes, it's very difficult to determine if

1 brochure because not only am I familiar with
2 this, but in some of my papers to East Park
3 Radiator, I extracted information from this
4 that described the greater performance of
5 rectangular tubes over cylindrical tubes.
6 Q. About what period of time would you
7 have seen this exhibit for the first time?
8 A. For the first time, this is, to my
9 knowledge, pretty old. It was when Fernstrum
10 was competing against Walters and DuraMax
11 Marine. I'm only guessing, but I think I would
12 have seen this in the 80s. Of course it was in
13 color.
14 MR. HOCHBERG: That's the end of
15 the deposition of Mr. Brakey. I mean it's the
16 end of my direct questions to him.
17 MR. BERGSMAN: Okay. I don't have
18 any questions.
19 THE NOTARY: You have the legal
20 right to read, examine and sign this deposition
21 if it is transcribed or you may waive that
22 right.
23 THE WITNESS: I would like to read
24 it.
25 (Deposition concluded at 4:57 p.m.)

I do further certify that I am not a relative, counsel or attorney for either party, or otherwise interested in the event of this action.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office at Cleveland, Ohio, on this 28th day of April, 2004.

Lorraine J. Klodnick

Lorraine J. Klodnick, Notary Public within and for the State of Ohio

My commission expires June 20, 2007.

1 SIGNATURE OF WITNESS

2

3

4

5

6 The deposition of MICHAEL W.

7 BRAKEY, taken in the matter, on the date, and

8 at the time and place set out on the title page

9 hereof.

10 It was requested that the

11 deposition be taken by the reporter and that

12 same be reduced to typewritten form.

13 It was agreed by and between

14 counsel and the parties that the Deponent will

15 read and sign the transcript of said

16 deposition.

17

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25

1 AFFIDAVIT

2 The State of Ohio,)

3) SS:

4 County of Cuyahoga)

5

6

7

8 Before me, a Notary Public in and for

9 said County and State, personally appeared

10 MICHAEL W. BRAKEY, who acknowledged that he/she

11 did read his/her transcript in the

12 above-captioned matter, listed any necessary

13 corrections on the accompanying errata sheet,

14 and did sign the foregoing sworn statement and

15 that the same is his/her free act and deed.

16 In the TESTIMONY WHEREOF, I have hereunto

17 affixed my name and official seal at this 23

18 day of May A.D 2004.

19

20

21

22 Notary Public

23

24

25 My Commission never Expires:

1 DEPOSITION ERRATA SHEET

2

3 RE: DURAMAX MARINE, LLC VS.

4 R.W. FERNSTRUM & COMPANY

5 RRS File No.: 9898

6 Deponent: MICHAEL W. BRAKEY

7 Deposition Date: APRIL 22, 2004

8

9 To the Reporter:

10 I have read the entire transcript of my

11 Deposition taken in the captioned matter or the

12 same has been read to me. I request that the

13 following changes be entered upon the record

14 for the reasons indicated. I have signed my

15 name to the Errata Sheet and the appropriate

16 Certificate and authorize you to attach both to

17 the original transcript.

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25

1 **DEPOSITION ERRATA SHEET**

2 **PAGE LINE**

3 Duramax NOT DuraMax (throughout testimony)

4 Carlon NOT Carlaw (Page 12 line 2)

5 Kaizen NOT kaizan (Page 87 line 23)

6 fendering NOT tendering (page 108 - Line 14)

7 Time NOT I'm (Page 130, Line 14)

8 Duracooler NOT Dura Cooler (throughout)

9 Marine NOT Marinas (Page 146 Line 6)

10 demountables NOT mountables (Page 156 Line 24)

11 * Got cut off before finishing comment here (Page 157 line 1)

12 competition is doing, namely channel steel,

13 Reinforces statement on Page 79 lines 21-25 on channel steel.

14 Pictorial NOT Pejorial Page 30 Lines 20, 25

15 leans NOT liens Page 75, Line 4

16 After document insert "Exhibit 5/G".

17 Flange Bulletin NOT flange bulletin Pg 79, Line 2

18 Installation Bulletin NOT installation bulletin Page 86 Line 4

19 Form 130 page 84, line 24

20 Form 140 page 86, Line 10

21 Catalog 1000 page 92 Line 1

22 Insert "not that" after "is" page 106 line 1

23 Change to Exhibit 5/AH page 111, line 11

24 Change "address" to "dress, page 136, Line 8

25 **SIGNATURE:** [signature] **DATE:** May 23, 2004

1 DEPOSITION ERRATA SHEET

2 PAGE LINE

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25 SIGNATURE: DATE:

Attorney Docket DX-3 (#90545)

CERTIFICATE OF MAILING

I hereby certify that this document is being deposited with the United States Postal Service as First Class mail in an envelope addressed: Commissioner for Trademarks, P.O. Box 1451, Alexandria, VA 22313-1451, on the date noted below:

Date: Nov. 15, 2004

Sean Mellino

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:

Application Serial No. 75/701,707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette at Page TM 400 on May 9, 2000

DURAMAX MARINE, LLC	)	
	)	
Opposer,	)	
	)	
v.	)	Opposition No. 119,899
	)	
R.W. FERNSTRUM & COMPANY,	)	
	)	
Applicant	)	

Commissioner for Trademarks
P.O. Box 1451
Alexandria, VA 22313-1451

OPPOSER'S NOTICE OF FILING THE TESTIMONY DEPOSITION OF RICHARD LOCKHART PURSUANT TO 37 C.F.R. § 2.125(c)

Opposer, Duramax Marine, LLC, by its attorneys, herewith files the certified transcript of the testimony deposition of Richard Lockhart taken in connection with this proceeding on April 23, 2004, along with Opposer's Exhibit Nos. 18 through 40, pursuant to Trademark Rule 2.123, 37 C.F.R. § 2.123. This transcript has been certified by the officer taking the deposition and it and the exhibits have been prepared for filing pursuant to Trademark Rule 2.123(f), 37 C.F.R. § 2.123(f).

Respectfully submitted,

Date: November 15, 2004

By: _____
D. Peter Hochberg
Counsel for Opposer
D. Peter Hochberg Co., L.P.A.
The Baker Building – 6th Floor
1940 East Sixth Street
Cleveland, Ohio 44114
(216) 771-3800

DPH/sm

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing "OPPOSER'S NOTICE OF FILING THE TESTIMONY DEPOSITION OF RICHARD LOCKHART PURSUANT TO 37 C.F.R. § 2.125(c)" was served via first class, postage prepaid, U.S. mail upon:

Samuel D. Littlepage, Esq.
Dickinson Wright PLLC
1901 "L" Street, N.W., Suite 800
Washington, D.C. 20036-3506

ATTORNEYS FOR APPLICANT

Date: November 15, 2004

By: _____
D. Peter Hochberg

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:
Application Serial No. 75/701/707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette
at Page TM 400 on May 9. 2000

DURAMAX MARINE, LLC,
Opposer,
vs.
R.W. FERNSTRUM & COMPANY,
Applicant.

Case No.
91119899

- - - - -

Deposition of RICHARD LOCKHART, called for examination under the Applicable Rules of Federal Civil Procedure, taken before me, Lorraine J. Klodnick, a Registered Professional Reporter and a Notary Public in and for the State of Ohio, pursuant to notice and stipulations of counsel, at the offices of D. Peter Hochberg Co., LPA, The Baker Building, 1940 East 6th Street, Cleveland, Ohio, on Friday, April 23, 2004, at 9:55 o'clock a.m.

- - - - -

1 RICHARD LOCKHART, of lawful age,
2 called for examination, as provided by the
3 Federal Rules of Civil Procedure, being by me
4 first duly sworn, as hereinafter certified,
5 deposed and said as follows:
6 EXAMINATION OF RICHARD LOCKHART
7 BY MR. HOCHBERG:
8 Q. Can you please give us your name
9 and address?
10 A. Richard Lockhart. Home address?
11 Q. Yeah.
12 A. 12470 Clay Street, Middlefield,
13 Ohio, 44062.
14 Q. Can you tell us your background
15 starting with high school and continuing?
16 A. Yeah. I graduated from Newbury
17 High School in 1969, then I went on to Kent
18 State University, graduated in 1973 with a
19 bachelor of business administration degree, BBA
20 degree. My first job was at Sajar Plastics,
21 which was an injection molding company, and I
22 worked in inventory control, purchasing.
23 Started there in 1974, left there in 1975,
24 joined Johnson Rubber Company in their marine
25 division. Then I've been there ever since

1 the marine division and in DuraMax Marine, LLC?
2 A. When I first started in my first
3 job with the marine division was an industrial
4 pump bearing side of things. We were just
5 starting into that business of supplying
6 cutlass bearings, which are water lubricated
7 bearings, into the industrial six.
8 Q. What was your function?
9 A. Inside sales predominantly.
10 Customer service, inside sales. Then from
11 there I went over into the marine side of
12 things. We had two divisions in the marine,
13 one industrial, one marine. On the marine side
14 you had your tendering products, your bearings,
15 coolers, stuffing boxes. I'd handle the east
16 coast when I got over there, inside sales,
17 customer service, traveling once in a while
18 with the reps. We had manufacturers reps that
19 covered specific territories. Then to the golf
20 coast, inland rivers.
21 Q. Can you explain what your function
22 was as you jumped --
23 A. Handle customer inquiries.
24 Q. Let me just interrupt for one
25 second. Everything that you testify to now is

1 boat afloat basically, so the propulsion line
2 products.
3 Q. When were you responsible for those
4 products?
5 A. Well, 1979 I supervised as
6 assistant sales manager the customer service
7 people for DuraMax Marine and outside
8 representatives.
9 Q. Do you still do that or did that
10 service terminate at some point?
11 A. I still do that, but I do more
12 government contract work now. I do more
13 traveling, outside sales work.
14 Q. Are you familiar with the keel
15 cooler which is sort of behind the present
16 trademark opposition?
17 A. Yes.
18 Q. How long have you been involved
19 with the keel cooler?
20 A. Which one? The one --
21 Q. Tell me which one are you --
22 A. The original keel cooler, the
23 demountable keel cooler, when I came to Johnson
24 rubber, we had a demountable keel cooler which
25 is a tube type cooler. Of course I was

1 MR. HOCHBERG: What I'm going to do
2 is mark as exhibits copies of all the
3 brochures. Then I'm going to have a set for
4 you.
5 MR. BERGSMAN: Can I see them?
6 MR. HOCHBERG: Sure.
7 MR. BERGSMAN: Can we go off the
8 record?
9 (Discussion off record.)
10 BY MR. HOCHBERG:
11 Q. Can you please take the brochure at
12 the top, periodical at the top of your stack,
13 can you identify that?
14 MR. BERGSMAN: Wait a second. Are
15 you going to hand me what you're showing him to
16 look at?
17 MR. HOCHBERG: Yeah. What I'm
18 going to do, I'm going to ask him to identify
19 the original and then I'm going to show the
20 copy. When I show him the copy I'll give it to
21 you.
22 MR. BERGSMAN: Okay.
23 MR. HOCHBERG: Is that all right?
24 MR. BERGSMAN: No. Actually, give
25 me the copy while you're asking him to identify

1 DuraMax's right to advertise and promote keel
2 cooler that does not include beveled. This
3 document was not produced. I have an objection
4 to introduce this into evidence at this time.
5 MR. HOCHBERG: I do not understand
6 your objection. You're objecting to an
7 advertisement or an article about Fernstrum
8 which you say gives DuraMax Marine the right to
9 make their unit?
10 MR. BERGSMAN: No. I'm objecting
11 because we asked for these types of documents
12 and it was never produced. I cite document
13 request number 9, document request number 10,
14 document request number 11, document request
15 number 13.
16 MR. HOCHBERG: I guess I'll take
17 that under advisement. I don't agree with that
18 at all. I'll also remind Mr. Bergsman that
19 when we requested documents there must be
20 thousands of documents that R. W. Fernstrum &
21 Company has and I think we may have gotten a
22 couple hundred, maybe 250. Of that 250 about
23 half of them were duplicates and so we got just
24 a very, very small percent. So if you're
25 objecting on these grounds, I think it is a

1 catalog or brochure.
2 Q. Can you just identify it,
3 differentiate it from other brochures?
4 A. Catalog 970.
5 MR. BERGSMAN: I'm going to object
6 to the introduction of this document into
7 evidence too because we had asked for this type
8 of documentation in our request for documents,
9 document request number 9, 10, 11, 12, 13, 16.
10 None of this was produced. I'm objecting to
11 its introduction and use at testimony.
12 MR. HOCHBERG: I will repeat my
13 previous. This is a document you already have,
14 Fernstrum catalog 970 grid cooler. We had
15 asked for documents from Fernstrum. Fernstrum
16 did not produce it. Mr. Lockhart was able to
17 find it in his records. That's why it's being
18 produced today.
19 BY MR. HOCHBERG:
20 Q. Can you compare Exhibit 19 to the
21 original document you're holding?
22 A. This is a copy of the original
23 document.
24 Q. When was the copy made?
25 A. Copy was made Tuesday, it was April

1 previous response to your objection in that
2 these are Fernstrum documents that we asked for
3 from Fernstrum. It was not produced. I'm not
4 sure if this was produced or not. Fernstrum
5 had an obligation to produce them and didn't.
6 It gave us a very small number of documents.
7 As you know, they had really vast numbers of
8 them. Mr. Lockhart had this in his collection
9 of brochures. That's why it's being produced
10 today.
11 MR. BERGSMAN: Your options with
12 respect to your objection was to file a motion
13 to compel or if you had these documents you
14 could have filed requests for admissions for
15 their authenticity, but nothing came up. Could
16 have sent them to us, said, hey, what about
17 these, what about documents like this, but none
18 of that stuff came.
19 We had asked for these documents so
20 that we could prepare for trial. None of these
21 were produced, therefore, I'm continuing my
22 objection.
23 MR. HOCHBERG: I would also, maybe
24 I'm repeating myself, but these are documents
25 that Fernstrum has already. You've already got

1 Fernstrum had the document, decided not to do
2 it. Mr. Lockhart, in reviewing documents that
3 he keeps in his -- that he keeps in his files,
4 found this document. That's why it's being
5 produced right now.
6 MR. BERGSMAN: Do we want to do a
7 continuing objection on this stack of
8 documents?
9 MR. HOCHBERG: I guess we better.
10 MR. BERGSMAN: How many documents
11 do you have there so we can identify them for
12 the record?
13 MR. HOCHBERG: My question is I
14 want to know whether we have finished with this
15 document 21.
16 MR. BERGSMAN: No.
17 MR. HOCHBERG: Okay. It's 36
18 Fernstrum documents here.
19 MR. BERGSMAN: Okay. From document
20 Exhibit Number 18 through what's going to be
21 document Exhibit Number 36, we have a
22 continuing objection that these documents
23 should have been produced during the discovery
24 by DuraMax and they were not produced.
25 Therefore, we object to their introduction into

1 Q. When was the copy made?
2 A. April 20th, 2004.
3 Q. And where was the copy made?
4 A. DuraMax Marine, LLC.
5 - - - - -
6 (Thereupon, Lockhart Deposition
7 Exhibit 22 was marked for purposes
8 of identification.)
9 - - - - -
10 BY MR. HOCHBERG:
11 Q. Now can you identify the next
12 document that you're holding?
13 A. This is a Fernstrum brochure that
14 is entitled Why Buy Fernstrum Grid Coolers.
15 Q. Is that an original document you're
16 holding?
17 A. This is an original document.
18 There's no number on it.
19 Q. I'm going to show you Exhibit 22,
20 ask if you can identify --
21 A. Exhibit 22 is a copy of the
22 original document.
23 Q. And when was this copy made?
24 A. April 20th at DuraMax Marine, LLC.
25 - - - - -

1 titled Box Coolers, Fernstrum Cooling for
2 Debris Laden Waters.
3 Q. I'm going to show you Exhibit 24.
4 Of course I'd like to ask you what Exhibit 24
5 is?
6 A. Exhibit 24 is a copy of the
7 original box cooler brochure.
8 Q. When was the copy made?
9 A. April 20th, 2004.
10 Q. Where was it made?
11 A. At DuraMax Marine, LLC.
12 Q. On this document I'd like to refer
13 you to the top of Exhibit 24. Compare this to
14 the original.
15 A. It's the same except when the copy
16 was made, the box coolers, the wording is not
17 legible. It's too dark.
18 - - - - -
19 (Thereupon, Lockhart Deposition
20 Exhibit 25 was marked for purposes
21 of identification.)
22 - - - - -
23 BY MR. HOCHBERG:
24 Q. If you would identify the next
25 original?

1 Q. I show you Exhibit 26, ask you to
2 compare them, tell me what Exhibit 26 is?
3 A. Exhibit 26 is a copy of the
4 original article.
5 Q. Where was the copy made?
6 A. DuraMax Marine, LLC.
7 Q. When was it made?
8 A. April 20, 2004.
9 - - - - -
10 (Thereupon, Lockhart Deposition
11 Exhibit 27 was marked for purposes
12 of identification.)
13 - - - - -
14 BY MR. HOCHBERG:
15 Q. Can you identify the original
16 document in your hand?
17 A. This is an advertisement from a
18 publication titled, Use a Fernstrum Grid
19 Cooler.
20 MR. BERGSMAN: I object to the
21 introduction of this on the grounds this is not
22 a product that's -- or advertisement that
23 appeared in the US. It obviously was Australia
24 or New Zealand; therefore, it's not relevant to
25 this proceeding.

1 A. Defco News and Reviews, 221
2 Portwall, Houston, Texas, 77029, P.O. box
3 22498.
4 MR. HOCHBERG: Off the record.
5 (Discussion off record.)
6 - - - - -
7 (Thereupon, Lockhart Deposition
8 Exhibit 28 was marked for purposes
9 of identification.)
10 - - - - -
11 BY MR. HOCHBERG:
12 Q. I'm going to give you Exhibit 28,
13 ask you to compare Exhibit 28 to the document
14 that you just read from into the record?
15 A. Document number 28 is a copy of the
16 original document that I just read from.
17 Q. Where was this copy made?
18 A. DuraMax Marine, LLC.
19 Q. This particular copy.
20 A. This particular copy, Houston,
21 Texas. You want me to reread it?
22 Q. My question was who made the copy?
23 Where was the copy made?
24 A. Copy was made at DuraMax Marine --
25 oh, I'm sorry, the copy was made at Hochberg,

1 Exhibit 30 was marked for purposes
2 of identification.)
3 - - - - -
4 BY MR. HOCHBERG:
5 Q. Can you read the next original?
6 A. This is called, We're Cooling the
7 World, Fernstrum grid cooler. From the
8 Workboat magazine. It's December 2002.
9 Q. How do you know it's from Workboat
10 magazine?
11 A. On the back. I can tell by the
12 front also, the Workboat show.
13 Q. Okay.
14 A. You may need the back of that.
15 (Discussion off record.)
16 Q. Can you compare Exhibit 30 to the
17 document you just read?
18 A. Exhibit 30 is a copy of the
19 original document.
20 Q. Where is the copy made?
21 A. DuraMax Marine, LLC.
22 Q. When was it made?
23 A. April 20, 2004.
24 Q. Turn the document over and can you
25 tell us where this document came from?

1 you're looking at now?
2 A. This is a Workboat magazine product
3 showcase dated October 2001.
4 Q. We'll show you Exhibit 32, ask if
5 you can identify what it is?
6 A. Exhibit 32 is a copy of the
7 original document.
8 Q. When was it made?
9 A. April 20th, 2004, at DuraMax
10 Marine, LLC.
11 MR. BERGSMAN: Off the record.
12 (Discussion off record.)
13 BY MR. HOCHBERG:
14 Q. Can you look at the next document,
15 identify it?
16 A. This is a Fernstrum grid cooler
17 advertisement that was from the Workboat
18 magazine, December 2003.
19 - - - - -
20 (Thereupon, Lockhart Deposition
21 Exhibit 33 was marked for purposes
22 of identification.)
23 - - - - -
24 BY MR. HOCHBERG:
25 Q. Can you identify Exhibit 33?

1 Q. Where was it made?
2 A. DuraMax Marine, LLC.
3 Q. When was it made?
4 A. April 20th, 2004.
5 - - - - -
6 (Thereupon, Lockhart Deposition
7 Exhibit 35 was marked for purposes
8 of identification.)
9 - - - - -
10 BY MR. HOCHBERG:
11 Q. Can you read the next original
12 document?
13 A. This is titled The Simplest Most
14 Dependable Form of Fresh Water Cooling. It's a
15 Fernstrum advertisement. It's from Workboat
16 magazine, January 1999.
17 MR. BERGSMAN: Are we talking about
18 35? How does he --
19 MR. HOCHBERG: We can make a copy
20 of the opposite side of the page and put that
21 into the record.
22 - - - - -
23 (Thereupon, Lockhart Deposition
24 Exhibit 36 was marked for purposes
25 of identification.)

1 ask you to compare them and to identify Exhibit
2 37?
3 A. Exhibit 37 is a copy of the
4 original document.
5 Q. Where was it made?
6 A. It was made at DuraMax Marine, LLC
7 April 20, 2004.
8 - - - - -
9 (Thereupon, Lockhart Deposition
10 Exhibit 38 was marked for purposes
11 of identification.)
12 - - - - -
13 BY MR. HOCHBERG:
14 Q. If you could read the next original
15 document?
16 A. This is a Fernstrum grid cooler
17 promotional piece titled, Just When You Thought
18 We Couldn't Get Any Cooler.
19 Q. Exhibit 38, I ask you to compare
20 them?
21 A. Exhibit 38 is a copy of the
22 original document.
23 Q. And where was the copy made?
24 A. DuraMax Marine, LLC.
25 Q. When was it made?

1 A. April 20, 2004.
2 Q. Where was it made?
3 A. At DuraMax Marine, LLC.
4 - - - - -
5 (Thereupon, Lockhart Deposition
6 Exhibit 40 was marked for purposes
7 of identification.)
8 - - - - -
9 BY MR. HOCHBERG:
10 Q. Can you review the original
11 document you're looking at right now?
12 A. This is an East Park Radiator
13 catalog titled Duraweld Keel Coolers.
14 Q. I'm going to give you Exhibit 40,
15 ask you to compare the two?
16 A. Exhibit 40 is a copy of the
17 original document.
18 Q. Where was it made?
19 A. DuraMax Marine, LLC.
20 Q. When was it made?
21 A. April 20, 2004.
22 Q. Now, I would like to show you a
23 portion of what was previously identified as
24 Exhibit 2. I'm going to refer in Exhibit 2 to
25 Bates numbers 0066, 0067, 0068 and 0069. Do

1 own personal knowledge.
2 MR. HOCHBERG: My question is do
3 you know what this drawing is on page 0069.
4 A. This drawing looks like a line
5 drawing of a keel cooler.
6 MR. BERGSMAN: Again, objection.
7 Witness is just speculating. He's not
8 testifying from his own knowledge. No proper
9 foundation has been laid for this testimony.
10 Q. Have you seen this application
11 previously?
12 A. Yes.
13 Q. Do you know what it's an
14 application for?
15 A. It's an application for a
16 trademark.
17 Q. And what is the trademark?
18 A. Trademark is the -- this line
19 drawing photo.
20 Q. On what page is it on?
21 A. 0069.
22 Q. How would you just in very general
23 terms, how would you describe this drawing?
24 Just very briefly.
25 MR. BERGSMAN: Objection. The

1 MR. BERGSMAN: Yeah, but I'm
2 objecting to the introduction of Exhibit Number
3 19 into evidence. You're asking him to testify
4 about Exhibit Number 19 and I'm objecting to
5 that because I'm going to try to keep this out
6 of evidence.
7 MR. HOCHBERG: All right.
8 BY MR. HOCHBERG:
9 Q. First of all, compare the two
10 documents, Exhibit 2, page 0069, and Exhibit
11 19, and tell us what differences, if any,
12 exists between the two?
13 A. Exhibit 19 and page 0069 are the
14 same basically, only looks like they were both
15 taken from the same product or photograph.
16 Exhibit 0069 doesn't have any threads.
17 MR. BERGSMAN: I also object to
18 this testimony on the grounds it's not helpful,
19 it's not adding anything to testimony. This is
20 something that the board can do. He's -- the
21 witness is improperly telling the board how it
22 should decide the case and how it should
23 interpret the evidence. So this testimony is a
24 waste of time and it's cumulative.
25 MR. HOCHBERG: The witness is

1 that itself just by looking at the two
2 documents.
3 BY MR. HOCHBERG:
4 Q. I'm going to ask you to compare
5 Exhibit 20 to page 0069 of Exhibit 2 and to
6 tell me once you compared them, when I say
7 compare them, I'm talking about the drawing on
8 Exhibit 20 to the drawing on 0069, and let me
9 know what their similarities are and what the
10 differences are between the two.
11 MR. BERGSMAN: Again, I object to
12 this testimony on the fact that it's not
13 helpful to a clear understanding of the
14 witness'testimony. It's in violation, it
15 doesn't meet the requirements of Federal Rule
16 701 for a lay opinion. You're asking the
17 witness to tell the board how it's supposed to
18 decide the case so it's not helping the board.
19 The board can make this decision by itself, so
20 I'm going to object to the testimony.
21 Counselor, do you intend to go
22 through each one of the Exhibits 18 through 39
23 and have the witness compare the drawing and
24 the marks to be registered to each one of the
25 depictions in these exhibits? If so, I would

1 scope of rule 702.
2 MR. BERGSMAN: So, Mr. Hochberg, to
3 the extent that you're going to have the
4 witness testify -- do comparisons between the
5 drawings and the depictions in Exhibit numbers
6 18 through 29, may I have a continuing
7 objection to this as -- based on the fact that
8 it's not following Federal Rules of Evidence
9 701 being it's not helpful, the board probably
10 can do this by themselves and, therefore, it's
11 a waste of time and cumulative evidence.
12 MR. HOCHBERG: You can have the
13 continuing objection. We will have the
14 continuing reply that I just read and which
15 would reply to rule 701 and 702.
16 BY MR. HOCHBERG:
17 Q. Now, you just testified comparing
18 Exhibit 19 to the trademark drawing on page
19 0069 of Exhibit 2. I'm now going to ask you to
20 compare the cover page of Exhibit 21 with the
21 cover page -- excuse me, with the trademark on
22 page 0069 of Exhibit 2. And first, can you
23 tell me any dissimilarities between the two and
24 any similarities between the two?
25 A. The dissimilarities of Exhibit 21

1 A. Exhibit 23 compared to the
2 trademark 0069 is shown at a different angle,
3 the products. And Exhibit 23 is from a
4 photograph of a product and trademark looks
5 like it's a line drawing from a photograph.
6 Q. Can you compare Exhibit 26 with the
7 drawing on the trademark application, Exhibit
8 0069, can you tell me the differences between
9 the two first?
10 A. Exhibit 26 and the differences
11 between the trademark 0069, again, it's the
12 angle of the view and Exhibit 26, again, is
13 taken looks like from a photograph of a product
14 and the trademark looks like it's a line
15 drawing from a photograph.
16 Q. How about can you compare Exhibit
17 32 to 0069 of Exhibit 2, and with respect to
18 Exhibit 32, there are a number of ads on that
19 page. So can you first point out what portion
20 of the page of Exhibit 32 you would be
21 referring to?
22 A. Exhibit 32 I would be referring to
23 the upper middle of the page, R.W. Fernstrum
24 ad.
25 Q. Can you tell me the similarities

1 MR. BERGSMAN: Again, I have the
2 same objection to this type of testimony as I
3 did to the testimony for the exhibits between
4 18 and number 39 is that --
5 MR. HOCHBERG: You don't have to
6 repeat it. We have the same response.
7 MR. BERGSMAN: Okay. You're giving
8 me a continuing objection?
9 MR. HOCHBERG: Right. And our
10 response is the same.
11 MR. BERGSMAN: Okay.
12 BY MR. HOCHBERG:
13 Q. Can you compare the two and tell
14 first what is the same about them?
15 A. Exhibit 5/K and the trademark 0069,
16 what is similar is the same product taken from
17 the photograph, the trademark is like a line
18 drawing from the photograph and 5/K is a
19 photograph of the product.
20 MR. BERGSMAN: Objection. Witness
21 has no idea whether this is a photograph or
22 not.
23 MR. HOCHBERG: The witness
24 testified that it looked like a photograph to
25 him.

1 A. Passenger Vessel News.
2 Q. Have you reviewed Passenger Vessel
3 News?
4 A. No.
5 Q. Let's review the upper portion
6 then. Can you compare the upper part of
7 Exhibit 5/X with page 0069 Exhibit 2? First
8 can you tell me the differences between those
9 two depictions?
10 A. Exhibit 5/X compared to the
11 trademark 0069, the difference is it's
12 basically a shot -- it's a different angle.
13 The product is the different angle, again, it
14 looks like Exhibit 5/X is a photograph of a
15 product and trademark is a line drawing of a
16 photograph.
17 Q. Have you seen depictions like
18 Exhibit 5/X elsewhere?
19 A. Yes.
20 Q. How many years have you seen that?
21 A. 20, 25 years I've seen that.
22 Q. Do you participate in any way in
23 the advertising done by DuraMax Marine of its
24 one piece keel cooler?
25 A. Yes.

1 Expo, which is in Boston and Seattle.
2 Q. Now, can you describe just how this
3 is laid out? What I'm really referring to is
4 whether there's a keel cooler that's somehow
5 related to that advertisement, that brochure?
6 A. Keel coolers shown, a photo of it
7 is shown in the middle of the promotional
8 piece, and there are installation photos along
9 the right side showing the keel cooler on the
10 vessel.
11 Q. Is this the only way that this keel
12 cooler, the Dura cooler would be shown on ads
13 to the future or might it be changed?
14 A. It could be changed. I mean
15 it's -- shows the product by itself and it
16 shows it in installation format.
17 Q. On the Dura cooler that's shown on
18 Exhibit 13, is the bevel apparent in that
19 picture, in the center of the page?
20 A. Yes.
21 Q. If we went to look at a picture of
22 a Dura cooler, would the bevel necessarily be
23 apparent?
24 MR. BERGSMAN: Objection. Assuming
25 facts not into evidence. You're asking him to

1 A. Yes.
2 Q. Might it happen in the future as
3 well?
4 A. Yes.
5 MR. HOCHBERG: I have no further
6 questions.
7 MR. BERGSMAN: I just have a few
8 questions.
9 EXAMINATION OF RICHARD LOCKHART
10 BY MR. BERGSMAN:
11 Q. The marks sought to be registered,
12 it displays the keel cooler kind of at an
13 unnatural angle, doesn't it?
14 MR. HOCHBERG: What do you mean
15 by -- objection. What do you mean by unnatural
16 angle?
17 Q. Well, to display a keel cooler like
18 that, you'd have to have a couple people
19 holding it?
20 A. Not necessarily.
21 Q. Okay. DuraMax does not sell a keel
22 cooler with rectangle headers, does it?
23 A. No.
24 Q. DuraMax sells keel coolers with
25 beveled or angled headers, correct?

1 Q. DuraMax touts the fact that because
2 of the beveled headers, external water travels
3 more quickly to the tubes increasing the heat
4 transfer efficiency of the cooler?
5 MR. HOCHBERG: If you know the
6 answer to that, answer it. If you don't know
7 it, say so. You have to think about the
8 answer.
9 A. Repeat the question again, please.
10 Q. Let me restate it. DuraMax touts
11 the fact that because of the beveled header,
12 the external water travels over the tubes more
13 quickly increasing the heat efficiency
14 transfer?
15 MR. HOCHBERG: Let me object to
16 that. What do you mean by the word tout?
17 MR. BERGSMAN: Promotes.
18 MR. HOCHBERG: Okay, promotes.
19 A. With the Dura cooler, yes.
20 Q. And DuraMax promotes the fact that
21 because of its beveled headers the footprints
22 of its Dura cooler may be reduced?
23 A. For the Dura cooler, yes.
24 Q. Okay. Let me show you what's been
25 marked as DuraMax Exhibit Number 10. That's --

1 A. Repeat that question, please.
2 Q. Based on your experience, to the
3 best of your knowledge, Fernstrum doesn't sell
4 a keel cooler with a beveled header?
5 A. That's correct, as far as I know.
6 Q. As far as you know, Fernstrum
7 doesn't advertise or promote a keel cooler with
8 a beveled header?
9 A. True.
10 Q. So a keel cooler with a rectangular
11 header is a Fernstrum cooler?
12 A. Depends. Like I said before, we
13 have a spiral tube cooler that has a nonbeveled
14 header.
15 MR. HOCHBERG: What period of time
16 are you talking about?
17 Q. Now, a keel cooler with a beveled
18 header will be a DuraMax cooler?
19 A. Not necessarily.
20 Q. Okay. Is that because other
21 companies sell keel coolers with beveled
22 headers?
23 A. Yes.
24 MR. HOCHBERG: Would read back the
25 last question and answer?

1 MR. HOCHBERG: At what period of
2 time?
3 Q. Right now. Right now. For this
4 period of time from the mark sought to be
5 registered at this time does not depict a
6 DuraMax keel cooler?
7 A. True.
8 MR. BERGSMAN: No more questions.
9 MR. HOCHBERG: Okay. Finished.
10 THE WITNESS: You have the legal
11 right to read, examine and sign this deposition
12 if it is transcribed or you may waive that
13 right.
14 MR. HOCHBERG: You want to read it.
15 THE WITNESS: I'll read it.
16
17 (Deposition concluded at 11:50 a.m.)
18
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1 I do further certify that I am not a
2 relative, counsel or attorney for either party,
3 or otherwise interested in the event of this
4 action.
5 IN WITNESS WHEREOF, I have hereunto
6 set my hand and affixed my seal of office at
7 Cleveland, Ohio, on this 28th day of
8 April, 2004.
9
10
11
12
13 Lorraine J. Klodnick
14 Lorraine J. Klodnick, Notary Public
15 within and for the State of Ohio
16
17 My commission expires June 20, 2007.
18
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25

1	Exhibit 34 was marked	30	8
2	Exhibit 35 was marked	31	7
3	Exhibit 36 was marked	31	24
4	Exhibit 37 was marked	32	17
5	Exhibit 38 was marked	33	10
6	Exhibit 39 was marked	34	12
7	Exhibit 40 was marked	35	6

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1 SIGNATURE OF WITNESS

2

3 Richard Lockhart

4

5

6 The deposition of RICHARD LOCKHART,

7 taken in the matter, on the date, and at the

8 time and place set out on the title page

9 hereof.

10 It was requested that the

11 deposition be taken by the reporter and that

12 same be reduced to typewritten form.

13 It was agreed by and between

14 counsel and the parties that the Deponent will

15 read and sign the transcript of said

16 deposition.

17

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1 AFFIDAVIT

2 The State of Ohio,)

3) SS:

4 County of Cuyahoga)

5

6

7

8 Before me, a Notary Public in and for

9 said County and State, personally appeared

10 RICHARD LOCKHART, who acknowledged that he/she

11 did read his/her transcript in the

12 above-captioned matter, listed any necessary

13 corrections on the accompanying errata sheet,

14 and did sign the foregoing sworn statement and

15 that the same is his/her free act and deed.

16 In the TESTIMONY WHEREOF, I have hereunto

17 affixed my name and official seal at this

18 day of 25th day of May A.D 2004.

19

20

21 Tammy J. Simsa

22 Notary Public

23 TAMMY J. SIMSA
Notary Public, State of Ohio
My Commission Expires Sept. 10, 2008
Recorded in Geauga County

24

25 My Commission Expires:

1 DEPOSITION ERRATA SHEET

2

3 RE: DURAMAX MARINE, LLC VS.

4 R.W. FERNSTRUM & COMPANY

5 RRS File No.: 9898

6 Deponent: RICHARD LOCKHART

7 Deposition Date: APRIL 23, 2004

8

9 To the Reporter:

10 I have read the entire transcript of my

11 Deposition taken in the captioned matter or the

12 same has been read to me. I request that the

13 following changes be entered upon the record

14 for the reasons indicated. I have signed my

15 name to the Errata Sheet and the appropriate

16 Certificate and authorize you to attach both to

17 the original transcript.

18

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1 Date: April 29, 2004 RRS File No.: 9898
2
3 To: Richard Lockhart
4
5 In Re: Duramax Marine, LLC vs.
6 R.W. Fernstrum & Company
7
Deponent: Since you did not waive
8 reading and signing of the transcript of
your deposition, your notarized signature
9 is required on the Certificate where
indicated; the Errata must be completed,
10 if necessary, signed and returned, along
with the original executed, notarized
11 Certificate within ___ 7 days ___ 30 days
from the date of this memorandum. Please
12 call our offices to arrange for an
appointment to come to our offices to
13 read and sign the transcript of the
Deposition.
14
X Deponent: Since you did not waive
15 reading and signing of the transcript of
your deposition, your notarized signature
16 is required. Please read the copy of the
transcript of your deposition, make any
17 corrections necessary on the Errata form
ONLY, sign the bottom of the Errata form,
18 sign the Certificate where indicated
BEFORE A NOTARY and return the Errata
19 form and original executed, notarized
Certificate within ___7 days _X_30 days
20 from the date of this memorandum. Please
call our offices with any questions.
21
22 cc: D. Peter Hochberg, Esq.
23 Marc Bergsman, Esq.
24
25

DEPOSITION ERRATA SHEET

PAGE	LINE	
4	11	Change "air" to "stair"
4	14	Change "tendering" to "fendering"
4	17,20,23	Change "Dura Max" to "Duramax"
5	1	Change "Dura Max to "Duramax"
5	6	Change "cutlass" to "Cutless"
5	7	Change "six" to "sector"
5	14	Change "tendering" to "fendering"
5	19	Change "golf" to "gulf"
6	20	Change "mountable" to "demountable"
6	21	Change "tendering" to "fendering"
6	23	Change "cutlass" to Cutless"
7	7	Change "Dura Max" to "Duramax"
8	15	Change "Dura cooler" to "Dura Cooler"
10	18,22	Change "DuraMax" to "Duramax"
10	24	Change "four and a half" to "fore and aft"
11	18	Change "Dura Max" to "Duramax"
13	13	After "previous" insert "question"
14	3	Change "Dura Max" to "Duramax"
16	18	Change "here is the Fernstrum store" to "Here is the Fernstrum's Store"
17	1	Change "do to "produce"
17	17	Change "It's" to "There are"
17	24	Change "Dura Max" to "Duramax"
18	3	Change "Dura Max" to "Duramax"
18	6	After "cooler and" insert "Fernstrum"
18	20	Change "wide" to "Why"
19	4,24	Change "Dura Max" to Duramax"
20	15	Change "Dura Max" to "Duramax"
21	7	Change "original box cooler" to "Original Box Cooler"
	11	Change "DuraMax" to "Duramax"
22	4	Change "grid cooler the drag tests" to "Gridcooler the Drag Tests"
	12	Change "Dura Max" to "Duramax Marine"
25	2	Change "box" to "Box"

SIGNATURE: [signature] DATE: May 25, 2004

1 DEPOSITION ERRATA SHEET

2 PAGE LINE

3 25 18,24 Change "DuraMax" to "Duramax"

4 25 24 Change "Hochberg" to "D. Peter Hochberg Co, LPA"

5 26 21 Change "DuraMax" to "Duramax"

6 27 21 Change "DuraMax" to "Duramax"

7 30 5 Change "DuraMax" to "Duramax"

8 30 14 Change "What do these six boats have in Common?"

9 to "What Do These Six Boats Have In Common?"

10 31 2 Change "DuraMax" to "Duramax"

11 32 13 Change "Hochberg & Associates" to "D. Peter Hochberg Co, LPA

12 33 6,24 Change "DuraMax" to "Duramax"

13 34 6 Change "DuraMax" to "Duramax"

14 35 3,19 Change "DuraMax" to "Duramax"

15 38 24 Change "DuraMax" to "Duramax"

16 46 18 Change "DuraMax" to "Duramax"

17 49 23 Change "DuraMax" to "Duramax"

18 50 10 Change "Duracooler" to DuraCooler

19 51 12,17,22 Change "Duracooler" to "DuraCooler"

20 52 6 Change "Duracooler" to "DuraCooler"

21 52 12 Change "channel" to ~~channels~~ "channels"

22 52 12 Change "you" to "there"

23 53 21,24 Change "DuraMax" to "Duramax"

24

25 SIGNATURE: [signature] DATE: May 25, 2004

1 DEPOSITION ERRATA SHEET

2 PAGE LINE

3 54 2,5,13 Change "DuraMax" to "Duramax"

4 55 10,25 Change "DuraMax" to "Duramax"

5 55 19,22,23 Change "Dura Max" to "Duramax"

6 57 18 Change "Dura Max" to "Duramax"

7 58 25 Change "DuraMax" to "Duramax"

8 59 6 Change "Dura Max" to "Duramax"

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25 SIGNATURE: [signature] DATE: May 25, 2004

Attorney Docket DX-3 (#90545)

CERTIFICATE OF MAILING

I hereby certify that this document is being deposited with the United States Postal Service as First Class mail in an envelope addressed: Commissioner for Trademarks, P.O. Box 1451, Alexandria, VA 22313-1451, on the date noted below:

Date: Nov. 15, 2004

Sean Mellino

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:

Application Serial No. 75/701,707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette at Page TM 400 on May 9, 2000

DURAMAX MARINE, LLC	)	
	)	
Opposer,	)	
	)	
v.	)	Opposition No. 119,899
	)	
R.W. FERNSTRUM & COMPANY,	)	
	)	
Applicant	)	

Commissioner for Trademarks
P.O. Box 1451
Alexandria, VA 22313-1451

OPPOSER'S NOTICE OF FILING THE TESTIMONY DEPOSITION OF JEFFREY LEESON PURSUANT TO 37 C.F.R. § 2.125(c)

Opposer, Duramax Marine, LLC, by its attorneys, herewith files the certified transcript of the testimony deposition of Jeffrey Leeson taken in connection with this proceeding on April 23, 2004, along with Opposer's Exhibit No. 41, pursuant to Trademark Rule 2.123, 37 C.F.R. § 2.123. This transcript has been certified by the officer taking the deposition and it and the exhibits have been prepared for filing pursuant to Trademark Rule 2.123(f), 37 C.F.R. § 2.123(f).

Respectfully submitted,

Date: November 15, 2004

By: _____
D. Peter Hochberg
Counsel for Opposer
D. Peter Hochberg Co., L.P.A.
The Baker Building – 6th Floor
1940 East Sixth Street
Cleveland, Ohio 44114
(216) 771-3800

DPH/sm

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing "OPPOSER'S NOTICE OF FILING THE TESTIMONY DEPOSITION OF JEFFREY LEESON PURSUANT TO 37 C.F.R. § 2.125(c)" was served via first class, postage prepaid, U.S. mail upon:

Samuel D. Littlepage, Esq.
Dickinson Wright PLLC
1901 "L" Street, N.W., Suite 800
Washington, D.C. 20036-3506

ATTORNEYS FOR APPLICANT

Date: November 15, 2004

By: _____
D. Peter Hochberg

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:
Application Serial No. 75/701/707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette
at Page TM 400 on May 9. 2000

DURAMAX MARINE, LLC,
Opposer,
vs.
R.W. FERNSTRUM & COMPANY,
Applicant.

Case No.
91119899

- - - - -

Deposition of JEFFREY LEESON, called for examination under the Applicable Rules of Federal Civil Procedure, taken before me, Lorraine J. Klodnick, a Registered Professional Reporter and a Notary Public in and for the State of Ohio, pursuant to notice and stipulations of counsel, at the offices of D. Peter Hochberg Co., LPA, The Baker Building, 1940 East 6th Street, Cleveland, Ohio, on Friday, April 23, 2004, at 12:05 o'clock p.m.

- - - - -

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2 (Thereupon, Leeson Deposition

3 Exhibit 41 was marked for purposes

4 of identification.)

5 - - - - -

6 JEFFREY LEESON, of lawful age,

7 called for examination, as provided by the

8 Federal Rules of Civil Procedure, being by me

9 first duly sworn, as hereinafter certified,

10 deposed and said as follows:

11 EXAMINATION OF JEFFREY LEESON

12 BY MR. HOCHBERG:

13 Q. Can you read this exhibit and just

14 identify it for the record?

15 A. This is the notice that I am to be

16 deposed.

17 Q. Can you give us your educational

18 background starting with high school and as far

19 as formal education?

20 A. Went to high school at Cleveland

21 Heights High School, graduated in 1960. I have

22 a Bachelor of Arts in physics from Western

23 Reserve University in 1964, and a Master of

24 Science in physics from Western Reserve

25 University in 1967.

1 during 1987. I worked for Lord Corporation in
2 Aurora, Ohio, 1989 to 1991.
3 And from 1991 until present for
4 DuraMax Marine, Middlefield, and at the present
5 location.
6 Q. Where is the present location?
7 A. Troy Township in Geauga County.
8 Q. During your work experience at
9 DuraMax Marine, can you give us sort of details
10 of what your responsibilities have been?
11 A. It's been a wide variety of
12 engineering responsibilities. DuraMax Marine
13 being a small company has a small engineering
14 staff and my responsibilities cover almost any
15 area of engineering that may arise from time to
16 time. It would include work in product design,
17 product development, application engineering,
18 quality engineering and providing technical
19 assistance and backup to other departments as
20 required.
21 Q. What are the main products on which
22 you have worked at DuraMax Marine?
23 A. I've probably worked on all of
24 DuraMax Marine products from one time or
25 another.

1 cooler would be suitable for each application
2 the customers inquire about.
3 Q. I'm going to first show you Exhibit
4 3, which as you can see is the file history.
5 On the cover here says trademark application
6 75/382,250. First of all, are you familiar
7 with at least a portion of this file? You can
8 take a look at it.
9 A. Yes, I'm familiar with at least a
10 portion of it.
11 Q. I'm going to show you a page from
12 this file which for some reason does not have a
13 Bates number, and maybe I'm going to -- maybe I
14 want to have this marked as an exhibit. This
15 is -- I think this is page --
16 MR. BERGSMAN: Off the record.
17 (Discussion off record.)
18 BY MR. HOCHBERG:
19 Q. Referring to Exhibit 3 and to the
20 trademark application in Exhibit 3, I'm
21 referring to page 6, and I'm going to give you
22 page 6 and ask you to identify what page 6
23 shows?
24 A. Page 6 shows photocopies of three
25 photographs.

1 MR. HOCHBERG: I'd like to respond
2 to that by saying Mr. Leeson is an engineer and
3 is an engineer who works with keel coolers. He
4 obviously recognizes the photographs readily,
5 because he's worked on them for many years, and
6 now we've shown him a drawing. He's also very
7 familiar with drawings. So you don't have to
8 be an expert in trademark law to know what a
9 drawing is.
10 MR. BERGSMAN: Based on counsel's
11 testimony --
12 MR. HOCHBERG: It's not testimony;
13 it was a response to an objection.
14 MR. BERGSMAN: -- he's just
15 proffered Mr. Leeson as an expert, so I will
16 object to Mr. Leeson's testimony on the grounds
17 that no expert testimony has been -- no expert
18 witnesses have been identified in this
19 proceeding. That's interrogatory number 7.
20 Fernstrum requested the identification of
21 expert witnesses. And in response to that
22 interrogatory, DuraMax said not yet available
23 and then DuraMax never supplemented its
24 response to interrogatory number 7.
25 So to the extent that Mr. Leeson's

1 testimony is not going to be helpful to the
2 board and it should be precluded. It's a waste
3 of time and it's unnecessarily cumulative.
4 MR. HOCHBERG: You objected to the
5 fact. I tried to expedite the testimony by
6 having him look at the drawing, so now I've
7 asked him to look at the entire page to review
8 it.
9 MR. BERGSMAN: If you have a
10 question --
11 MR. HOCHBERG: Whatever question I
12 ask you're going to object to, so I figured I
13 might as well get the whole thing in.
14 MR. BERGSMAN: But this is
15 improper. If you have a question to ask him,
16 ask him the question about -- that's the way
17 the testimony is supposed to go. You're
18 supposed to ask him a question. He's supposed
19 to answer it. He's not supposed to read in a
20 document.
21 MR. HOCHBERG: I was trying to
22 expedite his testimony by just referring to the
23 drawing and if you don't want to listen to
24 that, I don't particularly want to listen to it
25 myself.

1 areas solid, some areas in dotted lines, and
2 the drawing is very similar in size and angle
3 and in model number to the center photo on page
4 6.
5 Q. Now --
6 MR. BERGSMAN: Objection to the
7 testimony about model number. There's no
8 reference to model number in either drawing or
9 the photographs and model number would refer to
10 specialized or technical information that Mr.
11 Leeson would have.
12 THE WITNESS: If I said model
13 number, I'm sorry, I misspoke. I meant model
14 being the size and shape.
15 BY MR. HOCHBERG:
16 Q. I'm going to show you Exhibit 2,
17 which is the trademark application, number
18 75/701,707 which is the trademark which is the
19 subject of this opposition, and I'm going to
20 refer to page 0069 of Exhibit 2. I'd like to
21 ask you to compare the drawing on page 0069 of
22 Exhibit 2 with a drawing on page 5 of Exhibit
23 3. Tell me what differences there are and what
24 similarities there are.
25 MR. BERGSMAN: Excuse me. I'm

1 want to show you a page from it. I'm going to
2 show you pages 0111, 0112 and 0113 from Exhibit
3 2. I'd like to ask you to tell me if you know
4 what they are. Study them carefully.
5 A. No, I don't know what those are.
6 Parallel lines.
7 MR. HOCHBERG: I have no further
8 questions.
9 MR. BERGSMAN: No questions.
10 THE NOTARY: You have the legal
11 right to read, examine and sign this deposition
12 if it is transcribed or you may waive that
13 right.
14 MR. HOCHBERG: You want to read it.
15 THE WITNESS: Okay.
16
17 (Deposition concluded at 12:30 p.m.)
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1 I do further certify that I am not a
2 relative, counsel or attorney for either party,
3 or otherwise interested in the event of this
4 action.
5 IN WITNESS WHEREOF, I have hereunto
6 set my hand and affixed my seal of office at
7 Cleveland, Ohio, on this 28th day of
8 April, 2004.
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13 Lorraine J. Klodnick
14 Lorraine J. Klodnick, Notary Public
15 within and for the State of Ohio
16
17 My commission expires June 20, 2007.
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1 SIGNATURE OF WITNESS

2

3 Jeffrey Leeson

4

5

6 The deposition of JEFFREY LEESON,

7 taken in the matter, on the date, and at the

8 time and place set out on the title page

9 hereof.

10 It was requested that the

11 deposition be taken by the reporter and that

12 same be reduced to typewritten form.

13 It was agreed by and between

14 counsel and the parties that the Deponent will

15 read and sign the transcript of said

16 deposition.

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1 AFFIDAVIT

2 The State of Ohio,)

3) SS:

4 County of Cuyahoga)

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8 Before me, a Notary Public in and for

9 said County and State, personally appeared

10 JEFFREY LEESON, who acknowledged that he/she

11 did read his/her transcript in the

12 above-captioned matter, listed any necessary

13 corrections on the accompanying errata sheet,

14 and did sign the foregoing sworn statement and

15 that the same is his/her free act and deed.

16 In the TESTIMONY WHEREOF, I have hereunto

17 affixed my name and official seal at this 19th

18 day of May A.D 2004.

19

20

21 Tammy J. Simsa

22 Notary Public

23 TAMMY J. SIMSA
Notary Public, State of Ohio
My Commission Expires Sept. 10, 2008
Recorded in Geauga County

24

25 My Commission Expires:

1 DEPOSITION ERRATA SHEET

2

3 RE: DURAMAX MARINE, LLC VS.

4 R.W. FERNSTRUM & COMPANY

5 RRS File No.: 9898

6 Deponent: JEFFREY LEESON

7 Deposition Date: APRIL 23, 2004

8

9 To the Reporter:

10 I have read the entire transcript of my

11 Deposition taken in the captioned matter or the

12 same has been read to me. I request that the

13 following changes be entered upon the record

14 for the reasons indicated. I have signed my

15 name to the Errata Sheet and the appropriate

16 Certificate and authorize you to attach both to

17 the original transcript.

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1 DEPOSITION ERRATA SHEET

2 PAGE LINE

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25 SIGNATURE: DATE:

DEPOSITION ERRATA SHEET

PAGE	LINE	
4	21	Victorine is a misspelling. Victoreen is correct.
MULTIPLE		LOCATIONS DuraMax should be Duramax

SIGNATURE: Jeffrey Leisson DATE: May 19, 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:

Application Serial No. 75/701,707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette at Page TM 400 on May 9, 2000

DURAMAX MARINE, LLC	)	
	)	
Opposer,	)	
	)	
v.	)	Opposition No. 119,899
	)	
R.W. FERNSTRUM & COMPANY,	)	
	)	
Applicant	)	

Commissioner for Trademarks
P.O. Box 1451
Alexandria, VA 22313-1451

TRIAL TESTIMONY DEPOSITION EXHIBITS

The following exhibit numbers 1 – 41 pertain to the trial testimony depositions of Michael W. Brakey, Richard Lockhart and Jeffrey Leeson taken in connection with the above-referenced proceeding.

Attorney Docket DX-3 (#90545)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In the Matter of:

Application Serial No. 75/701,707
Mark: Drawing of a Marine Heat Exchanger
Published in the Official Gazette at Page TM 400 on May 9, 2000

DURAMAX MARINE, LLC	)	
	)	
Opposer,	)	
	)	
v.	)	Opposition No. 91119899
	)	
R.W. FERNSTRUM & COMPANY,	)	
	)	
Applicant	)	

Commissioner for Trademarks
2900 Crystal Drive
Arlington, VA 22202-3513

OPPOSER'S NOTICE OF TESTIMONY DEPOSITION

Please take notice that, pursuant to Trademark Rule 2.123(c), Opposer Duramax Marine, LLC, by its attorney, will take the testimony deposition upon oral examination of one of its consultants, Mr. Michael W. Brakey of 3309 Glencairn Rd., Shaker Heights, Ohio 44122, on April 22, 2004 at 10:00 a.m. at the office of D. Peter Hochberg Co., L.P.A., 1940 East 6th Street, 6th Floor, Cleveland, Ohio, 44114.

The deposition shall take place before a certified court reporter and shall continue until completed. The deposition shall seek background information about the deponent, the deponent's identification of documents, the deponent's testimony regarding the proposed trademark of Application Serial No. 75/701,707 and the proposed mark's relationship to keel coolers, the deponent's testimony on the prosecution of Application Serial No. 75/701,707, and the deponent's testimony on the keel cooler industry.

You are invited to attend and cross-examine.

Δ π EXHIBIT 1
Deponent Brakey
Date 4-22-04 Rptr. LK
WWW.DEPOBOOK.COM

Respectfully submitted,

Date: April 15, 2004

By: _____
D. Peter Hochberg
Counsel for Opposer

D. Peter Hochberg Co., L.P.A.
The Baker Building – 6th Floor
1940 East Sixth Street
Cleveland, Ohio 44114
(216) 771-3800

CERTIFICATE OF SERVICE

The undersigned hereby certifies that the OPPOSER'S NOTICE OF TESTIMONY DEPOSITION is being served by facsimile (1-202-659-1559) with confirmation by regular U.S. Mail, postage prepaid, to counsel for Applicant, Samuel D. Littlepage, Dickinson Wright PLLC, 1901 L Street, N.W. – Suite 800, Washington, D.C. 20036-3506, on the date shown below.

Date: April 15, 2004

Sean Mellino

DX-1

EXHIBIT 2
PENGAD 800-631-6989

GENERAL INFORMATION

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SER NO 75/701707  REG NO 0000000   FIL DT 05/10/1999     REG DT
EXAMINING ATTORNEY     LAW OFFICE    CHLO       LOCC 650 LOC DT 03/27/2000
ALT, JILL C.                114        CHEM       STAC 802 STA DT 06/21/2000
MARK MISCELLANEOUS DESIGN                                CLASS CT 01
INT CL 040                                   DRAW 2      REGISTER PRINCIPAL
US  CL 100 103 106                        SEC. 2F        AMDED TO
GOODS/     (040) - MANUFACTURE OF MARINE HEAT EXCHA      MK TYPE  SM
SERVICES  NGERS TO THE ORDER AND SPECIFICATION OF        ABAN DT
          OTHERS                                          CAN DT
OWNER     R. W. Fernstrum & Company                       PUB DT 05/09/2000
                                                     TTAB REPORTED LOST
OWNER     Menominee                                       TTAB PROCEEDING- NO
ADDRESS   MICHIGAN          498580097                     SEC 8  NO
                  PROSECUTION HISTORY                     SEC 15 NO
008 06/09/00 EXTENSION OF TIME TO OPPOSE FILED            REPUB 12C  NO
007 05/09/00 PUBLISHED FOR OPPOSITION                     1ST USE
006 04/08/00 NOTICE OF PUBLICATION                        00/00/1975-040
005 02/17/00 APPROVED FOR PUB - PRINCIPAL REGISTER        1ST USE COM
004 12/22/99 COMMUNICATION RECEIVED FROM APPLICANT        00/00/1975-040
003 11/05/99 NON-FINAL ACTION MAILED
002 10/27/99 ASSIGNED TO EXAMINER NO. 068113
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LOCATION-STATUS INFORMATION

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SER NO 75/701707  REG NO 0000000   FIL DT 05/10/1999     REG DT
EXAMINING ATTORNEY     LAW OFFICE    CHLO       LOCC 650 LOC DT 03/27/2000
ALT, JILL C.                114        CHEM       STAC 802 STA DT 06/21/2000
MARK MISCELLANEOUS DESIGN                                CLASS CT 01
                                                     TTAB REPORTED LOST
LOC       PUBLICATION AND ISSUE SECTION
CH TO LOC
CH TO EMP
STATUS    REQUEST FOR EXTENSION OF TIME TO FILE OPPOSITION

ITU EXMNR.                                ALLOWANCE NOTICE DATE
PUBLICATION DATE 05/09/2000                    ABANDONMENT DATE
                      TTAB  PROCEEDINGS
06/09/00    EXTENSION OF TIME TO OPPOSE FILED
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Δ π EXHIBIT 2
Deponent Brakey
Date 4-22-04 Rptr. LK
WWW.DEPOBOOK.COM

75-701707

LAW OFFICE 102

PRINCIPAL

ATTORNEY ADVISOR: ALT

Examining Attorney—(Please Print Name) TODD C. ALT	Date Published in Trademark O.G. PUBLISHED 05/09/00
Approved for Publication (Principal Register)—(Signature) 2-17-00	
Approved for Registration (Section 1(d))—(Signature)	
Approved for Registration (Supplemental Register)—(Signature)	Section 9 Renewal Accepted—(Signature)

75701707

SER219

TRADEMARK

[redacted]

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New Case

OCT 26 1999

Law Office 112

OCT 28 1999

LAW OFFICE 112

CONTENTS

	Entry	Date	Initials
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NOP 02
05/09/00

*** User: jalt ***

#	Total Marks	Dead Marks	Live Viewed Docs	Live Viewed Images	Status/ Search Duration	Search
01	1	0	1	1	0:01	"75701707"[sn]
02	1	0	1	1	0:01	"75715815"[sn]
03	409	N/A	0	0	0:01	"130325"[dc]
04	490	N/A	0	0	0:01	"150925"[dc]
05	2	2	0	0	0:01	3 and 4
06	697457	N/A	0	0	0:03	"040"[cc]
07	76	44	32	32	0:01	3 and 6
08	93	41	51	51	0:01	4 and 6
09	1738	N/A	0	0	0:01	"heat exchangers" [gs]
10	979964	N/A	0	0	0:04	applicant [on]
11	1310	N/A	41	41	0:01	9 not 10

Session started 11/5/99 10:53:27 AM
Session finished 11/5/99 11:11:35 AM
Total search duration 0:16 minutes
Session Duration 18:08 minutes

Default NEAR limit= 1 ADJ limit= 1

75701707

TRADEMARK APPLICATION SERIAL NO. _____ SER219

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

05/21/1999 FMACK1 00000008 75701707
01 FC:361 245.00 OP

PTO-1555
(5/87)

Mark: Miscellaneous Design

Class: 40

TRADEMARK EFF PROCESS.
RECEIVED
1999 MAY 10 P 4: 06
US PATENT &
TRADEMARK OFFICE

TO THE COMMISSIONER OF PATENTS:

Applicant: R. W. Fernstrum & Company
a Michigan corporation

Address: 1716 Eleventh Avenue
P.O. Box 97
Menominee, Michigan 49858-0097

The above-identified applicant has adopted and is using the trademark shown on the accompanying drawing for the following goods:

MANUFACTURE OF MARINE HEAT EXCHANGERS TO THE ORDER AND SPECIFICATION OF OTHERS

and requests that said mark be registered in the United States Patent and Trademark Office on the Principal Register established by the Act of July 5.

The mark was first used in connection with the services at least as early as 1975; was first used in connection with the services in interstate commerce at least as early as 1975; and is now in use in commerce. The was first used in another form in connection with the services at least as early as 1955; was first used in another form in interstate commerce at least as early as 1955.

The mark is used in advertising and promotional materials and three (3) specimens showing the mark as actually used in trade magazines are presented herewith.

POWER OF ATTORNEY

The undersigned hereby appoints Marc A. Bergsman, Samuel D. Littlepage, Conrad J. Clark, David R. Haarz, Christopher W. Brody, J. John Shimazaki, and Jeffrey M. Petrash, all members of the District of Columbia Bar, and all located at 1901 L Street, N.W., Suite 800, Washington, D.C. 20036, and Theresa A. Orr, a member of the Michigan Bar, located at 500 Woodward Avenue, Detroit, Michigan 48226-3425, to file this application with full power of substitution and revocation, and to transact all business in the Patent and Trademark Office in connection therewith.

Furthermore, Applicant hereby authorizes Dickinson Wright PPC its employees and agents, to act in connection with this application and upon whom may be served notices or process in proceedings affecting the mark.

The Patent and Trademark Office is requested to send correspondence to Marc A. Bergsman, of Dickinson Wright PLLC at 1901 L Street, N.W., Suite 800, Washington, D.C. 20036, or to telephone (202) 457-0160.

Enclosed is a check for $245 made payable to the Commissioner of Patents and Trademarks. Please charge any fee deficiency to Deposit Account No. 04-1061.

DECLARATION

The undersigned declares that he is the President of Applicant corporation, and is authorized to execute this application on behalf of said corporation; he believes said corporation to be the owner of the mark sought to be registered; to the best of his knowledge and belief no other person, firm, corporation, or association has the right to use said mark in commerce, either in the identical form or in such near resemblance thereto as to be likely, when applied to the goods of such other person, to cause confusion, or to cause mistake, or to deceive; all statements made herein of his own knowledge are true and all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and such willful false statements may jeopardize the validity of the application or any registration resulting therefrom.

R. W. FERNSTRUM & COMPANY

Dated: May 5, 1999

By: Paul W. Fernstrum
Paul W. Fernstrum
President

APPLICANT R. W. Fernstrum & Company

ADDRESS 1716 Eleventh Avenue
P.O. Box 97
Menominee, Michigan 49858-0097

FIRST USE 1975 IN COMMERCE 1975

GOODS OR SERVICES Manufacture of marine heat exchangers to the order and specification of others

05-10-1999
U.S. Patent & TMOfc/TM Mail Rcpt Dt. #11

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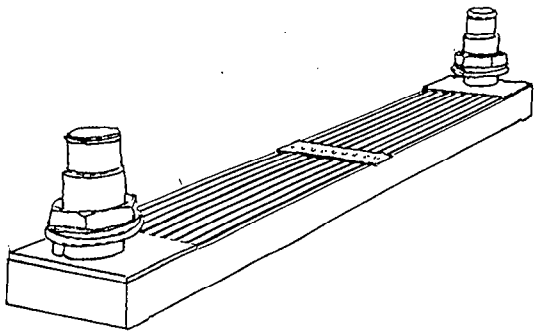


PUBLISHED
05/09/00

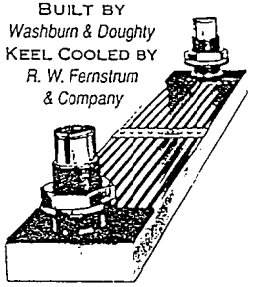
TRADEMARK
75701707

Maritime Directory magazine

4-1/2 W x 4-7/8 H

BUILT FOR
Winslow Marine
BUILT BY
Washburn & Doughty
KEEL COOLED BY
R. W. Fernstrum & Company

Tug Photo by: Eben Brown



You want the best of everything on your boat...as long as it's affordable...right? Then why don't you give us a call? For the cost of a phone call, we'll figure out which of over 8000 different Gridcoolers® is right for cooling your engine in your boat. How can you go wrong? Get the best cooling system you can...get a Fernstrum Gridcooler.

OVER 40 YEARS EXPERIENCE IN KEEL COOLING

CHECK THESE UNIQUE QUALITIES FOUND IN THE GRIDCOOLER

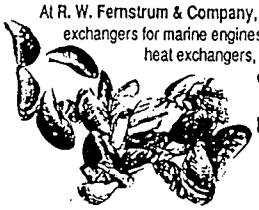
- Completely assembled and factory tested to assure reliability
- Silver brazed and welded joints form a rugged keel cooler
- Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube
- Custom designed to meet owner's operating conditions and the engine manufacturer's exact requirements
- The most compact form of keel cooling

R. W. FERNSTRUM & COMPANY 1716 11th Avenue Menominee, MI 49858 Phone: (906) 863-5553 Fax: (906) 863-5634

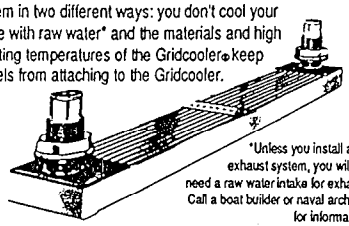
Passenger Vessel News 7 W x 4-5/8 H

Do you have to worry about zebra mussels? If you do, you're not alone, and soon almost everyone on the Great Lakes will have to take them into consideration.

At R. W. Fernstrum & Company, we've built the best heat exchangers for marine engines for over 40 years. Our heat exchangers, Gridcoolers, are closed cooling systems made of one of the best antifoulant materials available, copper-nickel. Therefore, our Gridcoolers can solve part of your zebra mussel problem in two different ways: you don't cool your engine with raw water* and the materials and high operating temperatures of the Gridcooler® keep mussels from attaching to the Gridcooler.



KEEP ZEBRA MUSSELS OUT OF YOUR COOLING SYSTEM



*Unless you install a dry exhaust system, you will still need a raw water intake for exhaust. Call a boat builder or naval architect for information.

#9
5-9-91

FERNSTRUM ENGINEERED KEEL COOLING

Why Fernstrum Gridcoolers on your boat? Because Fernstrum Gridcoolers have been proven durable, reliable, economical and lightweight in over 40 years of actual use by the military and many facets of the commercial and recreational marine industries.

If you're sick of zebra mussels overheating your engine, call us... we'll let you know which of our Gridcoolers is right for you.

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation. **Silver brazed and welded joints form a** rugged keel cooler, no slip joints or "O" rings to leak.

Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements. **The most compact form of keel cooling,** can be recessed for a flush with hull installation.

11

R. W. Fernstrum & Company

1716 11th Avenue • P. O. Box 97
Menominee, MI 49858

Phone: (906) 863-5553
Fax: (906) 863-5634

Seaway Review magazine 7 W x 4-7/8 H

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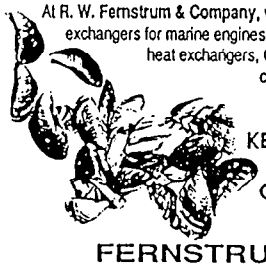
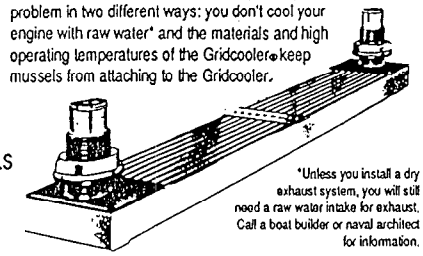


KEEP ZEBRA MUSSELS OUT OF YOUR COOLING SYSTEM



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Fax: (906) 863-5634

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

SERIAL NO. 75/701707 APPLICANT R. W. Fernstrum & Company	PAPER NO.
MARK MISCELLANEOUS DESIGN	ADDRESS: Assistant Commissioner for Trademarks 2900 Crystal Drive Arlington, VA 22202-3513
ADDRESS MARC A. BERGSMAN DICKINSON WRIGHT PLLC 1901 L STREET, N.W., SUITE [illegible] WASHINGTON, D.C. 20036	ACTION NO.
	MAILING DATE NOV - 8 [illegible]
	REF. NO.
FORM PTO-1525 (5-90) U.S. DEPT. OF COMM. PAT. & TM OFFICE	If no fees are enclosed, the address should include the words "Box Responses - No Fee." Please provide in all correspondence: 1. Filing Date, serial number, mark and Applicant's name. 2. Mailing date of this Office action. 3. Examining Attorney's name and Law Office number. 4. Your telephone number and ZIP code.

A PROPER RESPONSE TO THIS OFFICE ACTION MUST BE RECEIVED WITHIN 6 MONTHS FROM THE DATE OF THIS ACTION IN ORDER TO AVOID *ABANDONMENT. For your convenience and to ensure proper handling of your response, a label has been enclosed. Please attach it to the upper right corner of your response. If the label is not enclosed, print or type the Trademark Law Office No., Serial No., and Mark in the upper right corner of your response.*

RE: Serial Number: 75/701707

The assigned examining attorney has reviewed the referenced application and determined the following.

THE MARK IS MERELY DESCRIPTIVE

The examining attorney refuses registration on the Principal Register under Trademark Act Section 2(e)(1), 15 U.S.C. Section 1052(e)(1), on the ground that the proposed mark is merely descriptive in that it consists of a representation of an important feature or characteristic of the services. *In re Society for Private and Commercial Earth Stations*, 226 USPQ 436 (TTAB 1985); *In re Underwater Connections, Inc.*, 221 USPQ 95 (TTAB 1983).

A mark is merely descriptive under Trademark Act Section 2(e)(1), 15 U.S.C. 1052(e)(1), if it describes an ingredient, quality, characteristic, function, feature, purpose or use of the relevant services. *In re Gyulay*, 820 F.2d 1216, 3 USPQ2d 1009 (Fed. Cir. 1987); *In re Bed & Breakfast Registry*, 791 F.2d 157, 229 USPQ 818 (Fed. Cir. 1986); *In re MetPath Inc.*, 223 USPQ 88 (TTAB 1984); *In re Bright-Crest, Ltd.*, 204 USPQ 591 (TTAB 1979); TMEP section 1209.01(b).

Here, applicant seeks to register a fairly straightforward representation of its marine heat exchanger for custom manufacture of marine heat exchangers. A picture of the product applicant is custom manufacturing is telling a great deal about what the product looks like but indicates very little about the commercial source of the product. Indicating the commercial source of a product is the work of a trademark. Showing a picture of the goods is the work of marketing and advertising.

It is extremely dubious whether any among the relevant buying public will perceive the proposed mark as a service mark. Applicant's specimens make it appear as if the term "GRIDCOOLER" is the trademark for the goods and that the pictorial representation on the promotional piece is a picture of a "GRIDCOOLER".

The applicant should also note the following additional ground for refusal.

THE MARK DOES NOT FUNCTION AS A SERVICE MARK

The examining attorney refuses registration because the proposed mark does not function as a service mark to identify and distinguish the applicant's services from those of others and to indicate their source. Trademark Act Sections 1, 2, 3 and 45, 15 U.S.C. Sections 1051, 1052, 1053 and 1127; TMEP section 1301.02. Specifically, the proposed mark does not function as a service mark because it is merely informational. *In re Signal Companies, Inc.*, 228 USPQ 956 (TTAB 1986).

The mark appears to be a pictorial representation of applicant's marine heat exchangers, the product of its custom manufacturing service. It shows a customer what the goods look like, perhaps. It is informative in this regard. However, in the specimens of use, the pictorial representation appears to be just that – a picture of the goods. The trademark for the goods appears to be "GRIDCOOLER" and the picture or drawing is just a picture of a "GRIDCOOLER" and not a symbol of custom manufacturing services.

The examining attorney will reconsider this refusal if the applicant submits a substitute specimen showing use as a service mark. The applicant must verify, with an affidavit or a declaration under 37 C.F.R. Section 2.20, that the substitute specimen was in use in commerce at least as early as the filing date of the application. 37 C.F.R. Section 2.59 (a); TMEP section 905.10.

DESCRIPTION OF THE MARK

The applicant must submit a concise description of the mark. 37 C.F.R. Section 2.35; TMEP section 808 et seq. The statement may be in the following form:

The mark consists ^.

LITERATURE REQUIREMENT

The exact nature of the service and its product is not clear from the present record. In order to allow proper analysis of the services in connection with which the applicant intends to use the mark, the applicant must submit samples of advertisements or promotional materials for services of the same type. If such materials are not available, the applicant must describe the nature, purpose and channels of trade of the services with which the applicant has asserted a bona fide intent to use

the mark. 37 C.F.R. Section 2.61(b); TMEP sections 1103.04 and 1105.02. This requirement is non-waivable. Token compliance will be deemed non-compliance.

EXPEDITED COMMUNICATIONS DATA

The e-mail address is jill.alt@uspto.gov. The fax number is (703) 308-9207. The examining attorney's telephone number is (703) 308-9114 Ext. 133. Fax or e-mail avoid the twin possibilities of "telephone tag" and mailroom delay.

NO CONFLICTING REGISTRATIONS

The examining attorney has searched the Office records and has found no similar registered or pending mark which would bar registration under Trademark Act Section 2(d), 15 U.S.C. Section 1052(d). TMEP section 1105.01.

Jill C. Alt
Trademark Attorney, Law Office 114
Tel. (703) 308-9114 Ext. 133
jill.alt@uspto.gov

L0114

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of	)	
	)	
R. W. Fernstrum & Co.	)	Examining Attorney
	)	
Serial No. 75/701,707	)	Jill C. Alt, Esq.
	)	
Filing Date: May 10, 1999	)	Law Office 114
	)	
Mark: Miscellaneous Design	)	

21

AMENDMENT

Hon. Commissioner Of Patents
And Trademarks
Washington, D.C. 20231

12-22-1999
U.S. Patent & TMOfc/TM Mail Rcpt Dt. #26

Dear Sir:

This is responsive to Trademark Office Action No. 1 dated November 8, 1999.

Please amend the application to register the mark under Section 2(f) of the Lanham Act, 15 U.S.C. § 1052(f).

Please amend the application to include the following statement: "The mark consists of a drawing of a marine heat exchanger."

REMARKS

US PATENT & TRADEMARK OFFICE
1999 DEC 22 P 4:35
TRADEMARK FILE PROCESS RECEIVED

A. The Mark Has Acquired Distinctiveness

Registration was refused on the ground that the proposed mark is merely descriptive because is consists of a representation of a marine heat exchanger. According to the Trademark Examining Attorney, "It is extremely dubious whether any among the relevant buying public will perceive the proposed mark as a service mark."

In response to the descriptiveness refusal, Applicant has amended the above-captioned application to seek registration under the provisions of Section 2(f) of the Lanham Act, 15 U.S.C. § 1052(f). To support its claim that the design of the heat exchanger has acquired distinctiveness or secondary meaning, Applicant submits *A Survey Of Secondary Meaning Of The Shape And Appearance Of the Fernstrum Keel Cooler Tubing* by the Sorensen Marketing\Management Corporation (September, 1998) (hereinafter "Survey").[1] The survey is attached as Applicant's Exhibit 1. "Survey evidence, market research and consumer reaction studies are relevant in establishing acquired distinctiveness." TMEP § 1212.06(d); *Federal Glass Co. v. Corning Glass Works,* 162 U.S.P.Q. 279 (T.T.A.B. 1969)(survey evidence of various types accepted as proof of secondary meaning in mark); *In re Levis Strauss & Co.*, 165 U.S.P.Q. 348 (T.T.A.B. 1970)(survey proper evidence to prove secondary meaning in mark); 5 McCarthy On Trademarks And Unfair Competition § 32:158, p. 32-225 (4th ed. 1999)("Surveys as to the state of mind of prospective purchasers have been offered as evidence of the existence of secondary meaning in a mark")

The purpose of the survey was to determine whether the appearance of the heat exchanger had acquired secondary meaning. Survey, at p. 3. To accomplish this, the survey interviewer, a research and consulting company in the boat building and maintenance industry, prepared a data base of approximately 200 companies that sell, replace, or repair marine heat exchangers in states bordering the Gulf of Mexico. The

[1] The heat exchanger at issue is a keel cooler. It is called a keel cooler because it is attached to the keel of a ship which allows the ambient sea water to cool the engine cooling fluid. The term keel cooler is used in the Survey.

interviewer conducted 150 interviews. Survey, at pp. 5-6. The interview subjects were shown three photographs of the tubing of the heat exchanger and instructed to look at them as if they were examining a catalog or brochure. Survey, at p. 8.

Fifty-seven percent of the survey respondents said that the heat exchanger was manufactured by one company. Survey, at p. 12. Ninety-five percent of the respondents who said that the heat exchanger was manufactured by one company identified applicant as the manufacturer. Survey, at p. 14. Eighty-one percent of the total survey respondents identified applicant as the manufacturer of the heat exchanger. Survey, at p. 13. Based on these results, the market research company concluded that the appearance of the heat exchanger had acquired secondary meaning.[2]

In view of the foregoing, Applicant respectfully requests that the descriptiveness refusal be withdrawn and that the application should be approved for publication under Section 2(f).

B. The Subject Matter Sought To Be Registered Functions As A Service Mark.

Registration was refused on the ground that the proposed mark does not function as a service mark to identify and to distinguish the Applicant's services from those of others and to indicate their source. According to the Trademark Examining Attorney,

[2] Figures over 50 percent are generally regarded as sufficient to establish secondary meaning. 5 McCarthy On Trademarks And Unfair Competition § 32:190, p. 32-286 (4th ed. 1999). *See, Monsieur Henri Wines, Ltd. v. Duran*, 204 U.S.P.Q. 601 (T.T.A.B. 1979)(37 percent of the interviewees associated opposer's brand with a background design; probative to corroborate finding of strong trademark in design).

the subject matter sought to be registered is merely informational - - a picture of the product - - and not a symbol of custom manufacturing services.

The GRIDCOOLER keel cooler designed and manufactured by Applicant is a marine heat exchanger (*i.e.*, a radiator) that is attached to the hull of a boat. It is one of many different ways to cool a marine engine. Because of the different types of boats, engines, uses,[3] and positioning,[4] every marine heat exchanger is custom manufactured for the customer. An off-the-shelf purchase is the exception to the rule. Attached as Applicant's Exhibit 2 is the GRIDCOOLER information/questionnaire with the information necessary for applicant to design and build a GRIDCOOLER keel cooler. The required information has been highlighted. Boat owners and boat builders know that keel coolers must be custom manufactured for each application. This means that as far as the relevant public is concerned, Applicant's product and manufacturing services are inseparable. Therefore, a mark associated with the product will automatically be associated with the manufacturing services.

Attached as Applicant's Exhibit 3 is a product brochure. The design of the GRIDCOOLER keel cooler (*i.e.*, the mark) is prominently displayed on the cover of the brochure. Immediately underneath the mark is the legend "Engineered Keel Cooling". Because consumers and prospective consumers are knowledgeable/sophisticated marine purchasers who realize that each keel cooler must be custom designed and

[3] Marine engines are used for propulsion, bowthrusters, generators, and other uses.
[4] Keel coolers are mounted on the bottom or the sides of hulls, they are recessed into the hull or mounted on the hull, and they have different styles of shielding or protection. Each of these characteristics effects the cooling ability and, therefore, the design and size of the keel cooler.

manufactured, the relevant public associates the mark and the legend "Engineered Keel Cooling" with the manufacturing services rendered by Applicant.

In the middle of the brochure, Applicant points out that each keel cooler is custom manufactured: "Tailored to your exact specifications, the GRIDCOOLER is designed as a complete assembly." The mark is prominently on the top of the open brochure thereby leading the reader to make a direct association between the mark and the services. On the bottom of the center pages, the brochure proudly proclaims the following: "FERNSTRUM GRIDCOOLERS ARE CUSTOM-ENGINEERED FOR ALL TYPES OF VESSELS AND MARINE SERVICE."

Attached as Applicant's Exhibit 4 is a sample of Applicant's letterhead. In the upper left-hand corner in a rectangular box is the mark sought to be registered superimposed over a globe and above the legend "Engineered keel cooling". This directs the viewer to make a direct association between the mark and the services.

Attached as Applicant's Exhibit 5 is a sample of Applicant's shipping label. The mark sought to be registered appears in the upper left-hand corner next to the Applicant's trade name and the legend "Engineered keel cooling" allowing the viewer to make a direct association between the mark and the services. The customer has just bought a custom built GRIDCOOLER keel cooler and has received a package with this label attached. The customer will naturally associate the mark and "Engineered keel cooling" with the product built to his order and specifications by Applicant.

As Applicant's survey pointed out, the largest number of reasons given for the one company source identification centered on references to the appearance of the product. Applicant's Exhibit 1, at page 17 (number 2). Because every keel cooler is

custom manufactured for a particular customer, the customers associate the shape of the product with the design and manufacturing process. Ordering the product entails custom manufacturing and mark is used on every piece of promotional and sales literature.

All of Applicant's advertising includes the subject matter sought to be registered and highlights the fact that the product is custom manufactured to meet the owner's operating conditions and the engine manufacturer's cooling requirements. Attached as Applicant's Exhibit 6 are copies of representative advertisements featuring the design of the GRIDCOOLER keel cooler directly associated with the custom manufacturing feature.

Applicant's Exhibit 1 demonstrates that the relevant consumers associate the mark with Applicant. Marine keel coolers are custom manufactured for the specific application of the prospective customer. Applicant prominently displays the mark in all of its advertising, promotional, and sales materials with the legend "Engineered Keel Cooling". Customers naturally associate the mark with the manufacturing services rendered by Applicant.

With this background, the Examining Attorney should understand how and why the relevant public associates the mark and the manufacturing services rendered by Applicant. The specimens originally filed with the application demonstrate the association between the mark and the services. Accordingly, the requirement for new specimens supported by a declaration should be unnecessary.

C. Literature Requirement

The materials in Applicant's Exhibit Nos. 3 and 6 should satisfy the requirement for additional literature.

* * * *

In view of the foregoing, Applicant respectfully requests that the refusals to register on the grounds that the mark is merely descriptive and fails to function as a service mark should be withdrawn and the application should be approved for publication.

R. W. FERNSTRUM & CO.

Date: December 20, 1999

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Survey Research Studies Report

A SURVEY OF SECONDARY MEANING OF THE SHAPE AND APPEARANCE OF THE FERNSTRUM KEEL COOLER TUBING

September 1998

Sorensen Marketing\Management Corporation

Survey Research Studies Report

A SURVEY OF SECONDARY MEANING OF THE SHAPE AND APPEARANCE OF THE FERNSTRUM KEEL COOLER TUBING

September 1998

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I. BACKGROUND AND PURPOSE OF STUDY

A question has arisen concerning the trademark significance, if any, of certain visible elements, i.e., rectangular tubing, of a marine keel cooler manufactured by R.W. Fernstrum & Company ("Fernstrum") in connection not only with its application for federal trademark registration, but also in certain pending civil actions involving Fernstrum. This question addressed by this survey arose from allegations by Fernstrum that certain other companies had begun manufacturing and selling marine keel coolers possessing rectangular tubing that rendered them confusingly similar in appearance to those keel coolers manufactured and sold by Fernstrum.

The critical group (population) that has played, and continues to play, an important role in the marketplace relationships between Fernstrum and any other company manufacturing and selling keel coolers, are those persons and their companies who specify, recommend, buy, or install keel coolers for inboard boat engines.

The salient purpose of this study was three-fold:

(1) To learn whether or not and, if so, to what extent, members of the above defined relevant population identify and associate the appearance of the Fernstrum keel cooler tubing with a single particular source;

(2) If so, to ascertain what company source and brand identifications, if any, are made in any source attributions offered by members of this population on the basis of seeing unlabelled untitled photographs of the tubing portion of the

Fernstrum keel cooler; and

(3) To determine what, if any, explanations these respondents offer for the source and brand identifications they make when they see the Fernstrum keel cooler tubing.

Sorensen Marketing/Management Corporation, a market research and marketing counsel firm in New York, New York was retained in early 1998 by Samuel D. Littlepage, Esq. of Dickinson Wright, PLLC in Washington, D.C. to design, implement and report on this study with the direct involvement and supervision of Dr. Robert C. Sorensen who also prepared this Report.

The *Curriculum Vitae* for Dr. Sorensen, including his publications of the past ten years, is appended to this Survey Report as Exhibit G.

The cases in which Dr. Sorensen has offered deposition or courtroom expert testimony during the past six years are listed in Exhibit H appended to this Survey Report.

The fees and costs of this survey, including $26,527.36 paid to the field data base and interviewing organization for its time and travel expenses in five states, total $57,268.55 with the submission of this Report and appended Exhibits.

II. STUDY METHODS

A. Defined population (the universe) and sampling technique

The population identified for this study was defined as persons who during the past two years have personally been involved in specifying, recommending, buying, or installing any keel

coolers. Some respondents suggested they had sold, replaced, repaired, and/or provided maintenance service on new or used marine keel coolers. All such persons and their companies are marketing targets for companies manufacturing and distributing keel coolers.

For purposes of this survey, Dr. Sorensen retained Mr. Edward D. Fry of Edward Fry & Associates, Inc., a research and consulting company in the boat building and maintenance industry, to prepare a data base of all known companies located in the southern area of the United States bordering on the Gulf of Mexico that would fit the above listed specifications. The resulting data base listed nearly two hundred (200) such companies in five states, i.e., Alabama, Florida, Louisiana, Mississippi, and Texas. This list of companies was then approved by Dr. Sorensen for market research purposes.

Because these companies are targeted by a variety of keel cooler manufacturers, and because all such companies were wanted for this data base of prospective survey respondents, no criteria were either specified or implemented in the provision of company names. Thus no pruning or special selection of any company took place. No other company attributes were specified such as size, dollar sales, or product specialties.

In conversation with Mr. Littlepage, counsel for Fernstrum, Dr. Sorensen required and obliged counsel and Fernstrum not to inform or in any way suggest to any company or person on any list that a survey was to be conducted, or that a party had been or might be interviewed, what the interview was about, or that it had

anything to do with litigation. Mr. Fry and Mr. Littlepage were neither introduced to nor in communication with one another. Moreover, Dr. Sorensen made it abundantly clear that under no circumstances would he inform anyone before or after the survey was completed, of his interviewer's determination of which companies to contact, or the names of the persons therein qualified for interview, or the identity of any companies and persons contacted, or what anyone from a participating company had to say to the interviewers. It was also understood that the interviewing organization retained by the Sorensen firm would make the actual selection of companies for interview without Dr. Sorensen's knowledge or input other than his request for a systematic effort to complete one hundred fifty (150) interviews from the data base the interviewing organization developed.

The population was sampled on an intercept interview basis through the aforementioned company lists, sometimes first by telephone and other times by "drop-in" contact when the interviewer was in the vicinity of the company site. Additional persons were contacted but not interviewed because of their failure to qualify for the sample or because of their stated unwillingness or lack of time to participate.

The sample from the defined population is not depicted as a probability sample because its members did not have an equal or known chance of being selected for interview. But because the questionnaires were very carefully designed, the interviewing procedure well defined, the sample drawn from a variety of

locations in a five states region, and the results of the stimuli clearly indicating majorities in salient responses, it is appropriate to infer that the results of a larger probability sample would not differ significantly from those obtained from this survey except for reason of potential sampling error beyond our control.

B. Sample characteristics (Tables 4A-7A and 4B-7B)

Respondents were distributed geographically among the five states territory depending on how they "fell". The five states and the percentages of the 150 completed interviews from each are as follows (Tables 7A and 7B):

State	
Alabama	20.7%
Florida	07.3%
Louisiana	47.3%
Mississippi	07.3%
Texas	17.3%

Tables 4A and 4B indicate that 96.0% of total survey respondents were males and 4.0% were females. (Question 4a)

All respondents were asked Question 4b concerning their age: 12.7% were under 21 to 34 years of age; 46.7% were 35 to 49 years of age; and 40.7% were 50 years of age and over. (Tables 4A and 4B)

Tables 5A and 5B tabulate for all respondents "How many years have you been involved in specifying, recommending, buying, or

installing keel coolers?" (Question 5a), and Tables 6A and 6B answer for all respondents "What is your position with the company?" (Question 6).

C. The interview questionnaires and photographs

Dr. Sorensen designed the Screener Questionnaire (Exhibit A) and the Main Questionnaire. (Exhibit B) The purpose of the Screener Questionnaire in the sample selection process was to determine whether or not a prospective respondent in fact qualified as a member of the defined population in accordance with the above mentioned specifications. The Main Questionnaire consists of the definitive interview questions that address the survey's purpose set forth above.

A set of three (3) four-color photographs of the unlabelled Fernstrum keel cooler tubing from different angles were produced in accordance with Dr. Sorensen's specifications. The three photographs, appended collectively hereto as Exhibit C, were referred to in Question 1 which reads, in part: "Please look at these photographs taken from different angles of the same keel cooler one by one as I hand each to you and then lay them down in front of you. Look these photos over as you would if you were examining them in a catalog or brochure."

All respondents were told in Question 1 before the first query in the Main Questionnaire: "Now if you can't answer a question in this interview, it's okay to tell me so." (Exhibit B, page 1)

D. Interviewer instructions

Dr. Sorensen personally prepared three pages of detailed instructions for the field interviewer (Exhibit E). He further conducted a telephone briefing session and was available for questions by telephone.

These instructions provide basic ground rules for contacting people for interview, as well as how to screen respondents to be sure they are members of the appropriate universe and meet other quota screening specifications. They set forth rules, prohibitions and procedures; and they deal with critical matters such as assurance of confidentiality and what to say about the survey and its purpose. Moreover, Dr. Sorensen and his office were in frequent touch with the various interviewer supervisors.

E. Interviewer affirmation and interview validation

Interviewers were instructed to ask all questions in each Screener and Main Questionnaire exactly as they were printed, and interviewers were required to record accurately the respondent's complete answers to the questions in the Main Questionnaire. Each interviewer was asked to attest that she or he had selected and interviewed the indicated respondent in the listed company and had fully complied with the aforementioned interviewer instructions in conducting the interview. Thus, in the closing paragraph of each questionnaire, the responsible interviewer was required to sign and date the following certification: "This is to affirm that I have interviewed the above named respondent to the best of my ability in

accordance with the interviewing briefing instructions and that I recorded, as fully and accurately as possible, all of this respondent's answers to the above questions on the date below."

Moreover, 15.3% of the interviewer's work was validated by an independent organization, The Wats Room, Inc., an organization that specializes in telephone interviewing and telephone validations of survey interviews. This organization made its own random selection of respondents with whom survey questionnaires were completed and telephoned these persons for confirmation that the interview had taken place. As attested in a letter from the project manager, no difficulty was encountered. (Exhibit E) In this same appended exhibit is a copy of the script used in the conversation between validator-interviewer and each respondent contacted.

F. Coding and tabulating procedures

Dr. Sorensen personally read each one of the one hundred-fifty (150) completed questionnaires containing the answers to the questions. Answers to questions asked in an interview and recorded on a questionnaire must be broken down into identifiable categories of words, themes and names so that they can be quantified and thus counted, tabulated and analyzed. Some of these content categories already exist as "pre-coded" answers to closed-end questions that dictate known predictable factual specifics such as gender or age group answers. Other content categories are word and thematic content in answers to open-end questions and identified for use in quantifying each respondent's replies to the survey questions.

Using a code structure, the contents of all answers are examined and broken down into the specified categories utilized in Part III-STUDY FINDINGS and Exhibit I-TABLES OF INFORMATION of this final Report. This coding operation includes the assignment of a specific code number to each unit of content designated by specific words or themes. The coding analyst records the appropriate code numbers representing the corresponding open-ended answer on each questionnaire.

The raw data now in numerical form were then converted under Dr. Sorensen's direction to computer tables that appear herein as Exhibit I-TABLES OF INFORMATION. These tables, 1A through 7A and 1B through 7B consist of cross-tabulations of salient data and the "Marginals" which include literally the quantification of the entire answer data coded and tabulated by each one of the subject codes. "Code Sheets" which can be used to read the "Marginals" are appended hereto as Exhibit F.

G. Non-mention of litigation implications of study

The survey interviewer was not informed by Dr. Sorensen that the survey was being conducted for possible use in litigation or the name of the party in whose behalf the survey was being conducted. Moreover, the interviewer instructions and the interview questionnaire were designed to avoid providing any suggestions to survey respondents about who the survey sponsor or interested parties might be.

III. STUDY FINDINGS

A. Whether or not the keel cooler was manufactured by one company or more than one company (Tables 1A and 1B)

Special Note: The contents of this section are keyed to all tables and "marginals" located in Exhibit I.

As earlier indicated, Question 1 dealt with the introduction and display of three photographs of the same unmarked Fernstrum keel cooler tubing to all survey respondents. The three color photographs remained in front of the respondents until all questions concerning the keel cooler had been asked and answered.

All survey respondents were asked Question 2a: "Do you believe the same keel cooler shown in these three pictures is manufactured by one company or more than one company?" 57.3% of total survey respondents said "One company" when viewing the picture of the Fernstrum keel cooler tubing, 32.0% said "More than one company", and 10.7% said "Don't know" or "Not sure".

All survey respondents, regardless of their answer to Question 2a, were asked Question 2b: "What causes you to say that?"

20.9% of all respondents answering "One company" (12.0% of total survey respondents) made a comment bearing on the design and appearance of the keel cooler tubing they were viewing as the reason for their "One company" answer. Another same number and percentage of people, 20.9% of all respondents answering "One company" (12.0% of total survey respondents), referred to their knowledge of the field and their experience. 36.0% of those saying

"One company" (20.7% of total survey respondents) said that they only knew of one company making a keel cooler with the shape of tubing they were looking at.

Reasons given by respondents saying "More than one company" were scattered, the largest number-37.5% of those saying "More than one company (12.0% of total survey respondents) answering "Have more than one supplier/know of more than one manufacturer". One respondent referred to "Shape/design", another to "Standard keel cooler design" and 3 said they are "Aware that this design is copied".

B. Company source name identifications (Tables 2A and 2B)

All respondents, no matter what their answer to Questions 2a and 2b were asked Question 3a: "What do you believe is the name of the company ("companies" if respondent said "more than one company" in answer to Q. 2a) that manufacture(s) the keel cooler shown in the pictures you are looking at?"

No respondent replied "Don't know/not sure" to this question; 3.3% of total survey respondents said "Photographs provide insufficient I.D. information".

A net unduplicated 81.3% of total survey respondents made a Fernstrum company identification. Broken down, 78.7% of total survey respondents said "Fernstrum/R.W. Fernstrum", 2.7% said "Fernstrum Gridcooler" and 1.3% said "Gridcooler". (Note: GRIDCOOLER is the registered word trademark for the keel cooler product made and sold by Fernstrum.)

In addition, 3.3% of total survey respondents said "East Park Radiator/East Park", 1.3% said "Donovan Marine", 2.7% said "Duramax/Duramax Marine", and 7.3% said "Johnson/Johnson Marine". A substantial portion of respondents making these identifications, adding to 14.6% of total survey respondents, can be inferred as persons who would otherwise have made a Fernstrum identification if these four companies' keel cooler products had not existed, given what has been represented to me as the substantially identical overall shape, elements and appearance of these companies' respective products to those attributes of the Fernstrum keel cooler.

These Fernstrum source attributions to other brand named keel cooler products by respondents viewing the Fernstrum rectangular tubing indicate these respondents' confusion of the Fernstrum source with the sources of these other competing keel coolers utilizing the rectangular tubing.

No respondent cited "Johnson Rubber" or "Walter/Walter Machine", two companies which make a keel cooler with cylindrical or "round" tubing.

A net unduplicated 54.7% of total survey respondents, i.e., 95.3% of all survey respondents who had answered "One company", said "Fernstrum/R.W. Fernstrum" (including one person saying "Fernstrum Gridcooler") is the name of the company manufacturing the keel cooler shown them in the picture. No other company or brand name was mentioned by those who had answered "One company".

A net unduplicated 23.3% of total survey respondents, i.e.,

72.9% of all survey respondents who had answered "More than one company" made the Fernstrum identification. Among those saying "More than one company", 66.7% (an additional 21.3% of total survey respondents) said "Fernstrum/R.W. Fernstrum", 6.3% (an additional 2.0% of total survey respondents) said "Fernstrum Gridcooler", 4.2% (an additional 1.3% of total survey respondents) said "Gridcooler". As indicated in the preceding paragraph, all of the tabulated four non-Fernstrum source name identifications were made by respondents who had said the keel cooler they were viewing was made by "More than one company". (Table 2A)

C. Reasons for company source name identifications (Tables 3A and 3B)

All survey respondents were asked Question 3b for whatever company name or names they had previously cited: "What, if anything, in these pictures, causes you to say that?", followed by Question 3c: "Anything else?" The answers to these two questions are grouped and analyzed together.

The reasons given for a specific source name identification centered on the perceived design of the keel cooler tubing that respondents were seeing in the photographs. The largest number of reasons, given as an explanation for the "Fernstrum" company name identification by a net unduplicated 68.7% of total survey respondents, are grouped in three categories and break down as follows in the tabulation of individual reasons: 25.3% of total survey respondents (31.1% of all those identifying the keel cooler

as Fernstrum said Fernstrum for reason of "Shape/design"; 16.0% (19.7%) - "Rectangular 'grid' form"; and 46.7% (57.4%) - "Rectangular/square 'tubes'/shape of 'tubes'".

A few respondents who gave any one of these three explanations for the company they identified as a manufacturer of the keel cooler they were viewing named a company other than Fernstrum. Of the 5 persons (3.3% of total survey respondents) naming "East Park Radiator/East Park" as one of the sources, 1 said "Shape/design", 1 said "Rectangular 'grid' form", and 3 said "Rectangular/square 'tubes'/shape of 'tubes'". Of the 2 persons (1.3% of total survey respondents) who had named "Donovan Marine" as one of the sources, 1 said "Shape/design" and 1 said "Rectangular 'grid' form". Of the 4 persons (2.7% of total survey respondents) who had named "Duramax/Duramax, Inc.", all 4 said "Rectangular/square 'tubes'/shape of 'tubes'". Of the 11 persons (7.3% of total survey respondents) naming "Johnson/Johnson Marine" as one of the sources, 2 said "Shape/design", 1 said "Rectangular 'grid' form", and 9 said "Rectangular/square 'tubes'/shape of 'tubes'".

The reasons given for the mistaken source identifications of sources other than "Fernstrum" embody in substantial numbers the shape and appearance of the keel cooler rectangular tubing respondents were viewing.

IV. CONCLUSIONS

On the basis of findings from a survey of a representative sample of the defined relevant population of people dealing with

keel coolers, the following is clear:

1. 57.3% of the above-named relevant population, when viewing three photographs of Fernstrum keel cooler tubing, unmarked and unlabelled, believed that the keel cooler with this tubing is manufactured by one company.

2. The largest number of reasons given for the one company source identification--as opposed to more than one company--centered on references to appearance and to people's knowledge of the field or their experience.

3. A net unduplicated 81.3% of total survey respondents made a Fernstrum company identification. Broken down, 78.7% of total survey respondents said "Fernstrum/R.W. Fernstrum", 2.7% said "Fernstrum Gridcooler" and 1.3% said "Gridcooler".

4. It is likely that still other respondents would have made a Fernstrum source identification had they not erroneously identified other sources of a keel cooler that is substantially the same in visible elements and appearance as that made by Fernstrum.

5. 54.7% of total survey respondents, i.e., 95.3% of all survey respondents who had answered "One company", made a "Fernstrum/R.W. Fernstrum" source identification including one person saying "Fernstrum Gridcooler". No other company or brand name was mentioned by those who had answered "One company".

6. No respondent cited either "Walter/Walter Machine" or "Johnson Rubber" companies. Neither of these two companies makes nor markets a keel cooler with rectangular tubing that is similar to that of the Fernstrum keel cooler.

7. The largest number of reasons given for the "Fernstrum" source identification, offered by a net unduplicated 68.7% of total survey respondents are grouped in three categories: "Shape/design", "Rectangular 'grid' form" and "Rectangular/square 'tubes'/shape of 'tubes'". Moreover, only a few of the people who gave any one of these three explanations for the company they identified as a manufacturer named a company other than Fernstrum.

8. Confusion of the source of other keel cooler products having rectangular tubing with the Fernstrum keel cooler was indicated by respondents erroneously citing the non-Fernstrum products by name and referring to their rectangular tubing as their reasons for doing so.

9. For these reasons, it is clear that a high incidence of attribution or secondary meaning exists for Fernstrum with respect to the visual elements and appearance of its keel cooler tubing and, thus, for the Fernstrum keel cooler product itself.

September 1, 1998 Robert C. Sorensen

EXHIBITS A THROUGH I

Exhibit A

SORENSEN MARKETING/MANAGEMENT CORPORATION
SMMC - SDL - APRIL 1998

Qst. #:_____ 5-8
Int. #:_____ 9/
Survey # _____ 10
Area :_____ 11/

BOAT SURVEY

SCREENER QUESTIONNAIRE (USE PEN ONLY)

1. Hello, I'm (MY NAME) from (BLANK), a market research company. We're conducting a study in this area and I would like to ask you a few quick questions. We are ABSOLUTELY not selling or promoting any products.

2. We're talking about different boating items with different people. During the past two (2) years, have you personally been involved in specifying, recommending, buying, or installing any one of the following three items for any boat that you or your company is building, maintaining or repairing? Please do not guess. Tell me "Yes" or "No" or "Don't know" for each of the following: READ ENTIRE LIST, BUT GET ANSWER FOR EACH ITEM BEFORE ASKING ABOUT NEXT ITEM.

(1) Propellers and prop shafts?
(2) A keel cooler?
(3) A generator set?

IF RESPONDENT ANSWERS "YES" TO Q.2. (2), "A KEEL COOLER", GO TO Q. 4. IF OTHERWISE, GO TO Q. 3.

3. Still talking about these different boating items, do you believe that over the next six months you will or will not be personally responsible for specifying, recommending, buying or installing any one of the following three items for any boat that you or your company is building, maintaining or repairing? Again please do not guess. Just tell me "I believe I will" or "I believe I won't" or "I have no opinion". about any one of the following three items I'm going to read to you. READ ENTIRE LIST, BUT GET ANSWER FOR EACH ITEM BEFORE ASKING ABOUT NEXT ITEM.

(1) Propellers and prop shafts?
(2) A keel cooler?
(3) A generator set?

IF RESPONDENT ANSWERS "YES" TO Q.3, "A KEEL COOLER", GO TO Q. 4. IF OTHERWISE, TERMINATE AND RECORD BELOW

NOT QUALIFIED RE KEEL COOLER IN QUESTIONS 2 AND 3
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

4. Have you been interviewed in a market research survey any time in the last two months?

TERMINATE AND RECORD BELOW	YES
GO TO Q 5A	DON'T KNOW
TERMINATE AND RECORD BELOW	NO

PROBLEM WITH PAST MARKET RESEARCH INTERVIEW

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

5a. Do you generally wear eye glasses or contacts when you are carefully examining photographs of products such as those we discussed?

GO TO Q 5b	YES
GO TO Q 6	NO
GO TO Q 5b	DK/NS

5b. IF "YES" T0 Q 5a. Can you please wear your glasses (contacts) during the rest of this interview? Thank you.

GO TO Q 6	YES
TERMINATE AND RECORD BELOW	NO
TERMINATE AND RECORD BELOW	DK/NS

PROBLEM WITH EYE GLASSES/CONTACTS

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

6. DO NOT ASK: IF RESPONDENT APPEARS TO HAVE ANY LANGUAGE, HEARING, OR READING DIFFICULTIES, OR APPEARS TO BE IN A HURRY, TERMINATE AND RECORD BELOW

LANGUAGE/HEARING/READING/TIME DIFFICULTIES

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

7. Now I have only a few more questions where I need to show you some items. IF NOW AT SITE. Can we go some place here that is private with a desk or table so I can lay down some items for you to look at? IF TELEPHONING. Can we arrange a time today or tomorrow, when I can visit you at your work or home, where we can go some place private with a desk or table, so I can day down some items for you to look at? IF "NO", TERMINATE AND RECORD.

UNWILLING TO BE INTERVIEWED FURTHER

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

Exhibit B

SORENSEN MARKETING/MANAGEMENT CORPORATION
SMMC - SDL- APRIL 1998

Qs. #:_____ 5-8
Int. #: _____ 9/
Survey #: _____ 10/
Area:_____ 11/

MAIN QUESTIONNAIRE

BOAT SURVEY

1. **Hand each of three pictures one by one to respondent in order beginning with encircled item. (1)"A", (2)"K" and (3)"X". Continue asking this question:** Please look at these photographs taken from different angles of the same keel cooler one by one as I hand each to you and then lay them down in front of you. Look these photos over as you would if you were examining them in a catalogue or brochure. Now, if you can't answer a question in this interview, it's okay to tell me so. Pick up any of these photographs and look at them if you like. Tell me when you're ready for a couple of questions.

2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one company or more than one company?

One company	12/1
More than one company	/2
DK/NS	/3

2b. What causes you to say that? _____ 13/

_____ 14/

3a. What do you believe is the name of the company (companies if respondent said "more than one company" in answer to Q2a) that manufactures the keel cooler shown in the pictures you are looking at?

_____ 15/

_____ 16/

3b. **Ask and indicate answer for whatever company mentioned** What, if anything, in these pictures, causes you tosay that?

_____ 17/

_____ 18/

3c. Anything else?_____ 19/

_____ 20/

TAKE BACK AND CONCEAL PICTURES

4a. **Indicate (encircle code)**

Male	21/1
Female	/2

4b. Just so we can divide our interviewees into groups, will you please tell me which one of these age groups you are in? **Read out loud and indicate.**

21 to 34?	22/1
35 to 49?	/2
50 and over?	/3
Refused all ages	/4

5a. For about how many years have you been involved with specifying, recommending, buying, or installing keel coolers?

_____ 23-24

5b. Which are you most involved with: specifying, recommending, buying, or installing keel coolers?

Specifying	25/1
Recommending	/2
Buying	/3
Installing	/4

6. What is your position with your company?_____ 26-27

7. Just in case my supervisor wants to check that we had this interview, will you please let me reconfirm your name, address and telephone number? This information is confidential and we are not selling or promoting any products. Thank you very much for your help. We would appreciate your not mentioning this interview to anyone.

RESPONDENT'S NAME: _____

COMPANY NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____

TELEPHONE: _____ ZIP CODE: _____ 28-32

8. Thank you for your cooperation. ZIP CODE DK/NS 33/

To be signed by the interviewer: This is to affirm that I have interviewed the above named respondent to the best of my ability in accordance with the interviewing briefing instructions and that I recorded, as fully and accurately as possible, all of this respondent's answers to the above questions on the date below.

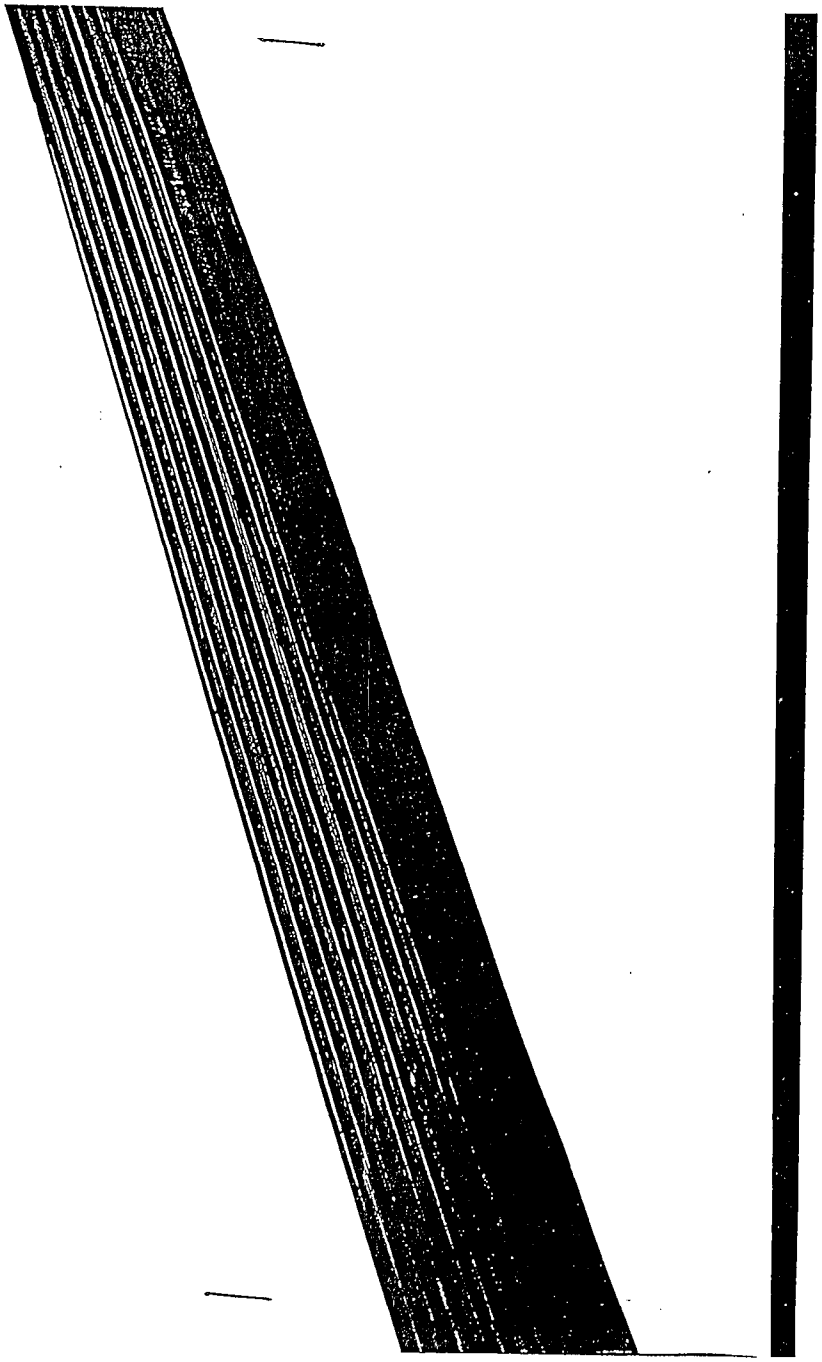
Interviewer's full name (no initials):

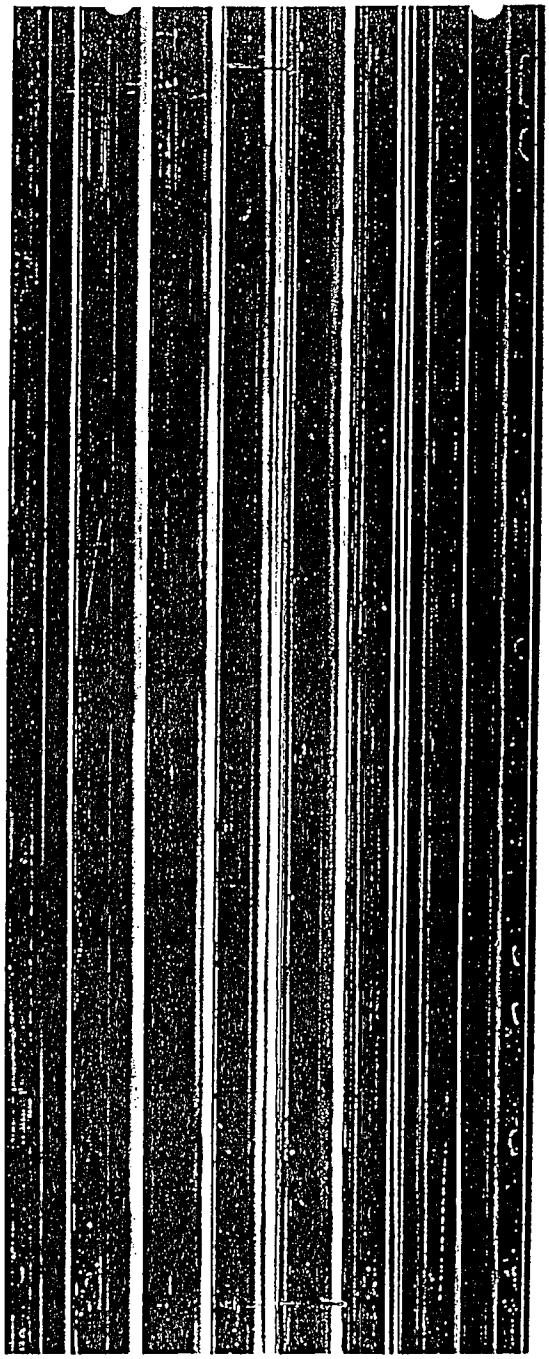
Name: _____ **Date:** _____

SDL-MQ-2

Exhibit C

SURVEY PHOTOGRAPHS





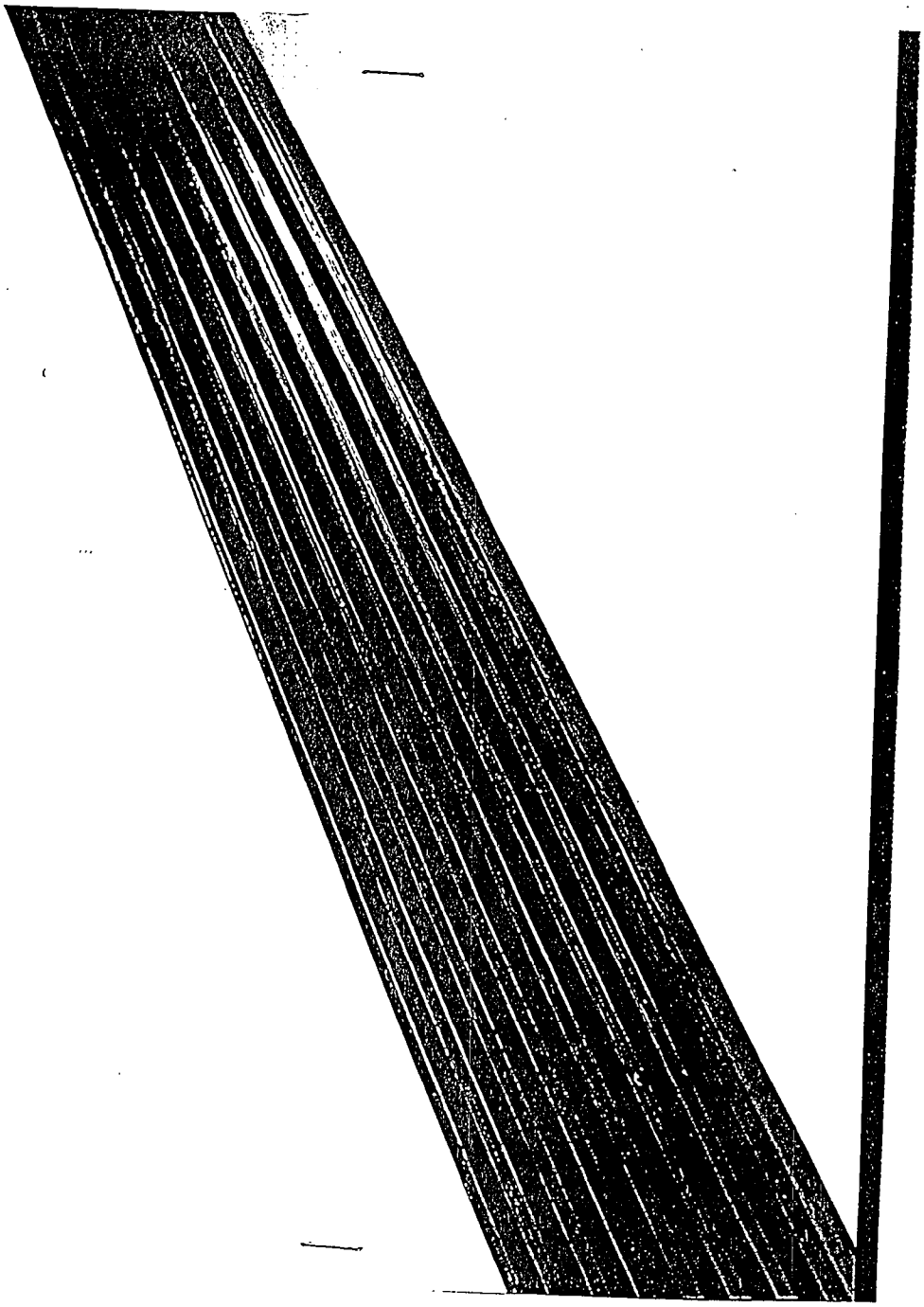


Exhibit D

SORENSEN MARKETING/MANAGEMENT CORPORATION
SMMC - SDL - APRIL 1998 *Strictly Confidential*

GENERAL INSTRUCTIONS - BOAT SURVEY STUDY

Thank you for working with us on this study. I appreciate your care and professionalism in this study because careful attention to detail and getting every word down is very important to us. Please keep and read these instructions carefully. Sign the "Briefing Attendance List" before you begin your interviewing. You are interviewer #1. Any other interviewer on this project must sign the attendance sheet as well, using the number on the "sign-in" line as his interviewer number. Every interviewer must have a copy of these instructions in hand before and during a survey briefing.

In this survey we will consider an interview as completed only if the respondent has been taken through the entire Screener Questionnaire and Main Questionnaire. The purpose of this survey is to learn more about people's reactions to three photographs of the same boat keel cooler.

RESPONDENT QUOTAS

150 completed interviews (Screeners and Main Questionnaires) are required from the sample provided you.

RESPONDENT CONTACT, ESTABLISHING RAPPORT, AND OTHER PROCEDURES

1. Please do not try to interview anyone who seems to be in a big hurry or is not willing to be interviewed. Don't hesitate to terminate the interview under these circumstances. On the other hand, see if the person can be qualified so that an effective interview can be conducted on another occasion.

2. If any respondent is hesitant about answering any of the questions, make it very clear that you are "not selling or promoting any thing" and that "this not a test".

3. You can also truthfully say that you don't know what the sponsor wants to know except "to learn more about the opinions of people who work with boats as defined in our Screening questions".

4. You can certainly tell people that this study is confidential and that every individual response will be combined together in a computerized total. We are not interested in keeping information about what any one individual thinks. Respondents' names and company affiliations are strictly confidential!!

5. Although this is a very unlikely possibility, do not interview a member of your family or a friend or relative. The person you interview must not be someone you personally know.

6. Never interview a person if anyone else is present with him/her. You can always request the person to be alone in the room with you during your interview.

7. The questionnaires and questions are constructed for a steady-paced interview, but don't encourage respondents to give thoughtless answers. We are asking for spontaneous responses, regardless of what experience or expertise the respondent may have

8. Particularly in this survey, it is essential that you be as full and accurate as possible in recording the respondent's answers to the questions in this questionnaire. Record the respondent's full answers to any open ended questions in his/her own words. Do not condense, summarize, paraphrase or abbreviate!

9. If you are asked who is sponsoring this study, make the truth clear: you do not know.

10. Write down the name of each individual for whom you have completed a Screener and Main Questionnaire on the validation form which has been issued to you. If there is an additional interviewer, each validation form must contain the work of only one interviewer. Be sure the top right-hand corner portion of each validation form is filled in, except for the "Supervisor's Name". Disregard the top left-hand corner portion if all interviews are from the same metropolitan area. Do not fill in the left hand column entitled "VAL. INT'S. NAME", but be sure to fill in the respondent's name, respondent's telephone number, date of interview, and Quest.# (interview number) for each completed interview.

11. The validation form, as well as the sign-in sheet, Screener Questionnaire and Main Questionnaire forms must be filled out with a dark black or blue ball point pen -- NOT in pencil. If anything you have written on any form must be changed, e.g., the respondent's name, draw a neat line through what you are changing and write a correction above or in a nearby margin or on the back of the form you are using. (Indicate whenever you go to the back of the page!) Erasures or ink blot-outs on any of these forms will require the entire interview to be rejected by our office.

USING THE QUESTIONNAIRES

Detailed instructions for the asking of each question are set forth in the screening and main portions of the questionnaires themselves. It is urgent that you follow them carefully and accurately. The following are important additional instructions:

1. Each interviewer need only use one Screener Questionnaire. A separate record must be kept of all interview terminations.

2. Each Main Questionnaire is numbered. If any replacement Main Questionnaire is needed, a blank questionnaire must be used for the replacement interview, numbered exactly the same as the replaced questionnaire, and stapled on top of the replaced questionnaire.

3. Even if a respondent asks, do not define any word or explain any name. If you are pushed on this, you can only say: "I'm sorry; I am not supposed to say anything other than to ask questions."

4. If the respondent does not understand a question, do not explain it in your own words or re-word it; just re-read the question as it appears in the questionnaire. If the respondent wants to change an answer to any question, indicate the question number and additional comment or newly revised answer on your questionnaire form. DO NOT eliminate or cross out the original answer under these circumstances.

5. Please read all questions to the respondent exactly as they are written. Do not add or subtract any words. You should have no opinion about what respondents are going to say, so please don't say anything or make sounds whose meaning is subject to any interpretation by the respondent other than your interest in her/him. <u>You must pay very careful attention to hearing and recording the respondent's answers.</u>

6. PROBING: We are asking you NOT to probe responses in the usual sense of seeking to learn everything in the respondent's mind relative to your interview question. We want their spontaneous reactions fully recorded. BUT: It is vital that you ask a respondent "Please explain your answer." or "Tell me what you mean." or "Why do you say that?" when you perceive the answer is unclear. Be sure to write down any probe question that you had to put to the respondent. Questionnaires that fail to reflect needed probing of this sort will NOT be accepted by our firm and will need to be replaced by you.

7. Where a person makes a comment even in reply to a closed-end question, please write it somewhere on your questionnaire page for that interview, indicating the question number to which it applies.

8. <u>IMPORTANT</u>: Sign each Main Questionnaire with your full name (no initials).

9. Also important!! Please write clearly. We are unable to accept questionnaires with answers that are even partly unreadable.

PLEASE BE SURE TO REFER ANY QUESTIONS IMMEDIATELY TO ROBERT SORENSEN OR COLIN SCOTT BY PHONE OR FAX. Do not give out any company name but your own. Thank you!!

Exhibit E

THE WATS ROOM, INC.
18 RAILROAD AVENUE
ROCHELLE PARK, NJ 07662
Tel (201) 845–3100 Fax (201) 845-3131
e-mail: awilson@twri.com

June 12, 1998

Dr. Robert C. Sorensen, President
Sorensen Marketing / Management
Corporation
50 East 77nd Street
New York City, NY 10021-1836

Dear Dr. Sorensen:

This is to certify that The Wats Room, Inc., an independent Interviewer service, has completed validation of the Boat Survey. Our interviewers established contact with 23 respondents at the telephone numbers listed on the validation forms. These respondents were chosen solely and randomly by The Wats Room, Inc. This represents fifteen per cent of each interviewer's work.

Our interviewers asked all of the following validation questions and accurately noted the responses thereto. Each telephone validator initialed the individual's telephone validation space, recorded the responses and ascertained that there were no problems.

The questions asked are as follows:

1. Did you participate in an interview at your office or workplace about keel coolers for boats?

   YES 23 NO 0 DK 0

2. The people who participated in the interview were shown color photographs of sections of keel coolers and asked questions about them. Do you recall that interview?

   YES 23 NO 0 DK 0

SINCERELY,

Ann Wilson

Ann Wilson
Project Manager

Exhibit F

SORENSEN MARKETING/MANAGEMENT CORPORATION
SMMC - SDL - APRIL 1998

BOAT SURVEY
CODE SHEETS

5-8	Questionnaire #
9	Interviewer #
10/	Survey #
11/1	Alabama
/2	Florida
/3	Louisiana
/4	Mississippi
/5	Texas

Q 1. Respondent is shown three photographs of the same keel cooler and asked to examine them as if in a catalogue or brochure.

Q 2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one company or by more than one company?

12/1	One company
/2	More than one company
/3	Don't know/not sure

Q 2b. What causes you to say that?

13/1	General appearance
/2	Shape/design
/3	Shape/design is unique
/4	Materials from which cooler is fabricated
/5	Standard keel cooler design
/6	Knowledge of field/experience
/7	Rectangular/square 'tubes'
/8	Only one company has rectangular 'grid' design/other brands have different designs
/9	Typical Fernstrum design
/0	Aware that this design is copied

14/1	Only know of one company/the only company I know
/2	Use this type/brand of cooler/Only type/brand used
/3	Most commonly used cooler
/4	Have seen magazine advertisements, catalogs, etc.
/5	Other coolers/makers have similar designs
/6	Have more than one supplier/know of more than one manufacturer
/7	Photographs provide insufficient information for identification
/8	Other
/9	Miscellaneous
/0	Don't know/not sure
/X	Other brands use round/cylindrical 'tubes'
/Y	Photographs appear to show same cooler

Q 3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

15/1	Donovan Marine
/2	Duramax/Duramax Marine
/3	East Park Radiator/East Park
/4	Fernstrum/R.W. Fernstrum
/5	Fernstrum Gridcooler
/6	Gridcooler
/7	Johnson/Johnson Marine
/8	Johnson Rubber
/9	Photographs provide insufficient I.D. information
16/1	Walter/Walter Machine
/8	Other
/9	Miscellaneous
/0	Don't know/not sure

Q 3b/c. What causes you to say that?

17/1	Shape/design
/2	Materials from which cooler is fabricated
/3	Color
/4	Rectangular 'grid' form
/5	Rectangular copper/brass/alloy design
/6	Rectangular/square 'tubes'/shape of 'tubes'
/7	Other brands use round/cylindrical tubes
/8	Photographs appear to show same cooler
/9	Most commonly used cooler
/0	Have seen magazine advertisements

18/1	Minimal/non involvement in brand purchase/specifications
/6	Fernstrum is principal manufacturer/Fernstrum is standard
/7	Use Fernstrum all the time
/8	Aware of Fernstrum 'knock-offs'
/9	Looks like Fernstrum design
/0	Have installed many of these

19/1	Looks like the coolers we use
/2	Mainly use inboard coolers
/3	Photographs provide insufficient I.D.
/4	It is a gridcooler
/5	Only Fernstrum has this design
/6	Install brand supplied with engine

20/8	Other
/9	Miscellaneous
/0	Don't know/not sure

Q 4a.

21/1	Male
/2	Female

Q 4b.

22/1	21 to 34
/2	35 to 49
/3	50 and over
/4	Refused all ages

Q 5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

23/1	Less than 1 year
/2	1 to 3 years
/3	4 to 6 years
/4	7 to 9 years
/5	10 to 12 years
/6	13 to 15 years
/7	16 to 18 years
/8	19 to 21 years
/9	22 to 24 years
/0	25 to 27 years

24/1	28 to 30 years
/2	31 to 33 years
/3	34 to 36 years
/4	37 to 39 years
/5	40 to 42 years
/6	43 to 45 years
/7	46 to 48 years
/8	Other
/9	Miscellaneous
/0	Don't know/not sure

Q 5b. Which are you most involved with: Specifying, recommending, buying, or installing keel coolers?

25/1	Specifying
/2	Recommending
/3	Buying
/4	Installing
/8	Other
/9	Miscellaneous
/0	Don't know/not sure

Q 6. What is your position with the company?

26/1	Owner
/2	President
/3	Vice-President
/4	Managing Director
/5	General Manager
/6	Program Manager
/7	Project Manager
/8	Engineering Manager
/9	Operations Manager
/0	Technical Manager

27/1	Supervisor
/2	Buyer/Purchaser/Estimator
/3	Foreman
/4	Superintendent
/5	Engineer
/6	Sales
/7	Naval Architect
/8	Other
/9	Miscellaneous
/0	Don't know/not sure

28-32	Zip Code
33/	Don't know Zip Code

Exhibit G

SORENSEN MARKETING/MANAGEMENT CORPORATION
50 EAST 77th STREET NEW YORK, NY 10021-1836
Tel (212) 879-5821 Fax (212) 879-5823 e-mail: mrklgsage@aol.com

ROBERT C. SORENSEN

CURRICULUM VITAE
As of February 1998

Profession: Marketing counsel and research/behavioral science; educator.

Education:

A.B. University of Chicago - 1944
Major: Sociology and Political Science

M.A. University of Chicago - 1948
Major: Sociology

Ph.D. University of Chicago - 1954
Major: Sociology (Social Psychology). Interdepartmental Majors: Mass Communications, Industrial Relations. Dissertation: The Role of Public Sentiment and Personal Prejudice in Criminal Jury Trials.

PRESENT AND PAST POSITIONS

President: Sorensen Marketing/Management Corporation: 1968-Present.

Provide analysis and information to meet specialized needs of institutional, corporate and law firm clients. Counsel for new product introduction, consumer behavior, marketing management, and acquisitions/mergers. Mass communications research and policy evaluation. Specialized counsel, research and expert testimony in intellectual property, advertising and anti-trust litigation. Research in change of venue, juror selection, and problems of proof. Testimony as expert market research/marketing witness in over 35 cases in United States District Courts and International Trade Commission.

Professor (Full, tenured) of Marketing, Rider University, Graduate and Undergraduate School of Business Administration: 1981 - 1993. Professor Emeritus since July 1993.

Taught courses in Market Research, Consumer Behavior, Marketing Management, Social Issues in Marketing, Creative Advertising, Advertising Principles, and Trademarks: Their Creation, Uses and Protection (a special topics course). Chairman: School of Business Academic Policy Committee (1990-92).

ROBERT C. SORENSEN - PRESENT AND PAST POSITIONS (continued)

Vice President and Corporate Director of Marketing, Warner Communications, Inc., *now Time Warner*: 1972-74.

Directed studies and concerned with serving marketing and economic needs of this information and entertainment conglomerate.

Executive Director, The Center For Advanced Practice, The Interpublic Group of Companies, Inc.: 1966-68.

Member of interdisciplinary "think tank" group concerned with product development and new product introduction for major clients world wide. First publisher of Psychology Today magazine.

Vice President and Corporate Director of Research, D'Arcy Advertising Company (now D'Arcy-Masius-Benton & Bowles): 1961-66.

Supervised all marketing research in main office (New York City), policy direction concerning research in other offices throughout the country, and assistant to board chairman and chief executive officer.

Director of Research, This Week Magazine: 1959-61.

Responsible for al l marketing, media, and circulation research for Sunday Magazine supplement appearing in 14 million Sunday newspapers each week.

Director of Audience Research and Analysis, Radio Free Europe, Munich: 1954-59.

Organized and administered research into broadcasting effectiveness, audience characteristics and media content analysis concerning western broadcasts and other forms of political warfare communications to and in five East European countries.

Operations Analyst and Korean Team Leader, Operations Research Office of The Johns Hopkins University: 1952-54.

Member of interdisciplinary group concerned with applying the behavioral sciences to military economic and political problems. Team leader in Korea during Korean war concerned with recruitment and utilization of Korean civilians by U.S. Army.

Assistant Professor of Legislation, College of Law, University of Nebraska: 1948-52.

Only social scientist on law school faculty concerned with application of the social sciences to legal drafting, problems of proof, legal research projects, and expert testimony for all senior law students.

Visiting Lecturer in Sociology, Northwestern University: Summer 1948.

Director of the Prelegal Division and member of prelegal faculty (part-time), The John Marshall Law School: 1946-48.

ROBERT C. SORENSEN - PRESENT AND PAST POSITIONS (continued)

Member: Editorial Board of The Trademark Reporter - 1990-92

Associate editor and Member of Publications Board: ZYGON: Journal of Religion and Science - Published by the Institute On Religion In An Age Of Science.

Current Member and/or Board Memberships:

American Association for the Advancement of Science
American Association for Public Opinion Research
American Marketing Association
American Sociological Association
Center for Advanced Studies in Religion and Science (Board Member)
Center for Learning and Living of Marymount Manhattan College (Facilitator)
The Dutch Treat Club
Institute on Religion in an Age of Science (Vice President and ex officio Council Member)
International Trademark Association
Marketing Research Association
Market Research Council
Childreach/Plan International - Formerly: Foster Parents Plan. (Past International Board Member and Chairman; present U.S. Board/Executive Committee Member and Past Chairman of Marketing Committee)
Scandinavian Seminar (Board Member and past Chairman)
Scandinavian Seminar College, Copenhagen (Past Board Member)
The University Club

Lecturer to many groups

Biographical Listings:

American Men and Women of Science (1973)
Who's Who in the World }
Who's Who in America }
Who's Who in the East } Current editions
Who's Who in Finance & Industry }
Who's Who in Advertising }

ROBERT C. SORENSEN PUBLICATIONS

Trademarks

Preparing and Proving Survey Research in Trademark Litigation. The first of a series of Practice Papers, monographs published by the U.S. Trademark Association, September 1990.

"Survey Research Execution in Trademark Litigation: Does Practice Make Perfection?" The Trademark Reporter (New York, July-August, 1983), Vol. 2, No. 4, p.349.

"Research Techniques for Measuring the Impact of Disparaging Use." 1980-81 Trademark Law Handbook (New York, 1980), p.209. The United States Trademark Association and Clark Boardman Company, Ltd.

"The Use of Survey Research in Trademark Law and Unfair Competition." Current Developments in Trademark Law and Unfair Competition (New York, July 12-14, 1978), p.71. Practicing Law Institute.

"Trademarks, Technology, and Social Change: Research Into Trademark Confusion." The Trademark Reporter (New York, January-February, 1972), Vol. 62, No. 1, p.43.

Communications/Marketing Research in Litigation

"Jury Selection and the Behavioral Sciences." Litigation (Winter 1976) Vol. 2, No. 2, p.30. Published by the Litigation Section of the American Bar Association.

Ph.D. Dissertation: Public Sentiment and Personal Prejudice in Criminal Jury Trials, University of Chicago, 1954.

"The Admissibility and Use of Opinion Research Evidence" (with Theodore C. Sorensen). New York University Law Review, Vol. 28, No. 7, November 1953, p.1213.

"Responding to Objections Against the Use of Opinion Survey Findings in the Courts" (with Theodore C. Sorensen). The Journal of Marketing, October, 1955, p.133.

"Re-Examining the Traditional Legal Test of Literary Similarity: A Proposal for Content Analysis" (with Theodore C. Sorensen). Cornell Law Quarterly, Vol. 37, No. 4, Summer 1952, p. 638.

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"United States v. Hiss: Its Significance for Criminology." Journal of Criminal Law, Criminology and Police Science, September-October, 1952, p. 299

Books

Free Will and Determinism (Editor with Viggo Mortensen). Includes own "Foreword" and paper - "Abundance and the Illusion of Free Choice." Aarhus (Denmark): University of Aarhus Press, 1987.

Adolescent Sexuality in Contemporary America.
New York: World Publishing Company, 1972.

Marketing and Economic Research

"Marketing for Product Use: Its Potential Role in Reducing Product Liability Problems"
Proceedings: Academy of Marketing Science - Developments in Marketing Science,
May 1989.

"The Economics of Information," Challenge, April 1960.

"Marketing Information and the Determination of Value."
Handbook of Mergers, Acquisitions and Buyouts. Steven James Lee and Robert Douglas Coleman, Editors. Prentice Hall, 1981.

Army Procurement and Payment of South Korean Labor. A declassified Monograph.
Washington, D.C.: Operations Research Office, The Johns Hopkins University, 1954.

"The Role of Attrition in Non-Profit Subscriber Service Organizations" (with M.A. Walsh)
Proceedings: International Conference on Services Marketing, October 1988.

"Corporate Marketing."
Applied Sociology. Howard E. Freeman, Russell R. Dynes, Peter H. Rossi and William Foote Whyte, Editors. Jossey - Bass, 1983.

"An Analysis of the Social Aspects of Complaint Reporting: A Survey of VCR Owners" (with William M. Strahle)
Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior, January 1990.

"A Study of Complaining Behavior: VCR Owners in Puerto Rico" (with William M. Strahle, Sigfredo Hernandez and Hector L. Garcia)
Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior, 1991-92.

ROBERT C. SORENSEN - PUBLICATIONS (continued)

"A Cross Cultural Study of Consumer Complaining Behavior: VCR Owners in the U.S. and Puerto Rico (with William M. Strahle, Sigfredo Hernandez and Hector L. Garcia)
Journal of Consumer Policy, 1991, Vol. 14, p. 35.

Communications Research

New Indicators of Psychological Operations Effects. A Monograph.
With F. Tims and F. Mushal, Washington: General Research Corporation, 1975.

"The Future of Communications" in Creativity and the Future,
A book published by British Petroleum Corporation, England 1970.

"Adolescent Sexuality: Crucible for Generational Conflict." Journal of Clinical Psychology, Vol.3, No.3, Fall-Winter 1974, p.44.

"Effective Communications and Personal Values."
The University of Missouri: Second International Symposium for Communications Research, 1966.

"New Perspectives in Advertising."
Ethics, Advertising and Responsibility, Francis X. Quinn, S.J., Editor, 1963, p.41, Institute of Social Ethics, Georgetown University.

"Media Research Can Learn From Psychological Warfare." Media/scope, March 1961, p.86.

"Can Advertising Be Both Moral and Legal?"
Advertising, Scripps-Howard Newspapers, 1961, Cincinnati.

"Sociological Aspects of Psychological Warfare."
J.S. Roucek, Editor, Contemporary Sociology. New York, Philosophical Library, 1958.

"Local Uses of Wired Radio in Communist Ruled Poland" (with Leszek L. Meyer).
Journalism Quarterly, Vol. 32, No. 3, Summer 1955, p. 343.

"The Influence of Public Opinion Polls Upon Legislators,"
Sociology and Social Research, 1950.

Education

"Scandinavian Seminar: Forty Years of Cultural Immersion." Scandinavian Review. Vol. 77, No. 2, Summer 1989, p. 65.

Exhibit H

SORENSEN MARKETING/MANAGEMENT CORPORATION
50 EAST 77TH STREET NEW YORK, NY 10021-1836
Tel (212) 879-5821 Fax (212) 879-5823 e-mail mrktgsage@aol.com

CASES IN WHICH ROBERT C. SORENSEN, Ph.D. HAS TESTIFIED: IN COURT AND/OR BY DEPOSITION 1992-1998.

June 1998

1. 1998 - Graham Webb International Limited Partnership v. Helene Curtis, Inc.
2. 1998 - ND Industries, Opposer and Nylock Fastener Corporation, Opposer.
3. 1997 - Mast-Jägermeister Aktiengesellschaft v. Frank-Lin Int'l Products, Ltd., Richard M. Trachtenberg & Joel K. Beth
4. 1997 - Brady v. Bodum/Bodum adv. Brady and Bodum v. Culinary Parts Unlimited, Inc.
5. 1997 - Sara Lee Corporation v. American Leather Products, Inc. and Donald Rappin
6. 1997 - Ringling Bros.-Barnum & Bailey Combined Shows, Inc. v. B.E.Windows Corporation
7. 1997 - Cardservice International, Inc. v. Webster R. McGee and WRM Associates.
8. 1997 - Touch Tel Corporation, v. AirTouch Communications, U.S. Patent and Trademark Office, Trademark Trial and Appeal Board.
9. 1996 - Warren Distribution, Inc., v. Prestone Products Corporation.
10. 1996 - The Black & Decker Corporation et als v. International Sales and Marketing, GSL Engineering Ltd. et als.
11. 1995 - National Presto Industries, Inc. v. Dazey Corporation.
12. 1995 - Crown Moving And Storage Company dba Crown Worldwide Moving & Storage v. Crown World Wide Movers, Inc. and Crown Pacific, Inc.
13. 1995 - Sportschannel Associates v. Commissioner of Patents and Trademarks.
14. 1994 - Church and Dwight Co., Inc. v. S.C. Johnson & Son, Inc.
15. 1994 - Nora Beverages, Inc. v. The Perrier Group of America, Inc.
16. 1994 - Masco Corp. of Indiana v. Globe-Union Industrial Corp.

CASES IN WHICH ROBERT C. SORENSEN, Ph.D. HAS TESTIFIED:
IN COURT AND/OR BY DEPOSITION 1992-1998.
(Continued)

17. 1993 - Marc Kasky, et al. v. Perrier Group of America, Inc.

18. 1992 - Ristvedt-Johnson, Inc. and Cummins-Allison Corp. v. Brandt, Inc. U.S. District Court, Chicago, Illinois. Civil Action 88C-3834.

19. 1992 - Zotos International, Inc. v. Conair Corporation. State District Court, Stamford, Connecticut.

20. 1992 - Outboard Marine Corporation, Opposor v. Brunswick Corporation, Applicant. U.S. Patent and Trademark Office, Washington, D.C.

21. 1992 - Hard Rock Cafe: Eastern District v. Western District. Arbitration proceedings in Los Angeles, California.

Exhibit I

TABLES OF INFORMATION

Tables 1A through 7A

Tables 1B through 7B

"Marginals"

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q2b. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
General appearance	1 0.7% 0.7%	1 1.2% 0.7%	-	-
Shape/design	5 3.3% 3.3%	4 4.7% 2.7%	1 2.1% 0.7%	-
Shape/design is unique	4 2.7% 2.7%	4 4.7% 2.7%	-	-
Materials from which cooler is fabricated	1 0.7% 0.7%	1 1.2% 0.7%	-	-
Standard keel cooler design	1 0.7% 0.7%	-	1 2.1% 0.7%	-
Knowledge of field/ experience	24 16.0% 16.0%	18 20.9% 12.0%	6 12.5% 4.0%	-
Rectangular/square 'tubes'	6 4.0% 4.0%	6 7.0% 4.0%	-	-
Only one company has rectangular 'grid' design/ other brands are different	2 1.3% 1.3%	2 2.3% 1.3%	-	-

TABLE 1A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q2b. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Typical Fernstrum design	1 0.7% 0.7%	1 1.2% 0.7%	-	-
Aware that this design is copies	3 2.0% 2.0%	-	3 6.3% 2.0%	-
Only know one company/ the only company I know	32 21.3% 21.3%	31 36.0% 20.7%	1 2.1% 0.7%	-
Use this type/brand of cooler/ only type/brand used	10 6.7% 6.7%	9 10.5% 6.0%	1 2.1% 0.7%	-
Most commonly used cooler	2 1.3% 1.3%	1 1.2% 0.7%	1 2.1% 0.7%	-
Have seen magazine advertisements, catalogs, etc.	6 4.0% 4.0%	-	6 12.5% 4.0%	-
Other coolers/makers have similar designs	1 0.7% 0.7%	-	1 2.1% 0.7%	-
Have more than one supplier/ know of more than one manufacturer	18 12.0% 12.0%	-	18 37.5% 12.0%	-

CONTINUATION OF TABLE 1A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q2b. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Photographs provide insufficient information for identification	5 3.3% 3.3%	1 1.2% 0.7%	-	4 25.0% 2.7%
Other brands use round/ cylindrical 'tubes'	1 0.7% 0.7%	1 1.2% 0.7%	-	-
Photographs appear to show same cooler	3 2.0% 2.0%	3 3.5% 2.0%	-	-
Other	18 12.0% 12.0%	8 9.3% 5.3%	6 12.5% 4.0%	4 25.0% 2.7%
Miscellaneous	6 4.0% 4.0%	1 1.2% 0.7%	3 6.3% 2.0%	2 12.5% 1.3%
Don't know/not sure	2 1.3% 1.3%	-	-	2 12.5% 1.3%

CONTINUATION OF TABLE 1A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

		Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company?		
	Total Resp.	One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Donovan Marine	2 1.3% 1.3%	-	2 4.2% 1.3%	-
Duramax/Duramax Marine	4 2.7% 2.7%	-	4 8.3% 2.7%	-
East Park Radiator/ East Park	5 3.3% 3.3%	-	5 10.4% 3.3%	-
Fernstrum/R.W. Fernstrum	118 78.7% 78.7%	81 94.2% 54.0%	32 66.7% 21.3%	5 31.3% 3.3%
Fernstrum Gridcooler	4 2.7% 2.7%	1 1.2% 0.7%	3 6.3% 2.0%	-
Gridcooler	2 1.3% 1.3%	-	2 4.2% 1.3%	-
Johnson/Johnson Marine	11 7.3% 7.3%	-	11 22.9% 7.3%	-
Johnson Rubber	-	-	-	-

TABLE 2A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Walter/Walter Machine	-	-	-	-
Photographs provide insufficient I.D. information	5 3.3% 3.3%	1 1.2% 0.7%	4 8.3% 2.7%	-
Other	7 4.7% 4.7%	-	7 14.6% 4.7%	-
Miscellaneous	2 1.3% 1.3%	-	2 4.2% 1.3%	-
Don't know/not sure	-	-	-	-

CONTINUATION OF TABLE 2A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Shape/design	41 27.3% 27.3%	29 33.7% 19.3%	9 18.8% 6.0%	3 18.8% 2.0%
Materials from which cooler is fabricated	4 2.7% 2.7%	3 3.5% 2.0%	-	1 6.3% 0.7%
Color	3 2.0% 2.0%	2 2.3% 1.3%	1 2.1% 0.7%	-
Rectangular 'grid' form	25 16.7% 16.7%	17 19.8% 11.3%	7 14.6% 4.7%	1 6.3% 0.7%
Rectangular copper/brass/ alloy design	11 7.3% 7.3%	10 11.6% 6.7%	1 2.1% 0.7%	-
Rectangular/square 'tubes'/ shape of 'tubes'	72 48.0% 48.0%	47 54.7% 31.3%	25 52.1% 16.7%	-
Other brands use round/ cylindrical tubes	12 8.0% 8.0%	6 7.0% 4.0%	5 10.4% 3.3%	1 6.3% 0.7%
Photographs appear to show same cooler	1 0.7% 0.7%	-	1 2.1% 0.7%	-

TABLE 3A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Most commonly used cooler	2 1.3% 1.3%	2 2.3% 1.3%	-	-
Have seen magazine advertisements	1 0.7% 0.7%	-	1 2.1% 0.7%	-
Minimal/non involvement in brand purchase/specifications	5 3.3% 3.3%	1 1.2% 0.7%	1 2.1% 0.7%	3 18.8% 2.0%
Fernstrum is principal manufacturer/Fernstrum is standard	1 0.7% 0.7%	-	1 2.1% 0.7%	-
Use Fernstrum all the time	2 1.3% 1.3%	1 1.2% 0.7%	-	1 6.3% 0.7%
Aware of Fernstrum 'knock-offs'	2 1.3% 1.3%	1 1.2% 0.7%	1 2.1% 0.7%	-
Looks like Fernstrum design	6 4.0% 4.0%	1 1.2% 0.7%	3 6.3% 2.0%	2 12.5% 1.3%
Have installed many of these	-	-	-	-

CONTINUATION OF TABLE 3A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Looks like the coolers we use	5 3.3% 3.3%	3 3.5% 2.0%	2 4.2% 1.3%	-
Mainly use inboard coolers	1 0.7% 0.7%	-	1 2.1% 0.7%	-
Photographs provide insufficient I.D.	7 4.7% 4.7%	1 1.2% 0.7%	4 8.3% 2.7%	2 12.5% 1.3%
It is a Gridcooler	2 1.3% 1.3%	2 2.3% 1.3%	-	-
Only Fernstrum has this design	3 2.0% 2.0%	1 1.2% 0.7%	2 4.2% 1.3%	-
Install brand supplied with engine	3 2.0% 2.0%	-	3 6.3% 2.0%	-
Other	11 7.3% 7.3%	4 4.7% 2.7%	4 8.3% 2.7%	3 18.8% 2.0%
Miscellaneous	26 17.3% 17.3%	11 12.8% 7.3%	14 29.2% 9.3%	1 6.3% 0.7%

CONTINUATION OF TABLE 3A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Don't know/not sure	1 0.7% 0.7%	-	1 2.1% 0.7%	-

CONTINUATION OF TABLE 3A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q4a. Respondent's Sex
Q4b. Respondent's Age

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
SEX				
Male	144 96.0% 96.0%	84 97.7% 56.0%	45 93.8% 30.0%	15 93.8% 10.0%
Female	6 4.0% 4.0%	2 2.3% 1.3%	3 6.3% 2.0%	1 6.3% 0.7%
AGE				
21 to 34	19 12.7% 12.7%	8 9.3% 5.3%	6 12.5% 4.0%	5 31.3% 3.3%
35 to 49	70 46.7% 46.7%	36 41.9% 24.0%	30 62.5% 20.0%	4 25.0% 2.7%
50 and over	61 40.7% 40.7%	42 48.8% 28.0%	12 25.0% 8.0%	7 43.8% 4.7%
Refused all ages	-	-	-	-

TABLE 4A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

		Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS		150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Less than 1 year	= .5	1 0.7% 0.7%	-	-	1 6.3% 0.7%
1 to 3 years	= 2	3 2.0% 2.0%	2 2.3% 1.3%	1 2.1% 0.7%	-
4 to 6 years	= 5	7 4.7% 4.7%	3 3.5% 2.0%	1 2.1% 0.7%	3 18.8% 2.0%
7 to 9 years	= 8	4 2.7% 2.7%	2 2.3% 1.3%	1 2.1% 0.7%	1 6.3% 0.7%
10 to 12 years	= 11	8 5.3% 5.3%	5 5.8% 3.3%	3 6.3% 2.0%	-
13 to 15 years	= 14	8 5.3% 5.3%	3 3.5% 2.0%	4 8.3% 2.7%	1 6.3% 0.7%
16 to 18 years	= 17	7 4.7% 4.7%	1 1.2% 0.7%	5 10.4% 3.3%	1 6.3% 0.7%
19 to 21 years	= 20	26 17.3% 17.3%	13 15.1% 8.7%	8 16.7% 5.3%	5 31.3% 3.3%

TABLE 5A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

		Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS		150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
22 to 24 years	= 23	13 8.7% 8.7%	8 9.3% 5.3%	5 10.4% 3.3%	-
25 to 27 years	= 26	21 14.0% 14.0%	12 14.0% 8.0%	9 18.8% 6.0%	-
28 to 30 years	= 29	16 10.7% 10.7%	13 15.1% 8.7%	3 6.3% 2.0%	-
31 to 33 years	= 32	4 2.7% 2.7%	2 2.3% 1.3%	2 4.2% 1.3%	-
34 to 36 years	= 35	15 10.0% 10.0%	11 12.8% 7.3%	3 6.3% 2.0%	1 6.3% 0.7%
37 to 39 years	= 38	1 0.7% 0.7%	-	-	1 6.3% 0.7%
40-42 years	= 41	9 6.0% 6.0%	5 5.8% 3.3%	2 4.2% 1.3%	2 12.5% 1.3%
43 to 45 years	= 44	1 0.7% 0.7%	1 1.2% 0.7%	-	-

CONTINUATION OF TABLE 5A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

		Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS		150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
46 to 48 years	= 47	1 0.7% 0.7%	1 1.2% 0.7%	-	-
Other		3 2.0% 2.0%	2 2.3% 1.3%	1 2.1% 0.7%	-
Miscellaneous		-	-	-	-
Don't know/not sure		-	-	-	-
MEDIAN		22.0	24.1	20.4	17.7
MEAN		23.3	24.7	22.0	19.3

CONTINUATION OF TABLE 5A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q6. What is your position with the company?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company?		
		One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Owner	11 7.3% 7.3%	9 10.5% 6.0%	1 2.1% 0.7%	1 6.3% 0.7%
President	11 7.3% 7.3%	10 11.6% 6.7%	-	1 6.3% 0.7%
Vice-President	5 3.3% 3.3%	3 3.5% 2.0%	1 2.1% 0.7%	1 6.3% 0.7%
Managing Director	1 0.7% 0.7%	-	-	1 6.3% 0.7%
General Manager	11 7.3% 7.3%	9 10.5% 6.0%	2 4.2% 1.3%	-
Program Manager	4 2.7% 2.7%	3 3.5% 2.0%	1 2.1% 0.7%	-
Project Manager	6 4.0% 4.0%	3 3.5% 2.0%	3 6.3% 2.0%	-
Engineering Manager	4 2.7% 2.7%	4 4.7% 2.7%	-	-

TABLE 6A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q6. What is your position with the company?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Operations Manager	8 5.3% 5.3%	4 4.7% 2.7%	4 8.3% 2.7%	-
Technical Manager	2 1.3% 1.3%	1 1.2% 0.7%	1 2.1% 0.7%	-
Supervisor	8 5.3% 5.3%	3 3.5% 2.0%	3 6.3% 2.0%	2 12.5% 1.3%
Buyer/Purchaser/Estimator	27 18.0% 18.0%	11 12.8% 7.3%	12 25.0% 8.0%	4 25.0% 2.7%
Foreman	3 2.0% 2.0%	2 2.3% 1.3%	-	1 6.3% 0.7%
Superintendent	11 7.3% 7.3%	4 4.7% 2.7%	6 12.5% 4.0%	1 6.3% 0.7%
Engineer	19 12.7% 12.7%	11 12.8% 7.3%	8 16.7% 5.3%	-
Sales	3 2.0% 2.0%	1 1.2% 0.7%	1 2.1% 0.7%	1 6.3% 0.7%

CONTINUATION OF TABLE 6A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q6. What is your position with the company?

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company?		
		One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Naval Architect	3 2.0% 2.0%	2 2.3% 1.3%	1 2.1% 0.7%	-
Other	14 9.3% 9.3%	7 8.1% 4.7%	4 8.3% 2.7%	3 18.8% 2.0%
Miscellaneous	1 0.7% 0.7%	1 1.2% 0.7%	-	-
Don't know/not sure	1 0.7% 0.7%	1 1.2% 0.7%	-	-

CONTINUATION OF TABLE 6A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Interview Location

	Total Resp.	Q2a. Do you believe the same keel cooler shown in these three pictures is manufactured by one or by more than one company? One Company	More Than One Company	Don't Know/ Not Sure
TOTAL RESPONDENTS	150 100.0% 100.0%	86 100.0% 57.3%	48 100.0% 32.0%	16 100.0% 10.7%
Alabama	31 20.7% 20.7%	15 17.4% 10.0%	11 22.9% 7.3%	5 31.3% 3.3%
Florida	11 7.3% 7.3%	7 8.1% 4.7%	3 6.3% 2.0%	1 6.3% 0.7%
Louisiana	71 47.3% 47.3%	34 39.5% 22.7%	29 60.4% 19.3%	8 50.0% 5.3%
Mississippi	11 7.3% 7.3%	7 8.1% 4.7%	4 8.3% 2.7%	-
Texas	26 17.3% 17.3%	23 26.7% 15.3%	1 2.1% 0.7%	2 12.5% 1.3%

TABLE 7A

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q2b. What causes you to say that?

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
General appearance	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
Shape/design	5 3.3% 3.3%	-	-	-	4 3.4% 2.7%	1 25.0% 0.7%	1 50.0% 0.7%	-	-	-	-	-	-	-
Shape/design is unique	4 2.7% 2.7%	-	-	-	3 2.5% 2.0%	-	-	-	-	-	-	-	-	-
Materials from which cooler is fabricated	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
S dard keel cooler design	1 0.7% 0.7%	-	-	-	-	-	-	-	-	-	-	-	-	1 12.5% 0.7%
Knowledge of field/ experience	24 16.0% 16.0%	-	1 25.0% 0.7%	2 40.0% 1.3%	23 19.5% 15.3%	1 25.0% 0.7%	-	3 27.3% 2.0%	-	-	-	1 14.3% 0.7%	-	-
Rectangular/square 'tubes'	6 4.0% 4.0%	-	-	-	6 5.1% 4.0%	-	-	-	-	-	-	-	-	-
Only one company has rectangular 'grid' design/ other brands are different	2 1.3% 1.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	-

TABLE 1B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q2b. What causes you to say that?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Typical Fernstrum design	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
Aware that this design is copies	3 2.0% 2.0%	-	-	-	3 2.5% 2.0%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
Only know one company/ the only company I know	32 21.3% 21.3%	-	-	-	32 27.1% 21.3%	-	-	-	-	-	-	-	-	-
Use this type/brand of cooler/ only type/brand used	10 6.7% 6.7%	-	-	-	10 8.5% 6.7%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
Most commonly used cooler	2 1.3% 1.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
Have seen magazine advertisements, catalogs, etc.	6 4.0% 4.0%	-	-	1 20.0% 0.7%	4 3.4% 2.7%	1 25.0% 0.7%	-	1 9.1% 0.7%	-	-	1 20.0% 0.7%	2 28.6% 1.3%	-	-
Other coolers/makers have similar designs	1 0.7% 0.7%	-	-	-	-	-	-	-	-	-	-	-	-	-
Have more than one supplier/ know of more than one manufacturer	18 12.0% 12.0%	1 50.0% 0.7%	3 75.0% 2.0%	3 60.0% 2.0%	11 9.3% 7.3%	1 25.0% 0.7%	-	6 54.5% 4.0%	-	-	2 40.0% 1.3%	2 28.6% 1.3%	1 50.0% 0.7%	1 12.5% 0.7%

CONTINUATION OF TABLE 1B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q2b. What causes you to say that?

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fornstrum /R.W. Fornstrum	Fornstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Photographs provide insufficient information for identification	5 3.3% 3.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	1 12.5% 0.7%
Other brands use round/ cylindrical 'tubes'	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
Photographs appear to show same cooler	3 2.0% 2.0%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	1 12.5% 0.7%
Other	18 12.0% 12.0%	1 50.0% 0.7%	1 25.0% 0.7%	-	10 8.5% 6.7%	-	-	2 18.2% 1.3%	-	-	2 40.0% 1.3%	-	1 50.0% 0.7%	3 37.5% 2.0%
Miscellaneous	6 4.0% 4.0%	-	-	-	4 3.4% 2.7%	-	1 50.0% 0.7%	-	-	-	-	-	-	1 12.5% 0.7%
Don't know/not sure	2 1.3% 1.3%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 1B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Donovan Marine	2 1.3% 1.3%	2 100.0% 1.3%	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	1 50.0% 0.7%	-
Duramax/Duramax Marine	4 2.7% 2.7%	-	4 100.0% 2.7%	-	4 3.4% 2.7%	-	-	3 27.3% 2.0%	-	-	-	-	-	-
East Park Radiator/ East Park	5 3.3% 3.3%	-	-	5 100.0% 3.3%	4 3.4% 2.7%	-	-	4 36.4% 2.7%	-	-	-	-	-	-
Fernstrum/R.W. Fernstrum	118 78.7% 78.7%	1 50.0% 0.7%	4 100.0% 2.7%	4 80.0% 2.7%	118 100.0% 78.7%	-	1 50.0% 0.7%	10 90.9% 6.7%	-	-	-	5 71.4% 3.3%	-	-
Fernstrum Gridcooler	4 2.7% 2.7%	-	-	-	-	4 100.0% 2.7%	1 50.0% 0.7%	-	-	-	-	1 14.3% 0.7%	-	-
Gridcooler	2 1.3% 1.3%	-	-	-	1 0.8% 0.7%	1 25.0% 0.7%	2 100.0% 1.3%	-	-	-	-	-	-	-
Johnson/Johnson Marine	11 7.3% 7.3%	-	3 75.0% 2.0%	4 80.0% 2.7%	10 8.5% 6.7%	-	-	11 100.0% 7.3%	-	-	-	-	-	-
Johnson Rubber	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 2B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Walter/Walter Machine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Photographs provide insufficient I.D. information	5 3.3% 3.3%	-	-	-	-	-	-	-	-	-	5 100.0% 3.3%	-	-	-
Other	7 4.7% 4.7%	-	-	-	5 4.2% 3.3%	1 25.0% 0.7%	-	-	-	-	-	7 100.0% 4.7%	-	-
Miscellaneous	2 1.3% 1.3%	1 50.0% 0.7%	-	-	-	-	-	-	-	-	-	-	2 100.0% 1.3%	-
t know/not sure	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 2B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Shape/design	41 27.3% 27.3%	1 50.0% 0.7%	-	1 20.0% 0.7%	36 30.5% 24.0%	2 50.0% 1.3%	1 50.0% 0.7%	2 18.2% 1.3%	-	-	-	2 28.6% 1.3%	1 50.0% 0.7%	1 12.5% 0.7%
Materials from which cooler is fabricated	4 2.7% 2.7%	-	-	-	4 3.4% 2.7%	-	-	-	-	-	-	-	-	-
Color	3 2.0% 2.0%	-	-	-	3 2.5% 2.0%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
Rectangular 'grid' form	25 16.7% 16.7%	1 50.0% 0.7%	-	1 20.0% 0.7%	23 19.5% 15.3%	1 25.0% 0.7%	-	1 9.1% 0.7%	-	-	-	3 42.9% 2.0%	1 50.0% 0.7%	-
Rectangular copper/brass/ a[illegible] design	11 7.3% 7.3%	-	-	-	11 9.3% 7.3%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
Rectangular/square 'tubes'/ shape of 'tubes'	72 48.0% 48.0%	-	4 100.0% 2.7%	3 60.0% 2.0%	69 58.5% 46.0%	1 25.0% 0.7%	1 50.0% 0.7%	9 81.8% 6.0%	-	-	-	4 57.1% 2.7%	-	-
Other brands use round/ cylindrical tubes	12 8.0% 8.0%	-	1 25.0% 0.7%	-	11 9.3% 7.3%	-	-	2 18.2% 1.3%	-	-	-	-	-	-
Photographs appear to show same cooler	1 0.7% 0.7%	-	-	-	-	1 25.0% 0.7%	1 50.0% 0.7%	-	-	-	-	-	-	-

TABLE 3B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Most commonly used cooler	2 1.3% 1.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	-
Have seen magazine advertisements	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
Minimal/non involvement in brand purchase/specifications	5 3.3% 3.3%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	1 20.0% 0.7%	-	-	1 12.5% 0.7%
Fernstrum is principal manufacturer/Fernstrum is standard	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
Use Fernstrum all the time	2 1.3% 1.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	-
Aware of Fernstrum 'knock-offs'	2 1.3% 1.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
Looks like Fernstrum design	6 4.0% 4.0%	1 50.0% 0.7%	-	-	4 3.4% 2.7%	-	-	-	-	-	-	1 14.3% 0.7%	1 50.0% 0.7%	1 12.5% 0.7%
Have installed many of these	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 3B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Looks like the coolers we use	5 3.3% 3.3%	-	-	1 20.0% 0.7%	5 4.2% 3.3%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
Mainly use inboard coolers	1 0.7% 0.7%	-	-	-	-	-	-	-	-	-	1 20.0% 0.7%	-	-	-
Photographs provide insufficient I.D.	7 4.7% 4.7%	-	-	2 40.0% 1.3%	4 3.4% 2.7%	-	-	2 18.2% 1.3%	-	-	1 20.0% 0.7%	-	-	-
It is a Gridcooler	2 1.3% 1.3%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	-
Only Fernstrum has this design	3 2.0% 2.0%	-	1 25.0% 0.7%	-	3 2.5% 2.0%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
Install brand supplied with engine	3 2.0% 2.0%	-	-	-	-	-	-	-	-	-	-	1 14.3% 0.7%	1 50.0% 0.7%	-
Other	11 7.3% 7.3%	-	-	1 20.0% 0.7%	7 5.9% 4.7%	-	-	-	-	-	-	1 14.3% 0.7%	-	1 12.5% 0.7%
Miscellaneous	26 17.3% 17.3%	-	1 25.0% 0.7%	2 40.0% 1.3%	17 14.4% 11.3%	2 50.0% 1.3%	1 50.0% 0.7%	4 36.4% 2.7%	-	-	3 60.0% 2.0%	1 14.3% 0.7%	1 50.0% 0.7%	1 12.5% 0.7%

CONTINUATION OF TABLE 3B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q3b/c. What causes you to say that?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Don't know/not sure	1 0.7% 0.7%	1 50.0% 0.7%	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 33

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q4a. Respondent's Sex
Q4b. Respondent's Age

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
SEX														
Male	144 96.0% 96.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	114 96.6% 76.0%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	7 87.5% 4.7%
Female	6 4.0% 4.0%	-	-	-	4 3.4% 2.7%	-	-	-	-	-	-	-	-	1 12.5% 0.7%
AGE														
to 34	19 12.7% 12.7%	-	1 25.0% 0.7%	-	10 8.5% 6.7%	-	-	1 9.1% 0.7%	-	-	1 20.0% 0.7%	2 28.6% 1.3%	1 50.0% 0.7%	2 25.0% 1.3%
35 to 49	70 46.7% 46.7%	-	3 75.0% 2.0%	5 100.0% 3.3%	54 45.8% 36.0%	3 75.0% 2.0%	1 50.0% 0.7%	7 63.6% 4.7%	-	-	3 60.0% 2.0%	4 57.1% 2.7%	-	5 62.5% 3.3%
50 and over	61 40.7% 40.7%	2 100.0% 1.3%	-	-	54 45.8% 36.0%	1 25.0% 0.7%	1 50.0% 0.7%	3 27.3% 2.0%	-	-	1 20.0% 0.7%	1 14.3% 0.7%	1 50.0% 0.7%	1 12.5% 0.7%
Refused all ages	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 4B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

		Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
		Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS		150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Less than 1 year	= .5	1 0.7% 0.7%	-	-	-	-	-	-	-	-	-	-	-	-	1 12.5% 0.7%
1 to 3 years	= 2	3 2.0% 2.0%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
4 to 6 years	= 5	7 4.7% 4.7%	-	-	-	3 2.5% 2.0%	-	-	-	-	-	-	-	-	2 25.0% 1.3%
7 to 9 years	= 8	4 2.7% 2.7%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	1 20.0% 0.7%	-	-	-
10 to 12 years	= 11	8 5.3% 5.3%	-	1 25.0% 0.7%	-	6 5.1% 4.0%	-	-	2 18.2% 1.3%	-	-	1 20.0% 0.7%	-	-	1 12.5% 0.7%
13 to 15 years	= 14	8 5.3% 5.3%	-	-	-	4 3.4% 2.7%	-	-	-	-	-	1 20.0% 0.7%	-	1 50.0% 0.7%	-
16 to 18 years	= 17	7 4.7% 4.7%	-	1 25.0% 0.7%	-	6 5.1% 4.0%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
19 to 21 years	= 20	26 17.3% 17.3%	-	1 25.0% 0.7%	1 20.0% 0.7%	18 15.3% 12.0%	2 50.0% 1.3%	-	1 9.1% 0.7%	-	-	-	2 28.6% 1.3%	-	2 25.0% 1.3%

TABLE 5B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

		Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS		150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
22 to 24 years	= 23	13 8.7% 8.7%	-	-	1 20.0% 0.7%	11 9.3% 7.3%	1 25.0% 0.7%	1 50.0% 0.7%	2 18.2% 1.3%	-	-	-	1 14.3% 0.7%	-	1 12.5% 0.7%
25 to 27 years	= 26	21 14.0% 14.0%	-	-	2 40.0% 1.3%	20 16.9% 13.3%	-	-	2 18.2% 1.3%	-	-	1 20.0% 0.7%	2 28.6% 1.3%	-	-
28 to 30 years	= 29	16 10.7% 10.7%	1 50.0% 0.7%	-	1 20.0% 0.7%	15 12.7% 10.0%	-	-	2 18.2% 1.3%	-	-	-	-	-	-
31 to 33 years	= 32	4 2.7% 2.7%	-	1 25.0% 0.7%	-	4 3.4% 2.7%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
34 to 36 years	= 35	15 10.0% 10.0%	1 50.0% 0.7%	-	-	13 11.0% 8.7%	-	-	-	-	-	-	1 14.3% 0.7%	1 50.0% 0.7%	-
37 to 39 years	= 38	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
40-42 years	= 41	9 6.0% 6.0%	-	-	-	7 5.9% 4.7%	1 25.0% 0.7%	1 50.0% 0.7%	-	-	-	-	-	-	1 12.5% 0.7%
43 to 45 years	= 44	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 5B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q5a. How many years have you been involved in specifying, recommending, buying, or installing keel coolers?

		Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
		Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS		150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
46 to 48 years	= 47	1 0.7% 0.7%	-	-	-	-	-	-	-	-	-	1 20.0% 0.7%	-	-	-
Other		3 2.0% 2.0%	-	-	-	3 2.5% 2.0%	-	-	-	-	-	-	-	-	-
Miscellaneous		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Don't know/not sure		-	-	-	-	-	-	-	-	-	-	-	-	-	-
IAN MEAN		22.0 23.3	29.0 32.0	17.0 20.0	23.8 24.8	23.8 24.6	20.0 26.0	23.0 32.0	22.3 22.5			12.6 21.2	21.5 21.7	14.0 24.5	11.0 15.7

CONTINUATION OF TABLE 5B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q6. What is your position with the company?

	Total Resp.	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?												
		Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fornstrum /R.W. Fornstrum	Fornstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Owner	11 7.3% 7.3%	-	-	-	10 8.5% 6.7%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
President	11 7.3% 7.3%	-	-	-	11 9.3% 7.3%	-	-	-	-	-	-	-	-	-
Vice-President	5 3.3% 3.3%	-	-	-	5 4.2% 3.3%	-	-	-	-	-	-	-	-	-
Managing Director	1 0.7% 0.7%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	-
C[illegible]al Manager	11 7.3% 7.3%	-	-	-	10 8.5% 6.7%	-	-	-	-	-	1 20.0% 0.7%	-	-	-
Program Manager	4 2.7% 2.7%	-	-	-	4 3.4% 2.7%	-	-	-	-	-	-	1 14.3% 0.7%	-	-
Project Manager	6 4.0% 4.0%	1 50.0% 0.7%	1 25.0% 0.7%	-	6 5.1% 4.0%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
Engineering Manager	4 2.7% 2.7%	-	-	-	3 2.5% 2.0%	-	-	-	-	-	1 20.0% 0.7%	-	-	-

TABLE 6B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q6. What is your position with the company?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fernstrum /R.W. Fernstrum	Fernstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Operations Manager	8 5.3% 5.3%	-	-	-	6 5.1% 4.0%	-	-	-	-	-	-	1 14.3% 0.7%	1 50.0% 0.7%	-
Technical Manager	2 1.3% 1.3%	-	-	1 20.0% 0.7%	2 1.7% 1.3%	-	-	1 9.1% 0.7%	-	-	-	-	-	-
Supervisor	8 5.3% 5.3%	-	-	2 40.0% 1.3%	5 4.2% 3.3%	-	-	2 18.2% 1.3%	-	-	-	-	-	2 25.0% 1.3%
Buyer/Purchaser/Estimator	27 18.0% 18.0%	-	2 50.0% 1.3%	1 20.0% 0.7%	20 16.9% 13.3%	1 25.0% 0.7%	-	4 36.4% 2.7%	-	-	2 40.0% 1.3%	2 28.6% 1.3%	-	1 12.5% 0.7%
F an	3 2.0% 2.0%	-	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	-	2 25.0% 1.3%
Superintendent	11 7.3% 7.3%	-	-	-	8 6.8% 5.3%	-	1 50.0% 0.7%	1 9.1% 0.7%	-	-	-	1 14.3% 0.7%	-	2 25.0% 1.3%
Engineer	19 12.7% 12.7%	-	1 25.0% 0.7%	-	16 13.6% 10.7%	1 25.0% 0.7%	1 50.0% 0.7%	1 9.1% 0.7%	-	-	1 20.0% 0.7%	1 14.3% 0.7%	-	-
Sales	3 2.0% 2.0%	-	-	-	2 1.7% 1.3%	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 6B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Q6. What is your position with the company?

	Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?													
	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fornstrum /R.W. Fornstrum	Fornstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Naval Architect	3 2.0% 2.0%	1 50.0% 0.7%	-	-	1 0.8% 0.7%	-	-	-	-	-	-	-	1 50.0% 0.7%	-
Other	14 9.3% 9.3%	-	-	1 20.0% 0.7%	9 7.6% 6.0%	1 25.0% 0.7%	-	1 9.1% 0.7%	-	-	-	-	-	1 12.5% 0.7%
Miscellaneous	1 0.7% 0.7%	-	-	-	-	1 25.0% 0.7%	-	-	-	-	-	-	-	-
Don't know/not sure	1 0.7% 0.7%	-	-	-	-	-	-	-	-	-	-	-	-	-

CONTINUATION OF TABLE 6B

SORENSEN MARKETING/
MANAGEMENT CORPORATION
BOAT SURVEY

Interview Location

Q3a. What do you believe is the name of the company/companies that manufactures the keel cooler shown in the pictures?

	Total Resp.	Donavan Marine	Duramax/ Duramax Marine	East Park Radiator/ East Park	Fornstrum /R.W. Fornstrum	Fornstrum Grid-cooler	Grid-cooler	Johnson/ Johnson Marine	Johnson Rubber	Walter/ Walter Machine	Photos Provide Insuff. ID Info	Other	Misc.	DK/NS
TOTAL RESPONDENTS	150 100.0% 100.0%	2 100.0% 1.3%	4 100.0% 2.7%	5 100.0% 3.3%	118 100.0% 78.7%	4 100.0% 2.7%	2 100.0% 1.3%	11 100.0% 7.3%	-	-	5 100.0% 3.3%	7 100.0% 4.7%	2 100.0% 1.3%	8 100.0% 5.3%
Alabama	31 20.7% 20.7%	-	-	-	21 17.8% 14.0%	1 25.0% 0.7%	2 100.0% 1.3%	1 9.1% 0.7%	-	-	1 20.0% 0.7%	2 28.6% 1.3%	1 50.0% 0.7%	5 62.5% 3.3%
Florida	11 7.3% 7.3%	-	-	-	8 6.8% 5.3%	-	-	-	-	-	-	1 14.3% 0.7%	-	1 12.5% 0.7%
Louisiana	71 47.3% 47.3%	1 50.0% 0.7%	4 100.0% 2.7%	4 80.0% 2.7%	55 46.6% 36.7%	3 75.0% 2.0%	-	9 81.8% 6.0%	-	-	3 60.0% 2.0%	4 57.1% 2.7%	1 50.0% 0.7%	2 25.0% 1.3%
Mississippi	11 7.3% 7.3%	1 50.0% 0.7%	-	1 20.0% 0.7%	10 8.5% 6.7%	-	-	1 9.1% 0.7%	-	-	1 20.0% 0.7%	-	-	-
[illegible]	26 17.3% 17.3%	-	-	-	24 20.3% 16.0%	-	-	-	-	-	-	-	-	-

TABLE 7B

SORENSEN MARKETING/MANAGEMENT CORPORATION
BOAT SURVEY

COLUMN NO.	TYPE/ HIGH	1	2	3	4	5	6	7	8	9	0	X	Y	REJ.	SIG.	QUAL. RESP.	TOTAL RESP.
105	(V-Y)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	150 100.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
106	(V-Y)	51 34.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	99 66.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
107	(V-Y)	20 13.3	20 13.3	20 13.3	20 13.3	11 7.3	10 6.7	10 6.7	10 6.7	10 6.7	19 12.7	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
108	(V-Y)	15 10.0	15 10.0	15 10.0	15 10.0	15 10.0	15 10.0	15 10.0	15 10.0	15 10.0	15 10.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
111	(S-5)	31 20.7	11 7.3	71 47.3	11 7.3	26 17.3	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
112	(S-3)	86 57.3	48 32.0	16 10.7	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
113	(M-0)	1 0.7	5 3.3	4 2.7	1 0.7	1 0.7	24 16.0	6 4.0	2 1.3	1 0.7	3 2.0	0 0.0	0 0.0	105 70.0	48 32.0	150 100.0	150 100.0
114	(M-Y)	32 21.3	10 6.7	2 1.3	6 4.0	1 0.7	18 12.0	5 3.3	18 12.0	6 4.0	2 1.3	1 0.7	3 2.0	50 33.3	104 69.3	150 100.0	150 100.0
115	(M-9)	2 1.3	4 2.7	5 3.3	118 78.7	4 2.7	2 1.3	11 7.3	0 0.0	5 3.3	0 0.0	0 0.0	0 0.0	21 14.0	151 100.7	150 100.0	150 100.0
116	(M-0)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	7 4.7	2 1.3	8 5.3	0 0.0	0 0.0	133 88.7	17 11.3	150 100.0	150 100.0
117	(M-0)	41 27.3	4 2.7	3 2.0	25 16.7	11 7.3	72 48.0	12 8.0	1 0.7	2 1.3	1 0.7	0 0.0	0 0.0	39 26.0	172 114.7	150 100.0	150 100.0
118	(M-0)	5 3.3	0 0.0	0 0.0	0 0.0	0 0.0	1 0.7	2 1.3	2 1.3	6 4.0	0 0.0	0 0.0	0 0.0	134 89.3	16 10.7	150 100.0	150 100.0
119	(M-6)	5 3.3	1 0.7	7 4.7	2 1.3	3 2.0	3 2.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	130 86.7	21 14.0	150 100.0	150 100.0
120	(M-0)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	11 7.3	26 17.3	1 0.7	0 0.0	0 0.0	112 74.7	38 25.3	150 100.0	150 100.0
121	(S-2)	144 96.0	6 4.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0
122	(S-4)	19 12.7	70 46.7	61 40.7	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	150 100.0	150 100.0	150 100.0

SORENSEN MARKETING/MANAGEMENT CORPORATION
BOAT SURVEY

COLUMN NO.	TYPE/ HIGH	1	2	3	4	5	6	7	8	9	0	X	Y	REJ.	SIG.	QUAL. RESP.	TOTAL RESP.
123	(S-0)	1	3	7	4	8	8	7	26	13	21	0	0	52	98	150	150
		0.7	2.0	4.7	2.7	5.3	5.3	4.7	17.3	8.7	14.0	0.0	0.0	34.7	65.3	100.0	100.0
124	(S-0)	16	4	15	1	9	1	1	3	0	0	0	0	100	50	150	150
		10.7	2.7	10.0	0.7	6.0	0.7	0.7	2.0	0.0	0.0	0.0	0.0	66.7	33.3	100.0	100.0
125	(H-0)	27	55	75	79	0	0	0	0	0	0	0	0	1	236	150	150
		18.0	36.7	50.0	52.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	157.3	100.0	100.0
126	(H-0)	11	11	5	1	11	4	6	4	8	2	0	0	87	63	150	150
		7.3	7.3	3.3	0.7	7.3	2.7	4.0	2.7	5.3	1.3	0.0	0.0	58.0	42.0	100.0	100.0
127	(H-0)	8	27	3	11	19	3	3	14	1	1	0	0	63	90	150	150
		5.3	18.0	2.0	7.3	12.7	2.0	2.0	9.3	0.7	0.7	0.0	0.0	42.0	60.0	100.0	100.0
128	(V-Y)	0	0	53	0	0	0	97	0	0	0	0	0	0	150	150	150
		0.0	0.0	35.3	0.0	0.0	0.0	64.7	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0
129	(V-Y)	0	11	0	0	0	31	26	0	11	71	0	0	0	150	150	150
		0.0	7.3	0.0	0.0	0.0	20.7	17.3	0.0	7.3	47.3	0.0	0.0	0.0	100.0	100.0	100.0
130	(V-Y)	5	0	45	8	52	25	0	0	0	15	0	0	0	150	150	150
		3.3	0.0	30.0	5.3	34.7	16.7	0.0	0.0	0.0	10.0	0.0	0.0	0.0	100.0	100.0	100.0
131	(V-Y)	5	5	13	13	26	22	12	13	6	35	0	0	0	150	150	150
		3.3	3.3	8.7	8.7	17.3	14.7	8.0	8.7	4.0	23.3	0.0	0.0	0.0	100.0	100.0	100.0
132	(V-Y)	26	20	14	13	3	8	9	11	25	21	0	0	0	150	150	150
		17.3	13.3	9.3	8.7	2.0	5.3	6.0	7.3	16.7	14.0	0.0	0.0	0.0	100.0	100.0	100.0
03	(S-1)	1	0	0	0	0	0	0	0	0	0	0	0	149	1	150	150
		0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99.3	0.7	100.0	100.0

FERNSTRUM
GRIDCOOLER **Recommendation**

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---ENGINE INFORMATION---

Use: ---select one--- other

Mani ld: ○ Wet ○ Dry

Mak :

Mod :

HP .PM:

Heat ejection:

Fresh water flow rate:

Fresh water temp into Gridcooler:

Fresh water: ○ *temp out* of or ○ *temp drop* across Gridcooler:

Mini m hull speed at full rated power: (under full load) (If speed is 0 knots, or the engine is used as a generator size for 1/2 mph.)

Max m s rate. temp:

Eng age:

% A reeze used:

Make & model of gear:

Back to Top

---BOAT INFORMATION---

Boat ype: Ferry other:

Hull onstruction: Steel other:

○ Painted

○ Unpainted

---COMMENTS---

---CONTACT INFORMATION---

Contact Name:

Company Name:

Phone:

Fax:

Email:

---FORM SUBMISSION---

Thank you for taking the time to answer the questions in our recommendation form. Using this form will provide you with information from us as to what Gridcooler will best suit your needs. We will contact you shortly through phone, fax, or email with our recommendation.

Submit Form | Clear Form

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PRODUCT INFO SALES

FORM PTO-102
Rev. (6-95)

U.S. DEPARTMENT OF CO
Patent and Tradema

75-382250

LAW OFFICE 104

PRINCIPAL

ATTORNEY ADVISOR: Bakley

Δ π EXHIBIT 3
Deponent Bakley
Date 4-22-04 Rptr. LK
WWW.DEPOBOOK.COM

Published
09/22/98

Examining Attorney - *(Please Print Name)*	Date Published in Trademark O.G.
Approved for Publication (Principal Register) - *(Signature)* Andrew P. Bakley 6/16/98	Section 8 Accepted - *(Signature)*
Approved for Registration (Section 1(d) - *(Signature)*	Section 15 - *(Signature)*
Approved for Registration (Supplemental Register) - *(Signature)*	Section 9 Renewal Accepted - *(Signature)*

GENERAL INFORMATION

SER NO 75/382250 REG NO 0000000 FIL DT 10/30/1997 REG DT
EXAMINING ATTORNEY LAW OFFICE CHLO LOCC 651 LOC DT 09/15/1998
BAXLEY, ANDREW 104 CHEM STAC 681 STA DT 07/21/1998
MARK MISCELLANEOUS DESIGN CLASS CT 01
INT CL 011 DRAW 2 REGISTER PRINCIPAL
US CL 013 021 023 031 034 SEC. 2F AMDED TO
GOODS/ (011) - External cooling system for mari MK TYPE TM
SERVICES ne engines, namely, heat exchangers ABAN DT
CAN DT
OWNER R. W. Fernstrum & Company PUB DT 09/22/1998

OWNER Menominee TTAB PROCEEDING- NO
ADDRESS MICHIGAN 498580097 SEC 8 NO
SEC 15 NO
REPUB 12C NO
1ST USE
00/00/1944-011
1ST USE COM
00/00/1944-011

PROSECUTION HISTORY

006 08/21/98 NOTICE OF PUBLICATION
005 06/16/98 APPROVED FOR PUB - PRINCIPAL REGISTER
004 05/18/98 COMMUNICATION RECEIVED FROM APPLICANT
003 05/18/98 COMMUNICATION RECEIVED FROM APPLICANT
002 04/21/98 NON-FINAL ACTION MAILED
001 04/16/98 ASSIGNED TO EXAMINER NO. 071995

LOCATION-STATUS INFORMATION

SER NO 75/382250 REG NO 0000000 FIL DT 10/30/1997 REG DT
EXAMINING ATTORNEY LAW OFFICE CHLO LOCC 651 LOC DT 09/15/1998
BAXLEY, ANDREW 104 CHEM STAC 681 STA DT 07/21/1998
MARK MISCELLANEOUS DESIGN CLASS CT 01

LOC PUBLICATION AND ISSUE
CH TO LOC
CH TO EMP NOT ASSIGNED
STATUS PUBLICATION/ISSUE REVIEW COMPLETE

ITU EXMNR. NOT ASSIGNED ALLOWANCE NOTICE DATE
PUBLICATION DATE 09/22/1998 ABANDONMENT DATE

TTAB PROCEEDINGS

LOCATION-STATUS INFORMATION

```
SER NO 75/382250  REG NO 0000000   FIL DT 10/30/1997      REG DT
EXAMINING ATTORNEY      LAW OFFICE    CHLO L4C   LOCC L4D LOC DT 04/23/1998
BAXLEY, ANDREW             104        CHEM       STAC 641 STA DT 04/20/1998
MARK MISCELLANEOUS DESIGN                                CLASS CT 01

LOC        TMEG LAW OFFICE 104 - DOCKET CLERK
CH TO LOC  TMEG LAW OFFICE 104 - AWAITING RESPONSE DOCKET
CH TO EMP  NOT ASSIGNED
STATUS     NON-FINAL ACTION - MAILED

ITU EXMNR. NOT ASSIGNED                ALLOWANCE NOTICE DATE
PUBLICATION DATE                            ABANDONMENT DATE
                      TTAB  PROCEEDINGS
```

GENERAL INFORMATION

```
SER NO 75/382250  REG NO 0000000   FIL DT 10/30/1997      REG DT
EXAMINING ATTORNEY      LAW OFFICE    CHLO L4C   LOCC L4D LOC DT 04/23/1998
BAXLEY, ANDREW             104        CHEM       STAC 641 STA DT 04/20/1998
MARK MISCELLANEOUS DESIGN                                CLASS CT 01
INT CL 011                                DRAW 2         REGISTER PRINCIPAL
US  CL 013 021 023 031 034                SEC. 2F IN PT  AMDED TO
GOODS/     (011) - External cooling system for mari      MK TYPE   TM
SERVICES   ne engines, namely, heat exchangers            ABAN DT
                                                           CAN DT
OWNER      R. W. Fernstrum & Company                       PUB DT

OWNER      Menominee                                       TTAB PROCEEDING- NO
ADDRESS    MICHIGAN          498580097                     SEC 8  NO
                PROSECUTION HISTORY                        SEC 15 NO
002 04/21/98 NON-FINAL ACTION MAILED                       REPUB 12C  NO
001 04/16/98 ASSIGNED TO EXAMINER NO. 071995               1ST USE
                                                           00/00/1944-011
                                                           1ST USE COM
                                                           00/00/1944-011
```

1/n 245 361 INT. CL. PRIOR US CL. 75382250

TRADEMARK MAILROOM REC'D OCT 30 1997 US PATENT

Mark: Flat, Grid-Like Surface of the Product

Class: 7

TRADEMARK MAILROOM REC'D OCT 30 1997 US PATENT & TRADEMARK OFFICE 95

TO THE COMMISSIONER OF PATENTS:

Applicant: R. W. Fernstrum & Company
a Michigan corporation

Address: 1716 Eleventh Avenue
P.O. Box 97
Menominee, Michigan 49858-0097

The above-identified applicant has adopted and is using the trademark shown on the accompanying drawing for the following goods:

External cooling system for marine engines, namely, heat exchangers 1C11 AB

and requests that said mark be registered in the United States Patent Office on the Principal Register under Section 2(f) established by the Act of July 5, 1946. The mark has become distinctive of the goods through applicant's substantially exclusive and continuous use in commerce for at least five years immediately preceding the date of this statement. Pw 2(f)

The mark was first used on the goods at least as early as 1944; was first used on the goods in interstate commerce at least as early as 1944; and is now in use in commerce.

Pw1

The mark consists of the flat, grid-like surface of the product formed by the uniform and parallel spacing of a series of rectangular tubes. The dotted lines on the drawing are not part of the mark but merely serve to indicate the position of the mark on the product.

The mark appears on the product and three (3) specimens showing the mark as actually used are presented herewith.

POWER OF ATTORNEY

The undersigned hereby appoints Marc A. Bergsman, Samuel D. Littlepage, Conrad J. Clark, Michael T. Platt, Stephanie K. Wade, and David R. Haarz, all members of the District of Columbia Bar, and Christopher W. Brody, a member of the Virginia Bar, all located at 1901 L Street, N. W., Suite 800, Washington, D.C. 20036, to file this application with full power of substitution and revocation, and to transact all business in the Patent and Trademark Office in connection therewith.

Furthermore, Applicant hereby authorizes Dickinson, Wright, Moon, Van Dusen & Freeman, its employees and agents, to act in connection with this application.

The Patent and Trademark Office is requested to send correspondence to Marc A. Bergsman, Dickinson, Wright, Moon, Van Dusen & Freeman, 1901 L Street, N.W., Suite 800, Washington, D.C. 20036, or to telephone (202) 457-0160.

Attached is a check for $245 made payable to the Commissioner of Patents and Trademarks. Please charge any fee deficiencies to Deposit Account No. 04-1061.

DECLARATION

The undersigned, Paul W. Fernstrum, declares that he is the President of Applicant corporation, and is authorized to execute this application on behalf of said corporation; he believes said corporation to be the owner of the mark sought to be registered; to the best of his knowledge and belief no other person, firm, corporation, or association has the right to use said mark in commerce, either in the identical form or in such near resemblance thereto as to be likely, when applied to the goods of such other person, to cause confusion, or to cause mistake, or to deceive; all statements made herein of his own knowledge are true and all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and such willful false statements may jeopardize the validity of the application or any registration resulting therefrom.

R. W. Fernstrum & Company

Dated: Oct 16, 1997 By: Paul W Fernstrum
Paul W. Fernstrum
President

75382250

TRADEMARK

75382250

NEW CASE DELIVERED
APR 17 1998
LAW OFFICE 104

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75382250

APPLICANT R. W. Fernstrum & Company

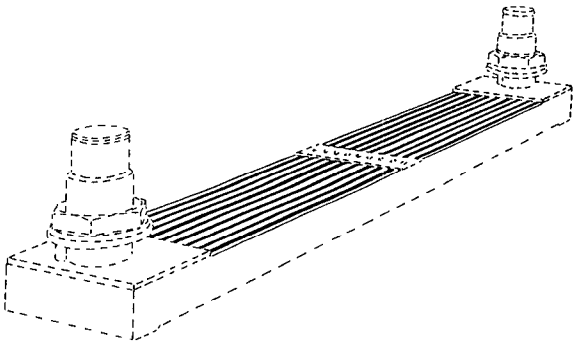
A Michigan corporation

ADDRESS 1716 Eleventh Avenue

Menominee, Michigan 49858-0097

FIRST USE 1944 IN COMMERCE 1944

GOODS OR SERVICES External cooling system for marine engines, namely, heat exchangers



TRADEMARK

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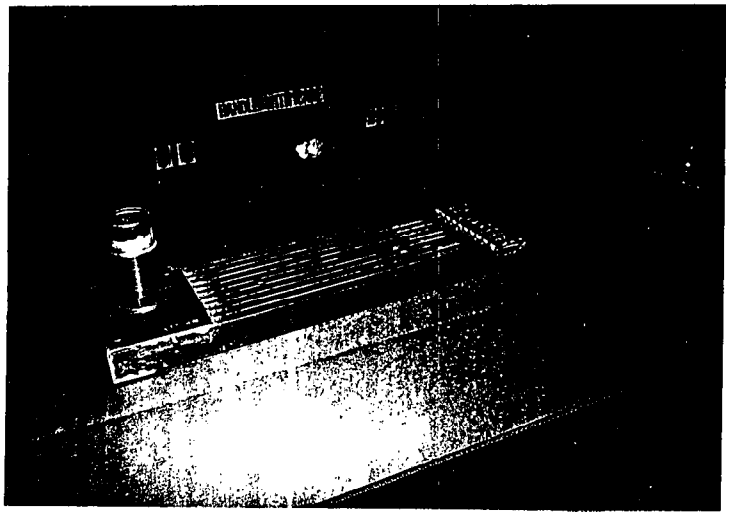

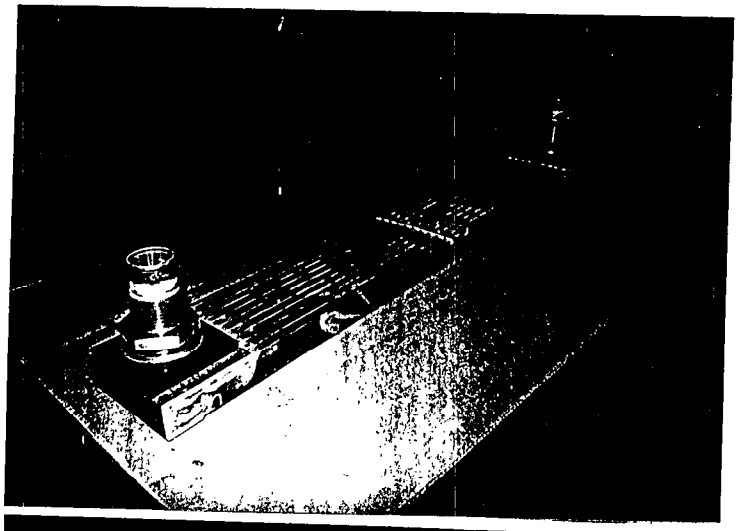

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NEW CASE DELIVERED

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UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

SERIAL NO. APPLICANT [illegible]/382250 R. W. Fernstrum & Company	PAPER NO.
MARK [illegible]SCELLANEOUS DESIGN	ADDRESS: Assistant Commissioner for Trademarks 2900 Crystal Drive Arlington, VA 22202-3513
ADDRESS [illegible] A BERGSMAN [illegible]NSON WRIGHT MOON VAN DUSEN [illegible] ST NW STE 800 [illegible]INGTON DC 20036	ACTION NO. 01 MAILING DATE 04/21/98 REF. NO.
FORM PTO - 1525 (5-90) U.S. DEPT. OF COMM. PAT. & TM OFFICE	If no fees are enclosed, the address should include the words "Box Responses - No Fee." Please provide in all correspondence: 1. Filing Date, serial number, mark and Applicant's name. 2. Mailing date of this Office action. 3. Examining Attorney's name and Law Office number. 4. Your telephone number and ZIP code.

A PROPER RESPONSE TO THIS OFFICE ACTION MUST BE RECEIVED WITHIN 6 MONTHS FROM THE DATE OF THIS ACTION IN ORDER TO AVOID *ABANDONMENT.* *For your convenience and to ensure proper handling of your response, a label has been enclosed. Please attach it to the upper right corner of your response. If the label is not enclosed, print or type the Trademark Law Office No., Serial No., and Mark in the upper right corner of your response.*

RE: Serial Number: 75/382250

The assigned examining attorney has reviewed the referenced application and determined the following.

The examining attorney has searched the Office records and has found no similar registered or pending mark which would bar registration under Trademark Act Section 2(d), 15 U.S.C. Section 1052(d). TMEP section 1105.01.

The examining attorney, however, refuses registration on the Principal Register because the proposed mark appears to be functional. Trademark Act Sections 1, 2 and 45, 15 U.S.C. Sections 1051, 1052 and 1127. That is, the proposed mark consists of a design feature of the identified goods which serves a utilitarian purpose. *In re Bose Corp.*, 772 F.2d 866, 227 USPQ 1 (Fed. Cir. 1985); *In re R.M. Smith, Inc.*, 734 F.2d 1482, 222 USPQ 1 (Fed. Cir. 1984); *In re Babies Beat, Inc.*, 13 USPQ2d 1729 (TTAB 1990); *In re Vico Products Mfg. Co., Inc.*, 229 USPQ 364 (TTAB 1985), *recon. denied*, 229 USPQ 716 (TTAB 1986); TMEP section 1202.03(a) *et seq.*

A mark may be functional in two senses. If the proposed mark embodies a design feature of the goods which is superior to other available designs and thus provides a competitive advantage to the user, then the proposed mark is *de jure* functional and unregistrable on either the Principal Register or the Supplemental Register. *See In re Morton-Norwich Products, Inc.*, 671 F.2d 1332, 213

USPQ 9 (CCPA 1982). Or, as another Court has characterized the test, if the underlying design is one which would be costly to do without, then the proposed mark is *de jure* functional. *W.T. Rogers Co., Inc. v. Keene*, 778 F.2d 334, 228 USPQ 145 (7th Cir. 1985).

On the other hand, if the proposed mark embodies a design feature of the goods which is one of many equally-feasible, efficient and competitive alternatives, then the mark is merely *de facto* functional and may be registrable on the Principal or the Supplemental Register. TMEP section 1202.03(a)(i)(C).

If the proposed mark is de facto functional and is inherently distinctive, then the mark is registrable on the Principal Register. If the proposed mark is *de facto* functional, but is not inherently distinctive, then the mark is registrable on the Principal Register only with a showing of acquired distinctiveness. Such a mark may also be registrable on the Supplemental Register. *See generally Oddi, The Functions of "Functionality" in Trademark Law*, 76 Trademark Rep. 308 (1986); TMEP section 1202.03(a)(i)(B).

The applicant should provide the following information to permit the examining attorney to reach an informed final determination concerning the proposed mark. The applicant should indicate whether the proposed mark is the subject of either a design or utility patent. If so, the applicant should provide all information concerning the patent. The applicant should indicate whether alternative designs are available for the feature embodied in the proposed mark. The applicant should indicate whether the alternative designs are equally efficient and whether alternatives are more costly to produce. The applicant must also provide information concerning designs used by competitors.

The applicant should also provide any available advertising, promotional or explanatory material concerning the goods, particularly any material specifically related to the feature embodied in the proposed mark. The applicant may also furnish any other evidence the applicant considers relevant to the registrability of the proposed mark. *In re Teledyne Industries, Inc.*, 696 F.2d 968, 217 USPQ 9 (Fed. Cir. 1982); 37 C.F.R. Section 2.61(b); TMEP section 1202.03(a)(iii).

Moreover, the applicant's present claim of acquired distinctiveness under Trademark Act Section 2(f), 15 U.S.C. Section 1052(f), is insufficient. *In re Andes Candies Inc.*, 478 F.2d 1264, 178 USPQ 156 (CCPA 1973); *Ralston Purina Co. v. Thomas J. Lipton, Inc.*, 341 F. Supp. 129, 173 USPQ 820 (S.D.N.Y. 1972); *In re MetPath, Inc.*, 1 USPQ2d 1750 (TTAB 1986); *In re Redken Laboratories, Inc.*, 170 USPQ 526 (TTAB 1971); *In re Interstate Folding Box Co.*, 167 USPQ 241 (TTAB 1970). Under Section 2(f), the applicant has the burden of proving the distinctiveness of the mark by clear and convincing evidence. This has not been done in the present case. Although the proposed mark has been in use in commerce for more than fifty years, the examining attorney needs more information concerning goods of the type to make an informed determination as to whether the proposed mark is capable of acquiring distinctiveness.

The applicant's allegation of five years' use alone is insufficient evidence of distinctiveness. The applicant may submit actual evidence to prove the distinctiveness of the mark in commerce. The Office will decide each case on its own merits. The examining attorney will consider the following principal factors in this decision: (1) how long the applicant has used the mark, (2) the type and amount of advertising of the mark and (3) the applicant's efforts to associate the mark with the goods. *See Ralston Purina Co. v. Thomas J. Lipton, Inc.*, 341 F. Supp. 129, 173 USPQ 820

(S.D.N.Y. 1972); *In re Packaging Specialists, Inc.*, 221 USPQ 917 (TTAB 1984); 37 C.F.R. Section 2.41; TMEP sections 1212, 1212.01 and 1212.06. This evidence may include specific dollar sales under the mark, advertising figures, samples of advertising, consumer or dealer statements of recognition of the mark and any other evidence that establishes the distinctiveness of the mark as an indicator of source.

If the applicant is not submitting a fee with the response, the applicant should include the following in the mailing address to ensure proper handling: 1) the words "Box Responses" and 2) the law office number of the assigned examining attorney.

Andrew P. Baxley
Trademark Examining Attorney
Law Office 104, (703) 308-9104 x 162

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

T.M.E.O. LAW OFFICE 104

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In re the Application of	
R. W. Fernstrum & Company	Examining Attorney
Serial Nos. 75/382,250	Andrew P. Baxley, Esq.
Filed: October 30, 1997	Law Office No. 104
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	

TRADEMARK MAILROOM REC'D MAY 18 1998 US PATENT & TRADEMARK OFFICE 64

REMARKS

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

TRADEMARK FEE PROCESS. RECEIVED 1998 MAY 18 P 4:04 US PATENT & TRADEMARK OFFICE

This is responsive to Examiner Action No. 1, dated April 21, 1998.

Applicant filed an application to register the flat, grid-like surface of its marine engine heat exchanger formed by the uniform and parallel spacing of a series of rectangular tubes. Applicant has not filed an application to register the entire configuration of the product. Registration was refused because the mark "appears to be functional". In addition, the claim of distinctiveness under Section 2(f) of the Lanham Act, 15 U.S.C. § 1052(f) was considered insufficient.

A. Functionality

According to the Examiner Action, the mark sought to be registered is functional because it serves a utilitarian purpose. Despite the fact that the examining attorney must establish a *prima facie* case that the configuration sought to be registered is *de jure* functional, the Patent and Trademark Office has produced no evidence whatsoever to show that the surface of Applicant's marine engine heat exchanger is required to be as it is for any functional reason to support the refusal. TMEP § 1202.03(a)(iv). Thus, it is not clear to Applicant what the examining attorney has in mind in using the terms "functional"

and "utilitarian". Nevertheless, Applicant will attempt to respond to the Examiner Action.

1. Controlling Authority

A product configuration which constitutes a superior design that competitors need to copy to compete effectively is *de jure* functional and unregistrable. *Greenhouse Systems Inc. v. Carson,* 37 U.S.P.Q.2d 1748, 1751 (TTAB 1995). Functionality means that the product in its particular shape works better than other shapes. *In re Hudson News Co.*, 39 U.S.P.Q.2d 1915, 1918 (TTAB 1996). However, the mere fact that a product configuration has utility does not make it unregistrable. Registrability depends upon the degree of utility and whether competition would be hindered. *In re Morton-Norwich* 671 F.2d 1332, 1340, 213 U.S.P.Q. 9 (CCPA 1982); and *Greenhouse Systems, Inc. v. Carson, supra.* In other words, the correct inquiry in this case is whether the flat, grid-like surface of Applicant's product creates superior performance characteristics so that affording it trademark protection would unduly restrict competitors.

In determining whether a configuration is *de jure* functional (whether the configuration of the article sought to be registered is a superior design and, therefore, should not be exclusively appropriated by an applicant) there are four factors that the Board may consider:

(1) the existence of a utility patent that discloses the utilitarian advantages of the design;

(2) advertising materials in which the originator of the design touts the utilitarian advantages of the design;

(3) the availability of functionally equivalent alternative designs; and

(4) facts indicating that the design results from a comparatively simple or cheap method of manufacturing the product.

In re Morton-Norwich Products, Inc., supra at 15.

a. There is no utility patent which discloses the utilitarian advantages of the design sought to be registered.

The trademark feature of Applicant's marine engine heat exchanger is the flat, grid-like surface appearance of the product. The flat, grid-like surface appearance is derived from a series of heat conducting tubes arranged in a side-by-side relationship to form a planar surface. That planar surface is characterized by the spaced apart faces of the tubes and their respective edges. The faces and edges form the flat, grid-like appearance from which the mark is derived. There is no utility patent which discloses the utilitarian advantages of the flat, grid-like appearance of the product.

Applicant is the owner of expired Letters Patent No. 2,382,218 (hereinafter the "Fernstrum Patent") in which the design sought to be registered is displayed. A copy of the Letters Patent is attached as Exhibit A. The mere existence of such a patent, however, is not determinative: "[a] utility patent must be examined in detail to determine whether or not the disclosed configuration is really primarily functional or just incidentally appears in the disclosures of the patent." 1 McCarthy On Trademarks And Unfair Competition § 7:89 (4th ed. 1998). The fact that a feature is depicted or described in a utility patent does not automatically render it "functional". Many non-functional configurations are incidentally included or recited in utility patents. *Sunbeam Products Inc. v. West Bend Co.*, 123 F.3d 246, 44 U.S.P.Q.2d 1161, 1169, n. 20 (5th Cir. 1997); *Black & Decker Inc. v. Hoover Service Center*, 886 F.2d 1285, 12 U.S.P.Q.2d 1250, 1255 (Fed.Cir. 1989)(patent was not evidence that a product shape was dictated by utilitarian advantages because the patent did not relate to the shape of the product); *Dogloo, Inc. v.*

Doskocil Manufacturing Company, 893 F.Supp. 911, 35 U.S.P.Q.2d 1405, 1410 (C.D.Cal. 1995)(since the patent did not claim any utilitarian advantages in the shape of the product, it was not probative of functionality). Indeed, it is only if the functional features of the product configuration themselves are described in the claims of a patent, is a utility patent "evidence" that the configuration is functional.

Accordingly, there is no *per se* prohibition against features disclosed in a patent receiving trademark protection after the patent has expired. *Thomas & Betts Corporation v. Panduit Corporation,* ___ F.3d ___, 46 U.S.P.Q.2d 1026, 1033 (7th Cir. 1998). Whenever a product configuration is disclosed as part of a utility patent, the issue presented is whether the grant of trademark protection for that product configuration would prevent the invention from being copied or used by the public. *Zip Dee, Inc. v. Dometic Corporation,* 931 F.Supp. 602, 38 U.S.P.Q.2d 1239 (N.D.Ill. 1996)(product configuration disclosed in patent was not necessary to practice the invention).

The Fernstrum Patent is silent in terms of configuring the tubes to create the flat, grid-like appearance described above. The Fernstrum Patent is concerned only with improving heat transfer by having the sides with the greatest width of the tubes extend in a vertical plane, see page 1, col.1, lines 31-36. The tubes are positioned longitudinally to give increased thermal capacity, see page 1, col. 1, lines 15-20. This disclosure means that it is the longer side of rectangular tubes which contribute to the improved heat transfer, not the configuration of the tubes at the top or bottom of the heat exchanger.

While the drawings of the Fernstrum Patent (*e.g.*, Figures 4, 6 and 8) depict the tubes in a side-by-side relationship, there is no mention in the patent of any utilitarian advantage to the flat, grid-like appearance of the tubes. The claims of the Fernstrum Patent do not recite limitations requiring that the tubes be arranged so that their faces form a flat surface resulting in the grid-like appearance. Consequently, the Fernstrum

Patent does not attribute any utilitarian advantage to flat, grid-like surface for the top or bottom surface of the heat exchanger and such a surface is certainly not necessary to practice the invention.

This *Morton-Norwich* factor weighs in Applicant's favor.

b. Applicant Does Not Tout The Utilitarian Advantages Of The Grid-Like Surface Sought To Be Registered Through Advertising.

Attached as Exhibit B is the Fernstrum GRIDCOOLER brochure. There is nothing in this brochure touting the utilitarian advantages of the grid-like surface sought to be registered.

Attached as Exhibit C are representative advertisements in trade magazines for the Fernstrum GRIDCOOLER. There is nothing in these advertisements touting the utilitarian advantages of the grid-like surface sought to be registered.

This *Morton-Norwich* factor weighs in Applicant's favor.

c. There Are Alternative Designs Available For Keel Coolers.

Since the effect upon competition is the essential factor in determining whether the configuration of a product is functional, it is most significant that there are alternative designs available for keel coolers. *In re Morton-Norwich Products, Inc.*, 213 U.S.P.Q. at 16. Attached as Exhibit D is a copy of the advertising brochure for the keel coolers of Walter Machine Company, Inc. and attached as Exhibit E is a copy of the advertising brochure for the keel coolers of the Johnson Rubber Company.

The Walter keel cooler is made of round tubing with spiral grooves.

> The spirals force the coolant flow to become turbulent, continually propelling and swirling the coolant against the inner wall of the tube, thereby greatly increasing heat transfer. The turbulating action makes WALTER TURBO TUBE much

> more efficient for heat transfer than smooth rectangular or round tube in which most of the coolant flows through the center of the tube without contacting the inner tube wall. Because TURBO TUBE is so efficient, a much more compact WALTER Keel Cooler can be used when compared with coolers using smooth rectangular or round tube.

Exhibt D, page 3.

Johnson Rubber Company also uses spiral tubing to ensure optimal cooling.

> **Efficient Heat Transfer:** The helical flow motion imparted to the coolant by the spiral configuration of Duramax tubing creates turbulence which greatly reduces heat transfer inefficiencies common to conventional smooth-wall tubing. Also, Duramax Spiral Tubes provide greater cooling surface area than plain tubing. As a result, Duramax Keel Coolers offer greater cooling efficiency than conventional straight tube systems and take less hull space for maximum cooling.

Exhibit E, at 2.

Attached as Exhibit F is the Declaration of Paul Fernstrum, President of R. W. Fernstrum & Company. In paragraph No. 5 of his Declaration, Mr. Fernstrum describes alternative designs that could be employed with respect to the top and bottom configuration of a keel cooler which would permit the cooler to function as well as the design of the keel cooler sought to be registered. Specifically, Mr. Fernstrum attests to the fact that the surface of the tubing does not have to be in the same plane or be essentially flat with sharp edges to function as a keel cooler. The tubing could be oval. The tubing could be fluted to increase surface area and heat transfer, thus, presenting a textured surface rather than a smooth surface. In yet another alternative, a number of oval or circular tubes could be staggered both horizontally and vertically presenting step appearance. See Exhibit B of the Fernstrum Declaration.

Attached as Exhibit G are six patents for keel coolers illustrating round and fluted tubing as alternative designs.

In view of the foregoing, this *Morton-Norwich* factor favors Applicant.

d. The Grid-Like Surface Sought To Be Registered Does Not Result From A Comparatively Simple Or Cheap Method Of Manufacturing A Keel Cooler.

In the Fernstrum Declaration, Paul Fernstrum attests to the fact that the appearance of the Fernstrum GRIDCOOLER does not translate into cost savings during the manufacturing process. Aluminum tubing made through the extrusion process the extruded cross sectional tube shape could be any shape (*e.g.,* rectangular, oval, fluted, hexagonal, triangular, trapezoidal, etc). Exhibit F, paragraph No. 7.

Copper-nickel gauge tubing is made by sending a sheet of metal through a series of rollers that turn the sheet into a round shape. The tube is then process through a high induction welding process where the edges of the tubing is heated into molten metal and the edges are forced together in a "forge weld." After the welding process the round tubing is sent through another series of rollers that turn it into a rectangular shape. Thus, rectangular tubing requires more processing than round tubing.

Applicant's competitors assert that their keel coolers are more economical. Walter touts its keel cooling device as the "Most Economical Keel Cooler".

> **Double Stem Models** The low prices of our double stem coolers make them a very economical keel cooling system, especially when compared with box-type coolers.

Exhibit D, page 6.

Johnson Rubber Company also touts its keel cooler as being "Engineered For Fast Economical Installation." Exhibit D, page 8. Thus, the competition maintains that its products are the most economical keel coolers on the market.

Since there is no manufacturing-cost benefit associated with the grid-like surface sought to be registered, this *Morton-Norwich* factor is in Applicant's favor.

In view of the foregoing, and because the Examining Attorney has not presented any evidence to support the functionality of the design sought to be registered, the refusal to register on the ground that the flat, grid-like surface of the product is functional should be withdrawn.

B. Secondary Meaning

1. Controlling Authority.

Applicant is required to establish a *prima facie* case of acquired distinctiveness. It is not necessary for the Applicant to conclusively establish secondary meaning. TMEP § 1212.01. The Applicant may present any competent evidence to establish that its mark has acquired distinctiveness. *Id.*

A *prima facie* case is a case supported by enough evidence that it will be presumed true until contradicted or overcome by other evidence. Black's Law Dictionary, page 1189, (6th ed. 1990). *Prima facie* evidence is evidence sufficient to establish a fact which, if not rebutted or contradicted, will remain sufficient. *Id.* at 1190.

Secondary meaning or acquired distinctiveness means consumer recognition. A mental association between the mark and the source. 2 McCarthy On Trademarks And Unfair Competition § 15:5, page 15-8 (4th ed. 1997). Therefore, Applicant is required only to produce facts sufficient to establish that the mark sought to be registered has some consumer recognition as a trademark.

b. Grounds For Refusal

According to the Examining Attorney: "The applicant's allegation of five years' use alone is insufficient evidence of distinctiveness." Although it was incumbent upon the Examining Attorney to present the basis for rejection in the Office Action, *In re Interstate Folding Box Co.*, 167 U.S.P.Q. 241 (T.T.A.B. 1970), Applicant is again left to speculate the reason for the refusal in order to fashion an appropriate response.

c. Evidence Of Acquired Distinctiveness.

In the original application, Applicant claimed that the flat, grid-like surface of the product had acquired distinctiveness by virtue of its substantially exclusive and continuous use in commerce for over fifty years.

Applicant is the owner of U.S. Registration No. 941,382 for the mark GRIDCOOLER for an external cooling system for marine engines. A copy of the registration is attached as Exhibit H.

In Exhibits B and C, Applicant has submitted representative samples of its advertisements and promotional materials. A drawing of the Fernstrum GRIDCOOLER including the flat, grid-like surface sought to be registered is included as an integral part of each promotional piece. The use of the flat, grid-like surface as a feature of the promotional materials creates in the mind of the relevant consumer a mental image of the GRIDCOOLER. The flat, grid-like surface calls forth images of a grid-like product; it is suggestive of the GRIDCOOLER. This mental image is emphasized by the combined use of the flat, grid-like surface of the product with the trademark GRIDCOOLER. All of Applicant's advertising prominently feature the flat, grid-like surface of the keel cooler used in close association with the word mark GRIDCOOLER, thereby drawing attention to the shape of a feature of the product. By drawing consumers' attention to the shape of a

feature of the product, they have come to associate the flat, grid-like surface with Applicant.

Attached as Exhibits I and J are Declarations by Douglas Oehrlein, President of Oarline Marine, a marine equipment manufacturers representative, and Robert L. Gilson, the owner of Gilson Marine & Industrial, a manufacturers representative for several product lines in the marine industry. Oehrlein attested to the fact that the Fernstrum GRIDCOOLER has an unmistakable appearance which he described as a grid-like appearance whichs is unique in the industry. Exhibit I, paragraph No. 8. Moreover, it is his experience that boat manufacturers and boat owners recognize keel coolers with a flat, grid-like appearance as originating exclusively with Applicant. Exhibit I, paragraph No. 9.

Gilson likewise attested to the fact that the identifying feature of the Fernstrum GRIDCOOLER is its flat, grid-like appearance. Exhibit J, paragraph No. 8. Gilson also attested to the fact that it is his experience that shipyard personnel and boat owners associate keel coolers with a flat, grid-like appearance exclusively with Applicant.

Attached as Exhibit K are forty-four (44) Declarations from shipyard owners, boat designers, and boat owners. The declarants attested to the facts that the flat, grid-like surface of the Fernstrum GRIDCOOLER has become <u>a recognized design uniquely associated with Applicant and that it is exclusively associated with Applicant</u>.

Declarations asserting recognition of the design sought to be registered as an indicia of source are relevant in establishing acquired distinctiveness. TMEP § 1212.06(c). The value of the declarations depend on the statements made therein and the identity of the declarant. *Id.* These declarations are probative of acquired distinctiveness because they comprise specific and material statements by knowledgeable and relevant persons. The declarations are from manufacturers

representatives, shipyard personnel, boat designers, and boat owners, all of whom are relevant and knowledgeable purchasers. *In re G. LeBlanc Corporation,* 429 F.2d 989, 166 U.S.P.Q. 561 (CCPA 1970)(letters from customers, prospective customers, and dealers were persuasive evidence that the particular configuration served as a trademark). The declarants specifically identified the flat, grid-like surface of the keel cooler as being uniquely and exclusively associated with Applicant and that to the best of their knowledge, Applicant is the only manufacturer of keel coolers with a flat, grid-like surface. *In re Bose Corp.*, 216 U.S.P.Q. 1001, 1005 (TTAB 1983), *aff'd,* 772 F.2d 866, 227 U.S.P.Q. 1 (Fed.Cir. 1985)(retailer's statement that he has been in contact with many purchasers of loud speaker systems of whom a substantial number would recognize the depicted design as originating with applicant is competent evidence of secondary meaning).

The fact that the declarations are similar in format and expression is of no particular significance because the declarants have sworn to the statements therein. *In re Flex-O-Glass, Inc.,* 194 U.S.P.Q. 203, 206 (TTAB 1977). A review of the declarations reveals that many declarants added statements and struck out statements while completing the documents. This demonstrates that the declarants were not blindly signing what was put before them. They were carefully reading and evaluating the statements before signing.

Forty-six declarations by persons in the marine industry stating not only that they recognize that flat, grid-like surface of the keel cooler as Applicant's trademark, but also that they are aware that others in the field recognize that design as Applicant's trademark, clearly constitutes a *prima facie* case of secondary meaning.

Application Serial No. 75/382,250

Conclusion

In general, the more descriptive the term, the greater the evidentiary burden to establish secondary meaning. 2 McCarthy On Trademarks And Unfair Competition § 15:28, page 15-44 (4th ed. 1997). In this case, however, Applicant is seeking to register the flat, grid-like surface of a keel cooler rather than a descriptive term. The Examining Attorney has before him extensive evidence showing over fifty years of substantially exclusive and continuous use of the flat, grid-like surface sought to be registered and evidence of actual consumer recognition.

With respect to the issue of functionality, all the *Morton-Norwich* factors favor registration. In view of the foregoing, Applicant respectfully submits that the flat, grid-like surface of the keel cooler sought to be registered is not functional and that Applicant has made a *prima facie* showing that the flat, grid-like surface has acquired secondary meaning. Accordingly, Applicant requests that the refusal to register be withdrawn and that the mark be approved for publication.

R. W. FERNSTRUM & COMPANY

Date: May 18, 1998

By: _____

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DC 71119-1 35598

Exhibit A

Patented Aug. 14, 1945 2,382,218

UNITED STATES PATENT OFFICE

2,382,218

OUTBOARD MARINE HEAT EXCHANGER

Robert W. Fernstrum, Detroit, Mich.

Application September 18, 1943, Serial No. 502,859

14 Claims. (Cl. 115—0.5)

The present invention relates to improvements in heat exchangers and more particularly, to a heat exchanger for water craft and vessels.

The primary object of the invention is to facilitate circulatory movement of the engine cooling fluid in a closed system to exclude foreign matter from the cooling system of the vessel's power plant or prime mover and to exclude corrosive forming chemicals which would otherwise be pumped through the water cooling jacket of the engine.

Another object of the invention is to provide an outboard heat exchanger for connection with the water jacket of an engine cooling system including a series of tubes, rectangular in cross-section and extending longitudinally of the keel of the vessel to give a greatly increased thermal capacity so as to maintain the coolant in the water jacket at a substantially constant temperature.

Another object of the invention is to provide an outboard heat exchanger adapted to be located in a recess in the key of a hull so as to be removed from the path of obstruction and so as to present little or no resistance to the water path during its motion through the water.

Another object of the invention is to provide an outboard type heat exchanger for water craft and other vessels including a pair of headers mounted in spaced relation along the keel of the boat or vessel with relatively flat heat conduction tubes extending therebetween with their sides of greatest width extending in a vertical plane so as to greatly increase the heat conduction surface and the general efficiency of the heat exchanger.

Another object of the invention is to provide the headers with slightly beveled surfaces to prevent the water in which the vessel is travelling from becoming pocketed in the space between the longitudinally extending tubes so as to insure proper heat conduction and the resultant continuous cooling of the liquid in the closed circulatory system.

Another object of the invention is to provide an outboard heat exchanger for water craft in which the heat exchanger is received in a longitudinally extending recess in the keel of the boat, and said recess is sealed by means of a sheathing of relatively thin metal to prevent water from finding its way between the joints of the heat exchanger and into the boat.

Another object of the invention is to provide an intermediate support for the longitudinal heat conduction tubes to prevent sagging thereof and distortion when contacting floating objects in the water.

Other objects and advantages of the invention will become apparent during the course of the following description forming a part of the specification, wherein:

Figure 1 is a side elevational view of a small water craft or motor boat illustrating a portion broken away to show the manner in which the heat exchanger is installed;

Figure 2 is a vertical cross sectional view taken on line 2—2 of Figure 1 looking in the direction of the arrows illustrating the structural details of the heat exchanger and the manner of mounting the same;

Figure 3 is a longitudinal cross-sectional view taken on line 3—3 in Figure 2 looking in the direction of the arrows further illustrating the details of construction and the manner of mounting the heat exchanger in a recess formed in the keel of the boat;

Figure 4 is a perspective view of the heat exchanger showing the underside thereof and the longitudinal heat conduction tubes connecting the headers at each end of the frame;

Figure 5 is a longitudinal cross sectional view of a small boat keel illustrating a modified form of the invention in side elevation and showing the same extending longitudinally of the keel;

Figure 6 is a bottom plan view of the modified form of the invention further illustrating the headers at each end of the heat exchanger and the central supporting strut therefor;

Figure 7 is a vertical cross sectional view taken on line 7—7 in Figure 5 looking in the direction of the arrows and illustrating the manner in which the heat exchanger tubes project slightly below the bottom of the boat in the modification;

Figure 8 is a plan view of a still further modified form of the invention showing the arrangement of the longitudinal tubes and illustrating the manner in which they are connected to the headers at each end of the heat exchanger;

Figure 9 is a side elevational view of the modified form of the invention shown in Figure 8 further illustrating the structural details and the general arrangement;

Figure 10 is a longitudinal cross sectional view of a boat hull taken along the keel line illustrating the packing sheathing received in the recess prior to the installation of the heat exchanger shown in Figures 8 and 9; and

Figure 11 is a vertical cross sectional view extending transversely of the keel line, illustrating

the manner in which the heat exchanger is received in the recess shown in Figure 10.

In the drawings, attention is directed to Figures 1 to 4 inclusive wherein there is shown a preferred embodiment, and in Figure 1 the reference character 5 will generally be employed to designate the hull of a small boat or water craft having a power plant such as an internal combustion engine. The boat 5 is provided with a super-structure 6 having a windshield 8 and the hull 5 is provided with a bottom wall 9 which is relatively flat for a portion of its length and tapers to the bow of the boat in a V-shaped formation.

Formed in the bottom of the hull 9 is a cutaway portion 10 and said cutaway portion is of elongated rectangular shape and extends longitudinally along the keel line of the hull. The elongated opening 10 may be formed between certain pairs of longitudinally extending hull members 11 as is clearly shown in Figure 2.

Mounted within the recess 10 is a box-like casing 12 having side and end walls 13 and 14, and said end walls are provided with a marginal flange 15 held in place by screws or the like as at 16, extending into the hull 9. Each end of the elongated casing is provided with a diagonal wall 17 extending transversely of the casing with its end welded or otherwise secured to the side walls 13. The edges of the diagonal walls 17 are welded or otherwise secured to the end walls 14 and the bottom wall of the casing as at 18 and 19 respectively, thus forming header chambers 20 for the free circulation of liquid. Each header has formed integral therewith or secured thereto a threaded nipple 21 for receiving the circulatory water pipe connected to the engine cooling system, not shown.

Interconnecting the header chambers 20 is a series of conduction tubes 22 having their ends bevelled as at 23 to coincide with the oblique wall 17 and said bevelled ends are welded in place to the oblique wall 17 so that water may circulate therethrough from one end to the other. Openings may be formed in the oblique walls 17 to establish communication between the tubes 22 and the header chambers 20 and said openings are spaced one from the other so that the conduction tubes 22 will be spaced a corresponding distance.

The conduction tubes 22 are preferably formed rectangular in cross-section, as is clearly illustrated in Figure 2 to increase the surface presented to the slipstream of the hull, resulting in a greater efficiency and increased heat conduction. Suitable piping may connect the threaded nipples 21 to the circulatory system of the boat engine and water-cooling jacket thereof.

In the modified form of the invention shown in Figures 5 to 7 inclusive, the boat hull is generally designated by the reference character 5a and likewise includes structural frame members including transverse ribs 11a. As in Figures 1 to 5 inclusive, the heat exchanger generally designated by the reference character 12a extends longitudinally of the hull 5a and is bolted to the bottom wall thereof 9a.

The heat exchanger comprises a pair of header members 14a having angular front and rear walls 17a and 18a conected to a header plate 19a. The diagonal walls 17a and 18a are connected at their ends by triangular-shaped end walls 20a thereby providing a closed header chamber within said diagonal walls. Threaded nipples 21a extend through suitable openings in the hull 5a and said threaded nipples are provided with gland nuts 22a to securely hold the headers in place. A series of longitudinally extending conduction tubes 23a have their ends bevelled similar to the ends 23 of the heat conduction tubes 22 shown in Figures 1 to 4 inclusive and said bevelled ends are welded about suitable openings formed in the oblique plates 18a. The tubes 23a are preferably rectangular in cross-section and have their interiors in communication with the header chambers of the headers 14a. The intermediate portions of said conduction tubes 23a may have welded thereto a plate 24a extending transversely thereof so that screws or the like as at 25a may be passed through openings 26a in the end portions of the anchoring plate 24a. The plate 24a is intended to prevent sagging of the conduction tubes 23a and to prevent vibration thereof when the boat is being propelled through the water.

The screw-threaded nipples 21a are adapted to be connected to the water cooling system or engine water jacket of the power plant so that circulatory movement of water or cooling medium through the conduction tubes will cool said water for being returned to the engine water cooling jacket.

In the further modified form of the invention shown in Figures 8 to 11 inclusive, the bottom wall 9b of the hull 5b (Figure 10) is built up to form a longitudinally extending recess adjacent the opening or cutaway portion 10b. The frame structure of the hull including the ribs 11b, is cut away so as to receive a longitudinal frame member 12b spaced from the hull 9b by suitable frame members 13b. The recess thus formed by the frame structures 12b and 13b is provided with a liner 14b of box-like form having side walls 15b connected by end walls 16b. The side and end walls 15b and 16b are provided with marginal flanges 17b and 18b respectively so that a series of wood screws 20b may be passed therethrough to securely hold the liner in place. The frame structure 12b is provided with a bore 21b at each end thereof and said bores are in alignment with openings 22b formed in the liner 14b.

The heat exchanger is generally designated by the reference character 25b and is constructed similar to the heat exchangers shown in Figures 1 to 7 inclusive in that it includes a series of longitudinally extending conduction tubes 26b the ends of which are connected to headers generally designated by the reference character 27b. The headers 27b include a top wall 28b having end walls 29b and relatively short bottom walls 30b. Interconnecting the top wall 28b and relatively short bottom wall 30b is an oblique wall 31b having a series of spaced openings for the reception of the bevelled ends of the heat conduction tubes 26b. Said bevelled ends may be welded or otherwise secured in place and are shaped similar to the ends 23 of the heat conduction tubes 22. End walls 32b complete the structure and form an enclosed header chamber in communication with each end of the conduction tubes 26b. Secured to the top walls 28b of the headers 27b is a threaded nipple 33b and said threaded nipples are adapted to extend through the openings 21b and 22b in the frame structure 12b and sheathing liner 14b respectively. Gland packing nuts may be threaded on the nipples 33b above the frame structure 12b to securely clamp the headers 27b in position and suitable pipes may be connected with the threaded nipples 33b for communication

with the cooling system of engine or power plant.

The intermediate portions of the heat conduction tubes 26b may be provided with an anchor plate 24b having openings at the corner portions thereof as at 35b to facilitate anchoring the tubes against vibration when the heat exchanger is in the position shown in Fig. 11. In this position, the heat conduction tubes 26b are partially concealed so that the lower walls thereof are flush with the bottom wall 8b of the hull 5b. Obviously, the heat conduction tubes will be out of the path of floating obstructions and will be completely protected from striking floating objects and other debris.

While the invention is particularly applicable to small water craft, such as motor boats, it is to be understood that the same may be applied to larger vessels for cooling circulatory liquid or fluid for various purposes.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred embodiments of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim is:

1. In combination with a marine hull structure having a keel line, a heat exchanger extending longitudinally of said keel line, said heat exchanger comprising spaced headers secured to the hull and a plurality of flat heat conduction tubes rectangular in cross-section connecting and in communication with said headers said conduction tubes being located within the confines of said spaced headers.

2. In combination with a marine hull structure having a keel line, a heat exchanger extending longitudinally of said keel line, said heat exchanger comprising spaced headers secured to the hull in longitudinal alignment with the keel line, a threaded pipe connection on each of said headers for connection with a liquid circulatory system, and a series of flat heat conduction tubes extending between said headers and in communication therewith along said keel line, said tubes being located within the confines of the headers out of the path of obstructions.

3. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein and arranged in longitudinal alignment with said hull keel line, a plurality of heat conduction tubes connecting said headers and in fluid communication with said chambers, said heat conduction tubes being arranged and confined in the space between said headers, and means for fastening said heat exchanger in said recess.

4. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein and arranged in longitudinal alignment with the keel line of said hull, a series of relatively flat heat conduction tubes connecting said headers in fluid communication with said chambers, threaded pipe couplings on each header extending through opening in said hull, and means for securing said heat exchanger in said recess, said heat conduction tubes being arranged so as to lie within the confines of the headers so as to be removed from the path of obstructions.

5. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein, a plurality of heat conduction tubes connecting said headers and in fluid communication therewith, and means for fastening said heat exchanger in said recess, said conduction tubes being rectangular in cross-section with their side walls extending in a plane perpendicular to the bottom of said hull structure and being positioned between said headers to be removed from the path of obstructions.

6. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein and arranged at each end of said recess, a plurality of flat heat conduction tubes rectangular in cross section connecting said headers and in fluid communication therewith, said heat conduction tubes being arranged between said headers in said recess to be removed from the path of obstructions, and means for fastening said heat exchanger in said recess, said headers each having a wall inclined oppositely to that of the other to create a flow action around and between said heat conduction tubes when the marine hull is propelled through the water.

7. In combination with a marine hull structure having a keel line and a recess extending longitudnally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein arranged at each end of said recess, a series of relatively flat heat conduction tubes rectangular in cross section connecting said headers in fluid communication with said chambers, threaded pipe couplings on each header extending through openings in said hull, and threaded gland nuts on said pipe couplings to clamp said heat exchanger in said recess, said heat conduction tubes being arranged in said recesses and within the confines of said headers to be removed from the path of obstructions.

8. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein located at each end of said recess, a plurality of flat heat conduction tubes connecting said headers and in fluid communication therewith, and means for fastening said heat exchanger in said recess, said heat exchanger being provided with a marginal flange portion for attachment to said hull structure and said flat conduction tubes being arranged within the confines of said recess to be removed from the path of obstructions.

9. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members in longitudinal alignment with the keel of said hull having chambers therein at each end of said recess, flat heat conduction tubes connecting and in fluid communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat conduction tubes being rectangular in cross section and arranged within the confines of said recess.

10. In combination with a marine hull struc-

ture having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat conduction tubes being substantially flat and rectangular in cross-section.

11. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat conduction tubes being substantially flat and rectangular in cross-section and being spaced a distance equal to their thickness.

12. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchange, each of said headers having a threaded coupling member adapted to extend through an opening in said hull to anchor said heat-exchanger within said recess.

13. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat exchanger having a marginal flange adapted to overlie the edge of said recess for securing said heat exchanger in position.

14. In a marine craft, a heat exchanger comprising header members spaced along the keel line of said marine craft, relatively flat heat conduction tubes connecting said headers, threaded coupling nipples on each header for connection with a fluid circulatory system of said marine craft, and inclined front and back walls on said headers extending forwardly and rearwardly so that the slip stream of said marine craft will be uninterrupted, said heat conduction tubes being rectangular in cross-section with their sides of greatest width extending perpendicular to the bottom of said marine craft and arranged within the confines of said headers so as to be removed from the path of obstructions.

ROBERT W. FERNSTRUM.

Exhibit B

CATALOG
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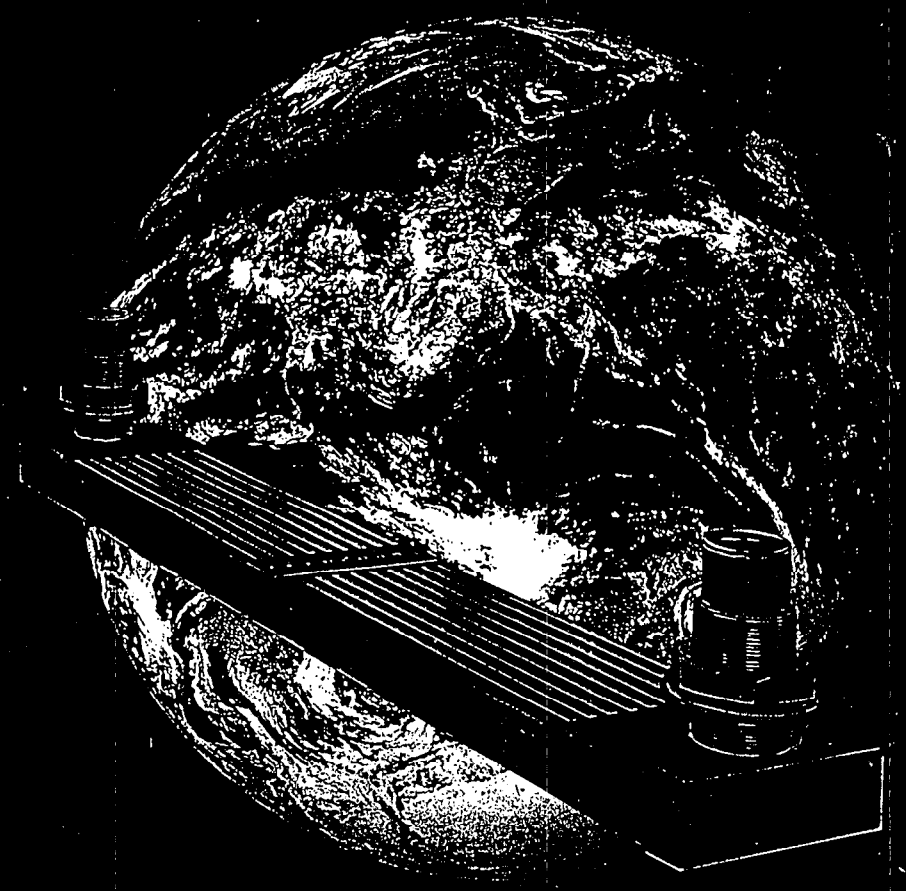
FERNSTRUM GRIDCOOLER®



ENGINEERED KEEL COOLING

COMPUTER SELECTED • COMPLETELY ASSEMBLED • FACTORY TESTED

"The FERNSTRUM GRIDCOOLER® is the simplest and most dependable form of fresh water cooling available."

50 YEARS EXPERIENCE IN ENGINEERED KEEL COOLING

Do you have overheating problems? Tired of messing around with pumps, strainers and sea cocks for your cooling system? Is marine fouling a problem for you?

Then why don't you give us a call? We'll figure out which Gridcooler is right for cooling your engine in your application.

How can you go wrong?

We've been engineering cooling systems for all types of marine engines for the last 50 years. Our product is so durable, efficient and easy to install that the U. S. Navy wrote their keel cooling specifications around our Gridcoolers.

In the commercial marine industry, our Gridcoolers are on push boats, tugs, dredges, dinner boats, oil recovery vessels and gambling boats. We're also on high speed boats like crew supply boats, catamarans, river fishing boats and search and rescue boats.

Gridcoolers can also be found on yachts like the late Malcom Forbes' yacht *Highlander* or the Roosevelt Presidential yacht M/V *Potomac.*

Why take chances when it comes to your engines' dependability? Do it right the first time... use Fernstrum Gridcoolers.

KEEL COOLER — The Gridcooler is a heat exchanger of the outboard or hull type, often referred to as a keel cooler because of its usual location, near the keel.

PROTECTION — The Gridcooler provides closed circuit engine cooling, eliminating sand and silt deposits in engine jackets, and protecting your engine from corrosion and deposits in salt water operation. A closed circuit cooling system also allows antifreeze to be added to the cooling system for colder climates.

UNIQUE DESIGN — The Gridcooler eliminates the sea water pump, strainer, scoop and sea cock. (Except for wet type exhaust systems, which usually require a small capacity pump). Gridcoolers are completely assembled and 100% tested (unlike kit type keel coolers). The Gridcooler's unique design also eliminates the objections associated with other types of keel cooling—such as bulkiness, drag, fouling and weight.

COME SEE US AT BOOTH 205

CHECK THESE QUALITIES FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation.

Silver brazed and welded joints form a rugged keel cooler, no slip joints or "O" rings to leak.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements.

Heavy guage 90/10 copper-nickel rectangular tube is structurally strong and increases the cooling surface over a given area.

Used for decades on commercial and military vessels. Gridcoolers were designed for the U.S. Navy during World War II.

U.S. Navy 20 year rating lets you know Fernstrum Gridcoolers are built to last.

Eliminates marine fouling problems associated with conventional inboard heat exchangers.

Closed cooling system, like your car's radiator; antifreeze can be added to the system for colder applications.

Eliminates sea cock, pumps and strainers, Gridcoolers only need the engine's jacket water pump for coolant flow and an expansion tank.

R. W. FERNSTRUM & COMPANY

P.O. BOX 97 • 1716 11th AVE.
MENOMINEE, MI 49858

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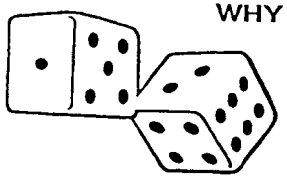
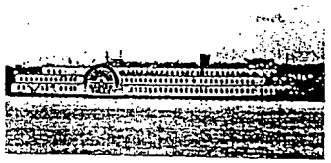
FAX: (906) 863-5634



WHY GAMBLE WITH DEPENDABILITY...

FERNSTRUM GRIDCOOLER® is a "SURE THING!"

Planning on getting into riverboat gambling? You'll need plenty of air conditioning to keep your customers cool...right? How are you going to keep that air conditioning system cool? For over 40 years, we've been making cooling systems for all types of marine engines and air conditioning systems... and that's all we make. Our product is so durable, efficient and easy to install that the U. S. Navy wrote their keel cooling specifications around our Gridcoolers. Why gamble with your vessel's dependability? Put your money on a proven winner... get Fernstrum Gridcoolers.



Dubuque Casino Belle
Built by
Patti Shipyard
Keel Cooled by
R. W. Fernstrum
& Company

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation. **Silver brazed and welded joints** form a rugged keel cooler, no slip joints or "O" rings to leak.

Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements. **The most compact form of keel cooling,** can be recessed for a flush with hull installation.

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Passenger Vessel News 7 W x 4-5/8 H
MAGAZINE

0520

THE FERNSTRUM STORY

A BRIEF HISTORY OF KEEL COOLING

Keel cooling first appeared in the early 1800's when someone hung a copper tube over the edge of a boat to condense steam. It later evolved into pieces of channel welded onto the hull. These channel cooling systems offered important advantages over raw water cooling. They eliminated silt and sand buildup in engine jackets and protected engines against salt water corrosion. Unfortunately, their sheer bulk reduced a ship's capacity and increased its drag. They were also prone to seaweed foulup. Clearly, a more compact and streamlined cooler was needed. This led to packaged keel coolers, and the FERNSTRUM success story.

SOME COOL FACTS ABOUT FERNSTRUM GRIDCOOLERS

The GRIDCOOLER is a heat exchanger of the outboard or hull type, often referred to as a keel cooler.

The GRIDCOOLER eliminates sand and silt deposits in engine jackets, and protects your engine from corrosion and deposits in salt water operation.

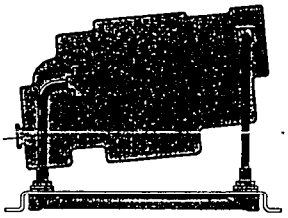
The GRIDCOOLER'S unique design eliminates the objections associated with keel cooling – such as bulkiness, drag, fouling, and weight. In many cases, a GRIDCOOLER requires only one twentieth of the space needed for channel cooling.

LOW DRAG – Independent tests run at the Vienna Model Test Basin have shown that drag is negligible or almost nonexistent when GRIDCOOLERS are recessed in a ship's hull. On our high speed test boats, we found that the difference between rolling and brushing regular anti-foulant hull paint on the hull of the boats created more drag than our GRIDCOOLERS.

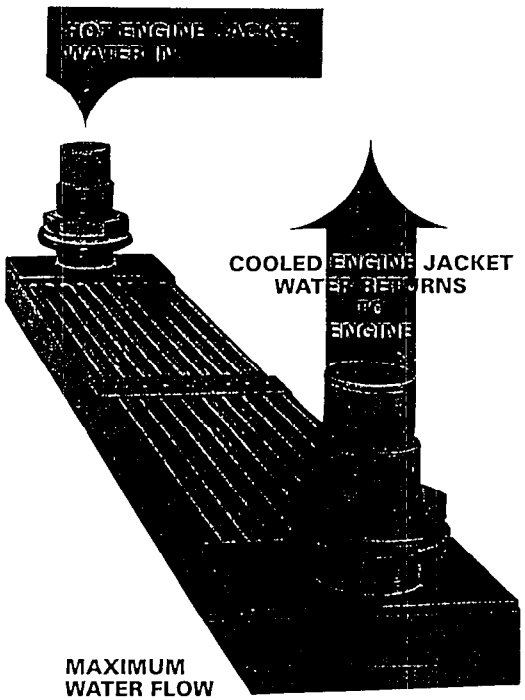
PRESSURE DROP – Because the pressure drop over the GRIDCOOLER is extremely low, it does not restrict the flow of jacket water, making possible the use of a centrifugal circulating pump, as well as displacement types.

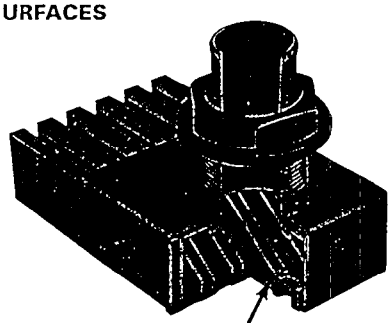
EASILY INSTALLED – The design of the GRIDCOOLER presents no greater problem than the ordinary through - hull fittings. The GRIDCOOLER eliminates the sea water pump, strainer, scoop, and sea cock. (Except for wet type exhaust systems, which usually require a small capacity pump). The GRIDCOOLER is a completely assembled unit ready for installation, complete with heavy neoprene gaskets for sealing the inside and outside of the hull.

VARIETY – GRIDCOOLERS are available in over 8000 models to meet your operating conditions and the engine manufacturer's exact cooling requirements for your engine.



Engine jacket water is piped directly to and from GRIDCOOLER which is in contact with sea water for transfer of heat.





Sectional illustration shows rugged construction. Note angular ends of the tubes, which increases inlet and outlet areas by 100%, eliminating restriction to assure maximum flow of engine jacket water.

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THE MODERN WAY TO COOL YOUR MARINE ENGINE

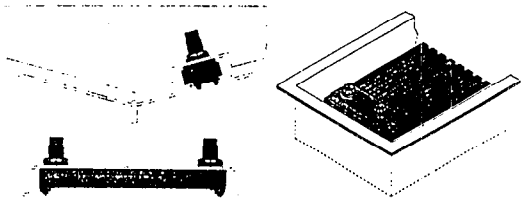
FERNSTRUM

GRIDCOOLER®

COMMON INSTALLATIONS

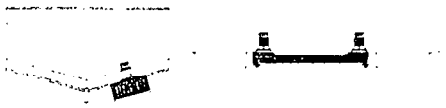
RECESSED

Recessing a GRIDCOOLER cuts down on drag and greatly increases the protection from damage. If possible, the ends of the recess should be flared to allow free flow of water over the entire cooler.



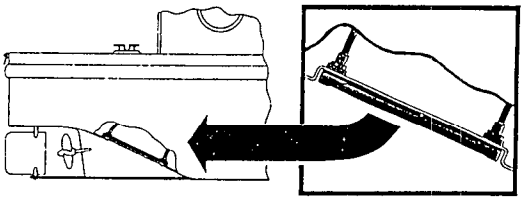
EXTERNAL TYPE

If the GRIDCOOLER can't be recessed for some reason, fairing blocks and side plates can be used for protection and streamlining.



SHALLOW DRAFT

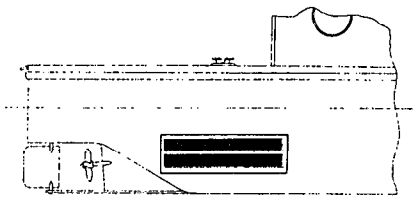
Due to the compact size of a GRIDCOOLER, it can be mounted along the keel or skeg, or even in the rake or tunnel of shallow draft river boats to take advantage of the additional water current created by the propeller.

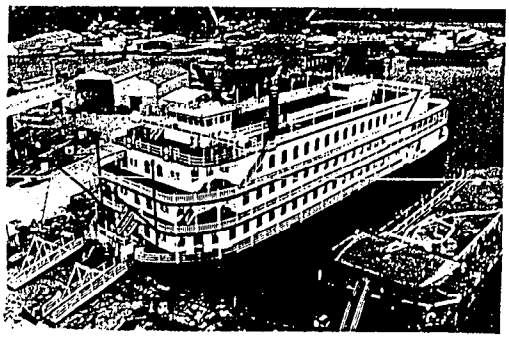


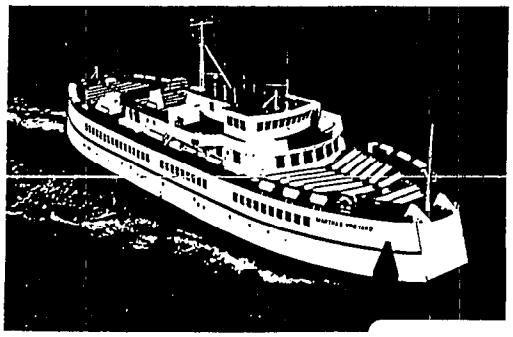
SIDE MOUNTED

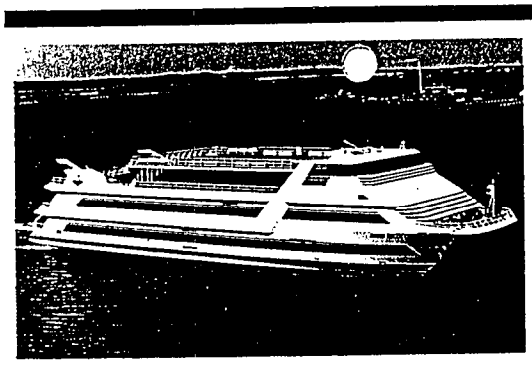
A GRIDCOOLER can be side mounted to avoid damage caused by running your vessel aground or if your vessel doesn't have room on the bottom of the hull.

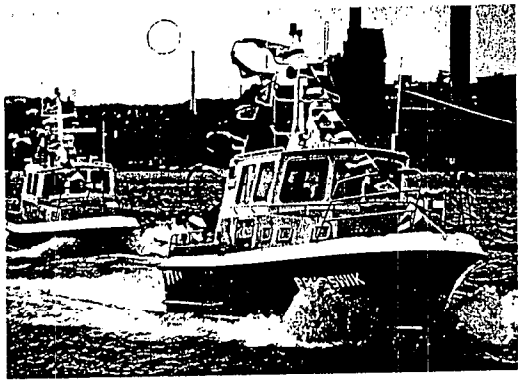
NOTE: For additional details see installation bulletins.

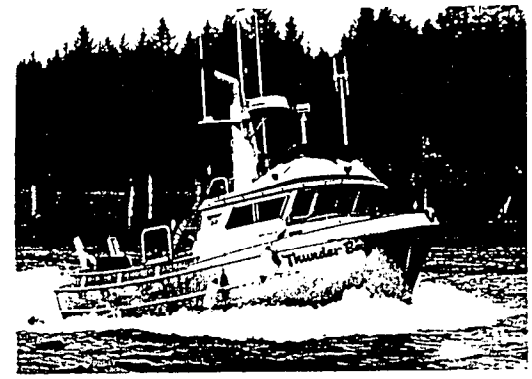


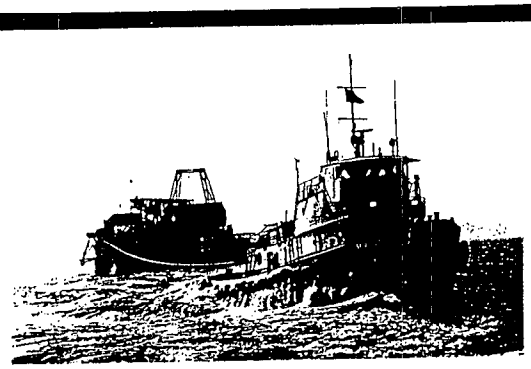












With the installation of a GRIDCOOLER, operational safety is improved when navigating in ice or debris laden waters, and you will no longer have a loss of power at critical times due to raw water pump failure, or strainers clogged with sandwich wrappers, silt, sand, sea weed, and other debris.

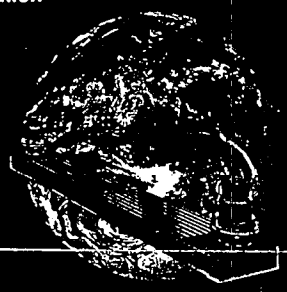
Thousands of GRIDCOOLERS are in operation with splendid success, proving their seaworthiness and reliability in years of operation by the U.S. Navy, Coast Guard, Army, and a variety of commerical and pleasure craft.

The improved performance and extended engine life saves you the cost of a GRIDCOOLER many times over. The Army's life expectancy for a GRIDCOOLER is 20 years (which is longer than the boat using the GRIDCOOLER).

The FERNSTRUM COMPANY is ready to work with you at any time to achieve your exact keel-cooling requirements. Let us ship you the FERNSTRUM GRIDCOOLER . . . the best product of this type on the market today.

The photos are typical of ships featuring Fernstrum GRIDCOOLERS for engineered keel cooling.

FERNSTRUM GRIDCOOLER®



ENGINEERED KEEL COOLING

0523

TO CONTACT US:

R. W. FERNSTRUM & COMPANY
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Phone: (906) 863-5553 • Fax: (906) 863-5634

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Phone: (906) 863-5553 • Fax: (906) 863-5203

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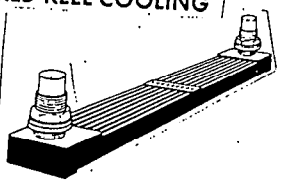
Exhibit C

a COMPLETE
pleasure craft is a craft
equipped with

FERNSTRUM
GRIDCOOLER®
ENGINEERED KEEL COOLING

- Safeguards Engine Performance
- The Most Efficient and Economical Keel Cooling in the Maritime Industry



- Computer-designed to your specific needs
- Factory-tested
- Completely assembled

To contact us . . .

R. W. FERNSTRUM & CO.
Menominee, MI 49858
(906) 863-5553 / Telex 263-3493

FERNSTRUM:

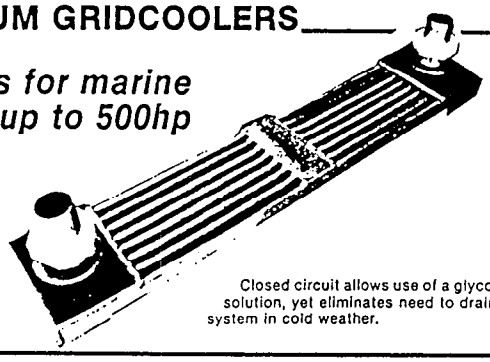
committed to remaining the leader in keel cooling.

. . .hence the introduction of two new

FERNSTRUM GRIDCOOLERS

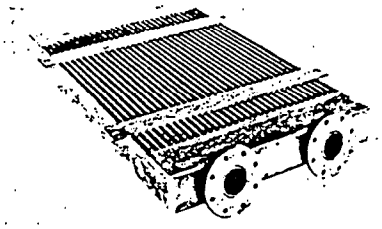
Aluminum Gridcoolers for marine engines up to 500hp

Made from aluminum alloys especially chosen for their resistance to salt water corrosion and compatibility with the 5086 aluminum hull, this new aluminum series Gridcooler is designed for cold salt water areas, such as the U.S. Northeast and Northwest coasts, and for use in fresh water, such as the Great Lakes and inland waterways. Current models have a capacity to cool up to 500hp.



Closed circuit allows use of a glycol solution, yet eliminates need to drain system in cold weather.

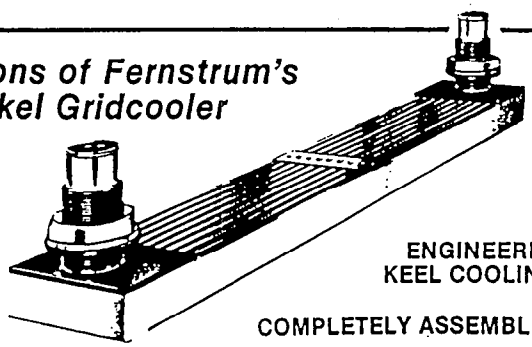
And Gridcoolers for drill rigs and production platforms



Extensive research and testing permitted development of a rectangular copper-nickel tube that will withstand higher pressure encountered in keel cooling auxiliary engines used in the offshore industry. The TB32 Gridcooler is simple in design, with engine fresh water directed to and from unit while in direct contact with sea water, thereby freeing up limited deck space.

All worthy companions of Fernstrum's standard copper-nickel Gridcooler

Fernstrum Gridcoolers eliminate the need for a sea water pump, strainer, inboard heat exchanger, scoop, and sea cock, along with the problems of maintaining a raw water cooling system. Gridcoolers can increase savings by greatly reducing the weight and amount of drag that conventional channel coolers have.



ENGINEERED
KEEL COOLING

COMPLETELY ASSEMBLED

TALK THEM OVER WITH US AT BOOTHS 1169-1170 AT THE INTERNATIONAL WORK BOAT SHOW

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R. W. FERNSTRUM & COMPANY
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Phone: (906) 863-5553 • Telex: 26-3493 • Answer Back: FERNSTRUM MNOM

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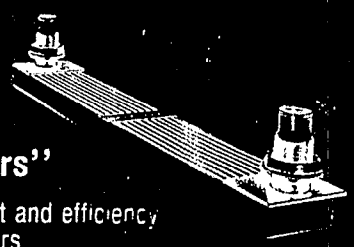
0526

FAST, EFFICIENT KEEL COOLING with FERNSTRUM Engineered "Gridcoolers"



Let us tell you about the cost and efficiency of our Gridcoolers

I AM INTERESTED IN ☐ COPPER-NICKEL GRIDCOOLERS
☐ ALUMINUM GRIDCOOLERS

NAME _____

FIRM _____

ADDRESS _____

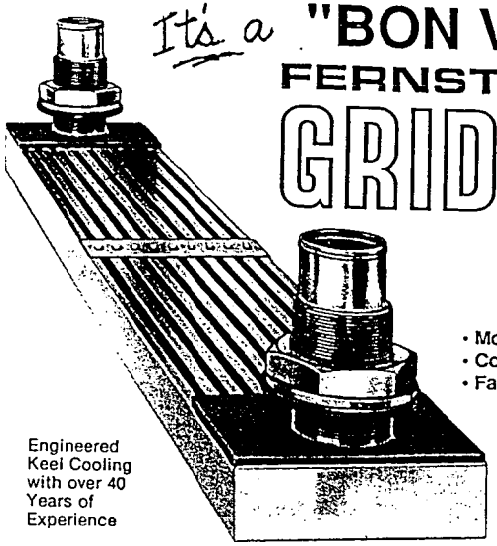
TEL _____

WHATEVER YOUR VESSEL...WHEREVER SHE GOES...

It's a "BON VOYAGE" with

FERNSTRUM

GRIDCOOLER®



ENGINEERED
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- Most Efficient & Economical Keel Cooling
- Computer Designed For Your Specific Needs
- Factory Tested • Completely Assembled

Engineered Keel Cooling with over 40 Years of Experience

For Complete Details, Call or Write

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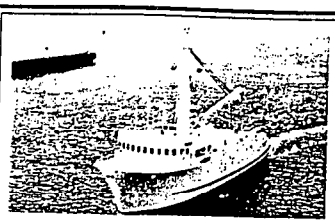

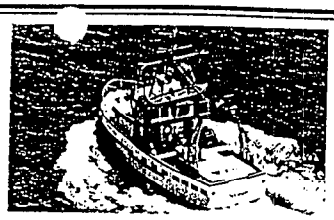

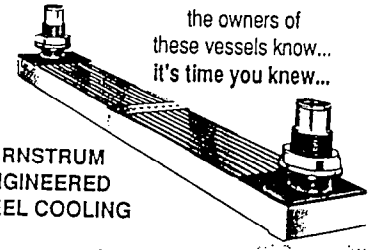

the owners of
these vessels know...
it's time you knew...

FERNSTRUM
ENGINEERED
KEEL COOLING

"The FERNSTRUM GRIDCOOLER® is the simplest and most dependable form of fresh water cooling available."

Ask any of our thousands of customers; they'll say the same thing. You can't find a better fresh water cooling system anywhere.
Call us... we'll let you know which of our over 8000 different Gridcoolers is right for you.

OVER 40 YEARS EXPERIENCE IN KEEL COOLING

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation.

Silver brazed and welded joints form a rugged keel cooler, no slip joints or "O" rings to leak.

Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements.

The most compact form of keel cooling, can be recessed for a flush with hull installation.

R. W. Fernstrum & Company

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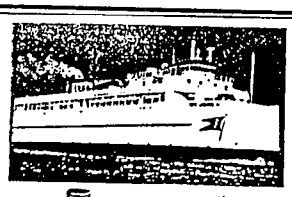
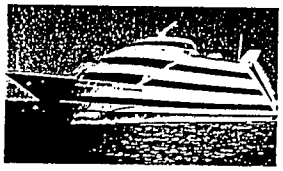
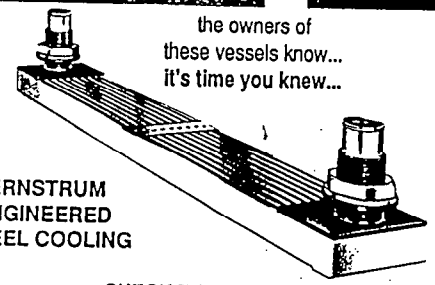
Menominee, MI 49858

Phone: (906) 863-5553
Fax: (906) 863-5634







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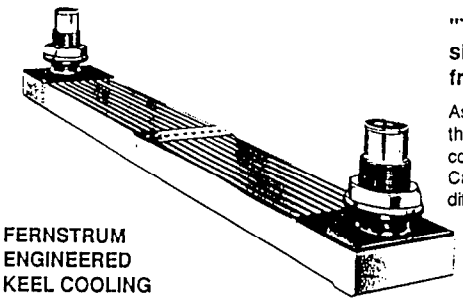
E EQUIPMENT CATALOG

FERNSTRUM GRIDCOOLER®



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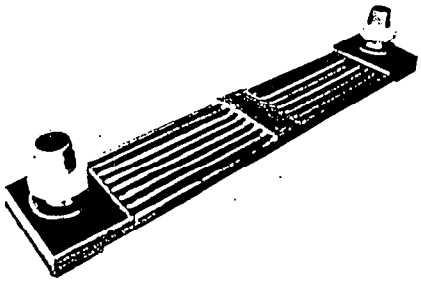
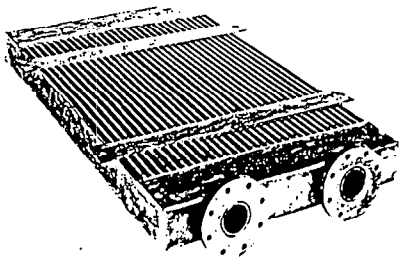
ALUMINUM GRIDCOOLERS...
SPECIFICALLY DESIGNED FOR UNPAINTED ALUMINUM HULLS



Made from aluminum alloys especially chosen for their resistance to salt water corrosion and compatibility with the 5086 aluminum hull, the aluminum series Gridcoolers are designed for cold salt water areas such as the U.S. Northeast and Northwest coasts, and for use in fresh water, such as the Great Lakes and inland waterways.

TB32 SERIES GRIDCOOLERS...
SPECIFICALLY DESIGNED FOR THE OFFSHORE INDUSTRY



Extensive research and testing permitted development of a rectangular copper-nickel tube that will withstand higher pressures encountered in keel cooling auxillary engines used in the offshore industry. The TB32 series Gridcooler is simple in design, with engine coolant directed to and from the unit while it is in direct contact with sea water, thereby freeing up limited deck space.

R. W. FERNSTRUM & COMPANY

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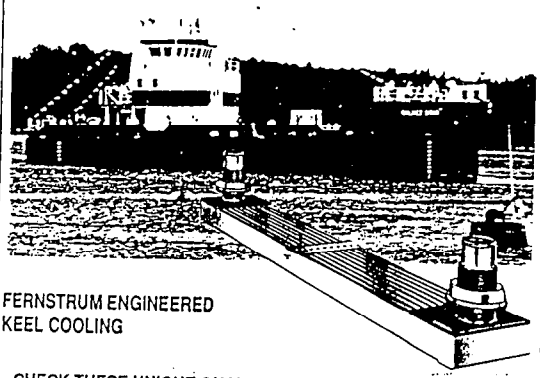

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KEEL COOLING

The Valdez Star...
Built by Goudy & Stevens
Designed by JBF Scientific
Owned by Alyeska Pipeline
Keel Cooled by R. W. Fernstrum & Company

Why Fernstrum Gridcoolers® on an oil skimmer? Because Fernstrum Gridcoolers have been proven durable, reliable, economical and lightweight in over 40 years of actual use by the military and many facets of the commercial marine industry.

Why Fernstrum Gridcoolers on the Valdez Star? Because JBF Scientific wanted to design the most reliable vessel they could to clean up oil spils. For that reason, they chose the most reliable keel cooling system available.

If you have an oil skimmer that needs to operate effectively in or near an oil spill, call us... we'll let you know which of our over 8000 different Gridcoolers is right for your vessel.

CHECK THESE UNIQUE QUALITIES FOUND IN THE GRIDCOOLER:

- Completely assembled and factory tested to assure reliability
- Silver brazed and welded joints form a rugged keel cooler
- Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube
- Custom designed to meet owner's operating conditions and the engine manufacturer's exact requirements
- The most compact form of keel cooling

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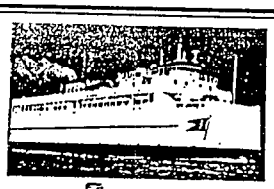
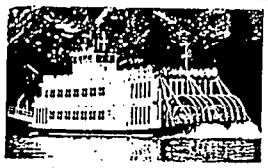
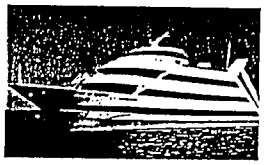
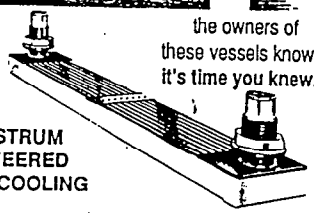
Workboat march/april









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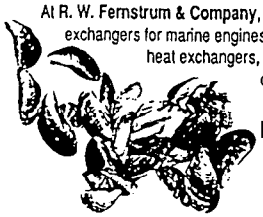
Passenger Vessel News

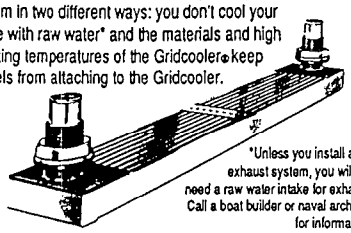
Passenger Vessel News 7 W x 4-5/8 H

Do you have to worry about zebra mussels? If you do, you're not alone, and soon almost everyone on the Great Lakes will have to take them into consideration.

At R. W. Fernstrum & Company, we've built the best heat exchangers for marine engines for over 40 years. Our heat exchangers, Gridcoolers, are closed cooling systems made of one of the best antifoulant materials available, copper-nickel. Therefore, our Gridcoolers can solve part of your zebra mussel problem in two different ways: you don't cool your engine with raw water* and the materials and high operating temperatures of the Gridcooler® keep mussels from attaching to the Gridcooler.



KEEP ZEBRA MUSSELS OUT OF YOUR COOLING SYSTEM



*Unless you install a dry exhaust system, you will still need a raw water intake for exhaust. Call a boat builder or naval architect for information.

#9
5-9-91

FERNSTRUM ENGINEERED KEEL COOLING

Why Fernstrum Gridcoolers on your boat? Because Fernstrum Gridcoolers have been proven durable, reliable, economical and lightweight in over 40 years of actual use by the military and many facets of the commercial and recreational marine industries.

If you're sick of zebra mussels overheating your engine, call us... we'll let you know which of our Gridcoolers is right for you.

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Seaway Review magazine 7 W x 4-7/8 H

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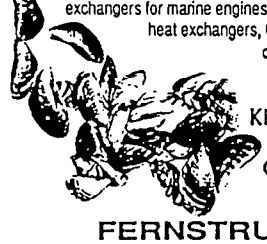
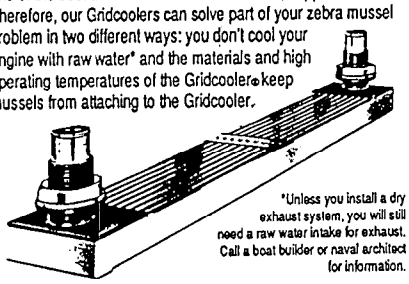


KEEP ZEBRA MUSSELS OUT OF YOUR COOLING SYSTEM



*Unless you install a dry exhaust system, you will still need a raw water intake for exhaust. Call a boat builder or naval architect for information.

#10
5-9-91

FERNSTRUM ENGINEERED KEEL COOLING

Why Fernstrum Gridcoolers on your boat? Because Fernstrum Gridcoolers have been proven durable, reliable, economical and lightweight in over 40 years of actual use by the military and many facets of the commercial and recreational marine industries.

If you're sick of zebra mussels overheating your engine, call us... we'll let you know which of our Gridcoolers is right for you.

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation. **Silver brazed and welded joints** form a rugged keel cooler, no slip joints or "O" rings to leak.

Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements. **The most compact form of keel cooling**, can be recessed for a flush with hull installation.

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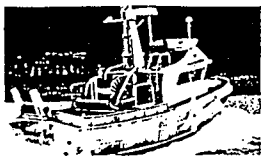
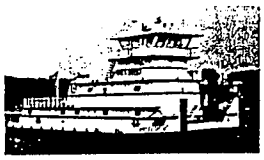
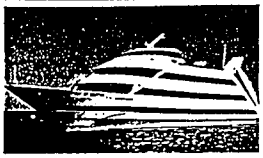
MARINE TECHNOLOGY & MARITIME SERVICES DIRECTORY

the owners of
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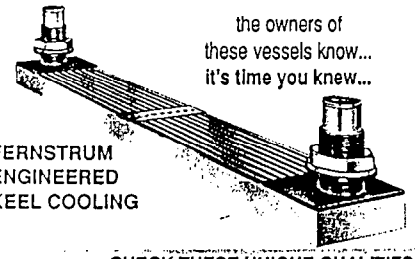

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Fax: (906) 863-5634
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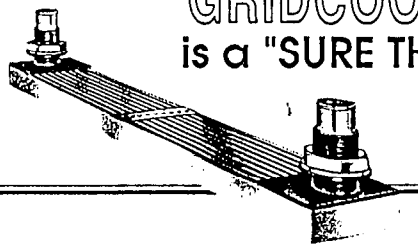
GRIDCOOLER®
is a "SURE THING!"

- Safeguards Engine Performance
- Factory-Tested
- Computer-Designed to Your Specific Needs
- Completely Assembled
- Easy to Install



Call or Write:
R. W. FERNSTRUM & COMPANY
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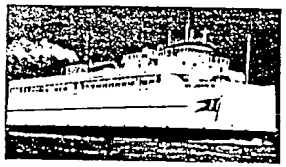
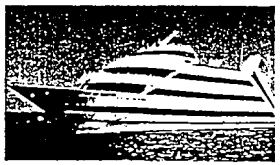
MARITIME REPORTER

WORK BOAT





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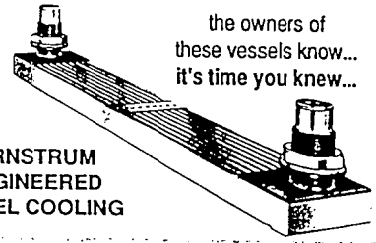

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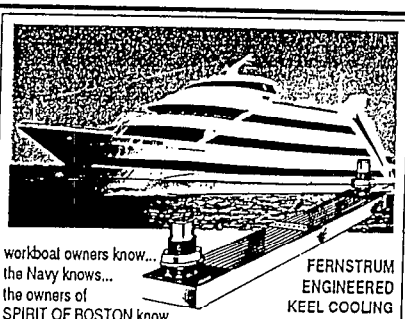

workboat owners know...
the Navy knows...
the owners of
SPIRIT OF BOSTON know...
it's time you knew...

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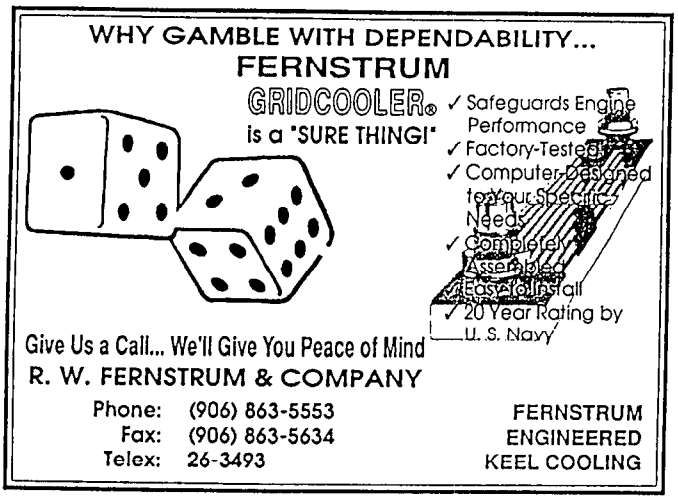
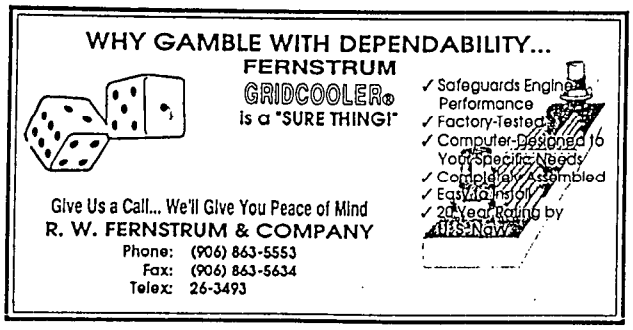
National Fisherman 4-7/8 W x 3-1/2 H

NEWSPAPER

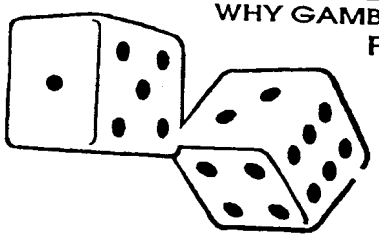


Workboat 4-9/16 W x 2-5/16 H

MAGAZINE



Passenger Vessel News 7 W x 4-5/8 H
MAGAZINE



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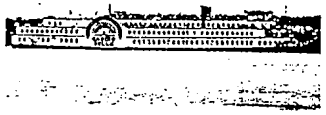

Dubuque Casino Belle
Built by
Patti Shipyard
Keel Cooled by
R. W. Fernstrum
& Company

For over 40 years, we've been making cooling systems for all types of marine engines... and that's all we make. Our product is so durable, efficient and easy to install that the U. S. Navy wrote their keel cooling specifications around our Gridcoolers.
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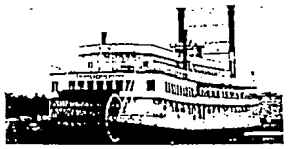

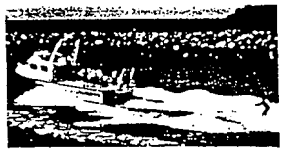

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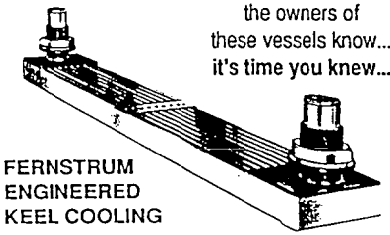

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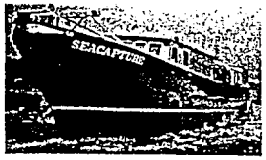
WorkBoat 7 W x 4-7/8 H MAGAZINE

NAT FISHERMAN



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Washburn & Doughty
BUILT BY
Washburn & Doughty
KEEL COOLED BY
R. W. Fernstrum & Company

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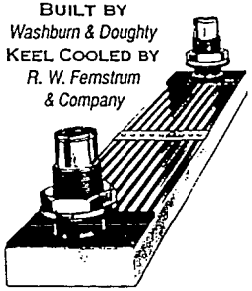
Maritime Directory magazine

4-1/2 W x 4-7/8 H

BUILT FOR
Winslow Marine
BUILT BY
Washburn & Doughty
KEEL COOLED BY
R. W. Fernstrum & Company

Tug Photo by: Eben Brown



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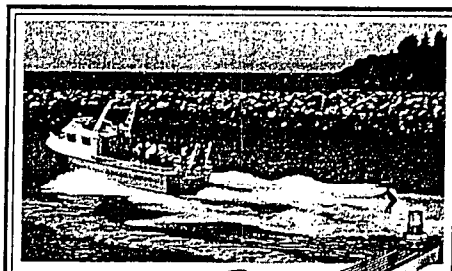
Munson Catalog

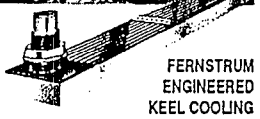
4-7/8 W x 4-3/4 H

MAGAZINE

Alaska Fisherman's
NEWSPAPER



ferry operators know...
the Navy knows...
the owners of
TEMPEST know...
it's time you knew...



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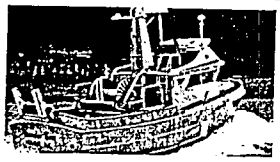
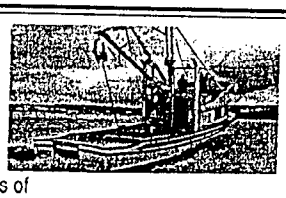
Pacific Fishing MAGAZINE #5-91





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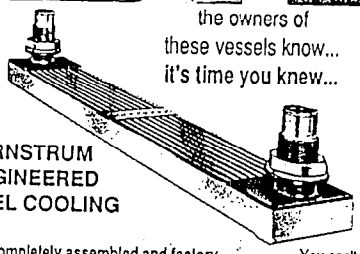

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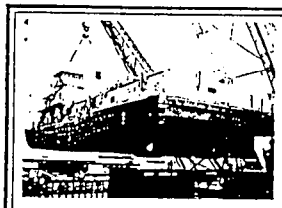
Maritime Reporter 6 W x 3 H

MAGAZINE



Designed by
Viking Maritec
Built by
Avondale
Keel Cooled by
R. W. Fernstrum & Company

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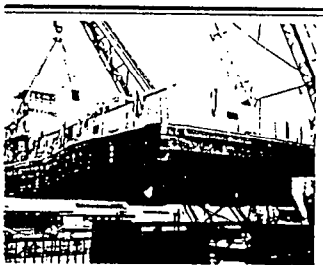
orkboat 7 W x 3-1/4

GAZINE



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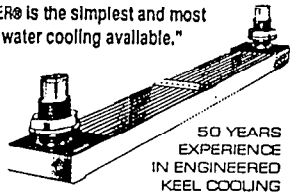

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You want the best of everything on your boat...as long as it's affordable...right?
Then why don't you give us a call? For the cost of a phone call, we'll figure out which of over 8000 different Gridcoolers is right for cooling your engine in your application.
How can you go wrong?

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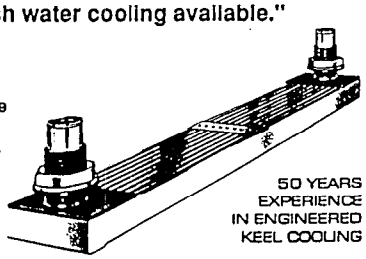
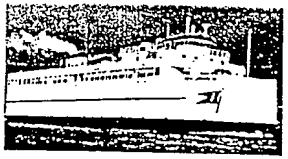
Why take chances when it comes to your engines' dependability? Do it right the first time... get Fernstrum Gridcoolers.

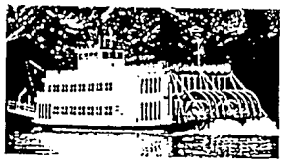


50 YEARS EXPERIENCE IN ENGINEERED KEEL COOLING

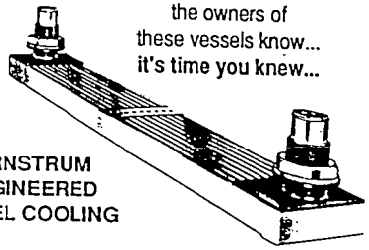
R. W. FERNSTRUM & COMPANY
1716 11th Avenue
Menominee, MI 49858

Phone: (906) 863-5553
Fax (906) 863-5634





the owners of
these vessels know...
it's time you knew...



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Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

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Maritime Reporter 7 W x 5 H

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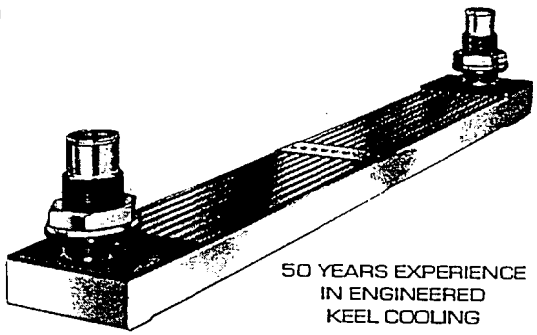

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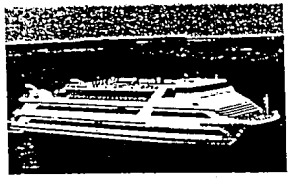
Maritime Reporter 6 W x 3 H

MAGAZINE



Designed by
Rodney E. Lay Associates
Built by
Atlantic Marine, Inc.
Keel Cooled by
R. W. Fernstrum & Company

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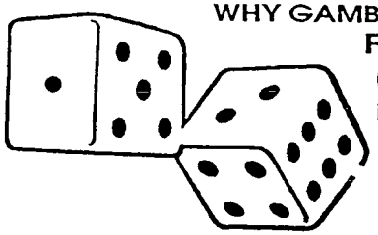
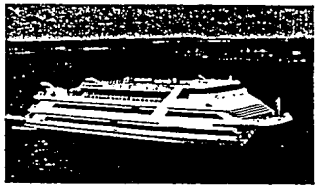


WHY GAMBLE WITH DEPENDABILITY...

FERNSTRUM GRIDCOOLER® is a "SURE THING!"



Alton Belle Casino II
Built by
Atlantic Marine, Inc.
Keel Cooled by
R. W. Fernstrum
& Company

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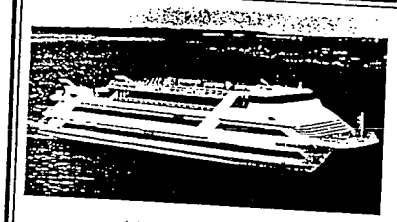
Passenger Vessel News 7 W x 4-5/8 H
MAGAZINE



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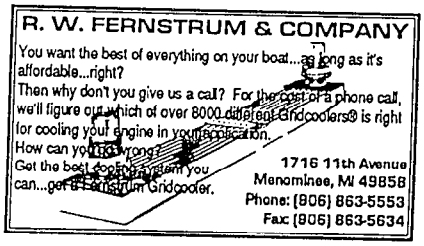

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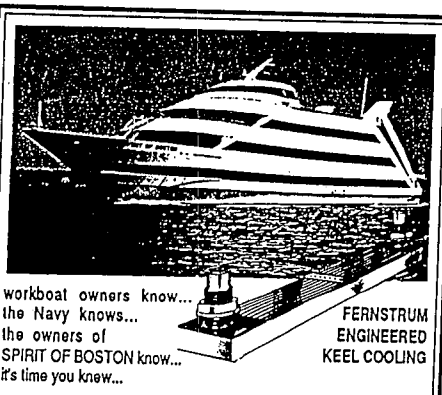
FERNSTRUM

GRIDCOOLER®

R.W FERNSTRUM & COMPANY
50 YEARS EXPERIENCE IN
ENGINEERED KEEL COOLING

The International WorkBoat Show

BOOTH
1636



workboat owners know...
the Navy knows...
the owners of
SPIRIT OF BOSTON know...
it's time you knew...

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Marine Log

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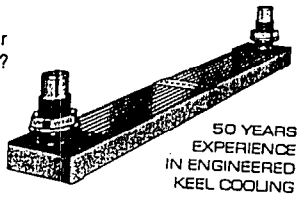

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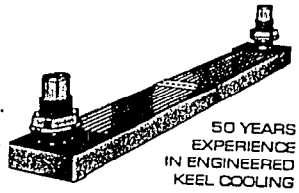

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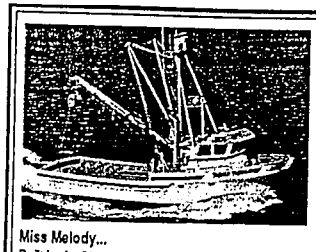
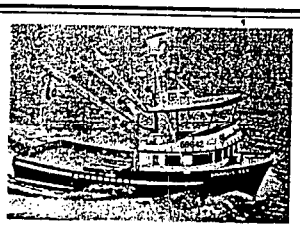
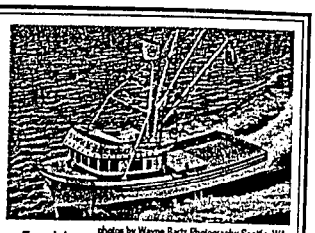
Alaska Fisherman Journal newspaper



Miss Melody...
Built by LeClercq Marine
Designed by LeClercq Marine
Keel Cooled by R. W. Fernstrum & Company



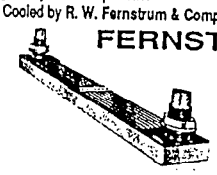
Sharon Ann...
Built by LeClercq Marine
Designed by Beck
Keel Cooled by R. W. Fernstrum & Company



photos by Wayne Bartz Photography Seattle, WA

Evanick...
Built by LeClercq Marine
Designed by Beck
Keel Cooled by R. W. Fernstrum & Company

FERNSTRUM ENGINEERED KEEL COOLING



Why Fernstrum Gridcoolers® on a fish boat? Because Fernstrum Gridcoolers have been proven durable, reliable, economical and lightweight in over 40 years of actual use by the military and many facets of the commercial marine industry.

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National Fisherman newspaper

photos by Wayne Bartz Photography Seattle, WA

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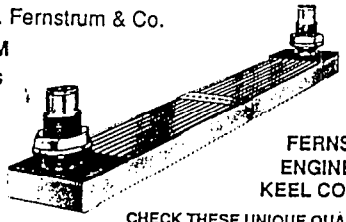

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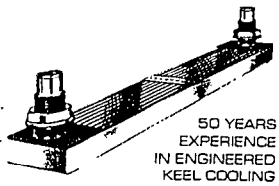

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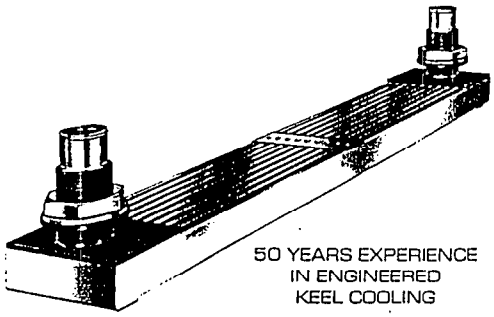

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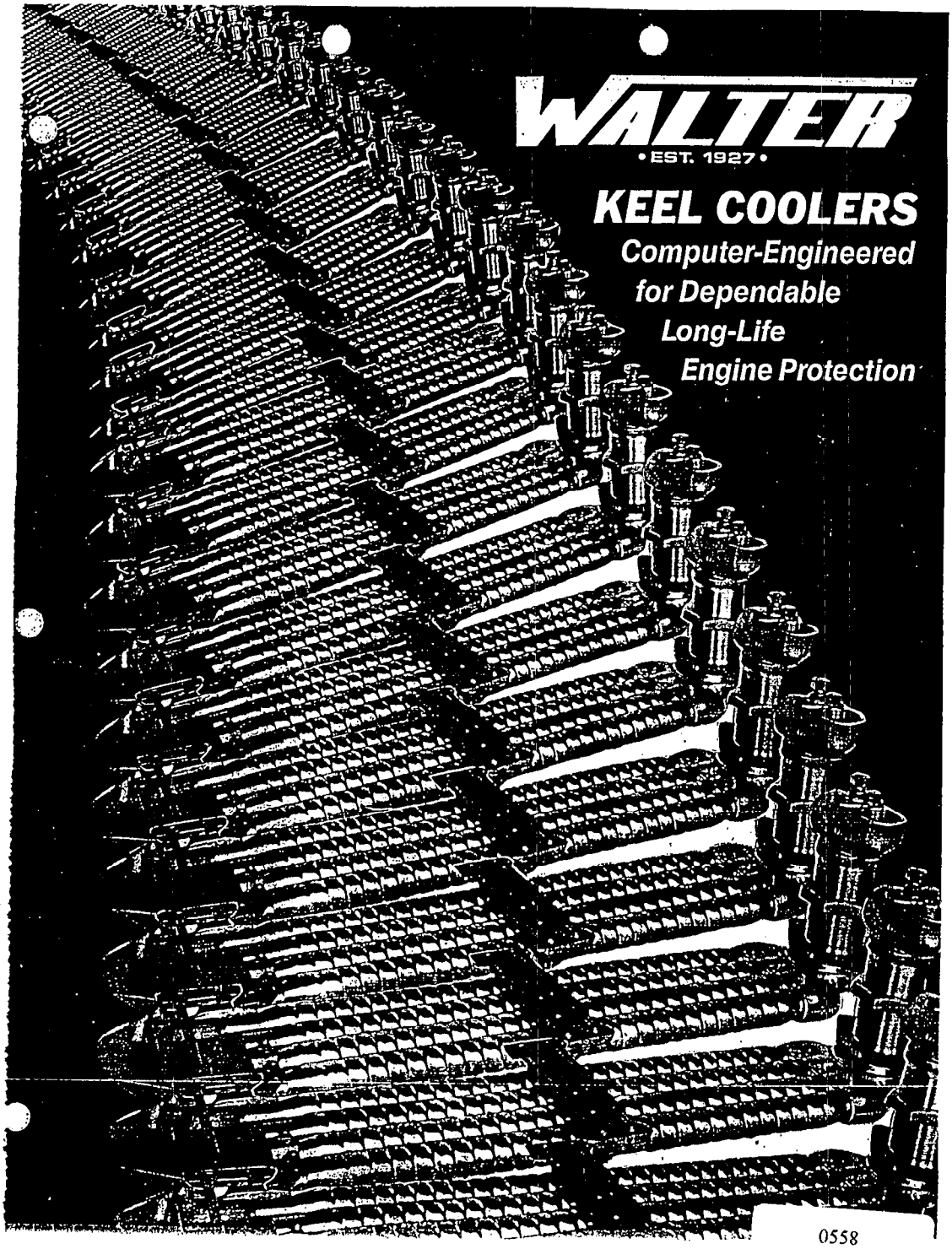
Exhibit D


WALTER
• EST. 1927 •
KEEL COOLERS
Computer-Engineered
for Dependable
Long-Life
Engine Protection

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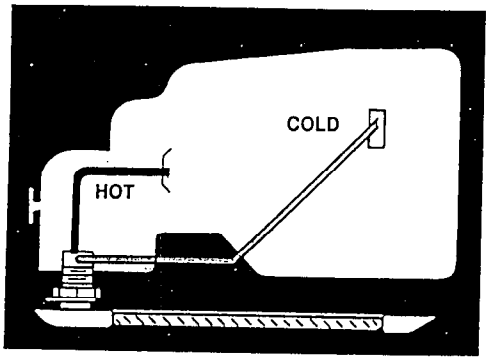
WALTER KEEL COOLERS

• EST. 1927 •

PROTECT YOUR ENGINE INVESTMENT!
WALTER Keel Coolers are outboard type freshwater closed cooling systems which are designed for years of reliable and trouble-free operation. By eliminating salt, silt and sand deposits in the engine jackets, WALTER Keel Coolers extend the life of your engines.



CUT DOWNTIME & OPERATE TROUBLE FREE!
Unlike inboard heat exchangers, WALTER Keel Coolers eliminate the possibility of the clogging of your strainers and fresh water pump. Since you can add anti-freeze, there is no need to drain the cooling system ever!

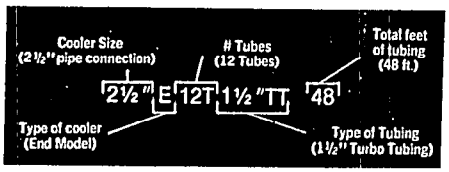
SAVE ON FUEL & MAINTENANCE COSTS!
Proper cooling without salt, mud, and sand allows your engine to run more efficiently, saving on fuel and maintenance costs. Lightweight and streamlined design means increased operating efficiency through the reduction of drag and weight when compared with cooling systems made of channel iron and bulky grid-type coolers.

PROVEN RELIABLE FOR OVER 50 YEARS!
Thousands of WALTER Keel Coolers have demonstrated their proven designs on ocean-going commercial, fishing, and naval vessels of up to 10,000 horsepower. Fifty years of experience in cooler design and manufacture goes into every WALTER Keel Cooler sold.

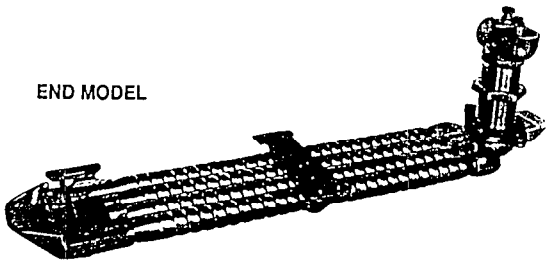
COMPUTER-AIDED ENGINEERING & CUSTOM SIZING!
The engineering staff of THE WALTER MACHINE COMPANY uses advanced computer programs to accurately recommend the proper WALTER Keel Cooler for each application based upon the worst possible operating conditions. Each WALTER Keel Cooler is sized for a minimum pressure drop so that there is no restriction to the coolant flow.

CAN THE COMPETITION MAKE THESE CLAIMS?

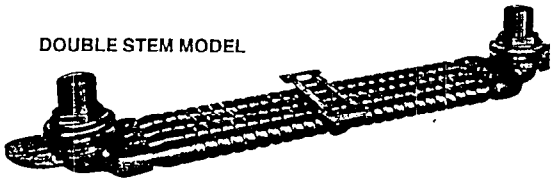
3 STYLES, 2 WITH ONLY 1 THRU-HULL FITTING!
WALTER Keel Coolers are available in 3 models, 19 sizes, and over 200 standard configurations to ensure a perfect fit for every cooling application from small generator sets to 10,000 HP propulsion engines to marine transmissions, aftercoolers, and intercoolers. The END MODEL and CENTER MODEL have only one thru-hull fitting, thereby greatly simplifying installation and inboard plumbing and reducing installation costs. Single stem model coolers feature a "temperature adjusting screw" to allow for engine temperature adjustment. Examples of each model are shown below; each model comes in various sizes.



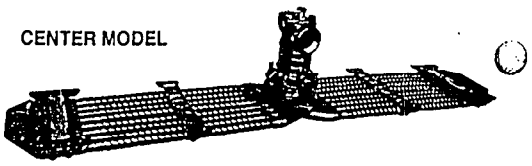
END MODEL



DOUBLE STEM MODEL



CENTER MODEL



ENGINEERED ENGINE COOLING

TURBO TUBE MAXIMIZES HEAT EXCHANGE AND ALLOWS FOR COMPACT KEEL COOLER SIZE!
All WALTER Keel Coolers feature WALTER TURBO TUBE which has spiral grooves on the outer wall and spiral ridges on the inner wall. The spirals force the coolant flow to become turbulent, continually propelling and swirling the coolant against the inner wall of the tube, thereby greatly increasing heat transfer. The turbulating action makes WALTER TURBO TUBE much more efficient for heat transfer than smooth rectangular or round tube in which most of the coolant flows through the center of the tube without contacting the inner tube wall. Because TURBO TUBE is so efficient, a much more compact WALTER Keel Cooler can be used when compared with coolers using smooth rectangular or round tube.

TURBO TUBE

THE MOST CORROSION RESISTANT MATERIALS!
WALTER TURBO TUBE is made of the premium 70/30 cupronickel alloy (70% copper, 30% nickel) which is stronger and more corrosion resistant than competitor's 90/10 cupronickel tubing. All WALTER Keel Coolers have headers made of solid bronze which, unlike rubber coolers, cannot possibly deform or become brittle due to temperature differences or age hardening. All coolers are supplied with monel fastenings and gaskets necessary for installation. High grade zinc anodes are attached at either end of every cooler to protect against galvanic corrosion.

NO CRACKED BRAZED JOINTS TO LEAK!
WALTER Keel Coolers are engineered with flexible double o-ring aircraft-type pressure seals which have proven completely reliable in thousands of installations. The tube is simply slipped into the header socket for a watertight connection. This eliminates the problem of brazed joints cracking in heavy seas as the hull flexes. Repairing cracked brazed joints is not only expensive but also requires skilled labor. Flexible WALTER design allows the tubes to conform to the hull curvatures. Should the vessel be repowered with a larger engine, the cooling capacity of the WALTER Keel Cooler can be increased by using WALTER Tube Couplings and additional tubes, possibly eliminating the need for an entire new cooling system.

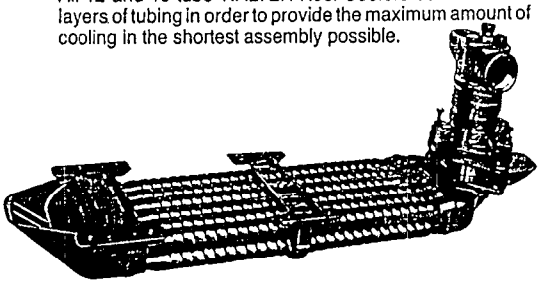
PRECISION MANUFACTURE!
The WALTER MACHINE COMPANY combines the use of the most highly advanced and accurate computerized "CNC" machinery with old-world craftsmanship and know-how in the manufacture of every WALTER Keel Cooler. For the shipbuilder and owner this means economical prices and replacement parts available from stock!

STREAMLINED DESIGN!
WALTER Keel Coolers have tube headers which are streamlined, unlike bulky box-type coolers which can create drag. It is not uncommon for WALTER Keel Coolers to be used on vessels with top speeds of 30 knots or more. WALTER Keel Coolers may also be easily recessed for flush-with-hull installations.

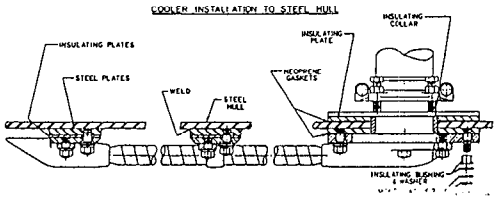
FOULPROOF DESIGN!
Due to the streamlined design, it is improbable for debris or mud to stay attached to WALTER Keel Coolers. Since there is a space between the hull and the round tube surface, seawater circulates between and down through the round tubes, continuously washing debris away from the cooling surfaces.

DEMOUNTABLE DESIGN!
WALTER Keel Coolers are designed to be demounted in minutes. This feature allows the cooler headers and tubing to be demounted without disturbing the inside thru-hull fittings or inboard plumbing. A vessel with spare TURBO TUBES aboard can quickly get back into operation should the cooler become damaged; there is no need to haul the boat since divers can remove the cooler underwater. No skilled labor is required to replace the damaged tubes; an ordinary wrench is all that is required.

DOUBLE STACK COOLERS
All 12 and 16 tube WALTER Keel Coolers consist of two layers of tubing in order to provide the maximum amount of cooling in the shortest assembly possible.



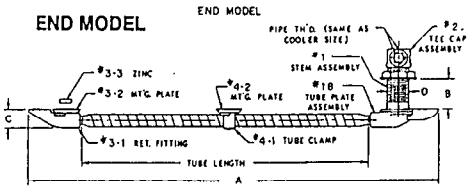
POSITIVE INSULATION FROM STEEL HULLS!
Insulating plates, bushings and washers are provided for installations on steel hulls in order to insulate the non-ferrous cooler fittings from the ferrous steel hull. Spacer plates and collars are provided for welding to the steel hull so that the need for small bolts through the hull, which are susceptible to leaks, is completely eliminated.



WALTER ESTD 1927 END MODEL KEEL COOLERS

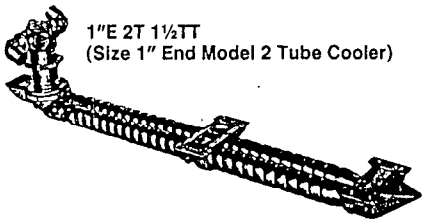
END MODELS Our most popular, shortest, and easiest keel cooler model to install, the WALTER END MODEL Keel Cooler has only one thru-hull fitting located at the end of the cooler which contains both the inlet and outlet water connections. Size 1¼" and larger END MODEL coolers feature a temperature adjusting screw and standard female pipe threads equal to the cooler size number for easy connection with standard pipe fittings (1½"E 4T has 1½" NPT pipe connections). END MODEL coolers are available in 2, 4, 8, 12, and 16 tube configurations depending upon the size of the engine's fresh water pump; the 12 and 16 tube coolers consist of a "double stack".

END MODEL

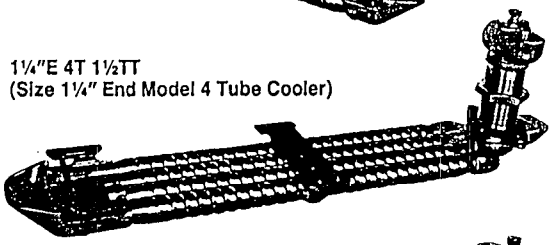


COOLER GROUP END MODELS	NO. OF TUBE CLAMPS	NO. AND LENGTH PER TUBE	MAX. WIDTH	A	B	C	D
¾" E 2T 1½ TT- 6	0	2- 3'	5¾	47½	2¼	1⅞	1¾
8	0	2- 4'	"	59½	"	"	"
10	0	2- 5'	"	71½	"	"	"
12	1	2- 6'	"	83½	"	"	"
14	1	2- 7'	"	95½	"	"	"
16	1	2- 8'	"	107½	"	"	"
20	1	2-10'	"	131½	"	"	"
1" E 2T 1½ TT- 6	0	2- 3'	5¾	47½	2¼	1⅞	2⅛
8	0	2- 4'	"	59½	"	"	"
10	0	2- 5'	"	71½	"	"	"
12	1	2- 6'	"	83½	"	"	"
14	1	2- 7'	"	95½	"	"	"
16	1	2- 8'	"	107½	"	"	"
20	1	2-10'	"	131½	"	"	"
1" E 4T 1½ TT- 12	0	4- 3'	9⅛	51	2¼	2	2⅛
16	0	4- 4'	"	63	"	"	"
20	0	4- 5'	"	75	"	"	"
24	1	4- 6'	"	87	"	"	"
28	1	4- 7'	"	99	"	"	"
32	1	4- 8'	"	111	"	"	"
40	1	4-10'	"	135	"	"	"
48	2	4-12'	"	159	"	"	"
56	2	4-14'	"	183	"	"	"
64	2	4-16'	"	207	"	"	"
80	3	4-20'	"	255	"	"	"
1¼" E 4T 1½TT- 12	0	4- 3'	9⅛"	51¼	3	2	2⅜
16	0	4- 4'	"	63¼	"	"	"
20	0	4- 5'	"	75¼	"	"	"
24	1	4- 6'	"	87¼	"	"	"
28	1	4- 7'	"	99¼	"	"	"
32	1	4- 8'	"	111¼	"	"	"
40	1	4-10'	"	135¼	"	"	"
48	2	4-12'	"	159¼	"	"	"
56	2	4-14'	"	183¼	"	"	"
64	2	4-16'	"	207¼	"	"	"
80	3	4-20'	"	255¼	"	"	"
1½" E 4T 1½ TT- 12	0	4- 3'	9⅛	51¼	3¼	2	2⅞
16	0	4- 4'	"	63¼	"	"	"
20	0	4- 5'	"	75¼	"	"	"
24	1	4- 6'	"	87¼	"	"	"
28	1	4- 7'	"	99¼	"	"	"
32	1	4- 8'	"	111¼	"	"	"
40	1	4-10'	"	135¼	"	"	"
48	2	4-12'	"	159¼	"	"	"
56	2	4-14'	"	183¼	"	"	"
64	2	4-16'	"	207¼	"	"	"
80	3	4-20'	"	255¼	"	"	"
2" E 8T 1½ TT- 24	0	8- 3'	16⅜	57	4	2¼	3¾
32	0	8- 4'	"	69	"	"	"
40	0	8- 5'	"	81	"	"	"
48	1	8- 6'	"	93	"	"	"
56	1	8- 7'	"	105	"	"	"
64	1	8- 8'	"	117	"	"	"
80	1	8-10'	"	141	"	"	"
96	2	8-12'	"	165	"	"	"
112	2	8-14'	"	189	"	"	"
128	2	8-16'	"	213	"	"	"
160	3	8-20'	"	261	"	"	"
2½" E 12T 1½ TT- 36	0	12- 3'	12⅞	58½	4⅛	3⅞	4½
48	0	12- 4'	"	70½	"	"	"
60	0	12- 5'	"	82½	"	"	"
72	1	12- 6'	"	94½	"	"	"
84	1	12- 7'	"	106½	"	"	"

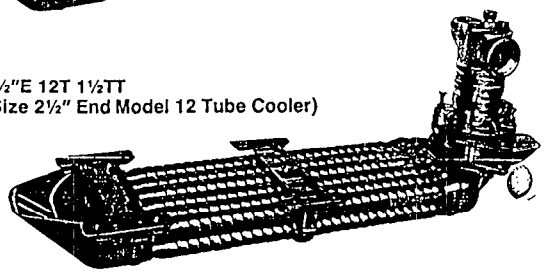
COOLER GROUP END MODELS (Cont.)	NO. OF TUBE CLAMPS	NO. AND LENGTH PER TUBE	MAX. WIDTH	A	B	C	D
2½" E 12T 1½ TT- 96	1	12- 8'	12⅞	118½	4⅛	3⅞	4½
120	1	12-10'	"	142½	"	"	"
144	2	12-12'	"	166½	"	"	"
168	2	12-14'	"	190½	"	"	"
192	2	12-16'	"	214½	"	"	"
240	3	12-20'	"	262½	"	"	"
3" E 16T 1½ TT- 48	0	16- 3'	18⅜	59¾	5¼	3⅞	5⅛
64	0	16- 4'	"	71¾	"	"	"
80	0	16- 5'	"	83¾	"	"	"
96	1	16- 6'	"	95¾	"	"	"
112	1	16- 7'	"	107¾	"	"	"
128	1	16- 8'	"	119¾	"	"	"
160	1	16-10'	"	143¾	"	"	"
192	2	16-12'	"	167¾	"	"	"
224	2	16-14'	"	191¾	"	"	"
256	2	16-16'	"	215¾	"	"	"
320	3	16-20'	"	263¾	"	"	"



1"E 2T 1½TT
(Size 1" End Model 2 Tube Cooler)



1¼"E 4T 1½TT
(Size 1¼" End Model 4 Tube Cooler)

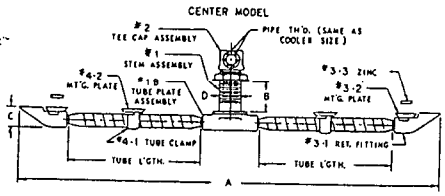


2½"E 12T 1½TT
(Size 2½" End Model 12 Tube Cooler)

WALTER CENTER MODEL KEEL COOLERS

EST. 1927

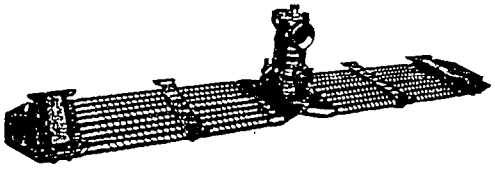
CENTER MODEL



CENTER MODELS The totally unique WALTER CENTER MODEL Keel Coolers have only one thru-hull fitting which is located in the center of the cooler and contains both the inlet and outlet water connections. The CENTER MODEL coolers are half as wide but twice as long as the END MODEL coolers. All CENTER MODEL coolers feature a temperature adjusting screw and standard female pipe threads equal to the cooler size number for easy connection with standard pipe fittings (2"C 4T has 2" NPT pipe connections). CENTER MODEL coolers are available with 2, 4, 8, 12 and 16 tube configurations depending upon the size of the engine's fresh water pump; the 12 and 16 tube coolers consist of a "double stack."

COOLER GROUP CENTER MODELS	NO. OF TUBE CLAMPS	NO. AND LENGTH PER TUBE	MAX. WIDTH	A	B	C	D
1¼" C 2T 1½ TT- 12	0	4- 3'	6⅜	86¾	3	2	2⅜
16	0	4- 4'	"	110¾	"	"	"
20	0	4- 5'	"	134¾	"	"	"
24	2	4- 6'	"	158¾	"	"	"
28	2	4- 7'	"	182¾	"	"	"
32	2	4- 8'	"	206¾	"	"	"
40	2	4-10'	"	254¾	"	"	"
48	4	4-12'	"	302¾	"	"	"
56	4	4-14'	"	350¾	"	"	"
64	4	4-16'	"	398¾	"	"	"
80	6	4-20'	"	494¾	"	"	"

3"C 8T 1½TT
(Size 3" Center Model 8 Tube Cooler)



OVER 1000 COMPUTER-AIDED RECOMMENDATIONS! All WALTER Keel Coolers are computer-aided designed for your specific operating conditions. Based on computer analysis and over 50 years of experience, our engineering staff is so confident that we publish over 1000 standard recommendations for all popular domestic and foreign engines, making it quick and simple to know which WALTER Keel Cooler is right for your application. Our standard recommendations are based on a maximum sea water temperature of 85°F (29.4°C) for worldwide operation. Propulsion engine recommendations are provided for 2, 5, and 10 knot minimum hull speeds under full rated power. Gen-set recommendations are for dockside service and assume a ½ knot current or thermal flow. If your vessel will operate exclusively in colder waters or has unusual operating conditions, W.M.C. engineers will be happy to recommend a specific cooler for your application. Please note that the cooling capacities of the END, CENTER and DOUBLE STEM models are equivalent as long as the size of the keel cooler and the amount of tubing are equal.

COOLER GROUP CENTER MODELS (Cont.)	NO. OF TUBE CLAMPS	NO. AND LENGTH PER TUBE	MAX. WIDTH	A	B	C	D
1½" C 2T 1½ TT- 12	0	4- 3'	6⅜"	86¾	3¼	2	2⅞
16	0	4- 4'	"	110¾	"	"	"
20	0	4- 5'	"	134¾	"	"	"
24	2	4- 6'	"	158¾	"	"	"
28	2	4- 7'	"	182¾	"	"	"
32	2	4- 8'	"	206¾	"	"	"
40	2	4-10'	"	254¾	"	"	"
48	4	4-12'	"	302¾	"	"	"
56	4	4-14'	"	350¾	"	"	"
64	4	4-16'	"	398¾	"	"	"
80	6	4-20'	"	494¾	"	"	"
2" C 4T 1½ TT- 24	0	8- 3'	10	96¾	4	2⅛	3¾
32	0	8- 4'	"	120¾	"	"	"
40	0	8- 5'	"	144¾	"	"	"
48	2	8- 6'	"	168¾	"	"	"
56	2	8- 7'	"	192¾	"	"	"
64	2	8- 8'	"	216¾	"	"	"
80	2	8- 10'	"	264¾	"	"	"
96	4	8- 12'	"	312¾	"	"	"
112	4	8- 14'	"	360¾	"	"	"
128	4	8- 16'	"	408¾	"	"	"
160	6	8- 20'	"	504¾	"	"	"
2½" C 6T 1½ TT- 36	0	12- 3'	12¾	99¾	4⅛	2¼	4½
48	0	12- 4'	"	123¾	"	"	"
60	0	12- 5'	"	147¾	"	"	"
72	2	12- 6'	"	171¾	"	"	"
84	2	12- 7'	"	195¾	"	"	"
96	2	12- 8'	"	219¾	"	"	"
120	2	12-10'	"	267¾	"	"	"
144	4	12-12'	"	315¾	"	"	"
168	4	12-14'	"	363¾	"	"	"
192	4	12-16'	"	411¾	"	"	"
240	6	12-20'	"	507¾	"	"	"
3" C 8T 1½ TT- 48	0	16- 3'	16⅜	100½	5¼	2¼	5⅛
64	0	16- 4'	"	124½	"	"	"
80	0	16- 5'	"	148½	"	"	"
96	2	16- 6'	"	172½	"	"	"
112	2	16- 7'	"	196½	"	"	"
128	2	16- 8'	"	220½	"	"	"
160	2	16-10'	"	268½	"	"	"
192	4	16-12'	"	316½	"	"	"
224	4	16-14'	"	364½	"	"	"
256	4	16-16'	"	412½	"	"	"
320	6	16-20'	"	508½	"	"	"
4" C 16T 1½ TT- 96	0	32- 3'	18⅜	106½	4¾	4	6¾
128	0	32- 4'	"	130½	"	"	"
160	0	32- 5'	"	154½	"	"	"
192	2	32- 6'	"	178½	"	"	"
224	2	32- 7'	"	202½	"	"	"
256	2	32- 8'	"	226½	"	"	"
320	2	32-10'	"	274½	"	"	"
384	4	32-12'	"	322½	"	"	"
448	4	32-14'	"	370½	"	"	"
512	4	32-15'	"	418½	"	"	"
640	6	32-20'	"	514½	"	"	"

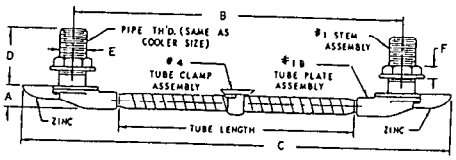
COMPUTER-AIDED DESIGNED KEEL COOLING SYSTEMS BACKED BY OVER 50 YEARS OF EXPERIENCE

WALTER DOUBLE STEM KEEL COOLERS

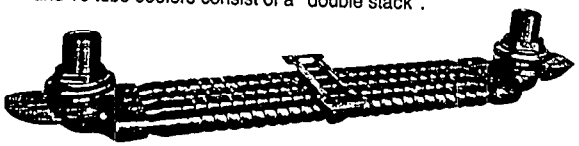
EST. 1927

Our Most Economical Keel Cooler!

DOUBLE STEM MODEL



DOUBLE STEM MODELS The low prices of our double stem coolers make them a very economical keel cooling system, especially when compared with box-type coolers. The DOUBLE STEM MODEL coolers have two thru-hull fittings, one at either end of the cooler, which have standard male pipe threads equal to the cooler size number for easy connection with standard pipe fittings (3"D 8T has 3" NPT pipe connections). DOUBLE STEM MODEL coolers are available in 4, 6, 8, 12, and 16 tube configurations depending upon the size of the engine's fresh water pump; the 12 and 16 tube coolers consist of a "double stack".



COOLER GROUP	NO. OF TUBE CLAMPS	NO. AND LENGTH PER TUBE	ZINCS (2 REQ'D)	MAX. WIDTH	A	B	C	D	E	F
2" D 4T 1½ TT- 12	0	4-3 ft.	Z-2	9⅛"	2 1/16"	44"	52¾"	3⅞"	2⅜"	15/16"
16	0	4-4 ft.	"	"	"	56"	64¾"	"	"	"
20	0	4-5 ft.	"	"	"	68"	76¾"	"	"	"
24	1	4-6 ft.	"	"	"	80"	88¾"	"	"	"
28	1	4-7 ft.	"	"	"	92"	100¾"	"	"	"
32	1	4-8 ft.	"	"	"	104"	112¾"	"	"	"
40	1	4-10 ft.	"	"	"	128"	136¾"	"	"	"
48	2	4-12 ft.	"	"	"	152"	160¾"	"	"	"
56	2	4-14 ft.	"	"	"	176"	184¾"	"	"	"
64	2	4-16 ft.	"	"	"	200"	208¾"	"	"	"
80	3	4-20 ft.	"	"	"	248"	256¾"	"	"	"
2½" D 6T 1½ TT- 18	0	6-3 ft.	Z-2	12¾"	2 3/16"	44¾"	54"	4⅛"	2⅞"	1"
24	0	6-4 ft.	"	"	"	56¾"	66"	"	"	"
30	0	6-5 ft.	"	"	"	68¾"	78"	"	"	"
36	1	6-6 ft.	"	"	"	80¾"	90"	"	"	"
42	1	6-7 ft.	"	"	"	92¾"	102"	"	"	"
48	1	6-8 ft.	"	"	"	104¾"	114"	"	"	"
60	1	6-10 ft.	"	"	"	128¾"	138"	"	"	"
72	2	6-12 ft.	"	"	"	152¾"	162"	"	"	"
84	2	6-14 ft.	"	"	"	176¾"	186"	"	"	"
96	2	6-16 ft.	"	"	"	200¾"	210"	"	"	"
120	3	6-20 ft.	"	"	"	248¾"	258"	"	"	"
3" D 8T 1½ TT- 24	0	8-3 ft.	Z-3	16⅜"	2⅛"	47¼"	60⅜"	6"	3⅝"	1⅛"
32	0	8-4 ft.	"	"	"	59¼"	72⅜"	"	"	"
40	0	8-5 ft.	"	"	"	71¼"	84⅜"	"	"	"
48	1	8-6 ft.	"	"	"	83¼"	96⅜"	"	"	"
56	1	8-7 ft.	"	"	"	95¼"	108⅜"	"	"	"
64	1	8-8 ft.	"	"	"	107¼"	120⅜"	"	"	"
80	1	8-10 ft.	"	"	"	131¼"	144⅜"	"	"	"
96	2	8-12 ft.	"	"	"	155¼"	168⅜"	"	"	"
112	2	8-14 ft.	"	"	"	179¼"	192⅜"	"	"	"
128	2	8-16 ft.	"	"	"	203¼"	216⅜"	"	"	"
160	3	8-20 ft.	"	"	"	251¼"	264⅜"	"	"	"
3½" D 12T 1½ TT- 36	0	12-3 ft.	Z-3	12¾"	3 11/16"	47⅝"	62"	6¾"	4⅛"	1¼"
48	0	12-4 ft.	"	"	"	59⅝"	74"	"	"	"
60	0	12-5 ft.	"	"	"	71⅝"	86"	"	"	"
72	1	12-6 ft.	"	"	"	83⅝"	98"	"	"	"
84	1	12-7 ft.	"	"	"	95⅝"	110"	"	"	"
96	1	12-8 ft.	"	"	"	107⅝"	122"	"	"	"
120	1	12-10 ft.	"	"	"	131⅝"	146"	"	"	"
144	2	12-12 ft.	"	"	"	155⅝"	170"	"	"	"
168	2	12-14 ft.	"	"	"	179⅝"	194"	"	"	"
192	2	12-16 ft.	"	"	"	203⅝"	218"	"	"	"
240	3	12-20 ft.	"	"	"	251⅝"	266"	"	"	"
4" D 16T 1½ TT- 48	0	16-3 ft.	Z-3	16⅜"	3⅞"	48¼"	63¼"	7 7/16"	4⅝"	1¼"
64	0	16-4 ft.	"	"	"	60¼"	75¼"	"	"	"
80	0	16-5 ft.	"	"	"	72¼"	87¼"	"	"	"
96	1	16-6 ft.	"	"	"	84¼"	99¼"	"	"	"
112	1	16-7 ft.	"	"	"	96¼"	111¼"	"	"	"
128	1	16-8 ft.	"	"	"	108¼"	123¼"	"	"	"
160	1	16-10 ft.	"	"	"	132¼"	147¼"	"	"	"
192	2	16-12 ft.	"	"	"	156¼"	171¼"	"	"	"
224	2	16-14 ft.	"	"	"	180¼"	195¼"	"	"	"
256	2	16-16 ft.	"	"	"	204¼"	219¼"	"	"	"
320	3	16-20 ft.	"	"	"	252¼"	267¼"	"	"	"

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NEGLIGIBLE DRAG FROM WALTER KEEL COOLERS

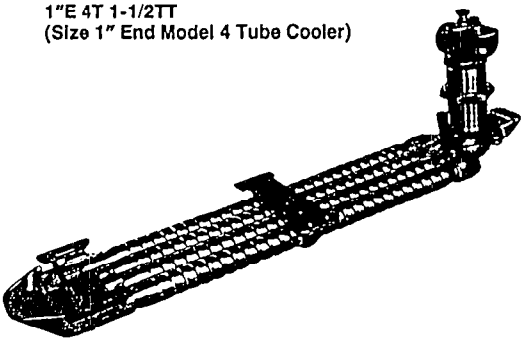
• EST. 1927 •

Due to the streamlined design of WALTER Keel Coolers, speed loss due to drag is much less than generally assumed by the average boat owner, and much less than with bulky box-type keel coolers. To determine the actual speed loss, we conducted a test on a planing hull powered by two 200 H.P. V-8 engines before and after installation of two 1"E 4T 1-1/8F-24 (Size 1" End Model 4 tube coolers with 24 feet of tubing) WALTER Keel Coolers. Under the same conditions (four full 50 gallon fuel tanks, operator and timer aboard), the boat was tested over the measured statute mile. Results of this test are as follows:

ENGINE RPM	WITHOUT KEEL COOLERS	WITH KEEL COOLERS
2800 RPM	16.48 mph	16.40 mph
3300 RPM	20.85 mph	20.62 mph
4000 RPM	25.40 mph	25.25 mph

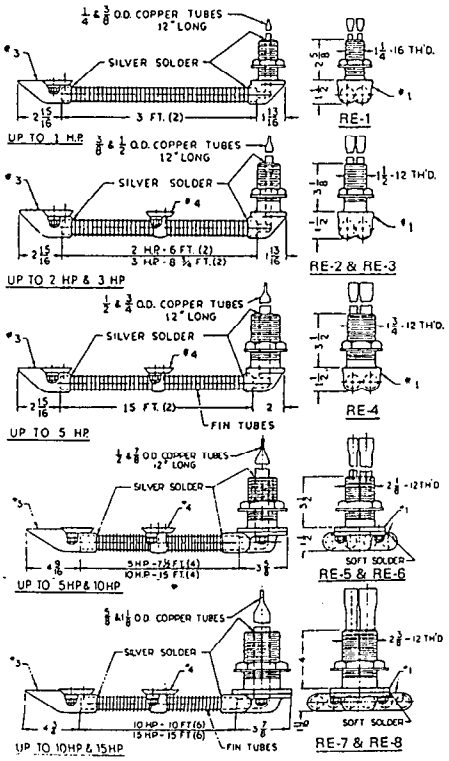
Only a .15mph loss of boat speed at 25 mph with two WALTER Keel Coolers!

1"E 4T 1-1/2TT
(Size 1" End Model 4 Tube Cooler)



WALTER REFRIGERANT KEEL COOLERS

• EST. 1927 •



WALTER Refrigerant Keel Coolers are efficient and completely reliable for cooling marine refrigeration and air conditioning equipment. The refrigerant (freon) is pumped directly through the cooler by the compressor where it is cooled by the outside sea water. Troublesome strainers and raw water pumps are completely eliminated. 90-10 cupro/nickel finned tubing and monel fastenings ensure reliable operation. All joints are silver soldered, high pressure tested, and then the system is dehydrated.

RE-1

Recommendations

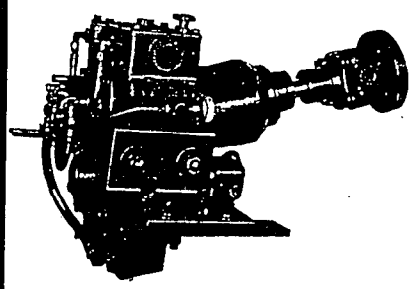
REFRIGERANT KEEL COOLERS

GROUP #	Suitable for up To	Size copper tube connections inside boat	Amount tubing required	#4 Tube clamps required
RE-1	1 H.P.	¼" & ⅜"	6 ft. (2 pcs. 3')	0
RE-2	2 H.P.	⅜" & ½"	12 ft. (2 pcs. 6')	1
RE-3	3 H.P.	⅜" & ½"	17½ ft. (2 pcs. 8¾')	1
RE-4	5 H.P.	½" & ¾"	30 ft. (2 pcs. 15')	2
RE-5	5 H.P.	½" & ⅞"	30 ft. (4 pcs. 7½')	1
RE-6	10 H.P.	½" & ⅞"	60 ft. (4 pcs. 15')	2
RE-7	10 H.P.	⅝" & 1⅛"	60 ft. (6 pcs. 10')	1
RE-8	15 H.P.	⅝" & 1⅛"	90 ft. (6 pcs. 15')	2

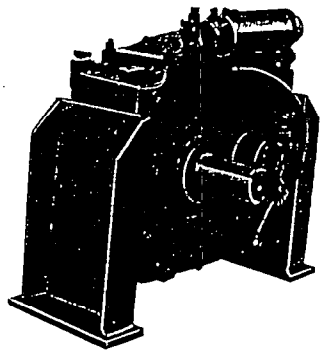
OTHER WALTER PRODUCTS...

• EST. 1927 •

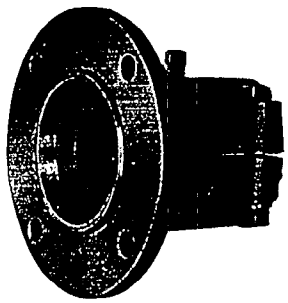
V-DRIVES



GEAR DRIVES



COUPLINGS



LIMITED WARRANTY

WALTER Keel Coolers are warranted against defective material or workmanship for a period of twelve months from date of delivery. The Walter Machine Co., Inc. obligation under this warranty is limited to replacement or repair of any defective material when returned prepaid to our factory in Jersey City, and shall be subject to our inspection and verification of claim. This warranty will not apply to any failure which results from accident, neglect, sinking, abuse, abnormal service, lack of maintenance, or improper installation or service. This warranty will not apply to haul-out, labor, launch, towing or storage charges, mechanic travel time, inconvenience, loss of time or income, removal and replacement and/or modification of any boat parts to facilitate repairs. The Walter Machine Co., Inc. will not accept responsibility for contingent liability through failure of any complete unit or part.

THE WALTER MACHINE COMPANY, INC.

• EST. 1927 •

P.O. BOX 7700, 84-98 CAMBRIDGE AVE.
JERSEY CITY, NEW JERSEY 07307
U.S.A.

TELEPHONE: (201) 656-5654
TELEFAX: (201) 656-0318
TELEX: 12065 WALTERCO JCTY

Exhibit E

Johnson® DURAMAX®

Spiral Tube Keel Coolers

Positive Cooling Protection For Ship Engines At All Operating Levels

0567

DURAMAX® KEEL COOLERS

THE ADVANCED OUTBOARD COOLERS FOR OWNERS AND BUILDERS WHO WANT ALL THE PROTECTION THEY CAN GET

To provide the most advantages available in a modern outboard cooler, including cost savings, Johnson engineers have incorporated important design innovations in the Duramax Keel Cooler. Of these, the most distinguishing and unique is the use of 90/10 cupro-nickel spiral tubes in a compact, easily mounted modular arrangement for the heat exchanger. The superior heat transfer capacity of spiral tubes ensures optimum cooling under the most demanding requirements of engine operation.

12 REASONS WHY DURAMAX KEEL COOLERS GIVE YOU ASSURED PROTECTION AND COST SAVINGS

Duramax Keel Coolers for cooling of main engines and auxiliary equipment on all types of vessels offer shipbuilders and owners the advantages of:

1. Superior Heat Transfer
2. Low initial cost
3. Multiple systems combined
4. Low operating cost
5. Simplified installation
6. Modular design
7. Wide range of cooling capacities
8. Custom sizing
9. Demountable tubes
10. Electrolysis protection plus corrosion resistant components
11. Expandable capacity
12. No through-the-hull fittings

Johnson Duramax outboard coolers provide a superior alternative to channel steel and conventional straight tubing coolers in terms of:

Efficient Heat Transfer: The helical flow motion imparted to the coolant by the spiral configuration of Duramax tubing creates turbulence which greatly reduces the heat transfer inefficiencies common to conventional smooth-wall tubing. Also, Duramax Sprial Tubes provide greater cooling surface area than plain tubing. As a result, Duramax Keel Coolers offer greater cooling efficiency than conventional straight tube systems and take less hull space for maximum cooling.

Low Initial Cost: Duramax Keel Coolers generally cost less than channel steel coolers, often by substantial amounts. The potential for savings in both labor and materials costs are shown on page 8.

Multiple Systems Combined: Through the additional feature of separators, coolant flow may not only be manipulated for higher and lower coolant velocities resulting in more efficient heat transfer, Johnson-Duramax Coolers can, in many cases, be broken into multiple systems eliminating the cost for additional headers — a substantial savings in initial construction costs, materials and space. See pages 4 and 5 for cost-saving combinations.

Workmen bolt in bottom Support Bracket on 12 tube double bank Spiral Tube Cooler. See page 8 for cost savings comparisons.

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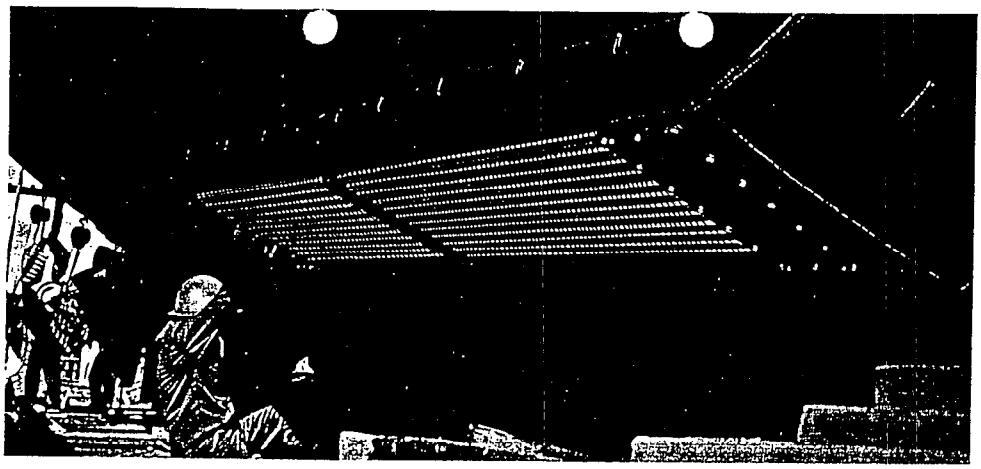


Spiral tube units have (1) flexibility to conform with hull contour, and are (2) specifically sized to provide adequate cooling capacity for main engines and auxiliary equipment under "worse case" conditions unless otherwise specified by customer.*
*(Minimum knots, maximum water temperatures at full RPM.)

Low Operating Cost: Reduction in operating costs is realized from improved operating efficiency obtained through reduction of drag and weight. The weight difference can be significant. For example, a cooling system made of channel steel would weigh approximately 39,000 pounds compared with slightly less than 1,200 pounds for a Duramax Sprial Tube Cooler producing the same amount of cooling.

Simplified Installation: Pre-fitted system components are quickly and easily assembled, generally in one-fourth to one-tenth of the time required to install channel steel keel coolers.

Modular Design: Standardized components enable the construction of Duramax Keel Coolers of the required cooling capacity.

Range of Cooling Capacities: Availability of tubes in a range of lengths together with flexibility in the configuration and number of their arrangement provide means for meeting capacity requirements.

Custom Sizing: Johnson Duramax Keel Coolers are sized to individual application. Computerized sizing ensures the selection of correct cooling capacity for maximum engine loads and total operating efficiency. The simplified selection procedure used for Duramax Keel Coolers is described on pages 12 and 13 of this brochure.

Demountable Tubes: Individually demountable tubes facilitate cleaning or replacement if ever damaged. The system can be readily expanded at any time if additional equipment requiring cooling is later installed on the vessel. The original cooler usually need not be replaced. For instance, a single bank system can be expanded to a double system without changing piping and/or header locations.

Electrolysis Protection: System is fully grounded with the use of a special support bracket to reduce electrolysis between heat exchanger components and vessel.

Saves Inboard Fittings: The Duramax Keel Cooler does not use through-the-hull fittings, which simplifies and speeds installation and eliminates the need for inboard sea chest.

Protective Shielding: Protective shielding is recommended for all Duramax Keel Cooler installations. The type of shielding required depends on the service conditions the vessel will meet. For example, the tube protection for vessels operating on seas amid floating ice has to be more substantial than for vessels that may churn up shells or small debris from harbor bottoms.

Also, location of the cooler on the hull will influence the type of protection that is to be used. Preferred locations for keel coolers are in protective areas of the hull (rake for example). If bow thrusters require their coolers to be located in the bow, they must be fully protected from pounding seas. When coolers are situated near the plane of rotation of the vessel's screws, protection from cavitation should be provided.

MULTIPLE SYSTEMS COMBINED

SAMPLES OF MULTIPLE SYSTEMS COMBINED

Caterpillar D379TA 565 BHP @ 1225 RPM at 2 Knots

A. JACKET WATER RECOMMENDATIONS:

1. Inlet-outlet plumbing same end: DC-1202-05-11
2. Inlet-outlet plumbing at opposite ends:..... DC-402-15-06

B. SEPARATE AFTERCOOLER

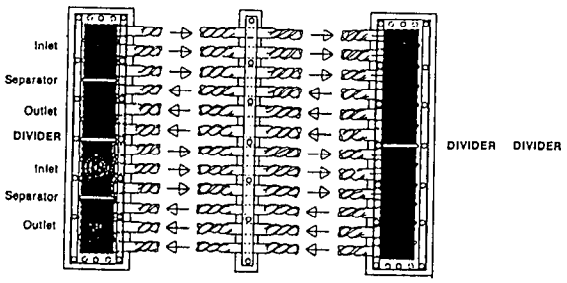
1. Inlet-outlet plumbing same end: DC-402-12-15
2. Inlet-outlet plumbing opposite ends:..... DC-601-16-03

C. COMBINING SYSTEMS A1 and B1, A2 and B2.

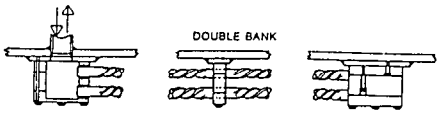
1. Inlets-outlets plumbing same end: DC-1202-10-44
2. Inlets-outlets plumbing opposite ends:..... DC-1201-18-28

C1 DURAMAX COOLER MODEL 1202-10-44

JACKET WATER



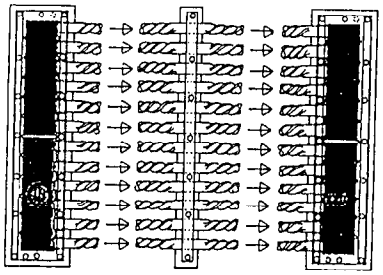
AFTERCOOLER



- A savings of 15+% in net costs of Coolers
- INSTALLATION COSTS CUT IN HALF
- 40% savings in required hull area

C2 DURAMAX COOLER MODEL 1201-18-28

JACKET WATER



AFTERCOOLER

- A savings of 7+% in net cost of Coolers
- INSTALLATION COSTS CUT IN HALF
- 25% savings in required hull area

Through the additional feature of separators, coolant flow may not only be manipulated for higher and lower coolant velocities resulting in more efficient heat transfer, Johnson Coolers can, in many cases, be broken into multiple systems eliminating the cost for additional headers — a substantial savings in initial construction costs, materials and space.

SAMPLES OF MULTIPLE SYSTEMS COMBINED

DETROIT DIESEL **ENGINE** 12V-71 340SHP @ 1800 RPM

A. RECOMMEND

1. Inlet-outlet plumbing at same end: DC-1201-05-11
2. Inlet-outlet plumbing at opposite ends: DC-601-10-02

DETROIT DIESEL **GENERATOR** 8V-71 200KW @ 1800 RPM

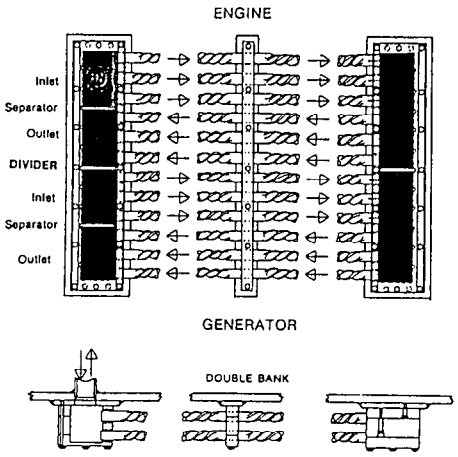
B. RECOMMEND

1. Inlet-outlet plumbing at same end: DC-601-12-12
2. Inlet-outlet plumbing at opposite ends: DC-601-12-02

C. COMBINING SYSTEMS A1 and B1, A2 and B2

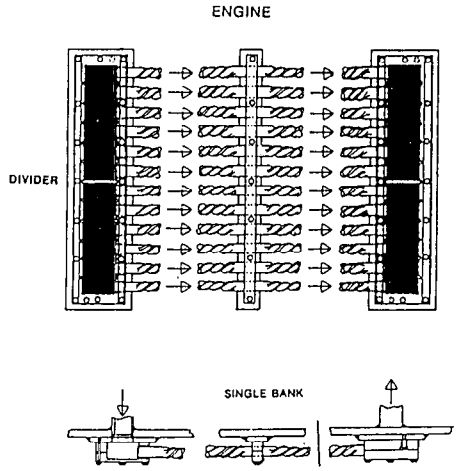
1. Inlets-outlets plumbing at same end: DC-1202-06-42
2. Inlets-outlets plumbing at opposite ends: DC-1201-12-24

C1 DURAMAX COOLER MODEL DC-1202-06-42



- A savings of 4+% in net costs of Coolers
- INSTALLATION COSTS CUT IN HALF
- 60% savings in required hull space

C2 DURAMAX COOLER MODEL DC-1201-12-24



- A savings of 6+% in net costs of Coolers
- INSTALLATION COSTS CUT IN HALF
- 30% savings in required hull space

UNIQUE COMPONENTS FOR SUPERIOR PERFORMANCE

To deliver long-term performance with total effectiveness, Johnson introduced important design innovations in its Duramax outboard keel cooler. The spiral tubes which provide more surface area and create a turbulent flow to boost the tube's heat transfer capabilities, is the heart of its cooler system. The tubes, of tough 90/10 cupro-nickel alloy, are light in weight and have excellent resistance to corrosive and erosive effects of seawater.

Spiraled tubing produces a forced helical motion to the coolant flow. Resulting in a turbulent action that extracts heat almost twice as efficiently as a smooth-walled grid. The spiraled tubing affords the bending strength of thicker tubing, yet allows the flexure needed to follow hull contours without significant stress.

Headers are molded rubber over a solid bronze insert, fitted internally with adjustable separators which clamp the cooling tubes in any desired combination of groupings. Units are available in four, six, eight, twelve, sixteen and twenty-four tube systems.

Stud plates for attachment to the hull are 3/4-in. steel plate, supplied drilled and tapped. Special stainless washer-head bolts are provided for single or double-bank assemblies. No through-hull fittings are required.

● ***STUDPLATES (2).*** *Plates 3/4-in. thick of mild steel (SAE 1010 - 1020) are welded to hull. They are tapped for 3/8-in. 18-8 stainless steel bolts with washers, for mounting deckheader assemblies.*

● ***TOP DECKHEADS (2).*** *Solid cast bronze frames have molded nitrile rubber bonded to surface for sealing and protection.*

● ***INTERDECKS.*** *For double-bank units, or expansion. Nitrile rubber-covered bronze interdeck can be placed between upper and lower decks, providing for an additional bank of heat-exchange tubing. Cooling capacity can thus be doubled with minimum cost and labor.*

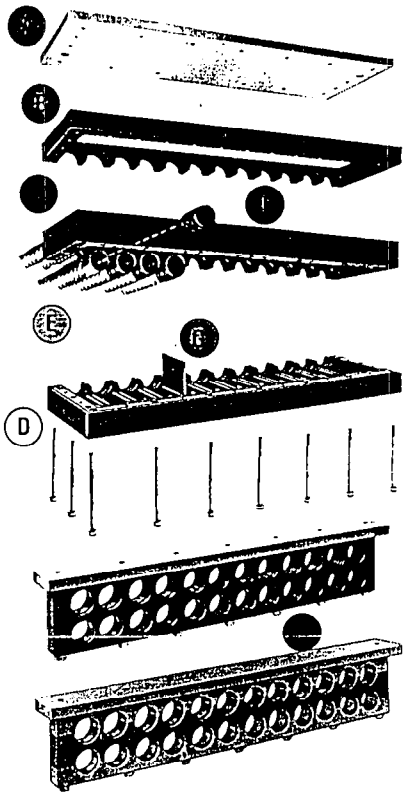
(D) ***BOTTOM DECKHEADS (2).*** *Nitrile-covered cast bronze boxes mate with top deckhead or interdecks to form an enclosed header with tubes clamped between.*

(E) ***TUBING.*** *Spiraled tubing of 90/10 cupro-nickel, available in 1-ft. increments from 3-ft. to 20-ft. lengths. Tube ends are round, and are fitted with nitrile rubber sleeve seals.*

● ***SLEEVE SEALS.*** *Nitrile sleeves have raised beading which compresses to form a seal in the header tube openings for watertight integrity.*

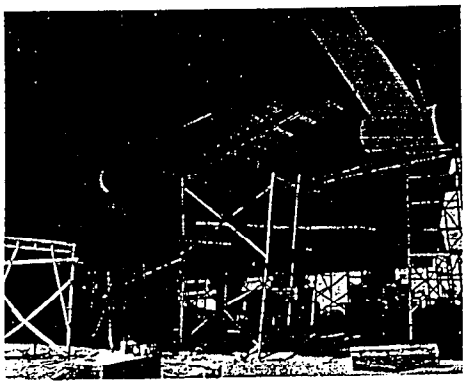
● ***SEPARATORS.*** *To manipulate flow and provide separate cooling of main engines and auxiliaries, headers may be compartmented using rubber-coated steel partitions which fit into slots located between all tubes.*

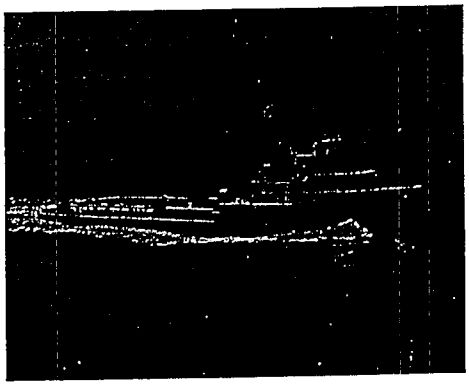
● ***SUPPORT BRACKETS.*** *Support structure of steel studplate and nitrile-covered mating brackets, for tubing support between headers. One grounding type support bracket is supplied with each cooler.*

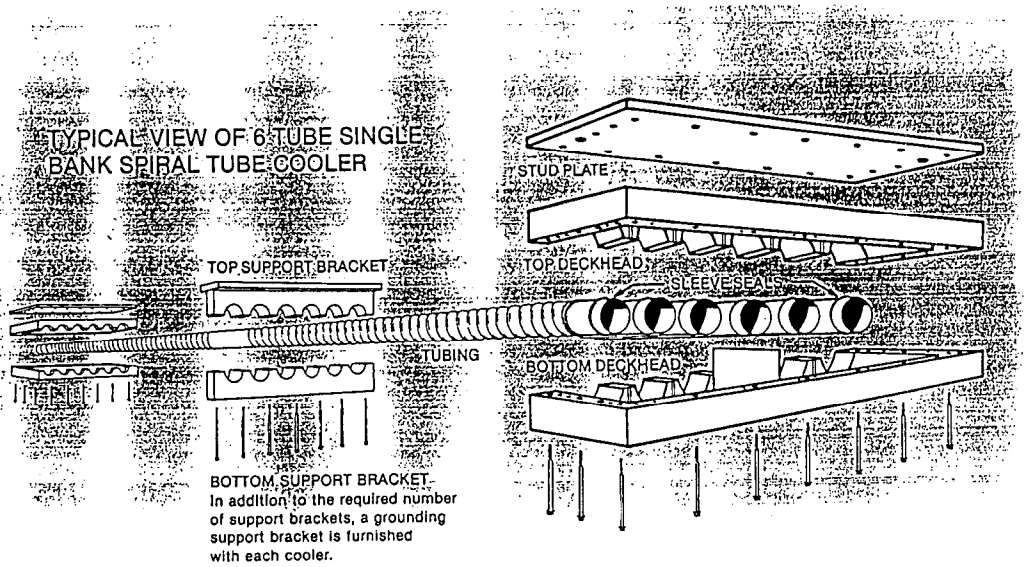


0572

The 212-ft. "Ocean Marlin" offshore supply vessel built by American Marine Corporation, New Orleans, La., for Ocean Marine Service, Inc., Houston, Texas, is equipped with Duramax Spiral Tube Coolers in a series of 24-tube, double-bank units for cooling the main engines, and a series of various units for bow thruster, generators, winch engines and air conditioning compressors.







ENGINEERED FOR FAST ECONOMICAL INSTALLATION

Installation of the Duramax Keel Cooler is fast and inexpensive compared to the time and cost spent on weld fabricating a keel cooler from channel steel. See cost comparisons in table below. Welding on Duramax Coolers is limited to joining stud plates to the hull. The remaining operations consist essentially of assembling the headers and tubes, and tightening the assembly bolts, which fasten to pre-threaded holes in the stud plates.

Water pipes to the inlet and outlet of the heat exchanger are welded to openings in the hull, thereby eliminating through-the-hull fittings and inboard sea chest.

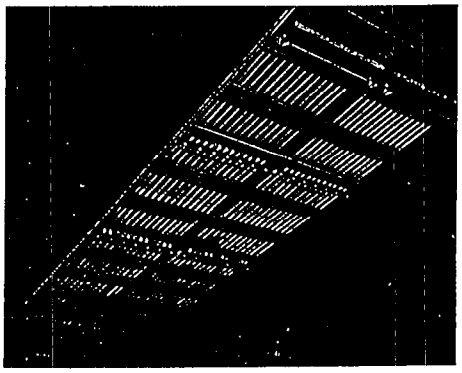
As shown here, key to quick assembly and maintenance is the use of nitrile sleeves which compress

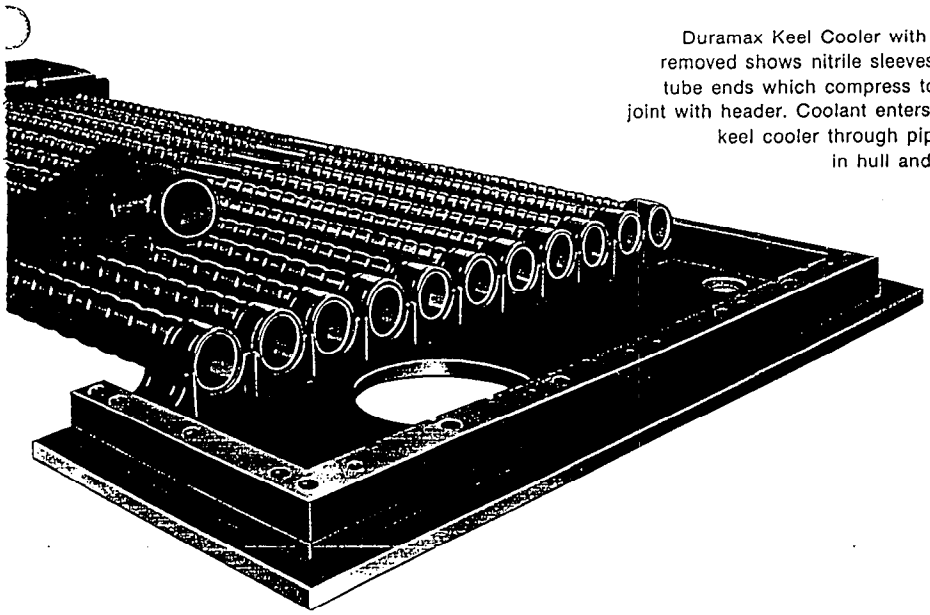
COMPARISON OF TYPICAL INSTALLATION COSTS AND MATERIAL/LABOR REQUIREMENTS FOR CHANNEL STEEL COOLER VS. DURAMAX KEEL COOLER

Engine BHP @ RPM:	Caterpillar 1000 @ 1225		General Motors 2500 @ 900		Wichmann 3000 @ 800	
Cooler Sized at Vessel Speed of:	4 Knots		4 Knots		4 Knots	
Heat Rejection to Coolant:	45,800 $\frac{BTU}{Min}$		90,200 $\frac{BTU}{Min}$		45,850 $\frac{BTU}{Min}$	
Fresh Water Pump Flow:Gal/Min	380		965		317	
Water Temperature to Cooler	185° F		180° F		170° F	
Water Temperature from Cooler	170° F		168° F		152° F	
Max. Anticipated Sea Water Temp.	85° F		85° F		90° F	
	CHANNEL STEEL	DURAMAX KEEL COOLER	CHANNEL STEEL	DURAMAX KEEL COOLER	CHANNEL STEEL	DURAMAX KEEL COOLER
Linear Feet	334 ft.	144 ft.	834 ft.	288 ft.	1000 ft.	216 ft.
Weight of Material	7,682 lb.	894 lb.	19,182 lb.	1150 lb.	22,993 lbs.	1120 lbs.
Hull Space Required	503 ft.²	35 ft.²	1,275 ft.²	135 ft.²	1500 ft.²	28 ft.²
Additional Surface Area Exposed to Drag	167 ft.²	25 ft.²	424 ft.²	25 ft.²	500 ft.²	25 ft.²
Coolant Needed to Supply System, Gallons (pounds)	625 gal. (4,680 lb.)	20 gal. (150 lb.)	1,560 gal. (13,000 lb.)	34 gal. (280 lb.)	1870 gal. (14,004 lbs.)	30 gal. (247 lbs.)
Total Weight of System	12,362 lb.	1044 lb.	32,182 lb.	1,430 lb.	36,997 lbs.	1,367 lbs.
Cost of Materials (Steel = 25¢/lb.)	$1,920.00	$2,060.00 (Cooler) $ 240.00 (Shroud)	$4,795.00	$3,350.00 (Cooler) $ 250.00 (Shroud)	$5,751.00	$3,381.00 (Cooler) $ 250.00 (Shroud)
Cost of Labor (Welders, laborers, overhead @ $6.00/ft.)	$2,004.00	$ 400.00	$5,004.00	$ 400.00	$6,000.00	$ 400.00
TOTAL COST	$3,924.00	$2,700.00	$9,799.00	$4,000.00	$11,751.00	$4,031.00

to form a watertight seal between tubing and headers. This method of connecting tubes to heads eliminates the use of unwieldy permanently assembled structures.

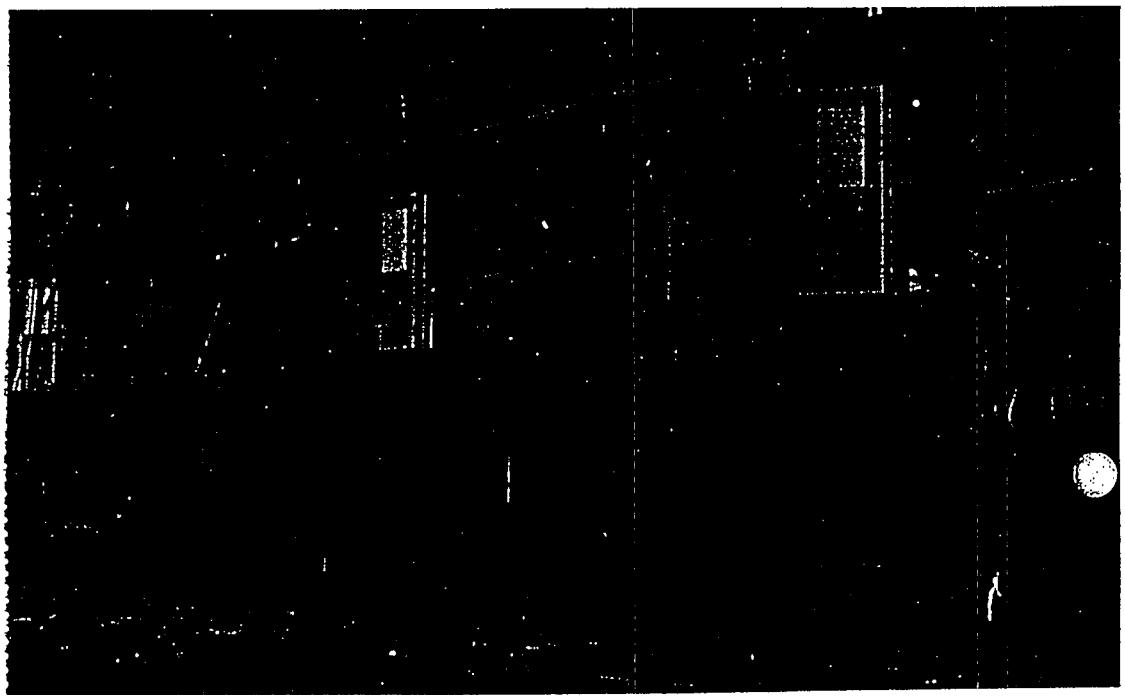
Combinations of single-bank units of 4, 6, 8, or 12 tubes or double-bank units of 8, 12, 16, or 24 tubes are available to match cooling capacity to need. Tube length can be specified in 1-ft. increments from 3-ft. up to 20-ft. Separate or individual cooling of main engines and/or auxiliaries is readily provided by inserting partitions within the head, layered between the tubes to form separated compartments.



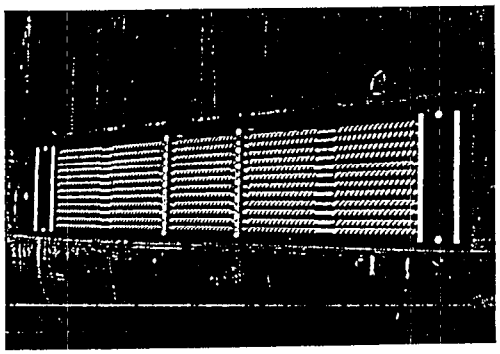


Duramax Keel Cooler with head cover removed shows nitrile sleeves fitted over tube ends which compress to form tight joint with header. Coolant enters and leaves keel cooler through pipe openings in hull and stud plate.

FLEXIBILITY OF INSTALLATION



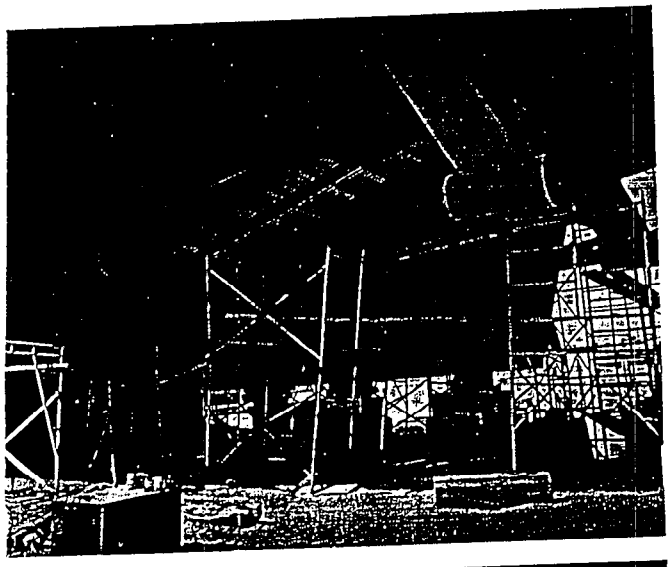
Johnson-Duramax Spiral Tube Coolers are engineered to allow for installation at various locations on the vessel's hull. The strong spiral tubes will flex depending on length of tubing, to fit hull contour. Tubing length from 3 to 20 feet, are in increments of 1 foot, Johnson's computerized method of Cooler "Sizing" to meet your vessel's requirements ensures a more precise method of Cooler selection and provides the correct cooling capacity for maximum engine loads and operating efficiency. The result is less cost for a "Cooler" that will cool more in less space.

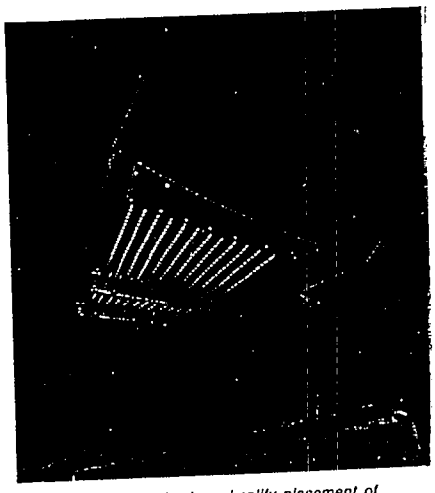


Twelve Tube Cooler — recessed into hull before protective shroud is added. Johnson Duramax Coolers are available in single bank systems of 4, 6, 8, or 12 tubes; or double bank systems of 8, 12, 16, or 24 tubes.

Photos Courtesy Skeet R. Sanders, Brent Marine Supply Co., Inc.

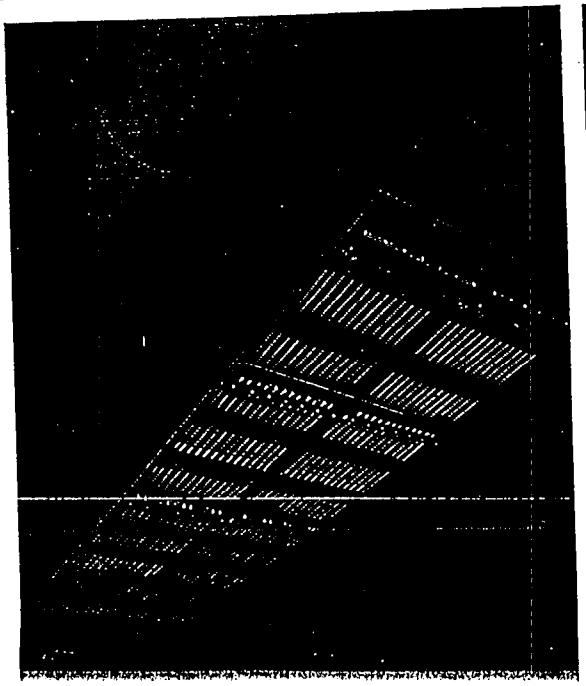
Sprial Tube Coolers, consisting of a series of 24 tube double bank coolers, are used on this 212-foot offshore supply vessel to cool Main Engines, Bow Thruster, Generators, Winch Engine and Air Conditioner Compressors. No through-the-hull fittings are required with Duramax Coolers, resulting in additional material and labor savings.

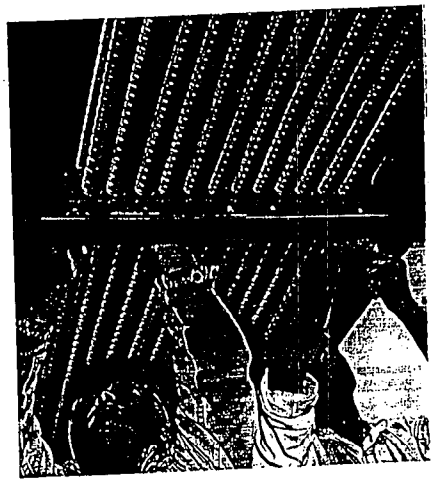




Johnson-Duramax Coolers simplify placement of cooler on the hull. Tubes allow for stress-free accommodation to hull curvature.

Varying ›oling needs ›enerated by vessels operating in ·arious water ›nditions are ›t by groups of Duramax Spiral Tube Coolers due to their ›dvantages of flexibility in placement on e hull — side / side banking or placed in tandem.





Although various types of protective shrouding are used, should a tube or tubes ever become damaged, they are easily replaced. Additionally, if auxiliary equipment requiring cooling is added, Johnson—Duramax provides for the selection of the optimum sized cooler which provides more cooling — in less space for less costs compared to ordinary straight channel.

DURAMAX KEEL COOLER SELECTION GUIDE

Determining the optimum size of Johnson Duramax Keel Cooler for a given set of operating conditions is a relatively simple procedure. Only two sets totalling five pieces of information are needed:

Operating Data

1. Minimum hull speed at full RPM (knots)
2. Ambient temperature of water in which vessel will work. (We use 85° F unless specified otherwise)

Engine Operating Data

3. Coolant temperature requirement for entering or exiting the engine, gear or aftercooler.
4. Unit's heat rejection (BTU/min)
5. Coolant flow (gpm)

Match these data with the corresponding information given in the appropriate Duramax Keel Cooler Selection Guide for the engine make and model you will be using, and the Duramax Keel Cooler model is identified for these operating conditions.

The Duramax Keel Cooler models that are recommended in the Selection Guide for specific engine makes and models provide the requisite cooling capacity according to computer calculations using the basic equation, $Q = hA\Delta T$, where:

Q = heat rejection, BTU/min

h = heat transfer coefficient, BTU per min. per °F per ft²

A = surface area of spiral tubing, ft²

T = the "appropriate" temperature difference (here, the logarithmic mean temperature difference "LMTD") °F

These relationships are shown in the following heat flow diagram for an engine-keel cooler circuit. The computer print-out reproduced here shows calculations using these relationships to determine the Duramax Keel Cooler to use with the engine and ship operating conditions noted in the example.

MFR = min. feet required

KT = knots

Duramax Keel Cooler Selection Guides are available for the most commonly specified domestic and overseas makes of engines and generator sets. The guides give data on each factor that affects keel cooler selection (heat rejection, temperature into cooler, temperature out of cooler, coolant pump flow, ambient water temperature, hull speed) for the engine models produced by a manufacturer. Tabular presentations of the data make the guides fast and easy to use.

"Duramax Cooler Installation Instructions" are available in a separate brochure as part of the total information package supplied with Duramax Keel Coolers.

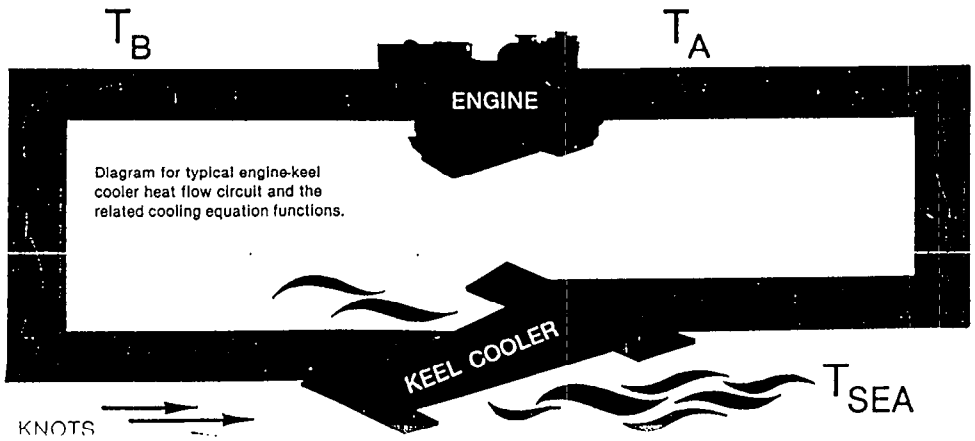
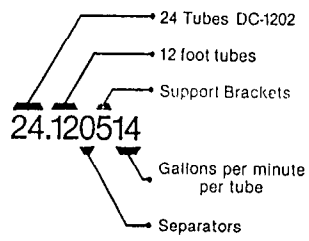


Diagram for typical engine-keel cooler heat flow circuit and the related cooling equation functions.

0578

ENGINE: D353TA

375 BHP @ 1225 RPM
DESCRIPTION
J. W. — A. C.



182.57 ***	T_A
176.00 ***	T_B
85.00 ***	T_{SEA}
145.00 ***	GPM
15000.00 ***	Q_E
31.14 ***	ΔT_{LMTD}

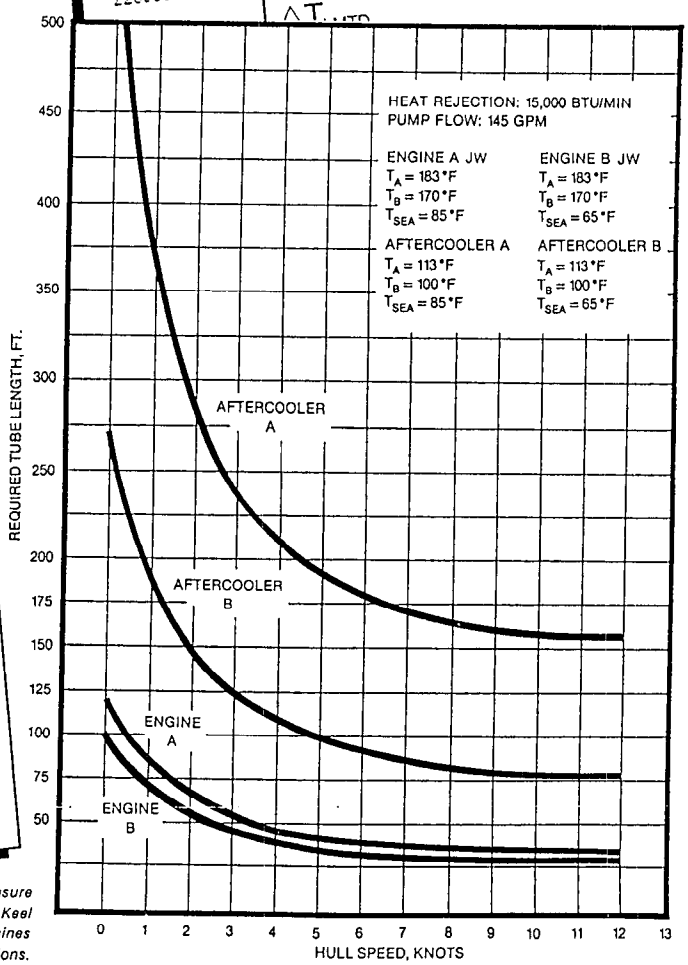
83.65 ***	T_A
76.57 ***	T_B
35.44 ***	T_{SEA}
551.00 ***	GPM
226800.00 ***	Q_E
	ΔT_{LMTD}

122.36	MFR
8.00	KT
24.061212	***
-24.062218	***
24.063224	***
24.065236	***
-12.110412	***
12.111424	***
-12.112436	***
-6.160719	***
6.161736	***

64.55	MFR
2.00	KT
24.031112	***
-24.032118	***
24.033124	***
24.035136	***
-12.060212	***
12.061224	***
-12.062236	***
-8.050513	***
8.051336	***
-6.110224	***
-4.170436	***

47.11	MFR
4.00	KT
-12.040112	***
12.041124	***
-12.042136	***
-8.060218	***
8.061236	***
-6.080124	***
-4.120236	***

43.00	MFR
5.00	KT
-12.040112	***
12.041124	***
-12.042136	***
-8.060218	***
8.061236	***
-6.080124	***
-4.110236	***



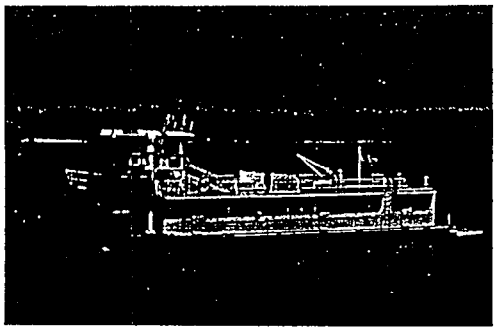
Computer-performed sizing calculations ensure precise matching of Johnson Duramax Keel Coolers with requirements of specific engines and vessel operating conditions.

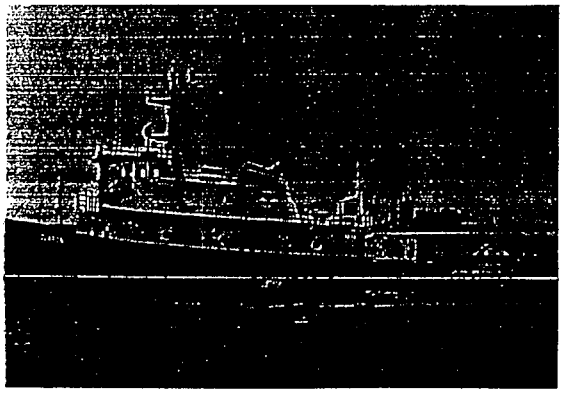
PERFORMANCE–THE ULTIMATE MEASURE OF TRUE VALUE

The best testimonials of reliable performance are records of successful applications. Duramax Keel Coolers are being selected in increasing numbers for a wide variety of vessels operating in various water environments. A few of the more recent installations are shown here.

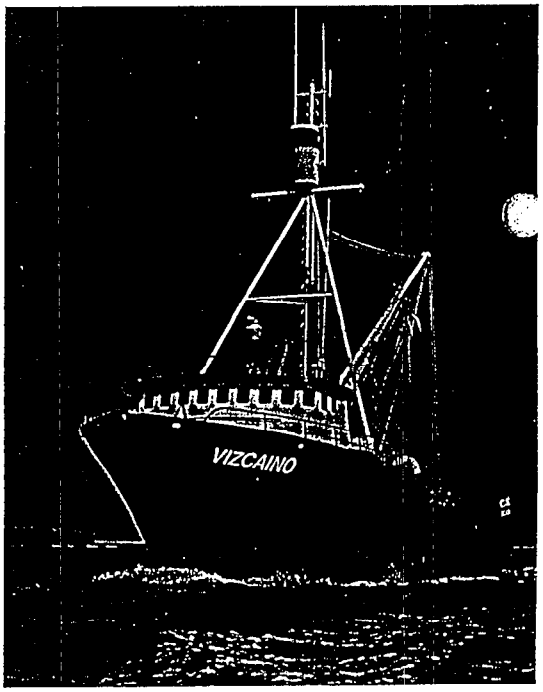
"Cindy Brent", built by Superior Boat Works, Greenville, Miss., for Brent Towing Co., Inc. Greenville, Miss., is equipped with Duramax Coolers recessed into the hull.

CINDY BRENT





CLARION



VIZCAINO

Recently built 114-ft. tug, "**Clarion**", is equipped with Duramax Keel Coolers. She was built by Modern Marine Power, Inc. for Andre Ledoux, Inc., Hahnville, La.

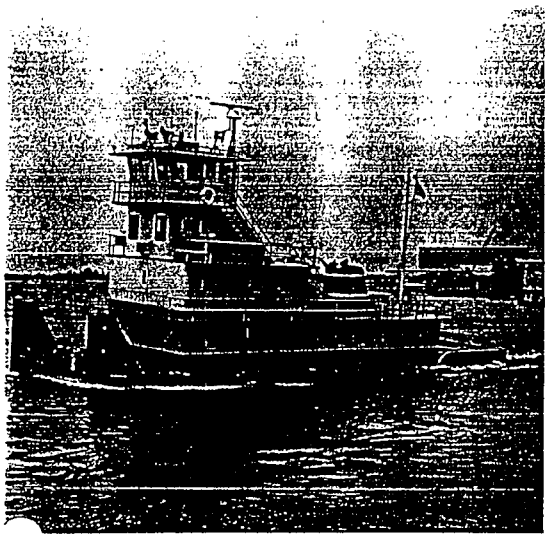
The "**Vizcaino**", one of six 108-ft. anchovy fishing vessels built for Pasquera Zapata, S.A. de C.V., Ensenada, Mexico, depends on Johnson Duramax Keel Coolers to cool her main engine. The vessels were designed by Marine Construction and Design Company.

The "**Shorty Baird**" has Duramax Coolers servicing the cooling needs of her main engine. Built by Superior Boat Works, Greenville, Mississippi for the U.S. Corps of Engineers, Little Rock District, the 86 foot vessel works 448 miles of the Arkansas and Verdigris Rivers.

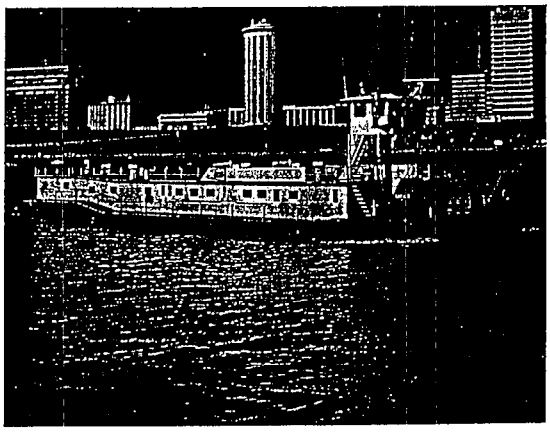
The towboat, "**Carol G**", built by Superior Boat Works, Greenville, Mississippi, for Apex Barge Co., St. Louis, Missouri, is equipped with a Duramax Keel Cooler.

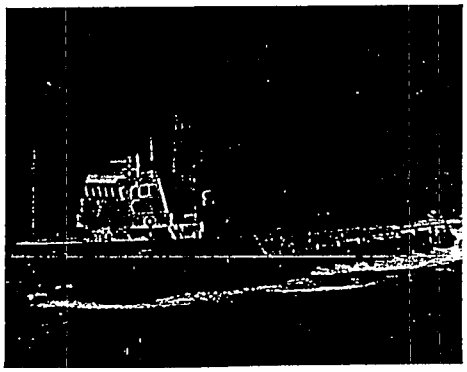
Duramax Keel Coolers are used on the 176-ft. long offshore tug/supply vessel "**Stonington**". Built by Wall Shipyard, Inc., Harvey, Louisiana, for The Seafarer Corp., Layfayette, Louisiana, this trim vessel is known for her strength and speed.

SHORTY BAIRD



CAROL G





STONINGTON

LIMITED WARRANTY

The products referred to in this brochure are warranted to be free from defects in material and workmanship if installed and used in strict accordance with our installation instructions. Our liability is limited to our sale price of any products proved to be defective and which have not been altered, machined, finished, or stored in substandard warehouse, or at our option, to the replacement of such products upon their return to us. No product is to be returned prior to our inspection and written approval. All claims under this limited warranty must be in writing and submitted to us within one year after receipt of the product by you. THIS LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL REPRESENTATIONS AND WARRANTIES EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The remedy set forth in this limited warranty shall be the exclusive remedy available to any person. No person has authority to bind us to any representation or warranty other than this limited warranty. We shall not be liable for any consequential damages resulting from the use of our products or caused by any defect, failure or malfunction of our products. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Johnson®

DURAMAX® MARINE
division of DURAMAX INC.

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Phone: (216) 632-1616 FAX: (216) 632-5265
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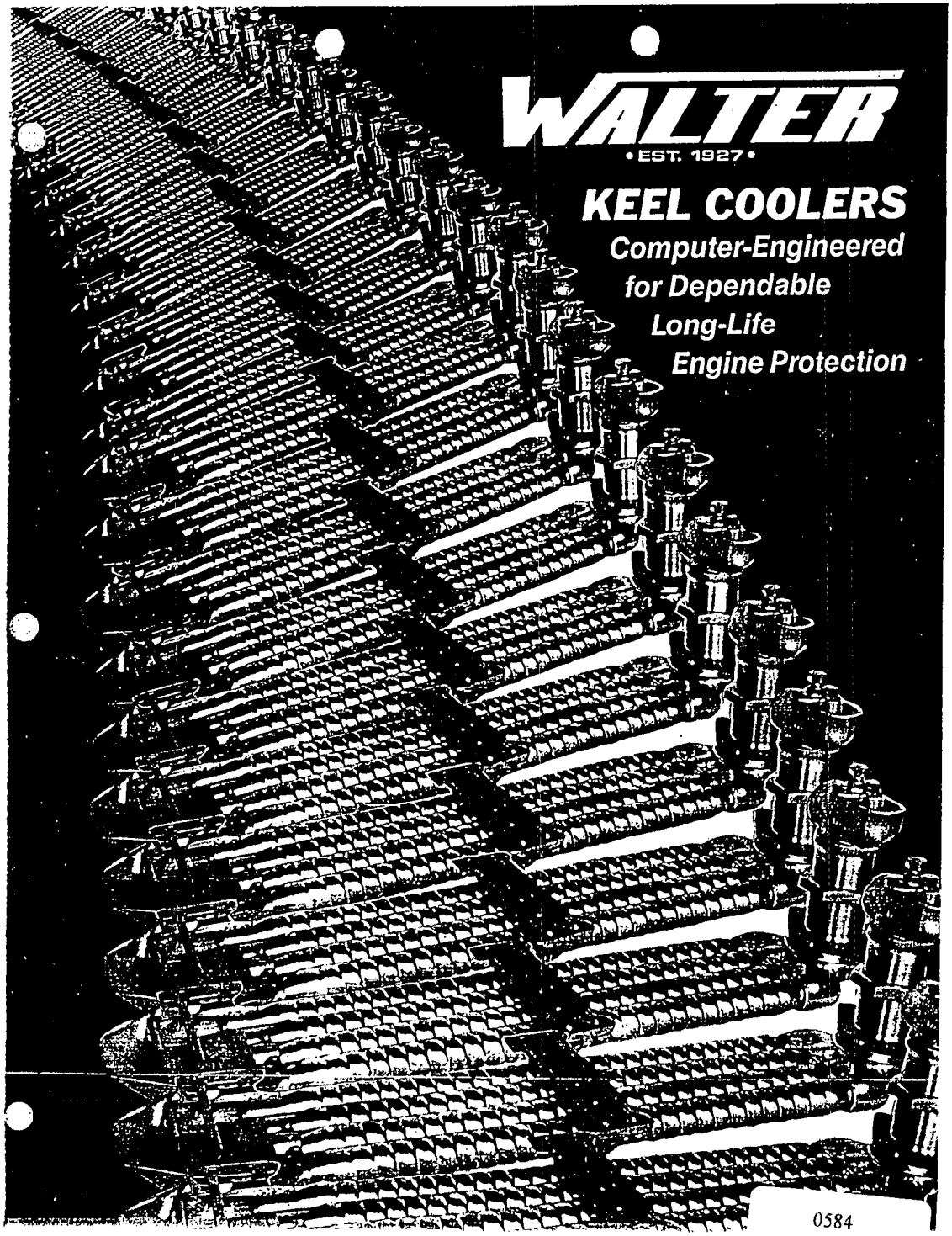
1-215-1192

Exhibit F



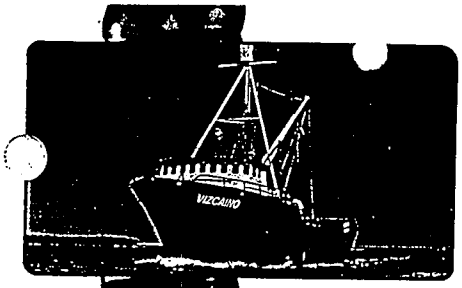
WALTER

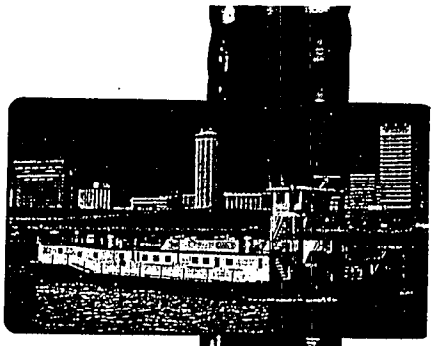
• EST. 1927 •

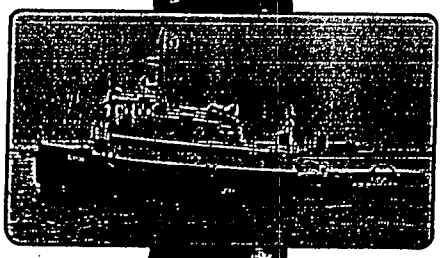
KEEL COOLERS

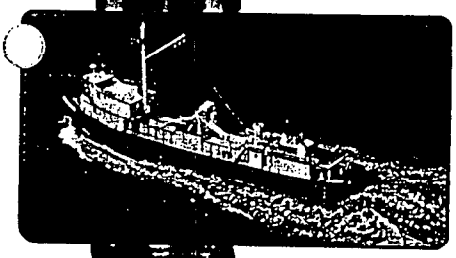
Computer-Engineered for Dependable Long-Life Engine Protection

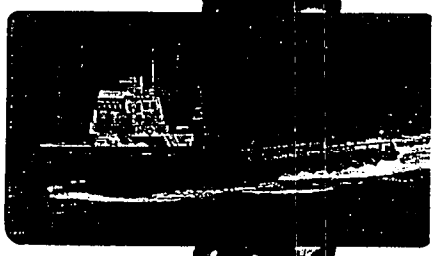
0584











Johnson® DURAMAX®

Spiral Tube Keel Coolers

Positive Cooling Protection For Ship Engines At All Operating Levels

0585

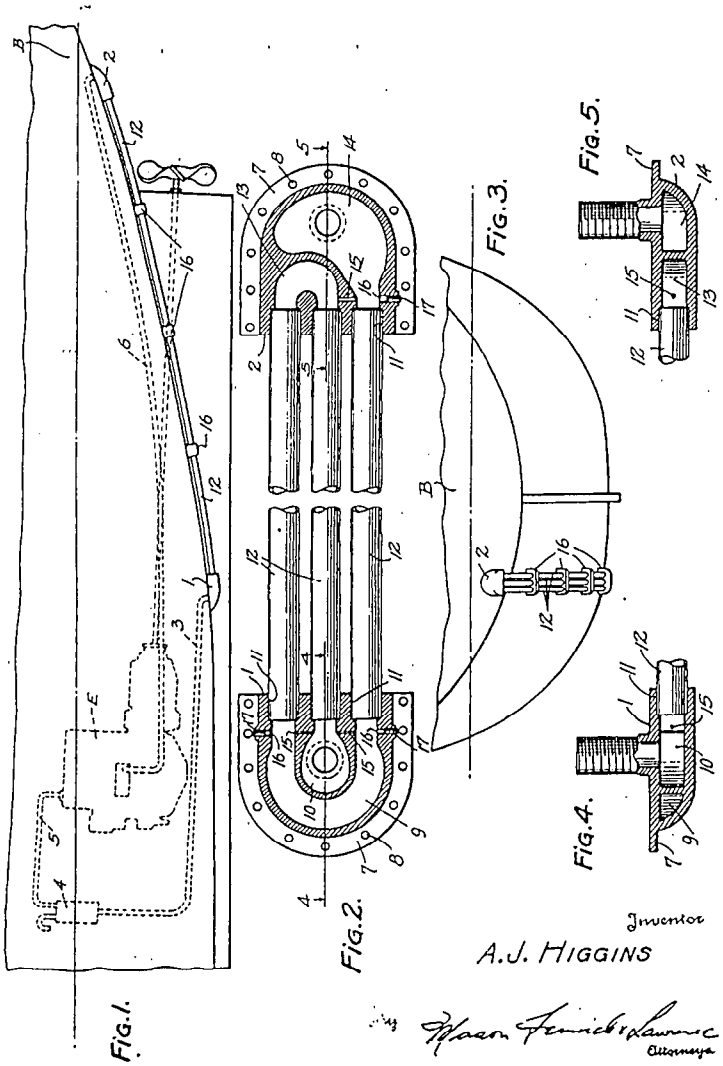
Exhibit G

FIS: 04/96 XR 2356844

Aug. 29, 1944. A. J. HIGGINS 2,356,844

HEAT DISSIPATOR FOR MARINE ENGINES

Filed May 11, 1942



Inventor
A. J. HIGGINS
By Mason Fenwick & Lawrence
Attorneys

Patented Aug. 29, 1944 2,356,844

UNITED STATES PATENT OFFICE

2,356,844

HEAT DISSIPATOR FOR MARINE ENGINES

Andrew Jackson Higgins, New Orleans, La.

Application May 11, 1942, Serial No. 442,526

1 Claim. (Cl. 257—124)

This invention relates to heat dissipators and more particularly to heat dissipators for the cooling system of internal combustion engines used in connection with vessels operating in salt water where a closed fresh water cooling system is utilized.

In connection with such systems it has been found that under heavy duty conditions steam is apt to develop in the water cooling system and where such steam does develop it is likely to form steam pockets in the condenser unit especially where such units include as usual a circuitous passage to increase the effective length of the cooling tubes and such steam pockets when they do develop, choke the circulatory system and prevent the functioning thereof.

The object of the present invention is to provide an improved construction and arrangement of the heat dissipator unit whereby the formation of such steam pockets is effectively prevented and the general efficiency of the device improved.

The invention consists in the novel construction, arrangement and combinations of parts as hereinafter more particularly described and claimed.

One sheet of drawings accompanies this specification in which like reference characters indicate like parts throughout:

Figure 1 is a fragmentary side elevation of the stern portion of a vessel showing the application of the present invention;

Figure 2 is a horizontal cross section through a heat dissipator unit;

Figure 3 is a fragmentary end view looking forward of the showing in Figure 1;

Figure 4 is a vertical longitudinal cross section on the lower header taken on line 4—4 of Figure 2; and

Figure 5 is a vertical longitudinal cross section taken through the upper header and on line 5—5 of Figure 2.

Referring to the drawing, B represents the stern portion of a vessel in which E indicates the internal combustion engine.

The heat dissipator unit comprises a lower header 1 and an upper header 2, the lower header being connected as by a pipe 3 with a reservoir 4 for fresh water which in turn is connected by pipe 5 with the circulatory cooling system of the engine E. The engine cooling system is further connected by pipe 6 with the upper header 2 and the headers 1 and 2 are connected by cooling pipes 12.

Each of the headers 1 and 2 comprises a main body portion having an externally directed flange 7 provided with a plurality of holes 8 through which bolts or lag screws can be passed to secure the header to the bottom of the vessel. The body portion of each header is provided with a plurality of channels so arranged as to provide in conjunction with the connecting pipes 12 a circuitous passage for the cooling medium.

In the embodiment herein illustrated the lower header 1 is connected centrally with the pipe 3 which communicates with a central passage 10 in the header which central passage is surrounded by an annular passage 9. Both of the passages 9 and 10 communicate with the exterior of the header through slightly enlarged sockets 11 adapted to receive and seat the ends of pipes 12. The upper header 2 is similarly provided with a plurality of passages 13 and 14, the openings of which are similarly provided with sockets 11 for the pipes 12. In the case of the upper header 2 the passages 13 and 14 are arranged side by side so that the cooling medium which enters the central passage 10 of the lower header will normally flow through the middle tube 12 and enter passage 13 of the upper header from whence it will pass through the upper tube 12 and enter the passage 9 of the lower header and from there will pass through the lower tube 12 and be delivered into the passage 14 which communicates with the pipe 6 and thence to the engine.

In operation, the heat dissipator as thus described and which, up to this point, is more or less conventional will under heavy service or abnormal duty be likely to form steam pockets especially in the passage 10 of the lower header where the hottest steam is delivered and in the passage 13 of the upper header where it is calculated to flow by reason of the upward inclination of the cooling pipes. The pressure in such steam pockets is greatly in excess of the pressure in the chambers 9 and 14 of the headers which contain the relatively cooler water having traversed a substantial portion of the condenser tubes.

To prevent the accumulation of steam in the chambers 10 and 13 the present invention contemplates the provision of relatively small bleeder passages 15 positioned in the walls separating chambers 8 and 10 of the lower header and 13 and 14 of the upper header. Such bleeder passages 15 can be readily provided in such header units which are normally formed as castings by drilling passages 16 in the outer wall to admit a drill and then after the passages 15 have been drilled in the inner walls threading the passages 16 and plugging same with screw plugs 17.

The provision of the bleeder passages 15 will not interfere with the normal circulation of the

cooling medium by reason of their relatively small size, but will upon new increase of pressure in chambers 10 or 13 by reason of the formation and delivery of steam thereto permit the bleeding of such excess pressure into the chambers 9 and 14, respectively, thus assuring a substantially equalized pressure between the chambers 9 and 10 of the lower header and 13 and 14 of the upper header and the effective prevention of the formation of steam pockets.

Where the condenser tubes 12 are of substantial length it is usual to provide supporting brackets 16 intermediate the headers but these are not related to the present invention.

Various modifications and the precise arrangement and construction of the headers and the means of providing the bleeder passage will readily suggest themselves, to those skilled in the art, but all within the scope of the present invention as claimed.

What I claim is:

Heat dissipator for the cooling medium of a marine combustion engine, comprising headers, each formed with a chamber having a port adapted to be connected with the engine circulatory cooling system and an arcuate chamber adjacent the ported chamber, the ported chambers and the ends of the arcuate chambers communicating by parallel pipes to form a continuous serpentine passage from port to port, with bleeder vents communicating the chambers in each header, as specified.

ANDREW JACKSON HIGGINS.

Oct. 7, 1952 T. MAIRS 2,612,858

MARINE ENGINE WATER COOLER

Filed May 17, 1948 2 SHEETS—SHEET 1

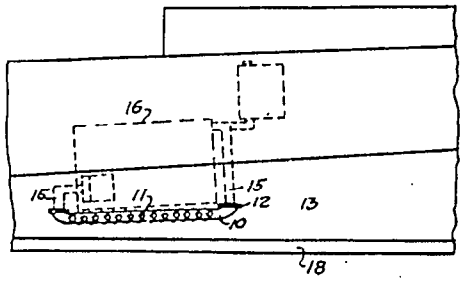


Fig. 1.

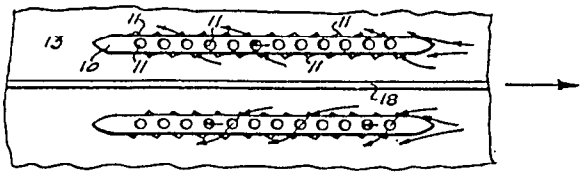


Fig. 2.

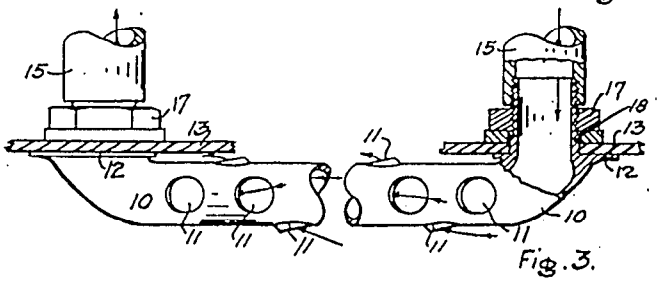


Fig. 3.

INVENTOR.
Thomas Mairs
BY
R. S. Elliott

Oct. 7, 1952 T. MAIRS 2,612,858

MARINE ENGINE WATER COOLER

Filed May 17, 1948 2 SHEETS—SHEET 2

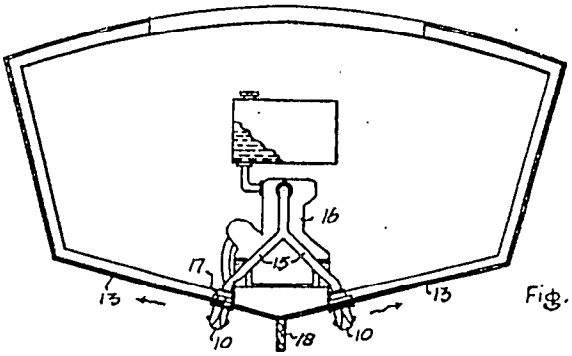


Fig. 4.

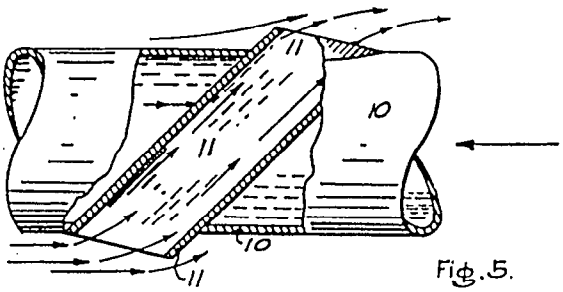


Fig. 5.

INVENTOR
Thomas Mairs
BY
ATTORNEY

Patented Oct. 7, 1952

2,612,858

UNITED STATES PATENT OFFICE

2,612,858

MARINE ENGINE WATER COOLER

Thomas Mairs, Tacoma, Wash.

Application May 17, 1948, Serial No. 27,402

1 Claim. (Cl. 115—0.5)

1

This invention relates to devices for cooling the water or other coolant used for cooling the engine of the internal combustion type and for other similar purposes, wherein the circulating engine water is conducted through piping immersed in the cold water outside the boat.

The objects of my invention are to provide means for cooling the circulating water which will cause the least resistance to the forward motion of the boat; which, on account of its efficiency, will provide a sufficient cooling effect for a relatively large engine; which secures a quick change of cold water through the device independent of the direction of motion of the boat; which is made in a complete unit and therefore may be installed under the bottom of any new or old boat without the necessity of hiring skilled labor; which is simple and rugged in construction, quick and easy to install, and highly efficient in use.

I attain these and other objects as will readily be perceived by those skilled in the art, by the devices and arrangements illustrated in the accompanying drawings, in which—

Fig. 1 is a side elevation of a part of a motor boat showing one of my devices mounted thereunder; Fig. 2 is a bottom plan view of such a boat, showing it equipped with two of my devices; Fig. 3 is a larger view of parts of my device partly in section; Fig. 4 is a cross-section of a motor boat showing two of my devices installed thereunder; and Fig. 5 is an enlarged view of a typical section of my device, a part being shown in section.

Identical numerals of reference refer to the same parts throughout the several views.

Many devices have been made for the purpose of cooling the circulating engine water through the agency of the relatively cold water in which the boat is floating, but they usually involve many pipe connections and have to be assembled or constructed on the boat bottom, thus calling for the expenditure of much skilled labor, time and money, which exert a large resistance to the motion of the boat through the water, and which are of so low an efficiency that they must be quite large in extent, involving many feet of piping.

It is for the purpose of overcoming the above and other deficiencies in the present practice that I have devised the following described integral structure.

Essentially this device comprises a cast tube 10 of suitable material and of sufficient size to accommodate the easy flow of the engine circu-

2

lating water, or coolant, and passing through and across this tube 10 are a plurality of open-ended tubes 11 of smaller diameter. The axes of these tubes 11 are set at an angle of about 45° with the axis of the tube 10 and may be arranged in a plurality of rows. As seen in Fig. 5, the open ends of the tubes 11 are parallel and are cut off at an angle of about 60° to the axes of the said tubes 11 and are so placed in the holes formed in the tube 10 for their reception, that the aft edges of the forward lying ends and the forward edges of the aft lying ends of the tubes extend a short distance out from the surface of the tube 10 while the opposite edges thereof are flush with the surface of the said tube 10.

The result of this construction is to form, at the forward ends of the said tubes 11 slight scoops which guide and force the relatively moving cold water to pass through the smaller tubes 11, and at the rearward ends of these tubes 11 this construction causes a suction as the boat is moved through the water, thus the cold water is caused to pass through the said smaller tubes 11 very swiftly, thus carrying off the heat from the surrounding circulating water in the tube 10.

The two ends of the tube 10 are turned at right angles towards the boat and are provided with flanges 12 adapted to butt against the boat bottom 13 and having screw-threaded extensions 14, passing through the boat bottom 13, to which suitable piping 15 to and from the cooling system of the marine engine 16. The nuts 17 hold the cooler flanges 12 tightly against the boat bottom 13 and prevent leakage through the holes formed therein.

Since my improved circulating water cooler is of integral construction and can be bought completely constructed and ready for installing on the boat, and is very strong and rugged, the only labor connected with its installation is to make two holes of suitable size and position, through which the extensions 14 will snugly pass into the interior of the boat, apply the nuts 17 thereto, and connect the piping 15 to the extensions 14 and to the engine cooling system.

Normally a single cooling tube 10 is used, but under certain circumstances two such tubes may be used, one on each side of the keel 18, for use either with a single engine, as shown, or with two marine engines.

The above described water coolers are made in right-hand and left-hand form, and are mounted under the boat in such manner that the forward ends of the tubes lie adjacent to the keel 18 of the boat, thus lying in the stream of water

forced laterally by the shape of the boat bottom, as indicated by the arrows in Figs. 2 and 4.

The form and shape of the several parts of my improved water cooler are such as to exert the least resistance to the motion of the boat in the water.

The form of the cooling tubes 11 are such as to be substantially equally efficient whether the boat is moving forward or backward, the only difference being that the water may not pass through the tubes 11 at as high a speed, in backing, due to the fact that it is moving towards, rather than away from, the keel.

It is, of course, to be understood that changes may be made in the construction of my improved water cooler as above shown and described, without departing from the spirit of my invention as outlined in the appended claim.

Having described my invention, what I claim and desire to secure by Letters Patent, is:

In a boat having a keel and a water-cooled engine provided with water intake and outlet ports; a closed cooling system for said water, comprising a tube adapted to be attached to the exterior of the boat below its water line adjacent the keel and secured at its opposite ends to said intake and outlet ports to form a closed cooling water circuit, and a plurality of cooling pipes extending transversely through said tube at an oblique angle to the longitudinal axis of the latter, the cooling pipes projecting from the tube to form water scoops at their leading ends whereby the water surrounding the boat is driven through said pipes as the boat is propelled, the scoop ends of the cooling pipes facing the boat keel whereby to receive the water projected laterally outward from said keel as the boat is propelled.

THOMAS MAIRS.

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April 13, 1965 G. WALTER 3,177,936

FLUTED HEAT EXCHANGE TUBE WITH INTERNAL HELICAL BAFFLE

Filed June 5, 1963 2 Sheets-Sheet 1

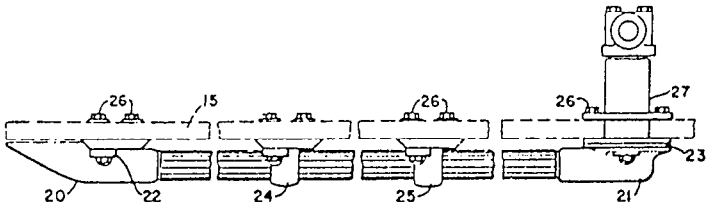

FIG. 1.

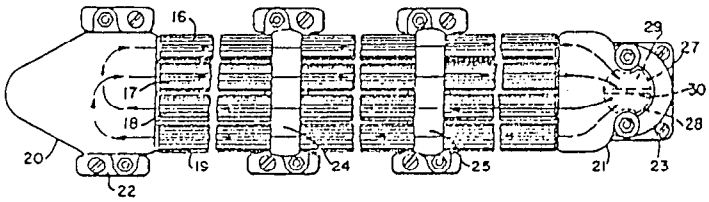

FIG. 2.

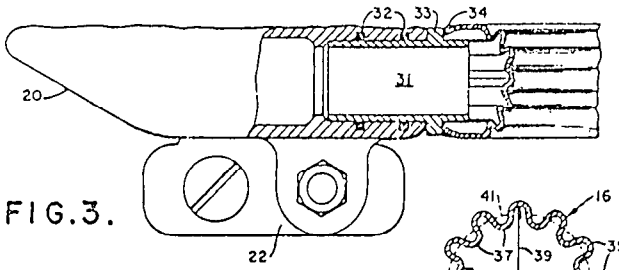

FIG. 3.

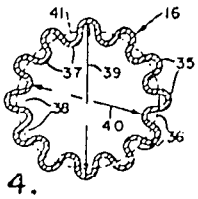

FIG. 4.

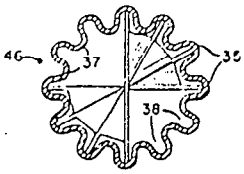

FIG. 5.

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FLUTED HEAT EXCHANGE TUBE WITH INTERNAL HELICAL BAFFLE

Filed June 5, 1963 2 Sheets-Sheet 2

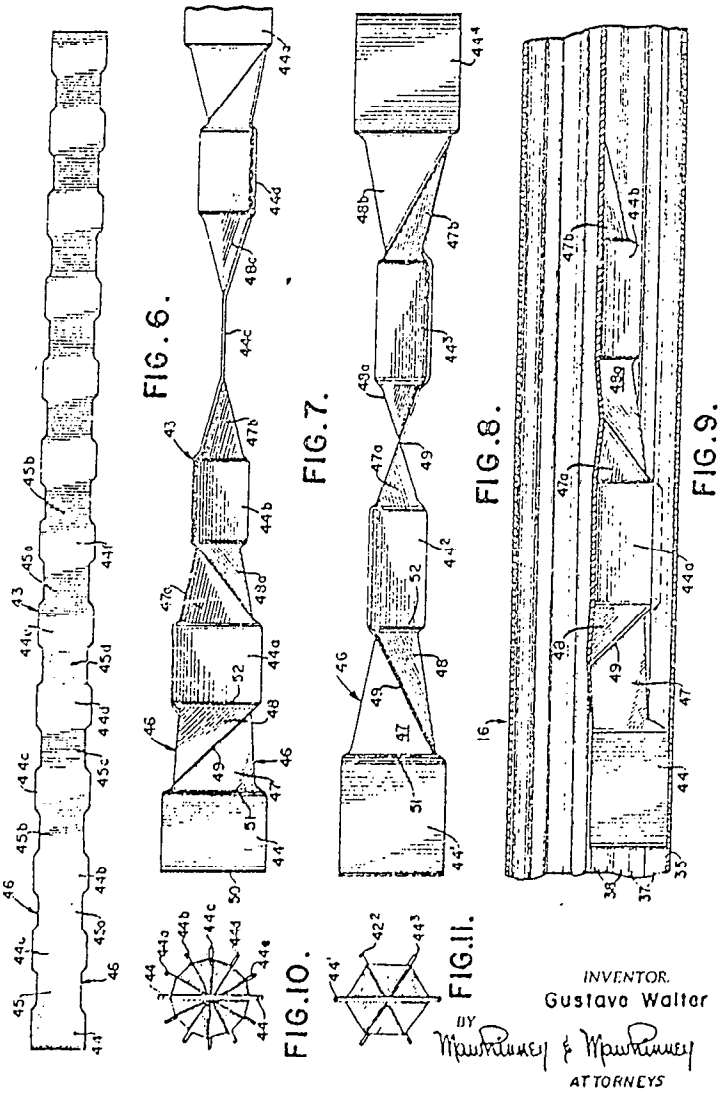

FIG. 6. FIG. 7. FIG. 8. FIG. 9. FIG. 10. FIG. 11.

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3,177,936

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3,177,936

FLUTED HEAT EXCHANGE TUBE WITH INTERNAL HELICAL BAFFLE

Gustave Walter, 15 Thorne St., Jersey City, N.J.

Filed June 5, 1963, Ser. No. 285,733

1 Claim. (Cl. 165—179)

The present invention relates to marine heat exchanger for engine coolant, and has for an object, among other objects and purposes, to provide a novel heat exchange unit for use in such engine cooling devices and systems as disclosed in my prior Patents 2,258,526, granted October 7, 1941, and 2,415,154, granted February 4, 1947.

Those prior patents provided keel cooling systems for marine engines in which heat exchangers were affixed beneath the hull of a boat involving closed fresh water cooling systems to protect the marine engines from the contamination and corrosion of raw water.

With the development of more powerful engines and fast power boats, the length of cooling tubes necessary to provide sufficient heat exchange for these engines, when installed in fast but comparatively short boats, is becoming prohibitive to fit available lengths beneath the boats, which reduced lengths also have raised problems of fastening conventional long cooling tubes to the keel or other portions of the bottoms of the boats.

In order to increase the rate of heat exchange experiments have been made with commercially available finned cooling tubes with the purpose to decrease the lengths of the cooling tubes while at the same time increasing the heat exchange capacity of the tubing.

However, while such finned cooling tubes increase the outside surface area, the inside surfaces remain plain and round or cylindrical so that as a whole such tubes have been found insufficient to provide sufficiently increased external surface cooling area to the fresh water inside the tubes. Furthermore, this available tubing has fins formed in a thread-like fashion which, when fastened to the bottom of the hull, are at right angles to the flow of the external cooling water over the tubes with the result that the flow over the external surfaces of the tubes is not desirably efficient since some of the particles of the water surrounding the fins are carried with the tubing at a reduced surface friction which diminishes the heat exchange.

It is the object and purpose of the invention to overcome the above difficulties by the development of a new form of tubing which admits of shorter length and smaller diameter while developing greater heat exchange capacity.

It is another object of the invention to provide fluted tubing in which the flutes on the tubing run lengthwise relatively to the movement of the tubes with the boat through the sea or other cooling water, thereby resulting in an efficient flow of this cooling water over the surface of the tubing.

A further object of the invention is to provide tubing of the smaller diameter referred to so that the same neatly fits to the bottom of the boat offering little drag or resistance to the speed of the boat.

A still further object of the invention is to provide in such a tubing a baffle or mixing device so constructed and arranged as to agitate the engine coolant water while flowing through the tubes in a manner to cause all of the engine coolant water flowing through the tubes to move toward and from the inner surfaces of the cooling tubes for good heat exchange.

A still further object of the invention is to provide a novel form of baffle or mixing device that partitions the tubes into at least two stream passages of a tortuous or serpentine form for increasing the paths of the coolant water longitudinally from end-to-end of the tubes, which

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paths are in effect therefore longer than the lengths of such tubes.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claim appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

FIGURE 1 is a side elevational view of an improved marine heat exchanger for engine coolants constructed in accordance with the present invention and shown as applied to a boat hull or keel indicated in broken lines.

FIGURE 2 is a bottom plan view of the same.

FIGURE 3 is an enlarged sectional view through one of the headers and one of the novel tubes showing a preferred form of tube mounting.

FIGURE 4 is a cross-sectional view taken through a preferred form of tubing.

FIGURE 5 is a view similar to FIGURE 4, showing a preferred form of baffle or mixing device installed in the tube.

FIGURE 6 is a side elevational view of a blank from which a form of baffle or mixing device may be constructed in any desired length to accommodate the selected length of tubing.

FIGURE 7 is a partial side elevational view of a form of baffle or mixing device which may be constructed from such blank.

FIGURE 8 is a side elevational view of another form of baffle or mixing device in a completed stage.

FIGURE 9 is a fragmentary longitudinal sectional view of a tube taken on an enlarged scale and illustrating the application of the baffle or mixing device to the internal structure of the tube.

FIGURE 10 is an end elevational view of the baffle according to FIGURE 7, taken from the left end thereof.

FIGURE 11 is an end elevational view of the form of baffle shown in FIGURE 8, taken from the left end thereof.

Referring more particularly to the drawings, 15 in FIGURE 1 designates the hull or keel of a boat, and 16, 17, 18 and 19 designate a cooling unit of four heat exchange tubes constructed in accordance with the preferred form of the invention.

These tubes are fitted at their opposite ends into terminal header fittings 20 and 21 which are affixed to the boat by end supports 22 and 23. Intermediate clamps 24 and 25 embrace the tube assembly and are also connected by bolts 26 or other fastenings beneath the keel or hull 15 of the boat so that the tubing and headers are exposed externally to the sea or other water.

A stem or stand pipe rises through the hull 15 from one of the headers 21. In this stand pipe are chambers 28 and 29 separated by a partition 30. One of these chambers, for instance the chamber 28, receives hot water from the engine water jacket, which hot water is circulated through certain of the tubes from the header 21 to the header 20 and thereupon in a return flow through other tubes back to the header 21 and to the opposite chamber 29 for recirculation of the cooled water back to the engine, all in accordance with the arrow indications in FIGURE 2.

Referring more particularly to FIGURE 3, a preferred form of mounting the tubes 16, 17, 18 and 19 to the headers 20 and 21 is by the use of tube adapters 31 of a cylindrical form open at both ends and fitted with neoprene or other rings 32 into the headers. These tube adapters 31 are provided with outstanding flanges 33 adapted to abut against the ends of the headers at one side and to receive at the other side the abutting ends of the tubing which is affixed to the adapters and/or to the flanges 33 by silver solder 34 or otherwise.

Referring more particularly to FIGURE 4 which shows a cross-section on an enlarged scale through one of the tubes according to a preferred form of the invention, 35 designates longitudinally running circumferentially spaced external projections of the tube wall separated by external spaced grooves 36 opening outwardly.

The tube wall is so fashioned as to provide longitudinally running circumferentially spaced internal projections 37 separated by internal grooves 38 which also run parallel with the axis of the tube. The internal groove diameter is indicated at 39 and the internal projection diameter at 40, from which it will be seen that the internal grooves 38 and the internal projections 37 are arranged in diametric pairs, which pairs are angularly displaced around the circumference of the tube.

The broken circular line 41 indicates the mean circumference of the tube, the external projections 35 and the internal projections 37 extending respectively outside and inside this circumferential line 41 in a configuration resembling a sine curve resulting in a wave-like effect which is probably best described as a fluted tube wall.

Although this preferred form of tube may be of any desired material and produced in any suitable manner, it is recommended that the tubes be seamless, thin-walled, for example of .025 inch thickness of Monel stainless corrosion resistant material. Such material will discourage barnacles and is of great strength. Initially a plain walled cylindrical tube of approximately 1½ inches outside diameter is selected and shaped or formed over a mandrel having an external wave-like pattern by rollers which reduce the diameter to approximately 1⅛ inches outside diameter.

It will be noted that the flutes of the tubing run lengthwise or axially in line to the flow of the cooling water which thus results in an efficient flow of this cooling water over the surface of such tubes.

The form of the tube also cooperates in a novel manner with the mixing baffle 43, shown more particularly in FIGURES 6 to 11.

The baffle may be made from stock stamped out as indicated in FIGURE 6 and cut off into desired lengths to accommodate the selected length of the tubing into which it is to be inserted. This stock strip comprises generally an axial succession of diametric plates in any suitable number designated 44, 44ᵃ, 44ᵇ, 44ᶜ, 44ᵈ, 44ᵉ, 44ᶠ, et cetera, separated by an axial succession of twist joint strips 45, 45ᵃ, 45ᵇ, 45ᶜ, 45ᵈ, 45ᵉ, 45ᶠ, et cetera.

The plates 44, 44ᵃ, et cetera, are flat throughout their length and breadth or height in order to slidably fit into the diametric paths of internal grooves 38 of the tube, the plates being of a width or height approximately that of the length of the diametric line 39 illustrated in FIGURE 4 with suitable tolerance to permit of the plate sliding freely in the diametric pairs of grooves 38 into which it is initially slidably fitted. In this condition the plate is flanked at both diametric opposed edges by internal projections 37 which therefore stabilize the plates against the reaction of the cooling water flowing through the tubes and in general hold the plates to alignment.

As shown in FIGURES 7 and 10, successive plates 44, 44ᵃ, 44ᵇ, 44ᶜ, 44ᵈ and 44ᵉ are displaced angularly from one another about the axis of the tube in the order stated by the angles subtended by the various diametric pairs of internal grooves 38 of the tube. Thus these diametric plates 44, 44ᵃ, et cetera, are progressively stepped angularly around the circumference of the tube, the same being connected together by the twist strips 45, 45ᵃ, 45ᵇ, et cetera, which twist strips are of lesser wall width or have cut away portions 46 to clear the internal projections 37 of the tube at cross-over points to permit the twist strips 45, 45ᵃ, et cetera, to connect adjacent diametric plates 44, 44ᵃ, et cetera, at their rear and forward edges 51 and 52 respectively.

While the twist strips may be fashioned in any suitable form so as to join such rear and front edges 51 and 52, of adjacent angularly disposed diametric plates 44, 44ᵃ, et cetera, it is preferred that these twist strips be comprised of leading sections 47, 47ᵃ, 47ᵇ, et cetera, and trailing sections 48, 48ᵃ, 48ᵇ, 48ᶜ, et cetera, in which the sections 47 et cetera and 48 et cetera are approximately triangular in form, being joined together by hypotenuse lines of division 49. The hypotenuse lines 49 are common to the pairs of triangles 47, 48 and 47ᵃ, 48ᵃ, et cetera, so that these triangular sections are in the form of mutual triangles.

These two triangular sections between each pair of diametric plates slope from the hypotenuse line 49 in substantially opposite directions to the edges 51 and 52 of the diametric plates so that the twist strips not only connect adjacent diametric plates which partake of no curvature but they also present to the streams of coolant water in the tube on opposite sides of the mixing baffle offset inclined surfaces diverting and directing the coolant water from the core throughout all strata to and against the internal fluted walls of the tubes thereby bringing all portions of the internally circulating coolant into circulating contact with such walls at which maximum cooling effect takes place.

From FIGURE 10 it appears that six of the diametric plates suffice to comprehend the entire 360 degrees of the circle where twelve pairs of internal grooves 38 are embodied in the tube wall.

In FIGURE 11 three diametric plates 44¹, 44² and 44³ suffice where the diametric plates are successively displaced angularly from one another through angles defined by every second diametric pair of internal grooves 38.

In FIGURE 7 the numeral 50 indicates the free edge of the diametric plate 44, first or last in the order of succession.

In the use of the device the tubes, fabricated as indicated or otherwise, are mounted between the headers and the heat exchanger fixed in place on a boat, being connected to the water cooling system of the engine in a circulation system.

The mixing baffles are of course inserted in the fluted tubes before the latter are mounted in the headers, or at least before the tubes are mounted in one of the headers. Such baffles are introduced into the open ends of the tubes by axial sliding motion in which the leading diametric plate is fitted into selected diametric pairs of internal grooves 38. The baffle is thereupon moved axially inward with the reduced diameter following twist strip entering the tube unimpeded by the internal projections 37 so that the next diametric plate will be correctly alined with the next diametric pair of internal grooves 38, or the next diametric pair of such internal grooves 38 as may be selected to receive the next diametric plate dependent upon the amount of angular twist given the intermediate twist strip, thereupon the lateral edges of this next diametric plate are entered into the diametric pair of internal grooves 38 presented thereto, it being understood that the relative angular positioning of the diametric plates will be such that each successive plate will accurately fit and easily slide in its designated diametric pair of grooves 38 with intermediate twist strips freely clearing the internal projections 37 at cross-over points and between adjacent diametric pairs of internal grooves 38.

With the baffles in place and the tubes connected to both headers, the device is ready to receive streams of water in each tube separated by its baffle with the baffles imposing on the two streams tortuous or serpentine patterns of flow both in the same rotative direction, that is, clockwise or counterclockwise dependent upon whether viewed from one or the other end of the tube.

The heat exchanger is thus reduced in over-all dimensions, the tubes admit of closer grouping and of shorter length while maintaining adequate heat exchange. With the device the pressure drop is less with more heat ex-

change. The tubing can be reduced, for instance from a length of ten inches to a length of six inches.

The mixing baffle may also be of Monel or other metal.

The twist strips impart the swirl pattern to the two streams on opposite sides of the baffle or partition, while the diametric plates support the twist strips and stabilize such strips in position against the reaction of the water currents. The twist strips may also receive some support and orientation at cross-over points from the internal projections with which they may be in contacting relation.

With reference to FIGURE 8 in comparison with FIGURE 11, it will be noted from FIGURE 11 that the length of the mixing baffle will extend from diametric plate 44^1 to the third plate in order 44^3; although FIGURE 8 shows an additional twist strip 47^b, 48^b and an additional diametric plate 44^4. These last two elements have been added in FIGURE 8 to show that where the tube is longer than from 44^1 to 44^3 the sequence may begin all over with a twist strip 47^b, 48^b leading to the diametric plate 44^4 which corresponds in position and orientation with the initial diametric plate 44^1. The series of course may be added to, as indicated in FIGURE 6, any length desired.

The unit length 44^1 to 44^3 is much shorter in FIGURE 8 than the unit length 44 to 44^5 in FIGURE 7 due to the fact that the twist strips in FIGURE 8 go through a greater angle of turning because the plates are stepped through angles corresponding to two of the internal grooves 38 of the tube; whereas in FIGURES 7 and 10 the twist strips are turned through the smaller angles between adjacent internal grooves 38.

FIGURE 9 corresponds to FIGURE 7 except that the scale is larger and FIGURE 9 is fragmentary.

The main purpose of my invention is to reduce the length and bulkiness of cooling tubes in an outboard marine engine cooling system. It is of utmost importance to obtain a simple and efficient system as unobtrusive as possible. The average modern motorboat, particularly the pleasure cruiser, is shorter and faster than its predecessor; its engine or engines are more powerful, thus, in order to fresh water cool this engine or engines, the cooling tubes of the outboard cooling system must be more efficient to fit in a shorter space on the bottom of the boat hull and, at the same time, small enough in diameter to present minimum drag to the speed of the vessel.

Therefore, by folding or fluting, a 1½ inch diameter tube having a surface area of 4.71 square inches for every inch of length, its diameter can be reduced to 1⅛ inches without losing any cooling area, whereas the plain 1⅛ inch diameter tubing has only 3.53 square inches area per inch of length or approximately 75% of the same diameter folded or fluted tube. A marine engine requiring twenty feet of 1⅛ inch cooling tubes for proper heat exchange can thus be effectively cooled with fifteen feet of the same diameter folded or fluted tube. By folding or fluting a 1½ inch diameter tube, as above mentioned, to 1⅛ inch diameter, the cross-sectional area of this fluted tube is then approximately the same as that of the 1⅛ inch diameter plain tube. However, since the length of this folded or fluted tube can be reduced by 25%, namely, from twenty to fifteen feet, the resistance to the flow of the water through this tubing is then also reduced. For instance, to circulate a large amount of cooling water through the engine jackets, then through the keel cooler, a low pressure centrifugal circulating pump is best suited for this purpose. However, such a pump will cavitate an increasing amount of water as the resistance to the flow of water increases and volume of circulation diminishes. Assuming that the cross-sectional area of the cooling tubes does not restrict the volume of circulation, then the length of cooling tubes is of utmost importance.

A 25% reduction in the length of the cooling tubes will substantially decrease the resistance to the flow of the cooling water through the cooling system and engine water jackets, resulting in a higher volume of cooling water circulation and additional cooling efficiency.

Although I have disclosed herein the best forms of the invention known to me at this time, I reserve the right to all such modifications and changes as may come within the scope of the following claim.

What is claimed is:

A heat exchange unit comprising

(*a*) a tube having

(*b*) a fluted wall with

(*c*) axially running circumferentially spaced external projections forming therebetween

(*d*) external spaced grooves opening outwardly and

(*e*) axially running circumferentially spaced internal projections forming therebetween

(*f*) internal spaced grooves opening inwardly,

(*g*) said external and internal projections being angularly displaced from one another,

(*h*) said external and internal grooves being also angularly displaced from one another,

(*i*) said internal grooves being relatively arranged in diametric pairs,

(*j*) a mixing baffle dividing the tube internally and longitudinally comprising

(*k*) an axial succession of diametric plates having side edge portions received in diametric pairs of the internal grooves and held by adjacent internal projections against angular shifting movements,

(*l*) said diametric pairs relatively displaced about the axis of the tube through successively greater angles, and

(*m*) twist joint strips joining adjacent plates,

(*n*) said strips being of reduced diameter compared to the plates to snugly clear the internal projections at cross-over areas,

(*o*) said strips comprising

(*p*) leading and trailing triangular sections bent in relatively opposite directions along hypotenuse lines,

(*q*) said leading sections connected with the rear edges of the plates and sloped from the planes of the plates laterally of said planes,

(*r*) said trailing sections sloped from the hypotenuse lines to the forward edges of the next successive plates.

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CHARLES SUKALO, *Primary Examiner.*

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[45] Oct. 15, 1974

[54] FINNED HEAT EXCHANGER AND SYSTEM

[76] Inventors: Thomas C. Knaebel, 405 Lindgate Dr.; Douglas G. Birk, 917 Mindy Ln., both of Kirkwood, Mo. 63122

[22] Filed: June 12, 1973

[21] Appl. No.: 369,225

[52] U.S. Cl. 165/44, 165/168
[51] Int. Cl. B61d 27/00
[58] Field of Search 165/44, 80, 47, 168, 169, 165/171

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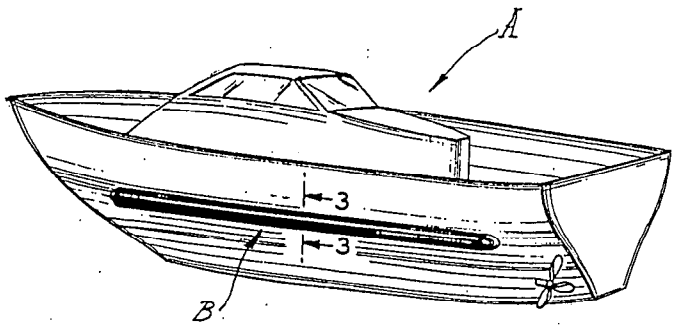
Primary Examiner—Charles Sukalo
Attorney, Agent, or Firm—Paul M. Denk

[57] ABSTRACT

In a heat exchanger primarily for usage in conjunction with a marine vessel, said heat exchanger includes a longitudinal member formed having at least one passageway provided therethrough, and a series of radially extending fins integrally connecting longitudinally of said member. The longitudinal member is preferably approximately semicircular in configuration, with said fins extending from the conic-like surface of said semicircular design, with the other or flat surface of said member provided for flush mounting against the hull of the vessel. Said fittings communicate by means of fluid lines with the cooling system of the inboard engine of the vessel, thereby providing a path for transfer of its cooling fluid or medium from said engine, and through the heat exchanger for effective dissipation of its heat out of the radial fins and into the ambient water.

2 Claims, 6 Drawing Figures



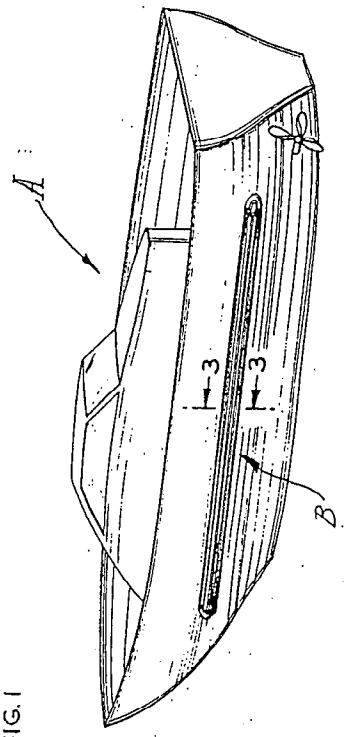


FIG. 1

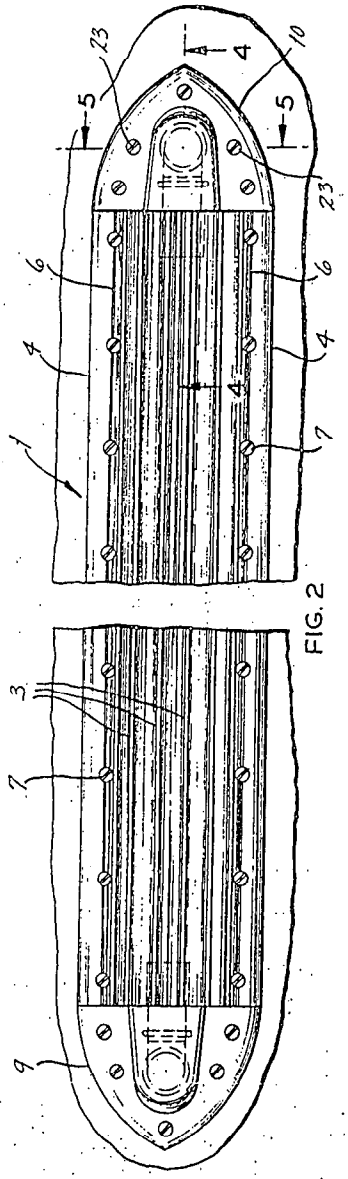


FIG. 2

FIG. 3

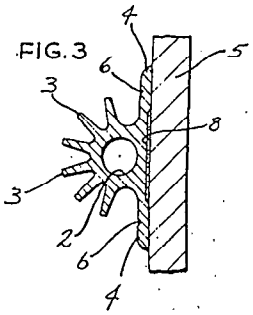


FIG. 4

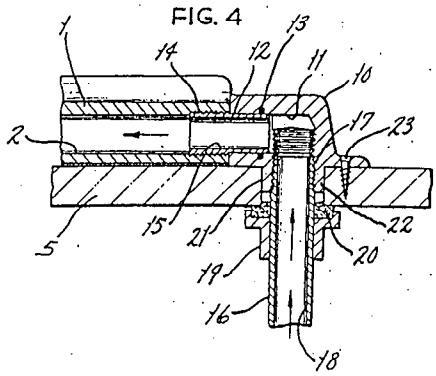


FIG. 5

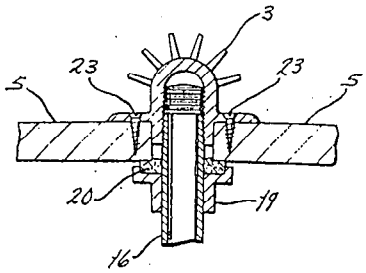
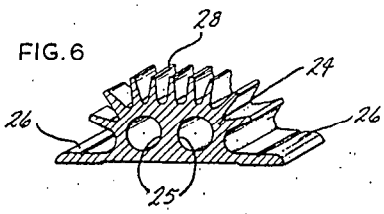


FIG. 6



FINNED HEAT EXCHANGER AND SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a heat exchanger, but more particularly, one that preferably has application for enhancing heat transfer from the inboard motor of a boat or other marine vessel.

Various styles of heat exchangers have been provided in the prior art principally for use in conjunction with the hull of the vessel and designed for dissipating the heat generated within its internal combustion engine. Most of these heat exchangers, or coolers, are designed having headers that mount to the keel of a vessel, said headers communicating with the cooling jacket of the boat engine, and further providing one or more tubes extending between said headers and through which the cooling means may be pumped to facilitate its heat exchange. These prior art devices are generally effective for their intended purposes, but the present invention provides a unique design in this type of a heat exchanger and which achieves enhanced heat transfer through the use of a finned heat exchanger mounting flush and longitudinally upon the hull of the vessel.

It is, therefore, the principal object of this invention to provide a heat exchanger which attains increased heat transfer from a longitudinally finned heat exchanger. It might be stated that the marine industry has long been plagued with failures in its engines, pumps, oil coolers, water condensers, refrigeration condensers, primarily due to the corrosive action of sea water which has heretofore frequently been used as the cooling medium. As is well known, electrolytic corrosion, fretting and general decomposition of the heat exchange materials through their contact with the sea water has been a constant source of costly maintenance and repair. Many hazardous and catastrophic failures at sea have been caused by breakdowns of this type due to the fact that the deterioration of the aforesaid nature is generally concealed from view with the corrosive effects of the sea water generally being undetectable beforehand.

Hence, it is another object of this invention to provide a unique and improved heat transfer system for the cooling of the internal combustion engine, its lubricating oil, and for a refrigeration condenser cooling and the like. Generally, this system contemplated a closed loop cooling system method by which the heat dissipation is affected through the disposition of a finned heat exchanger to the surrounding heat absorbing environment, rather than, as previously described with respect to the marine industry, having to absorb any sea water inboard to cool its aforesaid mechanical apparatuses.

It is another object of this invention to provide a heat exchanger which may be mounted longitudinally of the hull of a vessel, disposing its radial fins to the sea water, and being arranged in a manner that enhances the streamlined design and functioning of the keel and bilge portions of the vessel to reduce drag on its hull during movement.

An additional object of this invention is to provide a heat exchanger which can be easily manufactured, and whose installation can be easily accomplished due to its composite and compact design by one not necessarily possessing high mechanical skill.

The foregoing and other objects will become more apparent to those skilled in the art in light of the following summary, and upon reviewing the description of the preferred embodiment in view of the accompanying drawings.

SUMMARY OF THE INVENTION

The invention contemplates a heat exchanger which incorporates structure that performs two basic purposes, first, providing a passageway through a longitudinal member which integrally incorporates a series of radially disposed fins, for enhancing heat exchange for cooling the medium traversing through its passageway, while secondly, the invention incorporates flange means integral with the longitudinal member to provide for flush and stable mounting of the device to a supporting surface. while the heat exchanger may be utilized in a variety of applications, more preferably, it has been constructed for use in conjunction with the hull of a vessel, mounted below its water line when buoyant, and thereby expose the finned exchanger to the ambient water to enhance heat flow into the said surrounding environment.

As stated, the heat exchanger incorporates a longitudinal like member, which principally is manufactured as a straight member, but may be constructed of any malleable material, such as aluminum, magnesium, or the like, so that it may be contoured slightly to provide for its flush mounting upon the supporting surface to which it will be connected, for example, the curved side of the vessel. The longitudinal member provides at least one passage along its length, and at either end is connected to a fitting which may be rigidly secured to the surface of the hull, with each fitting communicating with a flow line to provide for transfer of the engine's cooling medium through the exchanger and to and from its cooling jacket. Preferably the invention has been designed for providing a means for cooling the water or other cooling medium normally contained within the cooling jacket of an internal combustion engine, such as the type usually utilized within an inboard marine vessel, but the invention may also be utilized for cooling other of its fluids, such as its lubricating oil. In addition, the invention can be constructed into a closed loop type of heat dissipator, containing a permanent type of anti freeze where needed, and be installed during manufacture of the vessel. Furthermore, the invention could be adapted to other types of apparatuses for cooling any of its warmed mediums, through exposure of its finned longitudinal members to the surrounding ambient environment. While the preferred embodiment of this invention discloses the longitudinal member as having its radial fins extending outwardly from its surface, it is just as likely, and within the teachings of the heat exchange art, that the radial fins could extend inwardly of the longitudinal member within its flow passageway, and thereby radiate the cooling mediums heat through said fins and longitudinal member into the surrounding atmosphere.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 provides a perspective view of a marine vessel disclosing the heat exchanger of this invention as being mounted adjacent its hull;

FIG. 2 provides a partial plan view of the heat exchanger of this invention;

FIG. 3 provides a cross-sectional view of the heat exchanger taken along the line 3—3 of FIG. 1;

FIG. 4 provides a sectional view of one end or the heat exchanger taken along the line 4—4 of FIG. 2;

FIG. 5 provides a sectional view of one fitting of the heat exchanger taken along the line 5—5 of FIG. 2; and

FIG. 6 provides a sectional view similar to the view disclosed in FIG. 3, but showing a modification in said heat exchanger.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In referring to FIG. 1, there is disclosed a marine vessel, such as an inboard yacht A, and which shows the invention B being mounted lengthwise along the hull of the vessel below its water line, so that any heated medium flowing through the heat exchanger will be exposed preferably to the sea water to enhance heat transfer from the said cooling medium. As will be hereinafter described, the preferred embodiment of this invention does contemplate the use of fins upon its external surface, and by properly arranging this heat exchanger at a location approximate the bilge of the hull, or where its sides commence to rise vertically from said bilge, not only is increased heat exchange achieved, as aforesaid, but the planing characteristics of the vessel during usage can be enhanced.

The heat exchanger B is more aptly disclosed in FIGS. 2 and 3, and is therein shown comprising a longitudinally disposed member 1 provided with at least one passageway therethrough along its length, with said longitudinal member having a series of radiating fins 3 extending integrally from its surface, and useful for dissipating the heat of any fluid medium that may be flowing through said passageway 2. It is to be noted that these fins are somewhat thicker at their base where they join integrally with the surface of the longitudinal member than they are at their tips where they extend and project into the surrounding environment, such as the sea water, and with this type of design provides for uniform and constant heat transfer along their length and height. As previously described, it is likely that these fins could project interiorly of the passage 2 and provide some service in inducing heat transfer from the cooling medium flowing therethrough for exchange into the surrounding environment.

The longitudinal member 1 is also provided with a pair of integral flanges 4 that extend laterally from its base, and is useful for providing flush mounting of the heat exchanger against any surface, such as the hull 5 of the vessel A. Each flange is provided with a longitudinal groove 6 along its length, and facilitates the locating and positioning of the fastener means, such as the screws 7, that stably mount the heat exchanger to a surface. It is also to be noted from FIG. 3 that the underside of the heat exchanger is provided with a recessed portion 8 which provides clearance to enhance its flush mounting to a surface when the fasteners 7 are attached. Obviously, it is easier to acquire the slight bending necessary to the heat exchanger flanges 4 and conform them to the supporting surface to which it mounts upon application of the fastener 7 by providing a recess at this base portion.

As also shown in FIG. 2, in addition to FIGS. 4 and 5, there are provided a pair of fittings 9 and 10 at either end of the longitudinal member 1 of the heat exchanger, and each fitting is provided with a passageway 11 therethrough and angularly turned, approximately 90°, to provide an inward directing of the flow of the cooling medium into the hull of the vessel and to provide for attachment to the various flow lines communicating with the cooling jacket of the vessel's engine, its lubricating oil reservoir, or other standard components of the internal combustion engine of said vessel that require cooling. Each fitting cooperates with a connector 12 which is snugly and hermetically sealed within its passageway 11 by means of a sealing ring 13, while the other end of said connector may be threadedly engaged, as at 14, internally within the passageway 2 of the longitudinal member 1. Obviously, it is just as likely that said connector may threadedly engage within the fitting 10, while its other end may be secured within the heat exchanger as shown at 14, or perhaps a sealing ring may be used at that location for hermetically sealing the connector within the passage of said heat exchanger. As can be seen, the connector 12 itself is also provided with a passageway therethrough, as at 15, to provide for unobstructed flow of the cooling medium therethrough and into or out of the passage 2.

A second connector 16 is threadedly engaged, as at 17, within the opposite end of the connector 10, and also incorporates an internally formed passageway 18 through which the cooling medium may flow while traveling to or from the heat exchanger member 1. The means for providing a fluid type connection of both the fitting and the connector 16 to the hull 5 of the vessel may be achieved in the usual manner, whereby a fastening ring 19 may threadedly engage said connector 16, or be fixedly attached in any other manner, for pressing against another sealing ring 20 that compresses against the inner side edges of the aperture 21 provided through the hull 5. Likewise, the fitting 10 is provided with a lip 22 that is designed for snug fitting within the hull aperture 21, and an integral flange surrounding the fitting 10 is designed for accommodating a series of fastening means, such as the screws 23 for securely mounting the fitting to said hull. Hence, a fluid type seal may be provided through the hull in this manner so as to prevent, as in the case of a vessel, any sea water from leaking into the same, while likewise, the fluid tight seal provided between the various connectors 12 and 16 with the fitting 10, and the longitudinal member 1 of the heat exchanger, prevents any undesirable intermixing of sea water with the cooling medium or other fluid passing through and receiving the advantages of the heat exchanger of this invention.

A modified form of the longitudinal member of this heat exchanger is shown in FIG. 6, wherein said longitudinal member 24 may be formed having a pair of passageways 25 provided therethrough so as to enhance the heat transfer characteristics of the device, with said member having the integral flanges 26 extending laterally from either side and being formed for functioning in the manner as previously described. Likewise, a series of fins 28 project, as shown in this case, exteriorly from the longitudinal member 24 to enhance heat flow out of the heat exchanger.

For further elaboration, the longitudinal members of this invention are generally formed having a configuration somewhat of a semicircular design, with the fins radiating from the conic like surface of said member, and the said flanges projecting laterally from what may be described as the flat portion of the semicircular design of the heat exchanger when viewed in cross section. Hence, and where the invention is disclosed in this

modified form as in FIG. 6, the cross section of the longitudinal member will not comprise an exact semicircular design, but it still contains somewhat of a conic design so as to provide a surface from which the fins may project reasonably radially for extending into the surrounding ambient environment.

Where the heat exchanger is to be used upon the hull of a sea-going vessel as previously analyzed, it has been found that this particular design of a heat exchanger is advantageous over what is disclosed in the prior art, since the flanges 4 and 26 of the member are disposed for flush mounting against the hull of the vessel, and thereby little or no foreign matter can become adheared to or lodged against the same, such as seaweed or other floating debris. Furthermore, the accumulation of barnicles, algae, or other bacterial growths are prevented from accummulating or germinating between the heat exchanger and the vessel hull due to the flush mounting of the flanges of this invention, which incidentally, may be additionally adheared to the hull through the use of an epoxy or other adhesive. Furthermore, the streamlined effect provided in having the fins radially extending from a heat exchanger enhances the removal of any algae as the vessel travels through the water, due to the projection of its fins into the same.

Numerous variations in the construction of the heat exchanger of this invention, within the scope of the appended claims, will occur to those skilled in the art in light of the forgoing disclosure. For example, as previously described, it might be desirable to extend the fins of the heat exchanger inwardly, rather than exteriorly, so as to minimize any damage that might be caused through the encountering of logs or driftwood that these vessels usually contact during usage. The embodiments shown and described are merely illustrative of the principles of this invention.

Having thus described the invention what is desired to be secured by Letters Patent is:

1. In combination with a water buoyant marine vessel incorporating an engine and cooling jacket capable of holding a supply of cooling medium, a heat exchanger mounted to the external surface of the hull of the vessel below its water line, a pair of fluid flow means connecting the proximate ends of said heat exchanger to the cooling jacket of the engine for use in transfer of the cooling medium to and from said jacket, said heat exchanger including a longitudinal member of a length to provide for its connection in a direction approximately along the length of the hull, said longitudinal member having at least one passage formed therethrough, said longitudinal member being approximately semicircular in cross section and formed having a conic-like side and a flat surface, a series of radially disposed longitudinal fins integrally formed from the conic-like side of the longitudinal member and extending into the ambient environment to enhance heat dissipation from the cooling medium, said radial fins being formed having a tapered design and narrowing from their connection with and extension from the conic-like side of the longitudinal member of the heat exchanger, flanges integrally connecting to and extending diametrically from either edge of the flat surface of said heat exchanger along the length of its longitudinal member, fastening means cooperating with said flanges to secure said heat exchanger to the vessel hull, said flanges being provided with slots along their length to facilitate the positioning of said fastening means, the combined flat surface of the heat exchanger and the underside of said flanges being formed having a recess therein to provide clearance for flush mounting of said heat exchanger to the vessel hull, said heat exchanger including a pair of fittings at the ends of its longitudinal member for hermetically sealing the exchanger at the location where it connects interiorly of the hull for communicating with the fluid flow means of said cooling jacket, connectors provided for securement of said fittings to each end of the longitudinal member, each connector inserting into the end of said longitudinal member and also into the proximate fitting, a sealing ring provided between said fitting and its connector to hermetically seal the same together, both of said connectors and the fittings have passages formed therethrough communicating with the passage of the longitudinal member for accommodating the flow of the cooling medium of the engine therethrough, additional connectors attaching with the fittings and disposed for extending through the hull of the vessel, a fastening ring cooperating with each said additional connectors for hermetically sealing said heat exchanger to the vessel hull to prevent interior leakage of the ambient water.

2. The invention of claim 1 wherein said longitudinal member of the heat exchanger is provided with a pair of passages internally along its length to accommodate the flow of the cooling medium therethrough.

* * * * *

March 28, 1961 P. H. R. WALDRON ET AL 2,976,834

MARINE HEAT EXCHANGER

Filed Dec. 4, 1958

Fig. 1

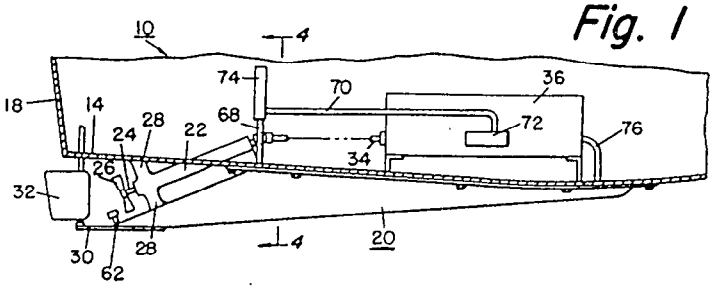


Fig. 2

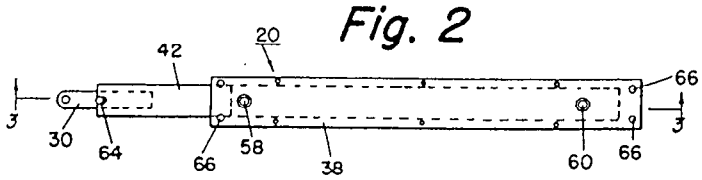


Fig. 3

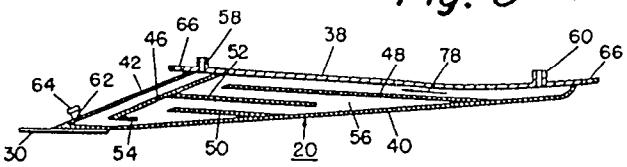
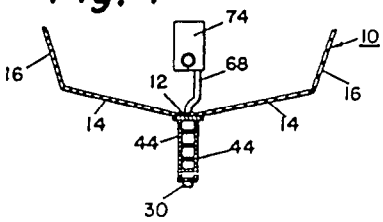


Fig. 4



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MARINE HEAT EXCHANGER

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Filed Dec. 4, 1958, Ser. No. 778,226

3 Claims. (Cl. 115—5)

This invention relates to a marine heat exchanger, and more particularly to a heat exchanger for use in cooling the engine of an inboard motor vessel. Even more particularly, the present invention relates to a heat exchanger for inboard motor vessels which is a part of the design of the hull of the vessel.

For cooling the engines of inboard motor vessel, particularly the smaller vessels, it is the common practice to use the water which surrounds the vessel. The raw cool water is pumped through the engine and the heated water returned to the surrounding medium. Where the coolant is sea water, the salt in the water has a corrosive reaction with the engine which rapidly reduces the life of the engine. A survey by the boating industry found that engines cooled by salt water deteriorate at least five times as rapidly as engines cooled by fresh water. Also, the salt water attacks the water pump, causing failure of the pump at most unpredictable times. Such failure is a major hazard in boating.

Another cooling system which has been used in an attempt to overcome the hazards of directly using the surrounding water, uses an inboard heat exchanger. A closed system pumps fresh water through the heat exchanger and the engine. A second system pumps the surrounding water through the heat exchanger to cool the fresh water. However, this system is bulky in that it requires an inboard heat exchanger and two separate pumping systems. Also, the heat exchanger and the salt water pump are subject to corrosion by the salt water.

It is an object of the present invention to provide an improved heat exchanger for the engine of an inboard motor vessel.

It is another object of the present invention to provide a heat exchanger for inboard motor vessels which is directly cooled by the water surrounding the vessel.

It is still another object of the present invention to provide a heat exchanger for inboard motor vessels which forms a part of the design of the hull of the vessel.

It is a further object of the present invention to provide a heat exchanger for inboard motor vessels which is relatively small and which rapidly cools the coolant for the engine.

It is still a further object of the present invention to provide a heat exchanger for inboard motor vessels which does not add any drag or any appreciable additional weight to the vessel.

Other objects will appear hereinafter.

For the purpose of illustrating the invention there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

Figure 1 is a sectional view of the hull of a vessel which includes the heat exchanger of the present invention.

Figure 2 is a top elevational view of the heat exchanger of the present invention.

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Figure 3 is a sectional view taken along line 3—3 of Figure 2.

Figure 4 is a sectional view taken along line 4—4 of Figure 1.

Referring initially to Figures 1 and 4 of the drawing, the hull of the vessel is generaly designated as 10. Hull 10 comprises a keel 12 having a bottom 14 extending upwardly and outwardly from each side of the keel 12. Sides 16 extend upwardly from the bottom 14. A transom 18 extends upwardly from the aftermost end of bottom 14, and extends between the sides 16. The heat exchanger 20 of the present invention extends downwardly from the keel 12.

A stuffing box 22 for the shaft 24 of the propeller 26 extends rearwardly through the keel 12 or bottom 14 of the hull 10. The outer end of stuffing box 22 is supported between the heat exchanger 20 and the keel 12 or bottom 14 by supporting posts 28. A skeg 30 extends rearwardly from the heat exchanger 20, and a rudder 32 is pivotably connected between the end of skeg 30 and the keel 12 or bottom 14 of the hull 10. Propeller shaft 24 is connected to the drive shaft 34 of the engine 36. For simplicity, engine 36 is shown mounted on the bottom 14 of the hull 10. However, the engine 36 may be mounted on a deck of the vessel or in any suitable place in the vessel.

Referring to Figures 3 and 4, the heat exchanger 20 of the present invention comprises a substantially rectangular top plate 38 which is long and narrow. The configuration of top plate 38 conforms to the configuration of the keel 12. A substantially rectangular bottom plate 40 is secured at one end to the top plate 38 adjacent the forward end of the top plate 38. Bottom plate 40 extends longitudinally along and downwardly away from the top plate 38. Bottom plate 40 extends longitudinally beyond the rear end of top plate 38. A substantially rectangular end plate 42 connects the rearmost end of bottom plate 40 to the top plate 38 adjacent the rearmost end of the top plate 38. Side plates 44 extend between the top plate 38 and the bottom plate 40 to completely enclose the heat exchanger 20.

A baffle plate 46 extends between the side plates 44 from the top plate 38 to a point spaced from the bottom plate 40. Baffle plate 46 is substantially parallel to and spaced from end plate 42. A pair of parallel, longitudinally extending baffle plates 48 and 50 extend between the side plates 44 from the bottom plate 40 to points spaced from the baffle plate 46. Another pair of parallel, longitudinally extending baffle plates 52 and 54 extend between the side plates 44 from the baffle plate 46 to points spaced from bottom plate 40. Baffle plate 52 extends between baffle plates 48 and 50, and baffle plate 54 is below baffle plate 50. Thus the baffle plates form a continuous labyrinth passage 56 which extends longitudinally back and forth across the heat exchanger 20 and then upwardly along the rearmost end of the heat exchanger 20. Top plate 38 has a port 58 extending through its rear end into the space between the end plate 42 and the baffle plate 46. A second port 60 extends through the forward end of top plate 38 into the space between the baffle plate 48 and the top plate 38. A drain pipe 62 extends through the bottom end of end wall 42 into the labyrinth passage 56, and a cap 64 fits tightly on the drain pipe 62.

Heat exchanger 20 is fabricated entirely of metal to provide for good conduction of heat. The top plate 38 of heat exchanger 20 is secured to the bottom of keel 12 by bolts or the like which extend through holes 66 in the ends of the top plate 38 which project beyond the end plate 42 and the bottom plate 40. However, if the vessel is originally constructed with the heat exchanger 20 of the present invention, the heat exchanger 20 may be con-

structed as a part of the keel 12 with the keel 12 acting the top plate 38.

As shown in Figure 1, the port 58 of the heat exchanger 20 is connected by pipes 68 and 70 to a water pump 72. A fill pipe 74 is connected between pipe 68 and pipe 70. Fill pipe 74 is larger in diameter than the pipes 68 and 70 so that the fill pipe 74 will serve as an expansion chamber. Pump 72 is connected to the inlet end of the cooling chamber of engine 36. A pipe 76 connects the outlet end of the cooling chamber of engine 36 to the port 60 of heat exchanger 20. Thus the heat exchanger 20, pipes 68, 70, and 76, and engine 36 form a closed system for circulating fresh cooling water through the engine 36 and the heat exchanger 20.

The operation of the cooling system which incorporates the heat exchanger 20 of the present invention is as follows:

The system is filled with fresh water through fill pipe 74. Pump 72 draws cool water from the heat exchanger 20 through port 58, pipes 68 and 70, and forces the cool fresh water through the cooling system of the engine 36. The warm water from the engine 36 is forced through the pipe 76 back into the heat exchanger 20 through port 60.

In the heat exchanger 20, the warm water from the engine 36 enters the foremost end, of the heat exchanger 20 through the port 60. The water then flows longitudinally through the uppermost portion of the labyrinth passage 56 between top plate 38 and baffle 48 in the direction of arrow 78. The water flows through the labyrinth passage 56 longitudinally back and forth across the heat exchanger 20 and downwardly toward the bottom rearmost end of the heat exchanger 20. As the water passes through the labyrinth passage 56, the water is cooled by the induction of heat from the water through the side plates 44 of the heat exchanger 20 to the cooler water surrounding the heat exchanger 20. The cool water from the bottom rearmost corner of the heat exchanger 20 is drawn up between end plate 42 and baffle plate 46 to the port 58, and then back to the engine 36.

In a vessel containing both warm and cool water, the warm water would normally rise to the top of the vessel and remain on top. However, in the heat exchanger 20 of the present invention, the warm water entering the top of the heat exchanger 20 is forced longitudinally back and forth and downwardly through the labyrinth passage 56. Thus, all the water is brought into direct contact with substantially the entire surfaces of the side walls 44 of the heat exchanger 20. This provides for the rapid cooling of the water in a heat exchanger which is of relatively small volume. Also, the baffles of the heat exchanger 20 of the present invention divide the cool water leaving the heat exchanger 20 from the warm water entering the heat exchanger 20. This prevents heating of the cooled water by convection of heat from the warm water.

The tapered design of the heat exchanger 20 of the present invention conforms to the design of the hull 10 of the vessel. Thus, the heat exchanger 20 does not add any drag to the vessel, yet extends into the water surrounding the vessel for proper cooling of the heat exchanger 20. Also, since the heat exchanger 20 of the present invention is relatively small in volume, it does not add any appreciable additional weight to the vessel.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

We claim:

1. A marine heat exchanger comprising a substantially rectangular, metal top plate, a rectangular metal bottom plate secured at its forward end to the forward end of said top plate and extending longitudinally beneath and downwardly away from said top plate, a metal end plate connected between the rear end of said bottom plate and the rear end of said top plate, a pair of parallel side plates connected between said top plate and said bottom plate, said top plate, bottom plate, end plate, and side plates forming an enclosed chamber, baffles means extending between said side plates and forming a labyrinth passage which extends longitudinally back and forth through the chamber from the forward end of said top plate to the rear end of said bottom plate so that a liquid flowing through said passage must flow adjacent to said bottom plate at spaced points along said bottom plate, and a pair of longitudinal spaced ports through said top plate, one of said ports opening into one end of said passage and the other port opening into the other end of said passage.

2. A marine heat exchanger comprising a substantially rectangular metal top plate, a rectangular metal bottom plate secured at its forward end to the forward end of said top plate and extending longitudinally beneath and downwardly away from said top plate, a metal end plate connected between the rear end of said bottom plate and the rear end of said top plate, a pair of parallel side plates connected between said top plate and said bottom plate, said top plate, bottom plate, end plate, and side plates forming an enclosed chamber, a first baffle plate extending between said side plates and downwardly from said top plate to just above said bottom plate, said first baffle plate being parallel to and adjacent said end plate but spaced from said end plate, a second baffle plate extending between said side plates and longitudinally from said bottom plate to a point spaced from said first baffle plate, a third baffle plate extending between said side plates and longitudinally from said first baffle plate to a point spaced from said bottom plate, said third baffle plate being substantially parallel to and spaced below said second baffle plate, said baffle plates forming a labyrinth passage through said chamber, a port through the rear end of said top plate opening into the space between said end plate and the first baffle plate, and a port through the forward end of said top plate opening into the space between said top plate and the second baffle plate.

3. A heat exchanger in accordance with claim 2 including a fourth baffle plate below said third baffle plate extending between the side plates and longitudinally from said bottom plate to a point spaced from said first baffle plate, and a fifth baffle plate below said fourth baffle plate extending between said side plates and longitudinally from said first baffle plate to a point spaced from said bottom plate.

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March 15, 1966 C. W. VAN RANST 3,240,179

COOLER

Filed Feb. 12, 1964 2 Sheets-Sheet 1

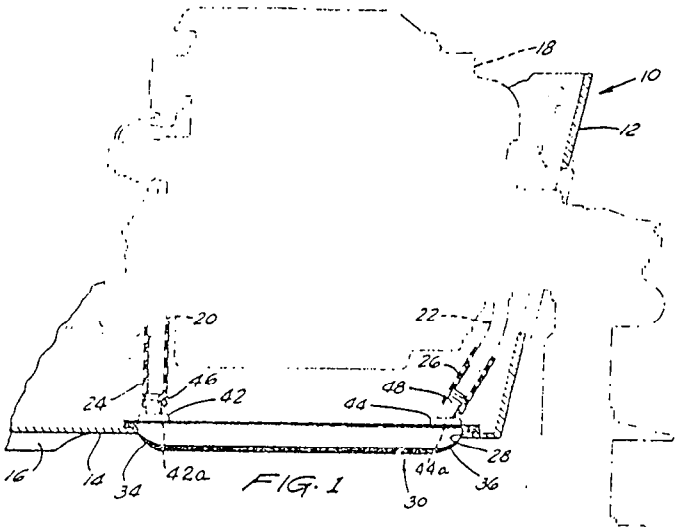

FIG. 1

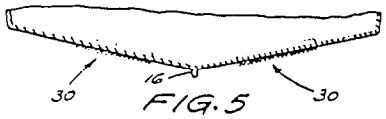

FIG. 5

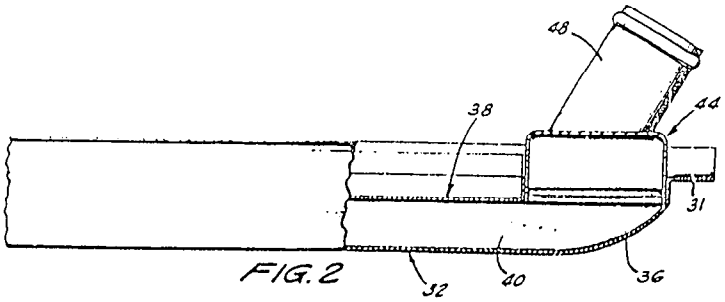

FIG. 2

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Filed Feb. 12, 1964 2 Sheets-Sheet 2

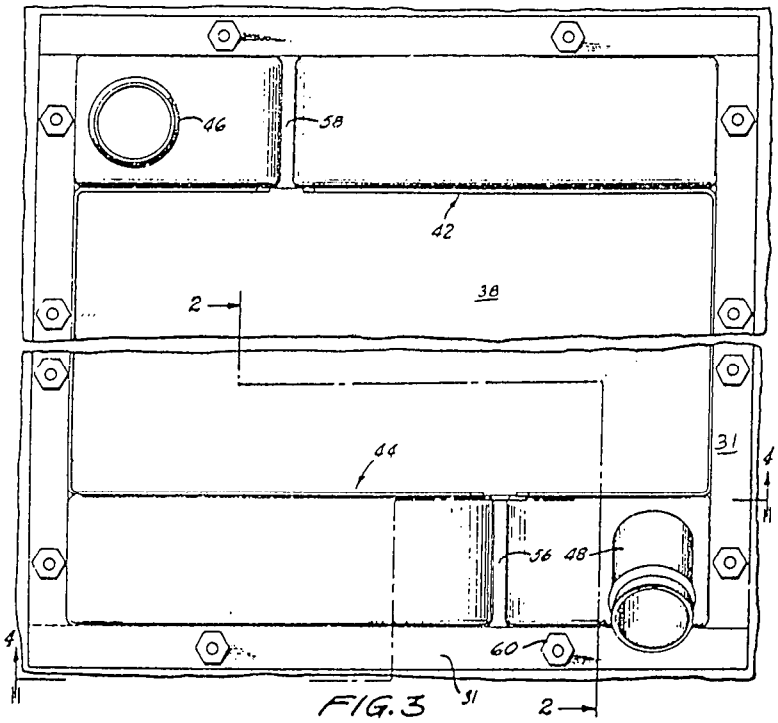

FIG. 3

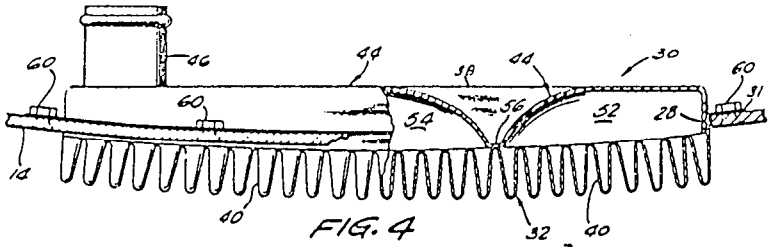

FIG. 4

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2 Claims. (Cl. 115—.5)

The present invention relates to coolers adapted to be used with marine vessels to provide cooling for propulsion engines and other auxiliary apparatus requiring cooling liquids.

It is the common practice in the marine industry to use liquid cooling systems for cooling propulsion engines and other auxiliary equipment. In most instances where ocean-going vessels are concerned, an internal fresh water circuit is employed for cooling the engines or equipment, and a companion seawater circuit, including a heat exchanger, is used for removing heat from the fresh water of the fresh water circuit. Liquid cooling systems of this character have certain inherent defects, particularly where small vessels are concerned, and therefore, efforts have been made to develop coolers which serve to eliminate the need for the companion seawater circuit.

One of the results of these efforts has been a cooler which is adapted to be mounted on the external side of the hull below the waterline of the vessel, and the cooler is made a part of the internal fresh water circuit. It is intended that the fresh water in the circuit will have the required amount of heat removed therefrom by heat removing action of the seawater on the external side of the cooler. Under ideal operating conditions such coolers have operated satisfactorily, but it has been found that adverse conditions may arise which render the cooler partially or totally ineffective, causing the vessel to be disabled by reason of overheating of the apparatus which requires cooling. This situation is particularly critical if the marine vessel is for military purposes. Thus, difficulties have arisen in instances where the vessel has been required to move in shallow waters where various forms of debris are present or in waters where seaweed, or the like, are present.

It is an object of the present invention to provide an improved cooler for use with a marine vessel, which cooler is constructed and arranged so that it will provide optimum cooling under various conditions of operation of the marine vessel.

It is still another object of the present invention to provide a cooler of the foregoing character which is also characterized by its manner of construction, enabling it to be economically produced.

It is still another object of the present invention to provide a cooler of the foregoing character which provides relatively large effective heat exchange areas in proportion to the size of the complete unit, and which has flow characteristics on both internal and external surfaces to provide a highly efficient heat exchange unit.

It is still another object of the present invention to provide a cooler which is characterized by the absence of flow obstructing portions outboard of the skin of the vessel.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIGURE 1 is a fragmentary vertical section taken along the keel of a marine vessel showing a propulsion engine in broken lines and showing the side elevation of a cooler embodying the present invention;

FIGURE 2 is an enlarged fragmentary side elevation, [illegible] one end of the cooler

2

FIGURE 3 is an enlarged fragmentary top plan view of the cooler, with the midportion removed;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3; and

FIGURE 5 is a reduced transverse section through the bottom portion of another marine vessel, showing an arrangement whereby two coolers are mounted in the vessel.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring now to the drawings, the invention will be described in greater detail. The marine vessel 10 has a hull with a stern or transom 12 and a generally flat bottom or skin 14 along which extends the keel 16. Mounted within the vessel 10 is the internal combustion engine 18 adapted to function as the propulsion engine. The engine 18 has a conventional fresh water cooling system with inlet and outlet hose fittings 20 and 22 to which are connected, respectively, the hoses 24 and 26. The bottom or skin 14 has an opening 28 therein which is closed by the cooler 30 which is fitted thereinto.

The illustrated embodiment of the invention is formed from a plurality of sections of stainless steel sheet material, which sections are joined together into an integral structure by suitable means, such as welding. The specific shapes of each of the various sections will not be discussed in detail, because it will be apparent to those skilled in the art that the cooler can be fabricated in various ways and still arrive at the same configuration that is disclosed in the drawings.

The cooler 30 has a bottom or outer sheet portion 32 which has a transverse sinuous configuration, as seen best in FIGURE 4, and the bottom or outer sheet portion 32 curves upwardly in streamlined fashion at its opposite ends 34 and 36. Between opposite ends 34 and 36 and located on the top inner surface of the sheet portion 32 is another sheet portion 38 which closes the spaces between the top or innermost ends of the convolutions in sheet portion 32, thereby defining a plurality of closed, parallel spaced tubes 40 extending fore and aft in the cooler 30 between the opposite ends 34 and 36. The tubes 40 open at their opposite ends 34 and 36, respectively, into headers 42 and 44 which have their respective openings 42*a* and 44*a* (FIGS. 1 and 2) disposed in a common plane and which hose fittings 46 and 48 extending upwardly therefrom and to which the hoses 24 and 26 are adapted to be connected. Thus, water, or other liquid coolants can flow into one header 42 or 44, through one of the openings 42*a* or 44*a*, through the tubes 40 and out the other header 42 or 44 through the other opening 42*a* or 44*a*. The headers 42 and 44 can be constructed to determine the number of passes the water makes between the headers before exiting from the cooler 30.

The perimetrical parts of the bottom or outer sheet portion 32 are extended outwardly of the tube convolutions 40 to form a flange 31 for fastening the cooler unit in the hull opening 28. As clearly shown in FIG. 4, this perimetrical flange 31 is disposed above the plane of the sheet portion 38 substantially equal to the thickness of the hull bottom 14. Thus, when the cooler unit 30 is set in the hull-bottom opening 28 the upper or inner ends of the tube convolutions 40 are disposed sub- [illegible] in the plane of the skin bottom 14. Hence

0610

the entire mid-portions of all of the tubes 40 are disposed entirely below the plane of the respective openings 42a and 44a to the headers.

The disclosed embodiment is constructed and arranged so that the water flowing between the hose fittings 46 and 48 will make three passes through the tubes 40 before leaving the cooler 30. This is accomplished by a partition arrangement provided in each of headers 42 and 44. As shown in FIGURES 3 and 4, the header 44 has a pair of compartments 52 and 54 which are separated by the top wall being connected at 56 to one of the top or innermost convolutions of sheet portion 32. Similarly, the header 42 has its top wall connected at 58 to another of the top or innermost convolutions of sheet portion 32. By virtue of this arrangement, a liquid entering header 44 through hose fitting 48 will initially travel lengthwise through the group of tubes 40 comprising the nine tubes in the right of FIGURE 4 then transversely across the compartment in header 42 which terminates at the connection 58, after which the liquid will travel lengthwise through the group of tubes 40 comprising the nine tubes in the center of FIGURE 4, then transversely across compartment 54, and then once more in the lengthwise direction through the group of tubes 40 comprising the nine tubes in the left of FIGURE 4 and to header 42 and out hose fitting 46.

As can be seen best in FIGURES 1, 2 and 4, only the tube portions 40 of the cooler 30 project outwardly from the skin 14 of the vessel 10, and the fore and aft ends of such tubes 40 are streamlined and merge into the skin 14 so that debris, weeds and the like, will not readily adhere to the tubes to interfere with the heat transfer from the liquid within the tubes 40 to the ambient water. Thus, the maximum heat transfer relationship is established and minimum opportunity is provided for interfering with the flow across the tubes 40 of the ambient cooling water.

It is also to be observed that the optimum flow characteristics of the fresh water within cooler 30 is provided so that maximum cooling efficiency is realized. It is to be noted that a smooth flow path exists from the tubes outside the skin of the ship back to the headers which are within the confines of the skin of the vessel.

The fabricated cooler 30 is secured at its peripheral edge to the hull of the vessel 10 by suitable means, such as the plurality of screws shown at 60. Thus, the cooler 30 forms, in effect, a closure in the hull of the vessel 10.

The cooler 30 is shown located adjacent to the stern of the vessel 10 in alignment with the keel 16. If desired, additional coolers may also be located on opposite sides of the keel 16, as is shown, by way of example, in FIGURE 5. Thus, separate coolers can be used for cooling

purposes in connection with a plurality of pieces of apparatus.

Having thus described my invention, I claim:

1. A marine vessel having a hull opening in the bottom thereof below the water line, a cooler comprising an outer sheet portion of sinuous configuration forming a series of parallel tube convolutions between opposite perimeters thereof, a pair of headers disposed transversely along the opposite perimeters of the outer sheet portion and having bottom openings communicating with the adjacent ends of the respective tube-forming convolutions, another sheet portion superimposed on the lower sheet portion between the headers and closing the innermost ends of the series of tube-forming convolutions, means fixed at diagonally opposite ends of the respective headers for communication with a fluid cooling system, each of the headers having a wall portion connected to one of the convolutions of the lower-sheet portion to transversely partition the header in two compartments, an outwardly-extending flange integrated with the outer sheet portion and disposed in a plane above the inner ends of the tube-forming convolutions and extending entirely around the perimeter of outer sheet portion, the unit being set in the hull opening with the flange secured to the hull to dispose the tube-forming convolutions entirely below the skin of the vessel bottom.

2. A cooler comprising an outer sheet portion of sinuous configuration forming a series of parallel tube convolutions between opposite perimeters thereof, a pair of headers disposed transversely along the opposite perimeters of the outer sheet portion and having bottom openings communicating with the adjacent ends of the respective tube-forming convolutions, another sheet portion superimposed on the lower sheet portion between the headers and closing the innermost ends of the series of tube-forming convolutions, means fixed at diagonally opposite ends of the respective headers for communication with a fluid cooling system, and each of the headers having a wall top portion connected to one of the convolutions of the lower sheet portion adjacently inward from the respective bottom opening by an inwardly curved portion of the top wall of the respective header to transversely partition the header into two compartments.

References Cited by the Examiner

UNITED STATES PATENTS

1,511,691	10 1924	Valk	165—44 X
2,415,154	2 1947	Walter	115—0.5 X
2,382,218	8 1945	Fernstrum	115—0.5

MILTON BUCHLER, *Primary Examiner.*

ANDREW H. FARRELL, *Examiner.*

Exhibit H

23

Int. Cl. 7

United States Patent Office

941,382

Registered Aug. 22, 1972

PRINCIPAL REGISTER
Trademark

see 8
for
10 yrs.

Ser. No. 343,833, filed Nov. 18, 1969

GRIDCOOLER

R. W. Fernstrum & Company (Michigan corporation)
Menominee, Mich. 49858

For: EXTERNAL COOLING SYSTEM FOR MARINE ENGINES AND INSTALLED UPON THE HULLS OF WATER CRAFT, in CLASS 23 (INT. CL. 7).
First use on or about June 1, 1950; in commerce on or about June 1, 1950.

A. D. HOOKS, Examiner

Exhibit I

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION OF DOUGLAS L. OEHRLEIN

I, Douglas L. Oehrlein, declare:

1. I am the President of Oarline Marine, marine equipment manufacturers representative located at 74257 Highway 25, Covington, Louisiana 70435. I founded Oarline Marine in 1980.

2. I have a Mechanical Engineering Degree from the University of Hawaii.

3 I have been in the ship building and marine equipment industry for twenty-three years. Prior to starting Oarline Marine, I was the Marketing Director for Dravo Steelship where I was responsible for specifying the marine equipment used in the production of the vessels built by Dravo Steelship. I also worked for Tidewater Marine Service, the world's largest offshore supply boat company. At Tidewater Marine Service, I was responsible for selling the Inland towing services of the company.

4. During my twenty-three years in the ship building and marine equipment industry, I have had the opportunity to inspect, touch, feel, and otherwise view many different keel cooling devices.

5. There are two basic methods for cooling a marine diesel engine. One type of cooling system is the in-board heat exchanger which brings seat water into the engine room via a pump and tubing. The cool sea water is circulated through the tubing past the fresh water from the engine. The heat from the fresh water is transferred to the sea water which is then dumped overboard through the engine exhaust.

6. The second type of cooling is outboard cooling or keel cooling. In keel cooling, the fresh water from the engine is piped into a cooling device attached to the outside of the boat and sea water flows past the cooling device as the boat moves through the water. Once again, the heat is transferred from the fresh water from the engine to the sea water.

7. Keel cooling systems are fabricated by using large (6-8 inch) channel iron to circulate the fresh water inside the channel for heat transfer or cooling. Johnson Durmax uses a round tube keel cooling device that that has two headers with inlet and outlet ports connected via a series of round tubes. Walter Marine Company designed a keel cooling device utilizing round spiral

tubes.

8. The R. W. Fernstrum GRIDCOOLER keel cooler is one of many methods of keel cooling available in the marine industry. I have been familiar with R. W. Fernstrum GRIDCOOLER keel coolers for over seventeen years. The R. W. Fernstrum GRIDCOOLER keel cooler was designed by R. W. Fernstrum and has a unique and unmistakable appearance which may be described as follows: the R. W. Fernstrum & Company GRIDCOOLER is constructed of a series of rectangular tubes connected via headers located at each end of the tubes, thus forming a grid-like appearance which is unique in the industry.

9. I am in daily contact with many boat manufacturers and boat owners and a substantial number of these people recognize keel coolers with a flat, grid-like appearance on the top and bottom of the product as originating with R. W. Fernstrum and they associate these products exclusively with R. W. Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 12-19, 1997

By: Douglas R. Oehrlein

Douglas L. Oehrlein

Exhibit J

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION OF ROBERT L. GILSON

I, Robert L. Gilson, declare:

1. I am the owner of Gilson Marine & Industrial, a company that functions as a manufacturers' representative for several products in the marine industry, including the R. W. Fernstrum & Company GRIDCOOLER. I formed my company approximately one year ago.

2. I have twenty-two years in the marine equipment business. Prior to starting Gilson Marine & Industrial, I worked for Lucian Q. Moffitt, Inc. from 1963 through 1972 as a sales representative for BF Goodrich Cutless Bearings. CUTLESS bearings are underwater products. From 1973 to 1977, I was the Sales Manager for Seles, Inc. in Akron, Ohio, marketing machine and hand tools in the tire and rubber industry. Seles, Inc. was acquired by Everhard Products (of Canton, Ohio) and from 1977 to 1984, I worked for Everhard Products as its Sales Manager. In 1984, I joined B.F. Goodrich Company. From 1984 through 1996, I was the

National Sales/Marketing Manager of Marine Products for BF Goodrich Company. BF Goodrich marketed a variety of marine products including water lubricated CUTLESS propeller shaft bearings.

3. During my twenty-two years in the marine equipment industry, I have had the opportunity to become very familiar with several different keel cooling devices manufactured by companies such as Walter Machine Company, Johnson Duramax Marine, Channel Iron, and R. W. Fernstrum & Company.

4. The Walter Machine Company keel cooler has spiral tubing which can be taken off the boat without disturbing the inboard plumbing.

5. The Johnson Duramax Marine keel cooler has spiral tubing which can be taken off the boat and changed in the field.

6. The Channel Iron keel cooler is a homemade version using channel iron for keel cooling.

7. The R. W. Fernstrum & Company GRIDCOOLER has rectangular tubing and has excellent quality.

8. The identifying feature of the R. W. Fernstrum & Company GRIDCOOLER is the rectangular tubing which creates a grid-

like appearance.

9. I am in daily contact with many shipyards and boat owners and a substantial number of these people recognize and associate keel coolers with the previously described rectangular tubing exclusively R. W. Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 12/22, 1997 By: Robert L. Gilson
Robert L. Gilson

Exhibit K

Exhibit K

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Jon Weaver (Name), declare:

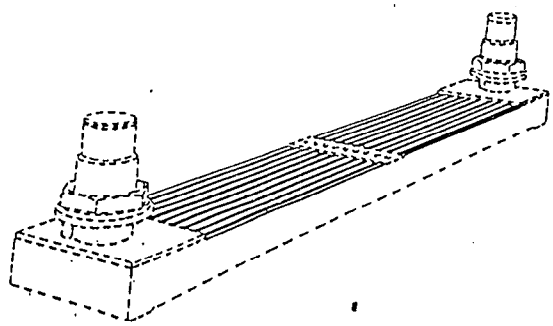
1. I am the Estimator (Title/Position) of Marine Construction & Design (Company Name),

a Shipyard (Type Of Company), located at 2300 W. Commodore Way, Seattle, Wa

I have been employed at Marine Construction & Design for 11 years.

2. Marine Construction & Design has been a customer of R. W. Fernstrum & Company for at least 30 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 30 years, Marine Construction & Design has purchased approximately 24 keel coolers from R. W. Fernstrum & Company, and has installed hundreds of Owner furnished R.W. Fernstrum keel coolers during conversions & modifications.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: Feb 24, 1998, 199X

By: _____

Name: Jon Weaver

Title: Estimator

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Chris Peteeson (Name), declare:

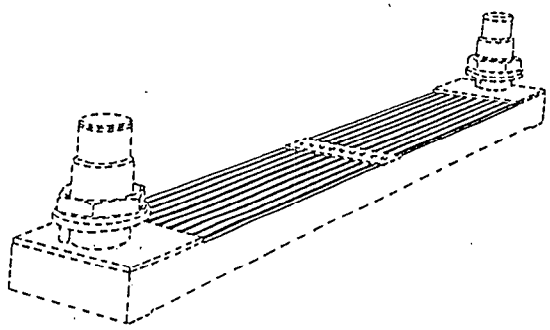
1. I am the Marine Engineer (Title/Position) of Guido Perla and Associates (Company Name), a Consulting Naval Architecture (Type Of Company), located at 720 Third Avenue, Suite 1200, Seattle, WA.

I have been employed at Guido Perla and Associates for 5 years.

2. ~~_____ has been a customer of R. W. Fernstrum & Company for at least ___ years.~~

Guido Perla and Associates has specified R.W. Fernstrom products for at least three years

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 3 years, Guido Perla and Associates has ~~purchased~~ specified approximately 30 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: March 3, 1997 By: [signature]

Name: Christopher A. Peterson

Title: Naval Architect / Marine Engineer

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, DOUG DIXON (Name), declare:

1. I am the VICE PRESIDENT (Title/Position) of GUIDO PERELLA & ASSOC (Company Name)

a NAVAL ARCHITECTURE (Type Of Company), located at 720 3RD AV

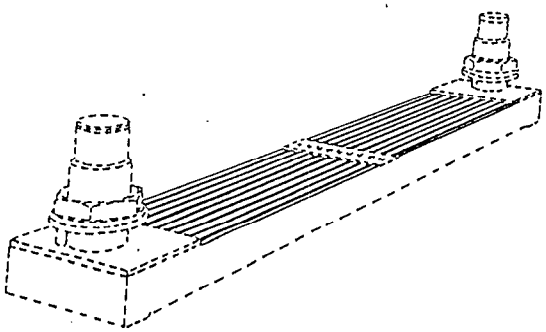
SEATTLE, WA.

I have been employed at GPA for 1 years.

2. ~~_____ has been a customer of R. W. Fernstrum & Company for at least ___ years.~~

SPECIFICS

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 5 years, GA has ~~purchased~~ approximately 30 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

with the keel cooler sold by R.
shown below:

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 3/6, 1998

By: [signature]

Name: Doug Dixon

Title: V.P.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, DON Fields, (Name), declare:

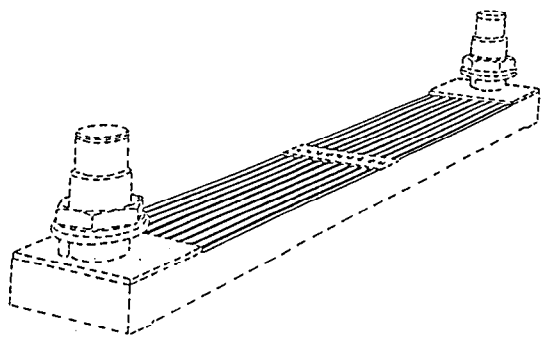
1. I am ~~the~~ an engineer (Title/Position) of The Glosten Assoc, Inc. (Company Name)

a Naval Arch. & Marine Engr. (Type Of Company), located at Seattle, Washington

I have been employed at The Glosten Assoc for 20 years.

2. The Glosten Assoc, Inc. has been a ~~customer~~ specifier of R. W. Fernstrum & Company for at least 20 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. ~~Over the past _____ years, _____ has purchased approximately _____ keel coolers from R. W. Fernstrum & Company.~~ DMF

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

~~7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.~~ D.M.F.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: March 3, 1998 By: Don M. Field

Name: Don M. Field

Title: Engineer

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Rick Schuster (Name), declare:

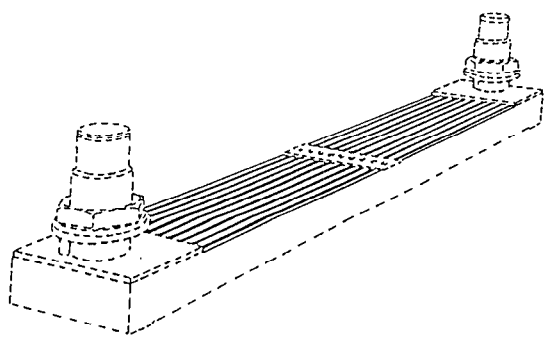
1. I am the MARINE ENGINEER (Title/Position) of THE GLOSTEN ASSOCIATES (Company Name)

a CONSULTING FIRM (Type Of Company), located at SEATTLE, Wa.

I have been employed at GLOSTEN for 10 years.

2. Rick Schuster has been a customer of R. W. Fernstrum & Company for at least 18 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



Engineered applications for

4. Over the past 18 years, Rick Schuster has ~~purchased~~ approximately 15 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of ~~boat manufacturers and boat owners~~ marine consultants recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: March 4, 1998 By: H. R. Schuster

Name: HAROLD SCHUSTER

Title: MARINE ENGINEER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

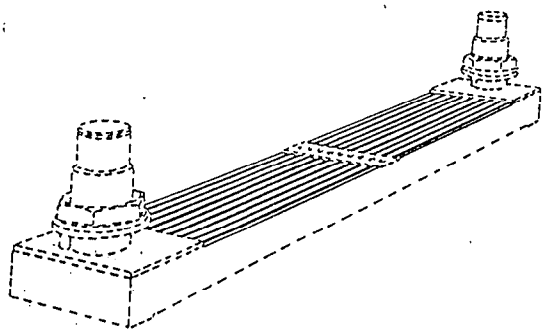
I, JONATHAN G. PARROTT (Name), declare:

1. I am the CHIEF NAVAL ARCHITECT (Title/Position) of JENSEN MARITIME CONSULTANTS (Company Name), a MARINE DESIGN/ENG'R'G (Type Of Company), located at 4241 21st AVE WEST, SEATTLE, WA 98199.

I have been employed at Jensen Maritime for 18½ years.

2. Jensen Maritime has ~~been a customer~~ worked with & specified equipment from of R. W. Fernstrum & Company for at least 15 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 15 years, Jensen MARITIME has ~~purchased~~ specified approximately 24 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2/27, 1998

By: Jonathan G. Parrott

Name: JONATHAN G. PARROTT

Title: CHIEF NAVAL ARCHITECT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

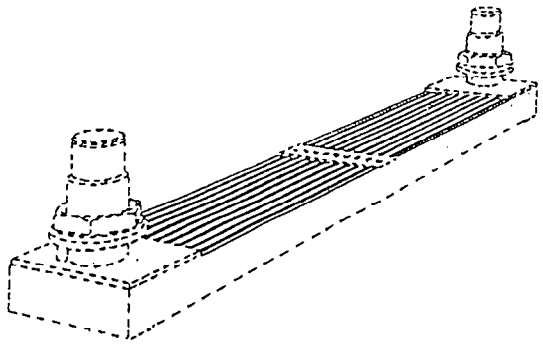
I, Preston Shuford (Name), declare:

1. I am the V.P. (Title/Position) of Higman (Company Name), a Inland Marine (Type Of Company), located at Orange, Texas.

I have been employed at Higman for 15 years.

2. Higman has been a customer of R. W. Fernstrum & Company for at least ~~25~~ 31 years. The M/V. Johnny Brown has Fernstrum Coolers & has had them since it was built in 1967 at Gulfport Shipyard, Port Arthur, Texas.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past ~~25~~ 31 years, Higman has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2-26, 1998

By: Higman Towing

Name: Preston Shuford

Title: V.P.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Gordon A. Keenan (Name), declare:

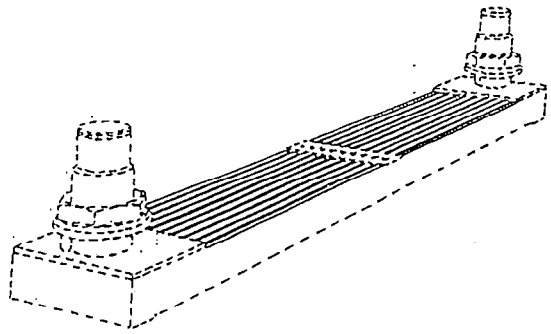
1. I am the Vice President (Title/Position) of Midstream Fuel Service, Inc. (Company Name)

a Marine Transportation (Type Of Company), located at P. O. Box 2826, Mobile, AL 36652

I have been employed at Midstream for 2 years.

2. Midstream has been a customer of R. W. Fernstrum & Company for at least 19 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



During eight years of inland towboat maintenance and repair experience at Exxon Shipp Company and Midstream Fuel Service, Inc., I have worked with many keel coolers from R. W. Fernstrum & Company.

4. Over the past 2 years, Midstream Fuel Service, Inc. has purchased approximately 0 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 199~~X~~8 By: _____

Name: Gordon A. Keenan

Title: Vice President

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, John B. Rice (Name), declare:

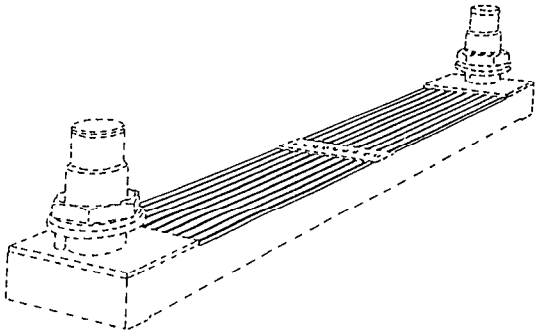
1. I am the President (Title/Position) of Byrne, Rice & Turner (Company Name)

a marine supply company (Type Of Company), located at 1172 CAMP ST, New Orleans, La.

I have been employed at Byrne, Rice & Turner for 16 years.

2. Byrne, Rice & Turner has been a customer of R. W. Fernstrum & Company for at least 7 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 7 years, Byrne, Rip & Turner has purchased approximately 117 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R. W. Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, declares that he is properly authorized to execute this declaration on behalf of Byrne, Rice & Turner; and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 12/3, 1997 By: John B. Rice

Name: John B. Rice

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, John Schillesci (Name), declare:

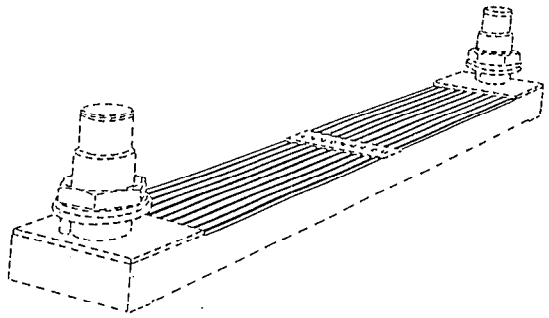
1. I am the SALESMAN (Title/Position) of Byrne Rice & Turner (Company Name)

a marine supply company (Type Of Company), located at 1172 CAMP ST, New Orleans, La.

I have been employed at Byrne, Rice & Turner for 6 years.

2. Byrne, Rice & Turner has been a customer of R. W. Fernstrum & Company for at least 7 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 7 years, Byrne, Rice + Turner has purchased approximately 117 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R. W. Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, declares that he is properly authorized to execute this declaration on behalf of Byrne, Rice and Turner, Inc ; and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 12/2/97, 1997 By: [signature]

Name: John Schillesci

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Michael D. Parks (Name), declare:

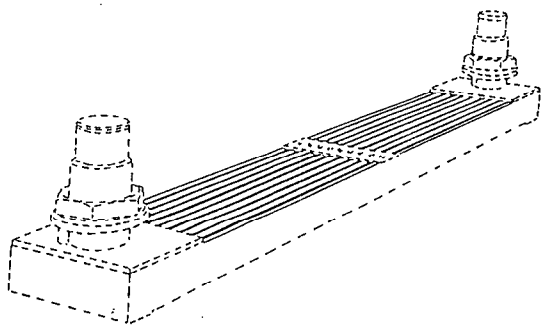
1. I am the Sales Person (Title/Position) of Byrne Rice & Turner (Company Name)

a marine supply company (Type Of Company), located at 1172 Camp St, New Orleans, La.

I have been employed at Byrne, Rice & Turner for 2 years.

2. Byrne Rice & Turner has been a customer of R. W. Fernstrum & Company for at least 7 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 7 years, Byrne, Rice + Turner has purchased approximately 117 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R. W. Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, declares that he is properly authorized to execute this declaration on behalf of BYRNE, RICE + TURNER; and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 12/3, 1997 By: Michael D Parks

Name: MICHAEL D. PARKS

245-3401

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

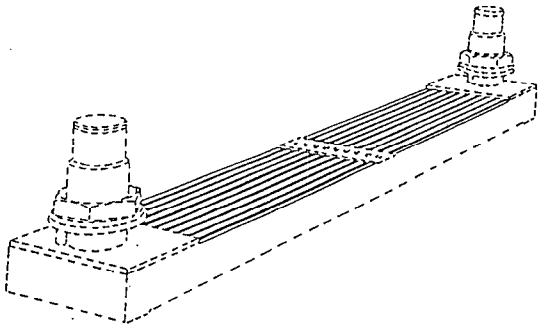
I, Dwight E. Hall (Name), declare:

1. I am the Vice President Operations (Title/Position) of Davis Boat Works, Inc (Company Name) a Vessel Repair (Type Of Company), located at 99 Jefferson Ave Newport News, Virginia 23607.

I have been employed at Davis Boat Works for 13 years.

2. Davis Boat Works has been a customer of R. W. Fernstrum & Company for at least 13 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 13 years, Davis Boat Works, has purchased approximately 20 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 3-2, 1998

By: Dwight E Hall

Name: Dwight E Hall

Title: Vice President Operation

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

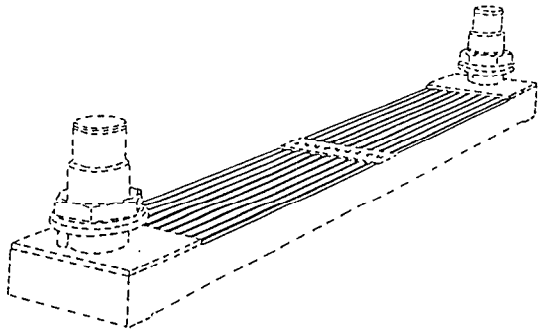
I, STEVE PLANCICH (Name), declare:

1. I am the SUPT. (Title/Position) of PACIFIC FISHERMEN INC. (Company Name), a SHIPYARD (Type Of Company), located at SEATTLE WASHINGTON.

I have been employed at PAC. FISH. for 12 years.

2. PAC. FISH. INC. has been a customer of R. W. Fernstrum & Company for at least 12 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 12 years, PAC. FISH. INC. has purchased approximately 5 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: FEB. 25, 1998 By: Stephen Planck

Name: STEPHEN PLANCK

Title: SUPERINTENDENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, P.T. DENNEY (Name), declare:

1. I am the SHIP SUPT. (Title/Position) of PACIFIC FISHERMEN, INC (Company Name)

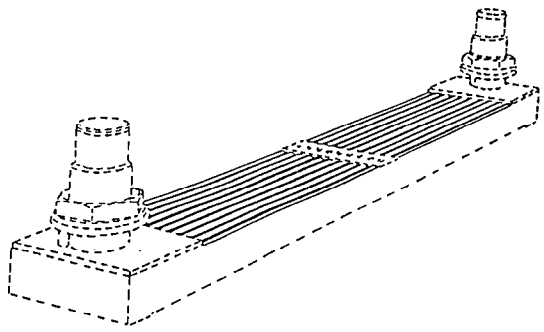
a SHIP YARD (Type Of Company), located at 5351 24TH AVE N.W.

SEATTLE, WA 98107-4196.

I have been employed at PACIFIC FISHERMEN for 10 years.

2. PACIFIC FISHERMEN has been a customer of R. W. Fernstrum & Company for at least 10 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 10 years, _____ has purchased approximately 20 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2/27/98, 1997 By: P.T. Denney

Name: PATRICK T. DENNEY

Title: SHIP SUPT.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, BRUCE CULVER (Name), declare:

1. I am the OWNER (Title/Position) of BRUCE CULVER, NAVAL ARCHITECT (Company Name)

a ENGINEERING CONSULTANT (Type Of Company), located at SEATTLE, WASHINGTON

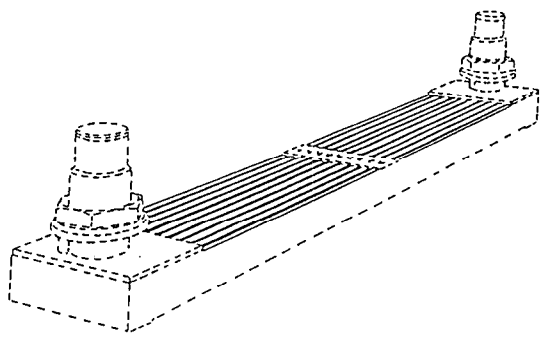
_____.

I have been employed at BRUCE CULVER, NAVAL ARCHITECT for 7 years.

2. _____ has been a customer of R. W. Fernstrum & Company for at least ___ years.

HAVE NEVER DIRECTLY PURCHASED KEEL COOLERS

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past _____ years, _____ has purchased approximately 0 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: FEB. 25, 1997 By: Bruce A. Culver

Name: BRUCE A. CULVER

Title: OWNER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

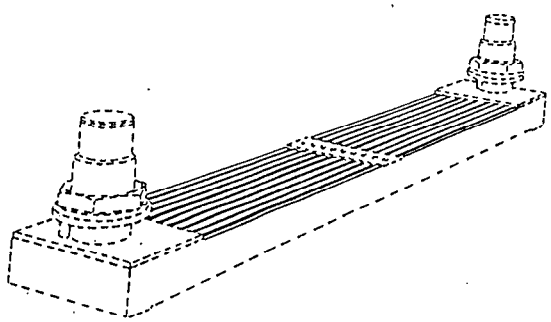
I, JAMES A. COLE (Name), declare:

1. I am the BUSINESS DEVELOPMENT & DESIGN (Title/Position) of ELLIOTT BAY DESIGN GROUP (Company Name) a NAVAL ARCHITECTS & MARINE ENGINEERS (Type Of Company), located at 5301 SHILSHOLE AVE. NW, SUITE 200, SEATTLE, WASHINGTON 98107.

I have been employed at ELLIOTT BAY DESIGN GROUP for 4 years.

2. ELLIOTT BAY DESIGN GROUP has been a customer of R. W. Fernstrum & Company for at least 8 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 8 years, ELLIOTT BAY DESIGN GROUP has ~~purchased~~ SPECIFIED approximately 50 keel coolers ~~from~~ MFG. BY R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: MAR. 2, ~~1997~~ 1998

By: James A. Cole

Name: JAMES A. COLE

Title: BUSINESS DEVELOPMENT & DESIGN

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

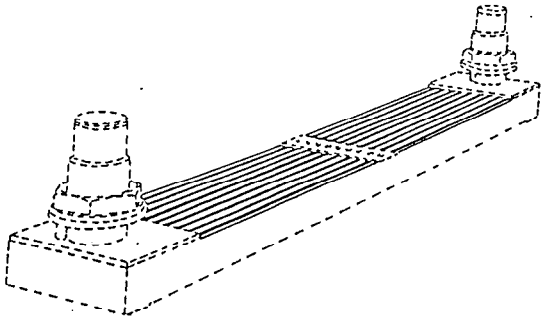
I, BRIAN KING (Name), declare:

1. I am the CHIEF MARINE ENGINEER (Title/Position) of ELLIOTT BAY DESIGN GROUP (Company Name) a ENGINEERING CORPORATION (Type Of Company), located at ~~STATE~~ 5301 SHILSHOLE AVE, NW, SEATTLE, WA 98107.

I have been employed at ELLIOTT BAY DESIGN for 10 years.

2. ELLIOTT BAY DESIGN has been a customer of R. W. Fernstrum & Company for at least 9 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 9 years, ELLIOTT BAY DESIGN has ~~purchased~~ specified approximately 36 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: MARCH 2, ~~1997~~ 1998 By: _____

Name: BRIAN KING

Title: CHIEF MARINE ENGINEER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

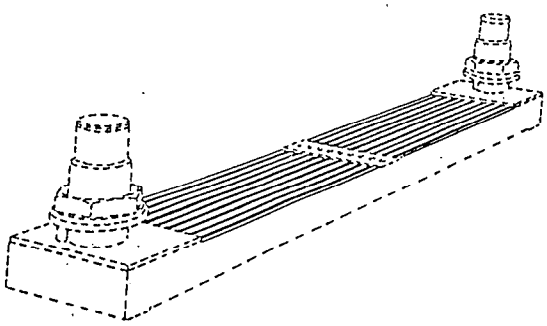
I, L. PAUL ZANKICH (Name), declare:

1. I am the PRESIDENT (Title/Position) of COLUMBIA-SENTINEL ENGINEERS INC. (Company Name), a NAVAL ARCHITECTURE & MARINE ENGINEERING (Type Of Company), located at 3840 WEST MARGINAL WAY S.W. SEATTLE, WA 98106.

I have been employed at COLUMBIA-SENTINEL AND MARINE POWER ~~AND EQUIPMENT~~ CO for 12 years, for 8 YEARS

2. COLUMBIA-SENTINEL & my PREVIOUS EMPLOY AT MARINE POWER ~~& EQUIPMENT CO.~~ has been a customer of R. W. Fernstrum & Company for at least 20 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 20 years, I have specified ~~has purchased~~ approximately 30 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 24 February, 1997

By: L Paul Zankich

Name: L. PAUL ZANKICH

Title: PRESIDENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

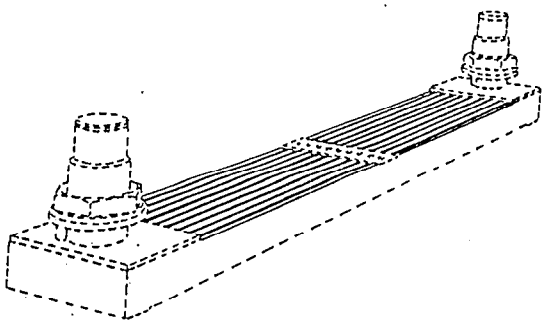
I, Bruce Whittomore (Name), declare:

1. I am the Vice President-Engineering (Title/Position) of Marco Seattle (Company Name), a Shipbuilders, Naval Architects (Type Of Company) & Machinery Manufacture located at Seattle, Washington, USA.

I have been employed at Marco Seattle for 12 years.

2. Marco Seattle has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Marco Sonic has purchased approximately 25 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2-24, 1998 By: [signature]

Name: Bruce O. Whittemore

Title: Vice President - Engineering
Naval Architectures

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, DUANE LIABLE (Name), declare:

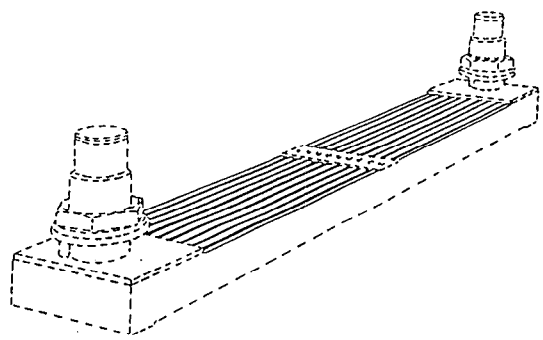
1. I am the PRESIDENT (Title/Position) of THE GLOSTEN ASSOC. (Company Name)

a NAVAL ARCH./MAR. ENGR. (Type Of Company), located at SEATTLE, WA

I have been employed at GLOSTEN for 27 years.

2. THE GLOSTEN ASSOC. has been a ~~customer~~ SPECIFIER of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Glosten has ~~purchased~~ specified approximately 100 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W.. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 27 FEB, 1998 By: Duane H. Laible

Name: DUANE H. LAIBLE

Title: PRESIDENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

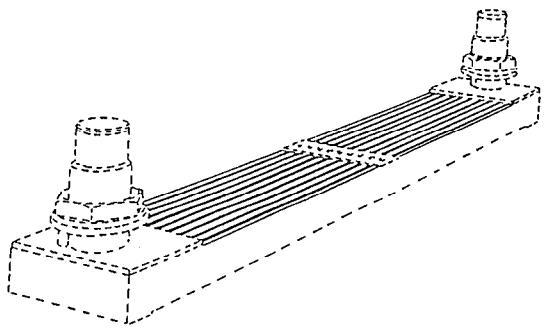
I, STEVE CAMPBELL (Name), declare:

1. I am the MARINE SALES (Title/Position) of CARTER MACHINERY CO. (Company Name) a CATERPILLAR DISTRIBUTOR (Type Of Company), located at 1601 S. MAIN ST., NORFOLK, VA.

I have been employed at CARTER MACH. CO. for 12 years.

2. CARTER MACHINERY has been a customer of R. W. Fernstrum & Company for at least 18 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 12 years, CARTER MACHINERY has purchased approximately 12 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2/25, 1997 By: Steve Campbell

Name: STEVE CAMPBELL

Title: MARINE ENGINE SALES

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, ROBERT H SHREWSBURY Jr, declare:
(Name)

1. I am the PRESIDENT/owner of WESTERN TOWBOAT Co. Inc.
(Title/Position) (Company Name)

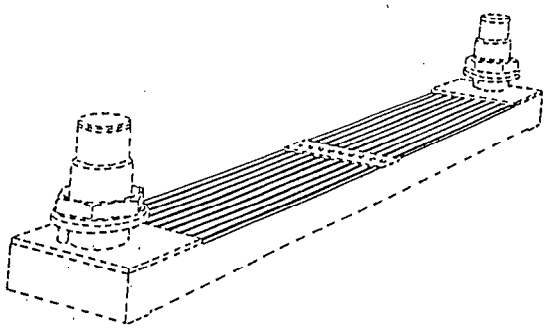
a TUG & BARGE OPERATOR located at 617 NW 40th ST
(Type of Company)

Seattle WA 98107.

I have been employed at WESTERN TOWBOAT for 28 years.

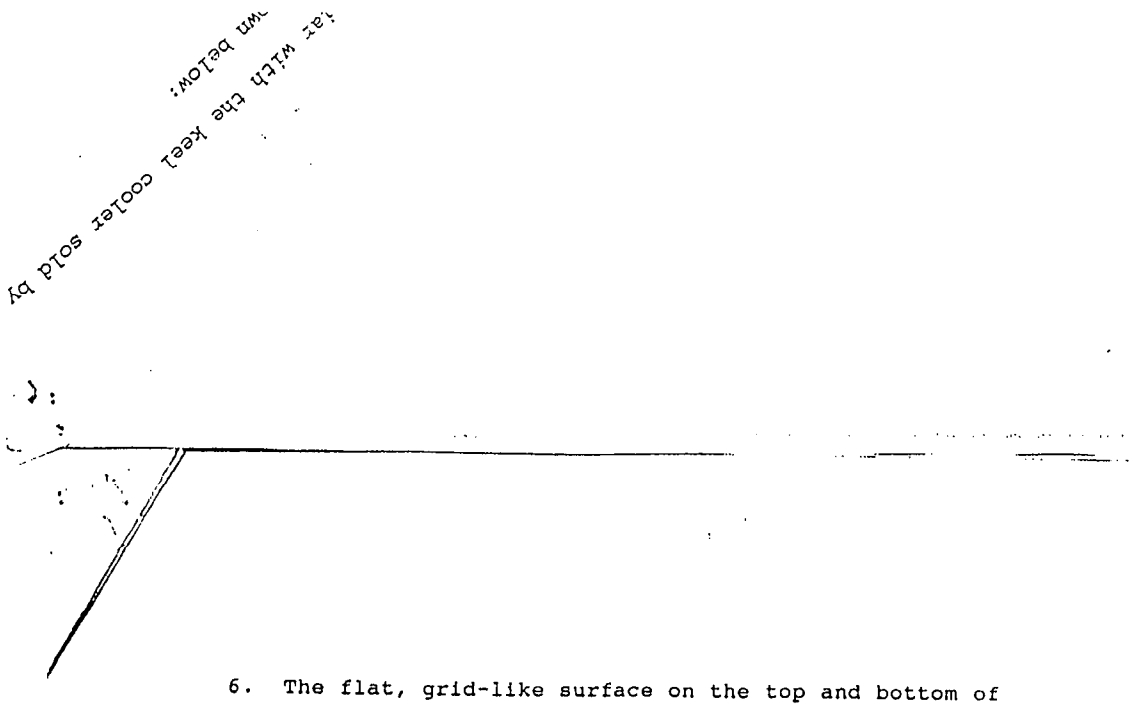
2. WESTERN TOWBOAT has been a customer of R. W. Fernstrum & Company for at least 30 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 16 years, WESTERN TOWBOAT Co has purchased approximately 18 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.



6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: Tuesday Feb. 24 1998

By: Robert H Shrewsbury

Name: Robert H Shrewsbury Jr

Title: President

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, RICHARD H. SHREWSBURY (Name), declare:

1. I am the SEC / OWNER (Title/Position) of WESTERN TOWBOAT CO. (Company Name)

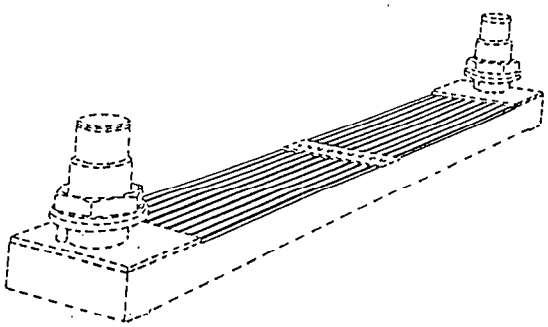
a TUG & BARGE OPERATOR (Type Of Company), located at 617 NW 40TH ST.

SEATTLE WA. 98107-5026.

I have been employed at WESTERN TOWBOAT for 25 years.

2. WESTERN TOWBOAT CO has been a customer of R. W. Fernstrum & Company for at least 30 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 16 years, WESTERN TOWBOAT CO. has purchased approximately 14 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 7-24-, 1998 By: Richard H. Shrewsbury

Name: RICHARD H. SHREWSBURY

Title: Sec.

FRED MEYERS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

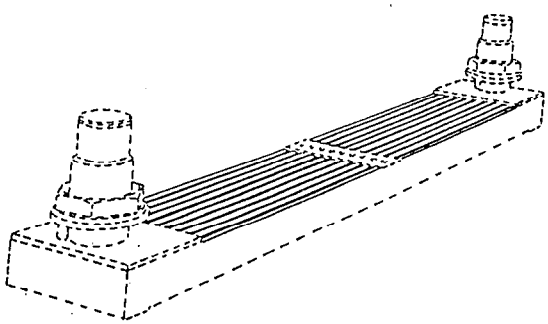
I, DOUGLAS WOLFF (Name), declare:

1. I am the CHIEF NAVAL ARCH (Title/Position) of ELLIOTT BAY DESIGN, GROUP (Company Name) an ENGINEERING CORP (Type Of Company), located at SEATTLE, WA.

I have been employed at ELLIOTT BAY DESIGN for 5 years.

2. N/A has been a customer of R. W. Fernstrum & Company for at least ___ years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 5 years, I HAVE SPECIFIED ~~has purchased~~ approximately 12 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

personally familiar with the keel cooler sold by R. which is shown below:

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2/24/98, ~~1997~~

By: [signature]

Name: DOUGLAS WOLFF

Title: CHIEF NAVAL ARCHITECT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

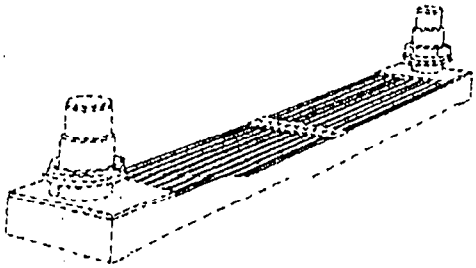
I, PAUL W. SOPER (Name), declare:

1. I am the PORT ENGINEER (Title/Position) of KIRBY INLAND/DIXIE CARRIE (Company Name) a INLAND TUG & BARGE (Type Of Company), located at 2102 BROADWAY HOUSTON, TX. 77012.

I have been employed at KIRBY/DIXIE for 21 years.

2. KIRBY/DIXIE has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 20 years, KIRBY/DIXIE has purchased approximately 30+ keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 3/9/98, 1997

By: Paul W. Soper

Name: Paul W. Soper

Title: Port Engineer

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

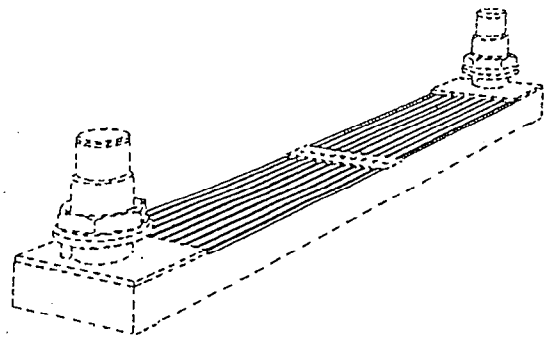
I, Ginger S. Norwood (Name), declare:

1. I am the Personnel Administrator (Title/Position) of Higman Marine (Company Name), a Inland Marine (Type Of Company), located at Orange, TX

I have been employed at Higman Marine for 33 years.

2 Higman has been a customer of R. W. Fernstrum & Company for at least 31 years.

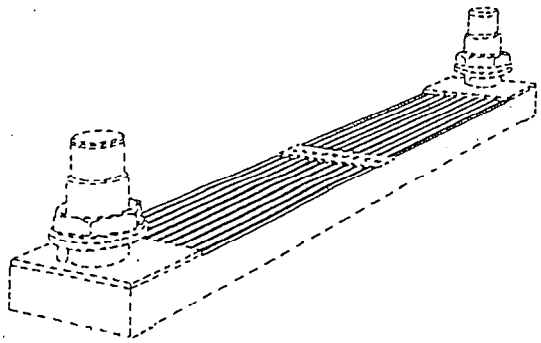
3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 31 years, Nigman has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 31 years, HIGMAN has purchased approximately 280 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2-26-98, ~~1997~~ By: HIGMAN MARINE

Name: Claude Dennis

Title: MAINTENANCE SUPERVISOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, ALBERTO DE LAPUENTE, declare:
(Name)

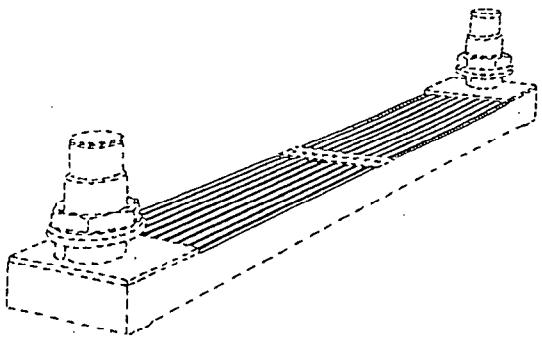
1. I am the FLEET MANAGER of HIGMAN MARINE,
(Title/Position) (Company Name)

a INLAND MARINE, located at ORANGE, TX.
(Type Of Company)

I have been employed at HIGMAN for 2 years.

2. HIGMAN has been a customer of R. W. Fernstrum & Company for at least 31 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 31 years, HIGMAN has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2-26-98, ~~1997~~ By: HIGMAN MARINE

Name: ALBERTO DELA PUENTE

Title: [illegible]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

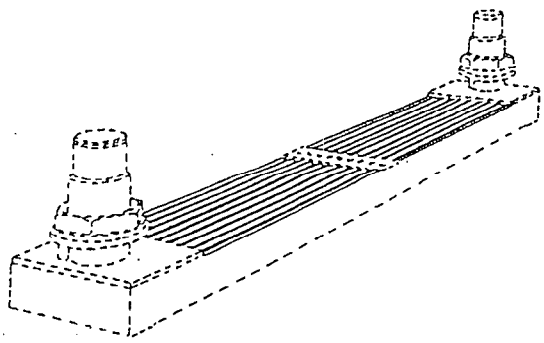
I, RANDY LAUGHLIN (Name), declare:

1. I am the PORT CAPTAIN (Title/Position) of HILMAN MARINE (Company Name), a INLAND MARINE (Type Of Company), located at ORANGE TX

I have been employed at HILMAN for 23 years.

2 HILMAN has been a customer of R. W. Fernstrum & Company for at least 31 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 31 years, HILGMAN has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 2-26-98, 1997

By: HILGMAN MARINE

Name: [illegible]

Title: Port Captain

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

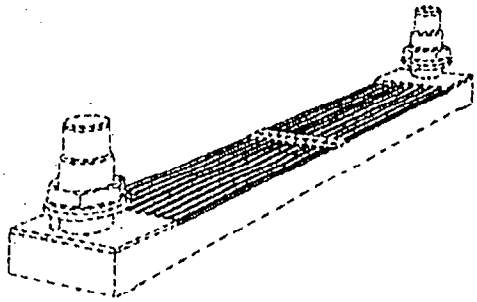
I, Christopher Cole (Name), declare:

1. I am the Sales & Marketing (Title/Position) of HALTER MARINE, INC. (Company Name), a Shipbuilder (Type Of Company), located at Equitable Shipyard (HALTER) 4325 FRANCE ROAD, NEW ORLEANS, LA 70126

I have been employed at Halter Marine for 7 years.

2. HALTER MARINE has been a customer of R. W. Fernstrum & Company for at least 30 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 7 years, HALTER MARINE has purchased approximately 700 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 8/27, 1998

By: Higman Marine

Name: Ginger S. Norwood

Title: Personnel Administrator

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: March 12, 199

By: Christopher M. Cole

Name: Christopher M. Cole

Title: Sales & Marketing Mgr.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Charles E. Burrell (Name), declare:

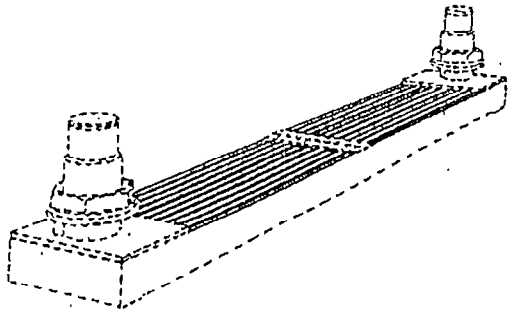
1. I am the Sales Manager (Title/Position) of LEEVAC Shipyards, Inc (Company Name)

a Shipyard (Type Of Company), located at Jennings, Louisiana

I have been employed at LEEVAC Corporate Transportation Shipyard for 30 years.

2. LEEVAC Shipyards Inc has been a customer of R. W. Fernstrum & Company for at least 30 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 30 years, LEEVAC SHIPYARDS, INC has purchased approximately MANY keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: March 11, 1998 By: Charles E. Burrell

Name: Charles E. Burrell

Title: Sales Manager

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Bob Jones (Name), declare:

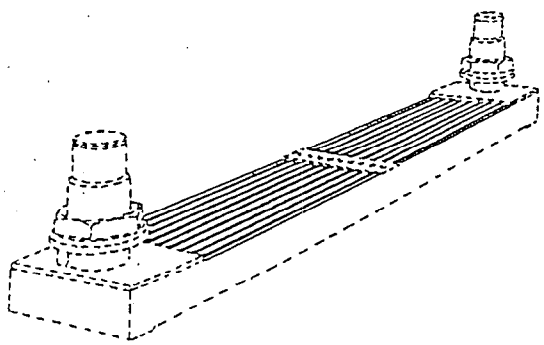
1. I am the Manager of Purchasing and Accounts (Title/Position) of Mississippi Marine Corporation (Company Name)

a shipyard (Type Of Company), located at 2219 Harbor Front Road, Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 16 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 1998 By: _____

Name: Bob Jones

Title: Manager of Purchasing and Accounts

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Don Stewart (Name), declare:

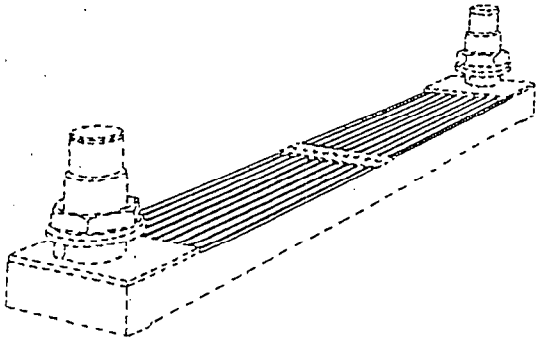
1. I am the Manager of Engineering (Title/Position) of Mississippi Marine Corporation (Company Name)

a shipyard (Type Of Company), located at 2219 Harbor Front Road, Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 20 years.

2 Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 1998 By: Don Stewart

Name: Don Stewart

Title: Manager of Engineering

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Don Ray (Name), declare:

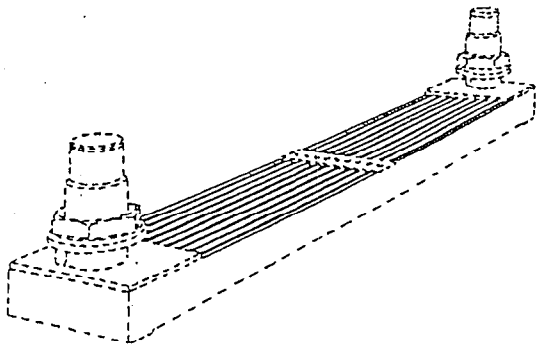
1. I am the Manager, Repair Operations (Title/Position) of Mississippi Marine Corporation (Company Name)

a shipyard (Type Of Company), located at 2219 Harbor Front Road, Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 23 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 1998

By: Don Ray

Name: Don Ray

Title: Manager, Repair Operations

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Tommy McKinnon (Name), declare:

1. I am the Vice President-Operations (Title/Position) of Mississippi Marine Corporation (Company Name)

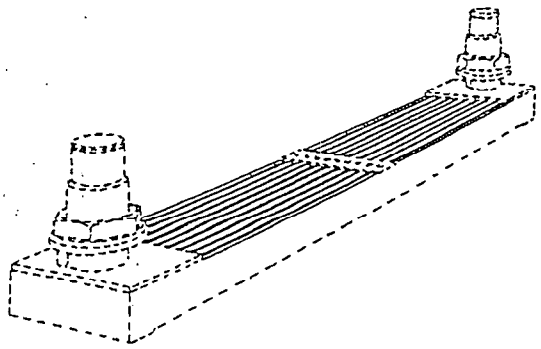
a shipyard (Type Of Company), located at 2219 Harbor Front Road,

Greenville, MS 38701

I have been employed at Mississippi Marine Corporation for 25 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 1998 By: Tommy McKinnon

Name: Tommy McKinnon

Title: Vice President-Operations

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Jeff Nightingale (Name), declare:

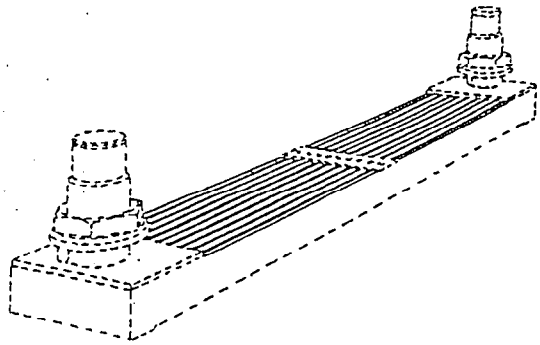
1. I am the Executive Vice President (Title/Position) of Mississippi Marine Corporation (Company Name)

a shipyard (Type Of Company), located at 2219 Harbor Front Road, Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 25 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No. .
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, CHARLES DUNIC (Name), declare:

1. I am the MAINTENANCE SUPERVISOR (Title/Position) of HIGMAN MARINE (Company Name), a INLAND MARINE (Type Of Company), located at ORANGE, TX.

I have been employed at HIGMAN for 20 years.

2 HIGMAN has been a customer of R. W. Fernstrum & Company for at least 31 years.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Jeff Nightingale (Name), declare:

1. I am the Executive Vice President (Title/Position) of Mississippi Marine Corporation (Company Name)

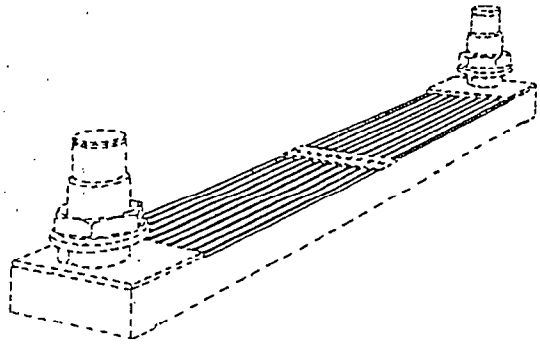
a shipyard (Type Of Company), located at 2219 Harbor Front Road,

Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 25 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, CHARLES DUNIC (Name), declare:

1. I am the MAINTENANCE SUPERVISOR (Title/Position) of HIGMAN MARINE (Company Name), a INLAND MARINE (Type Of Company), located at ORANGE, TX.

I have been employed at HIGMAN for 20 years.

2. HIGMAN has been a customer of R. W. Fernstrum & Company for at least 31 years.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
	)	
R. W. Fernstrum & Company	)	Examining Attorney
	)	
Serial Nos. 75/	)	
	)	
Filed:	)	Law Office No.
	)	
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, Jeff Nightingale (Name), declare:

1. I am the Executive Vice President (Title/Position) of Mississippi Marine Corporation (Company Name)

a shipyard (Type Of Company), located at 2219 Harbor Front Road, Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 25 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 1998 By: Jeff Nightingale

Name: Jeff Nightingale

Title: Executive Vice President

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, D. John Nichols (Name), declare:

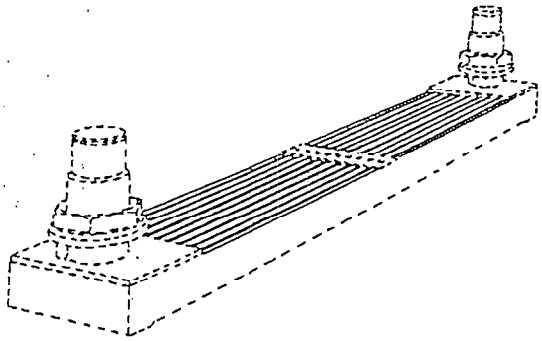
1. I am the President (Title/Position) of Mississippi Marine Corporation (Company Name)

a shipyard (Type Of Company), located at 2219 Harbor Front Road, Greenville, MS 38701.

I have been employed at Mississippi Marine Corporation for 25 years.

2. Mississippi Marine Corporation has been a customer of R. W. Fernstrum & Company for at least 25 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 25 years, Mississippi Marine Corporation has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: February 26, 1998 By: D. John Nichols

Name: D. John Nichols

Title: President

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

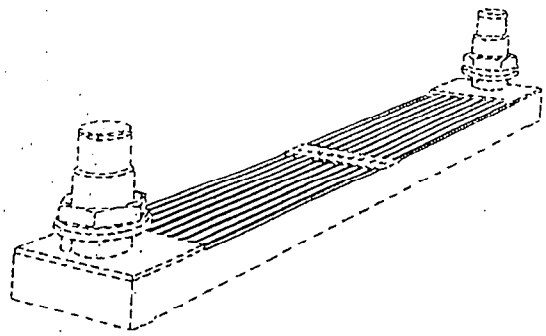
I, ELVEN DYKES (Name), declare:

1. I am the Facility Manager (Title/Position) of Canal Barge Co Inc (Company Name) a Marine Transportation (Type Of Company) located at 835 Union St. New Orleans, La. 70112.

I have been employed at Canal Barge for 29 years.

2. Canal Barge has been a customer of R. W. Fernstrum & Company for at least 30 years.

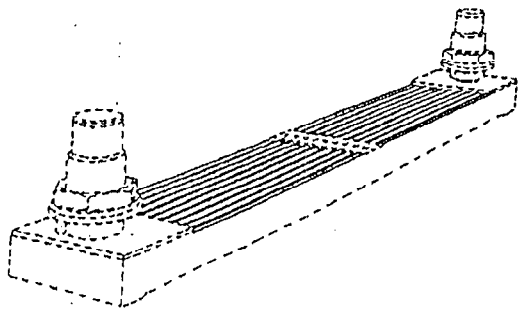
3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past _____ years, _____ has purchased approximately _____ keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 10 years, HOLLYWOOD MARINE, INC. has purchased approximately 20 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 03/10/98, 1997

By: J R Binion

Name: JACK R. BINION

Title: VICE PRESIDENT, OPERATIONS

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 5-3-1998, ~~1999~~ By: Elven Dykes

Name: Elven Dykes

Title: Facility Manager

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of R. W. Fernstrum & Company Serial Nos. 75/ Filed: Mark: The Flat, Grid-Like Surface Of The Keel Cooler	Examining Attorney Law Office No.

DECLARATION

I, William Oliver (Name), declare:

1. I am the V.P. & GM (Title/Position) of Kirby Inland Marine, Maintenance (Company Name)

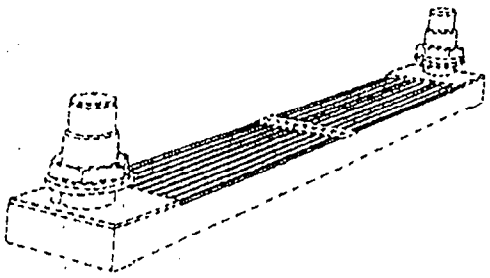
a Marine Transportation (Type Of Company), located at 2102 Broadway

Houston, Tx 77012

I have been employed at Kirby & Chotin for 45 years.

2. Chotin, Dixie & Kirby has been a customer of R. W. Fernstrum & Company for at least 28 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 28 years, Chotin, Dixie & Kirby Vessels has purchased approximately 200 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 3/6, 1998

By: William D. Oliver

Name: Wm D. Oliver

Title: VP & GM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

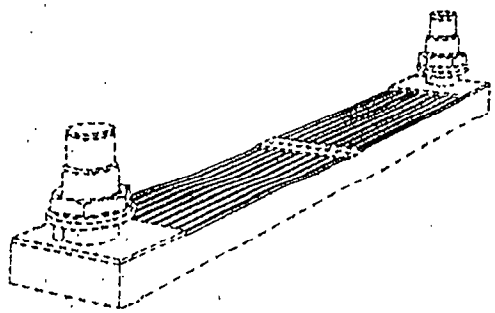
I, RALSTON P. COLE (Name), declare:

1. I am the DIRECTOR (Title/Position) of STEWART + STEVENSON SERVICE INC. (Company Name) a ENGINE DISTRIBUTOR (Type Of Company), located at 1400 DESTREHAN AVE. HARVEY, LOUISIANA 70058.

I have been employed at S+S for 11 years.

2. S+S AND I HAVE ~~has~~ been a customer of R. W. Fernstrum & Company for at least 31 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 31 years, S&S AND/OR I ~~has~~ HAVE purchased approximately 100 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: FEB. 27, 1997 By: Ralston P. Cole

Name: RALSTON P. COLE

Title: DIRECTOR - GULF COAST REGION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

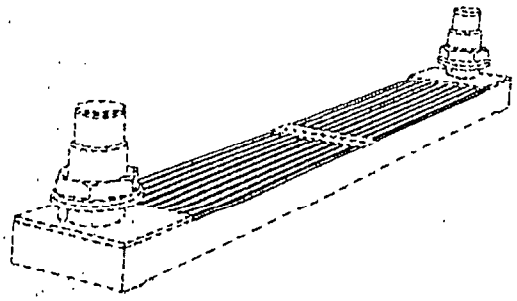
I, Charles McCleskey Jr. (Name) declare:

1. I am the Ops Mgr (Title/Position) of Colle Towing Co (Company Name) a Marine Towing and Tug Repair (Type Of Company) located at P.O. Box 340 Pascagoula, Ms 39568.

I have been employed at Colle Towing Co for 18 years.

2. Colle Towing Co. has been a customer of R. W. Fernstrum & Company for at least 12 years.

3. I am personally familiar with the keel cooler sold by R. W. Fernstrum & Company which is shown below:



4. Over the past 12 years, Colle Towing Co has purchased approximately 20 keel coolers from R. W. Fernstrum & Company.

5. I am not aware of any other manufacturer of keel coolers that produce a keel cooler with a flat, grid-like surface on the top and bottom of the product, that design being formed by a uniform and parallel spacing of tubing.

6. The flat, grid-like surface on the top and bottom of R. W. Fernstrum & Company's keel cooler has become a recognized design uniquely associated with that company.

7. I have observed that a substantial number of boat manufacturers and boat owners recognize that keel coolers with a flat, grid-like appearance on the top and bottom of the product originate are exclusively associated with R.W.Fernstrum & Company.

****

The undersigned being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that all statements made of his own knowledge are true and all statements made on information and belief are believed to be true.

Date: 3-9-98, ~~1997~~

By: [signature]

Name: Charles McVeigh, Jr.

Title: President, V.P.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of	)	
R. W. Fernstrum & Company	)	Examining Attorney
Serial Nos. 75/	)	
Filed:	)	Law Office No.
Mark: The Flat, Grid-Like Surface Of The Keel Cooler	)	

DECLARATION

I, JACK R. BINION (Name), declare:

1. I am the VICE PRESIDENT, OPERATIONS (Title/Position) of HOLLYWOOD MARINE, INC. (Company Name), a PUSHBOAT/BARGE OPERATOR (Type Of Company), located at 55 WAUGH DR., 10TH FLOOR HOUSTON, TEXAS 77251.

I have been employed at HOLLYWOOD MARINE, INC. for 21 years.

2. HOLLYWOOD MARINE, INC. has been a customer of R. W. Fernstrum & Company for at least 10 years.

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT COMMISSIONER FOR TRADEMARKS
2900 Crystal Drive
Arlington, Virginia 22202-3513

Aug 21, 1998

NOTICE OF PUBLICATION UNDER 12(a)

1. Serial No.:
75/382,250

2. Mark:
Miscellaneous Design

3. International Class(es):
11

4. Publication Date:
Sep 22, 1998

5. Applicant:
R. W. Fernstrum & Company

The mark of the application identified appears to be entitled to registration. The mark will, in accordance with Section 12(a) of the Trademark Act of 1946, as amended, be published in the Official Gazette on the date indicated above for the purpose of opposition by any person who believes he will be damaged by the registration of the mark. If no opposition is filed within the time specified by Section 13(a) of the Statute or by rules 2.101 or 2.102 of the Trademark Rules, the Commissioner of Patents and Trademarks may issue a certificate of registration.

Copies of the trademark portion of the Official Gazette containing the publication of the mark may be obtained at $38.00 each for domestic orders, or at $47.50 each for foreign orders from:

The Superintendent of Documents
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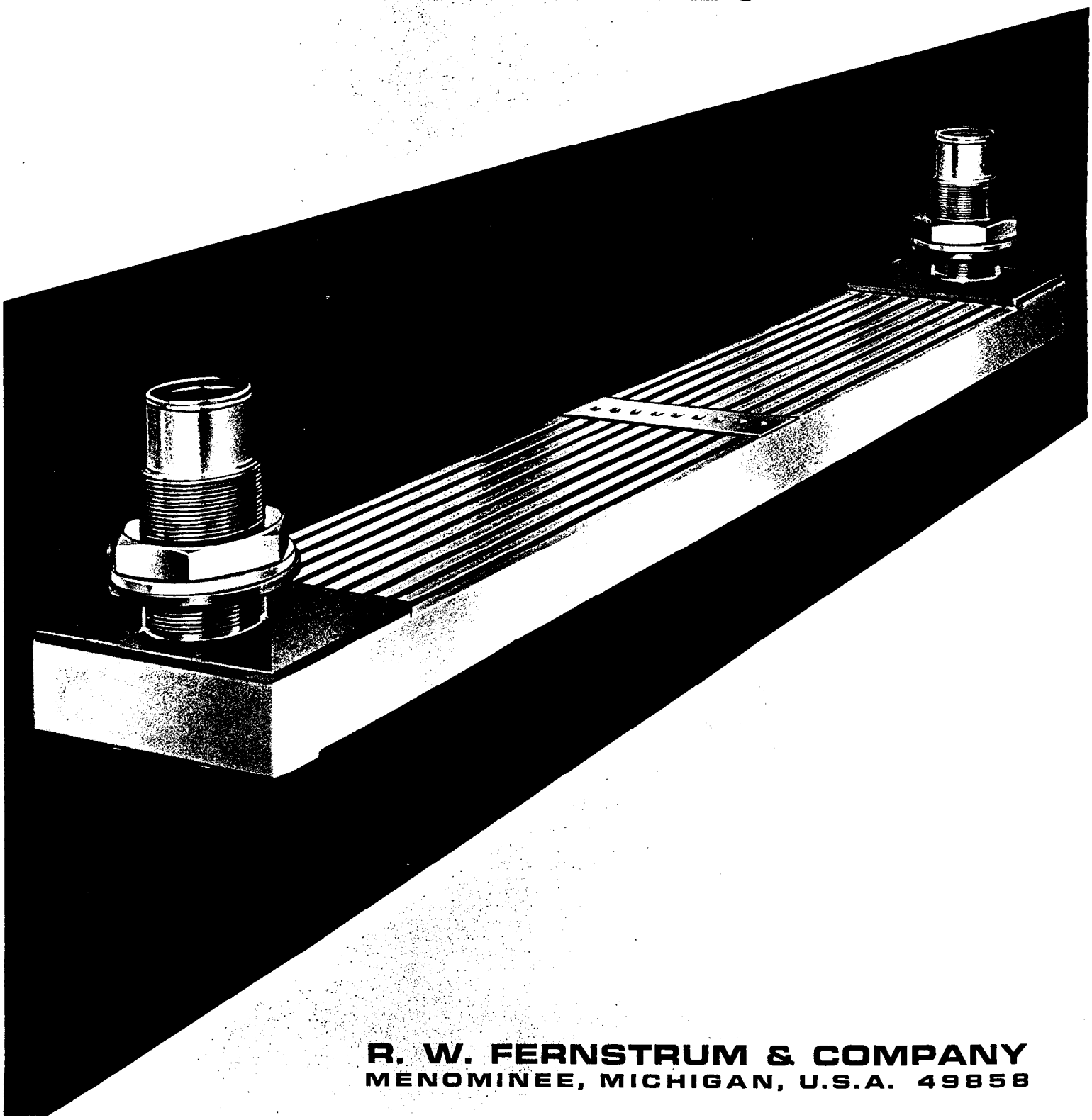
PO Box 371954
Pittsburgh, PA 15250-7954
Phone: (202)512-1800

By direction of the Commissioner.

CATALOG
970

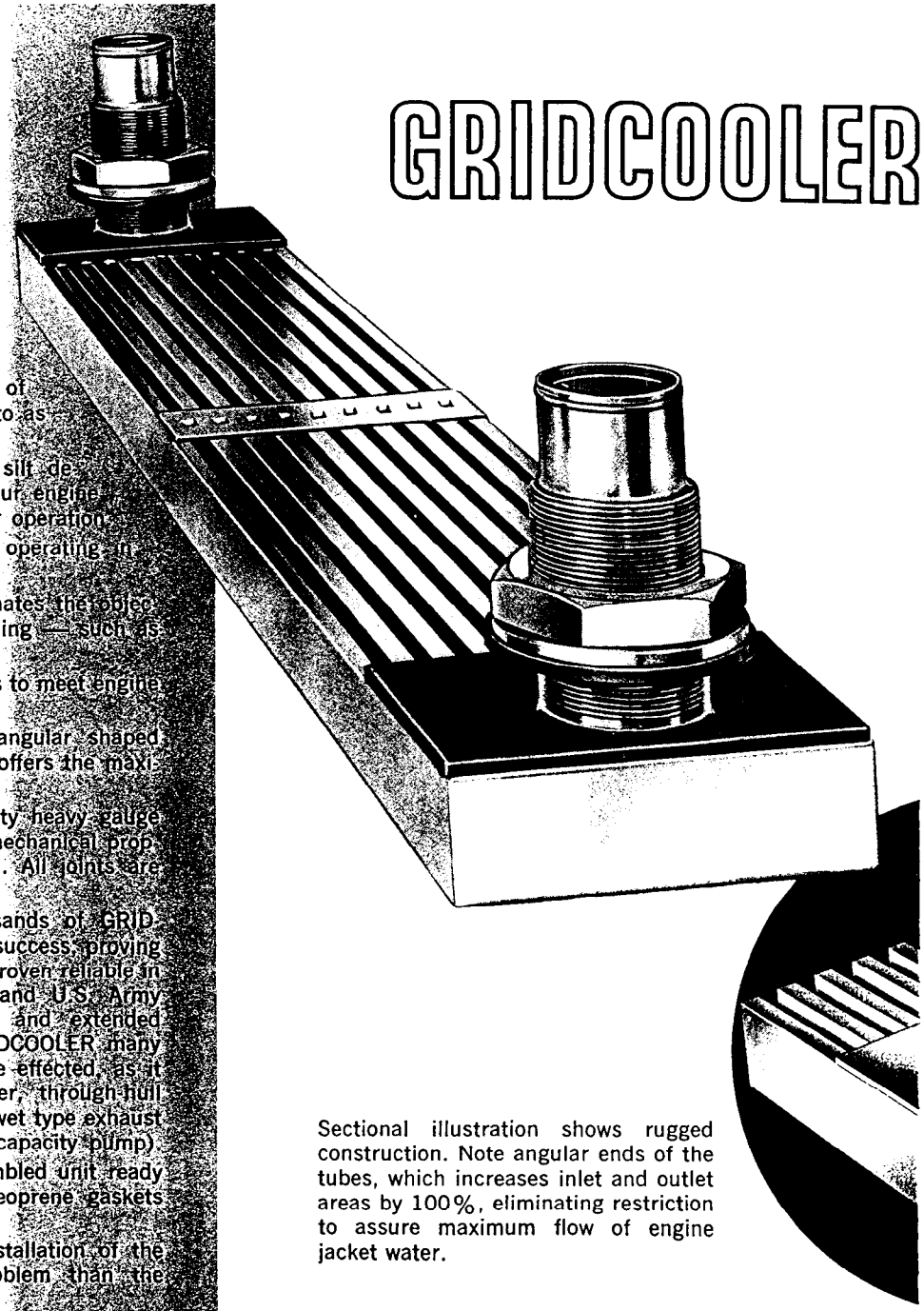
Δ π EXHIBIT 4
Deponent Brakey
Date 4-22-04 Rptr. LK
WWW.DEPOBOOK.COM

FERNSTRUM GRIDCOOLER®



R. W. FERNSTRUM & COMPANY
MENOMINEE, MICHIGAN, U.S.A. 49858

GRIDCOOLER



is a heat exchanger of the outboard or hull type, often referred to as a keel cooler.

eliminates sand and silt deposits in engine jackets, and protects your engine from corrosion and deposits in salt water operation. No clogging to cause overheating when operating in shell ice-laden water.

unique design eliminates the objections heretofore associated with keel cooling — such as bulkiness, resistance and fouling.

are available in many sizes to meet engine requirements and operating conditions.

are constructed of rectangular shaped tubing, which is structurally strong, and offers the maximum in cooling surface.

used are of the finest quality heavy gauge copper, and copper base alloys of high mechanical properties resistant to erosion and corrosion. All joints are high temperature brazed.

— thousands of GRIDCOOLERS are in operation with splendid success, proving their seaworthiness in all types of craft. Proven reliable in years of operation by the U.S. Navy, and U.S. Army Engineers. The improved performance and extended engine life saves you the cost of a GRIDCOOLER many times over. Many installation savings are effected, as it eliminates the sea water pump, strainer, through-hull fitting, scoop, and sea cock. (Except for wet type exhaust systems, which usually require a small capacity pump)

is a completely assembled unit ready for installation, complete with heavy neoprene gaskets for sealing inside and outside of hull.

— The external installation of the GRIDCOOLER presents no greater problem than the ordinary through-hull fitting.

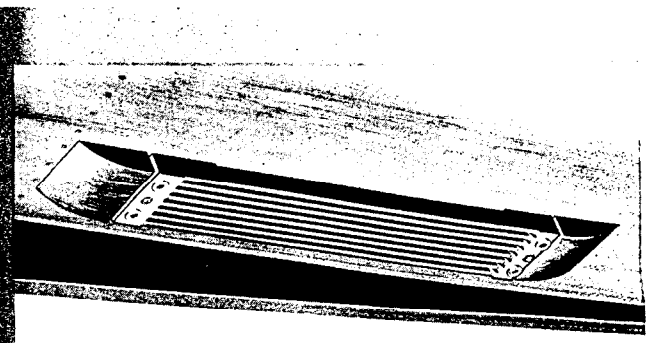
— The design of the GRIDCOOLER is such that it is impossible for debris or seaweed to become attached to the unit. It is always free of foreign matter as the motion of the boat through the water keeps it flushed clean, thereby giving continuous service without interruption.

— The header wall between the tubes is inclined to permit streamlined flow of water to the tube surfaces for free and easy running. Many installed in boats having speeds of 25 and more miles per hour.

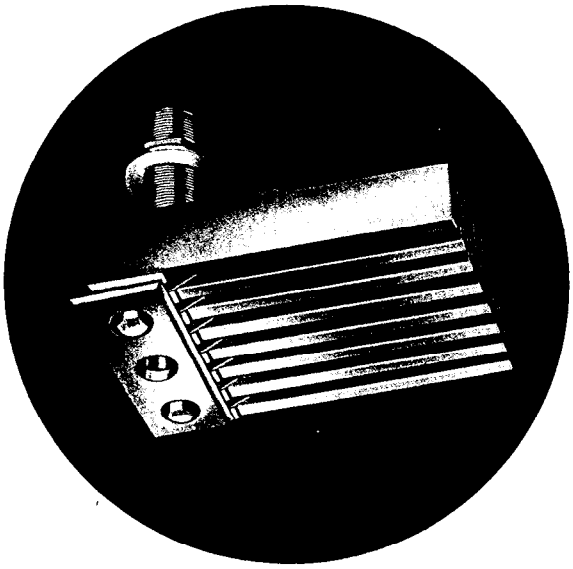
is extremely low, and therefore does not restrict the flow of jacket water, making possible the use of a centrifugal circulating pump, as well as displacement types.

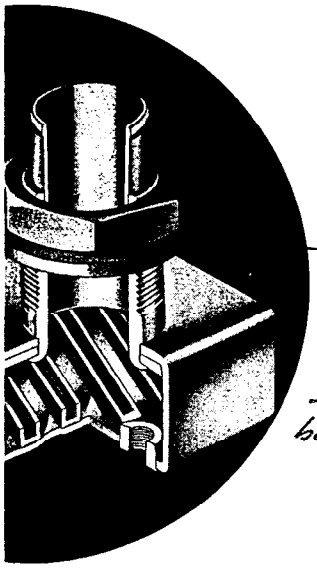
— The GRIDCOOLER being compact can be installed in a protected part of the hull, such as along the keel or skeg, and can even be installed in the rake or tunnel of shallow draft river boats. It can also be recessed into the hull as illustrated (lower right), making a flush type installation. Safety is insured when navigating in ice or debris laden waters.

Sectional illustration shows rugged construction. Note angular ends of the tubes, which increases inlet and outlet areas by 100%, eliminating restriction to assure maximum flow of engine jacket water.



. . THE SIMPLEST AND MOST DEPENDABLE FORM OF FRESH WATER COOLING

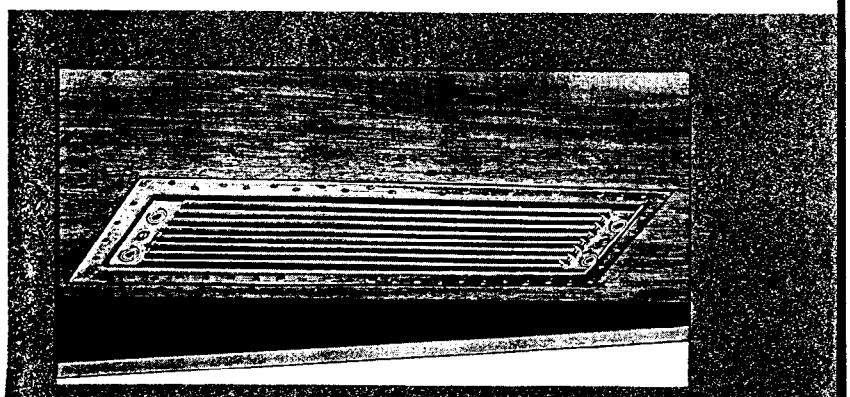




This illustration shows mounting of replaceable zinc electrode plate to headers. Minimizes galvanic corrosion in sea water operation. Furnished as standard equipment on sea water coolers.

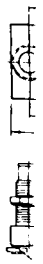
→ This can leak. Only way to check is when vessel is launched. If it does leak vessel must be drydocked.

A GOOD ENGINE NEEDS GRIDCOOLER PROTECTION



Flush type installation for maximum protection. Unit is recessed within hull line, with no loss in heat transfer capacity.

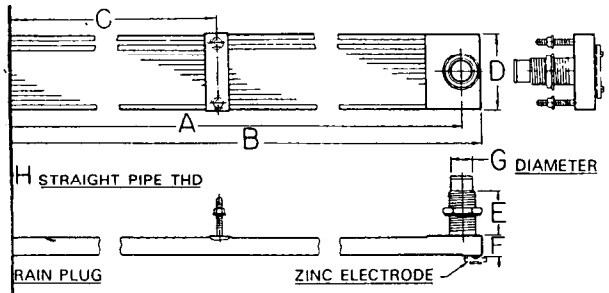
GRIDCOOLER INSTALLATION DIMENSIONS



SINGL

MODEL	A	B	C	D	E	F	G	H
B624B	24	27		3 15/16	3 1/2	1 3/4	1 1/2	1 1/2
B630B	30	33		3 15/16	3 1/2	1 3/4	1 1/2	1 1/2
B636B	36	39		3 15/16	3 1/2	1 3/4	1 1/2	1 1/2
B642B	42	45	21	3 15/16	3 1/2	1 3/4	1 1/2	1 1/2
B648B	48	51	24	3 15/16	3 1/2	1 3/4	1 1/2	1 1/2
B824B	24	27		5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B830B	30	33		5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B836B	36	39		5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B842B	42	45		5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B848B	48	51	24	5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B854B	54	57	27	5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B860B	60	63	30	5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
B866B	66	69	33	5 3/8	3 1/2	1 3/4	1 1/2	1 1/2
C630C	30	33 1/2		5 3/16	4	1 15/16	2	2
C636C	36	39 1/2		5 3/16	4	1 15/16	2	2
C642C	42	45 1/2		5 3/16	4	1 15/16	2	2
C648C	48	51 1/2	24	5 3/16	4	1 15/16	2	2
C654C	54	57 1/2	27	5 3/16	4	1 15/16	2	2
C660C	60	63 1/2	30	5 3/16	4	1 15/16	2	2
C830C	30	33 1/2		7 1/16	4	1 15/16	2	2
C836C	36	39 1/2		7 1/16	4	1 15/16	2	2
C842C	42	45 1/2		7 1/16	4	1 15/16	2	2
C848C	48	51 1/2		7 1/16	4	1 15/16	2	2
C854C	54	57 1/2	27	7 1/16	4	1 15/16	2	2
C860C	60	63 1/2	30	7 1/16	4	1 15/16	2	2
C866C	66	69 1/2	33	7 1/16	4	1 15/16	2	2
C872C	72	75 1/2	36	7 1/16	4	1 15/16	2	2
C878C	78	81 1/2	39	7 1/16	4	1 15/16	2	2
C884C	84	87 1/2	42	7 1/16	4	1 15/16	2	2
D830	30	36		7 1/16	5	2 3/4	2 1/2	2 1/2
D836	36	42		7 1/16	5	2 3/4	2 1/2	2 1/2
D842	42	48		7 1/16	5	2 3/4	2 1/2	2 1/2
D848	48	54		7 1/16	5	2 3/4	2 1/2	2 1/2
D854	54	60		7 1/16	5	2 3/4	2 1/2	2 1/2
D860	60	66		7 1/16	5	2 3/4	2 1/2	2 1/2
D866	66	72	33	7 1/16	5	2 3/4	2 1/2	2 1/2
D872	72	78	36	7 1/16	5	2 3/4	2 1/2	2 1/2
D878	78	84	39	7 1/16	5	2 3/4	2 1/2	2 1/2
D884	84	90	42	7 1/16	5	2 3/4	2 1/2	2 1/2
D890	90	96	30†	7 1/16	5	2 3/4	2 1/2	2 1/2
D896	96	102	32†	7 1/16	5	2 3/4	2 1/2	2 1/2
D1030	30	36 3/4		8 15/16	5	2 3/4	3	3
D1036	36	42 3/4		8 15/16	5	2 3/4	3	3
D1042	42	48 3/4		8 15/16	5	2 3/4	3	3
D1048	48	54 3/4		8 15/16	5	2 3/4	3	3
D1054	54	60 3/4		8 15/16	5	2 3/4	3	3
D1060	60	66 3/4		8 15/16	5	2 3/4	3	3
D1066	66	72 3/4	33	8 15/16	5	2 3/4	3	3
D1072	72	78 3/4	36	8 15/16	5	2 3/4	3	3
D1078	78	84 3/4	39	8 15/16	5	2 3/4	3	3
D1084	84	90 3/4	42	8 15/16	5	2 3/4	3	3

FERNSTRUM GRIDCOOLERS ARE



PASS

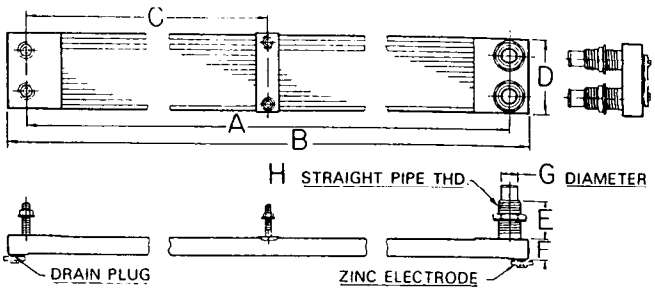
MODEL	A	B	C	D	E	F	G	H
D1090	90	96¾	30†	8 15/16	5	2¾	3	3
D1096	96	102¾	32†	8 15/16	5	2¾	3	3
D10102	102	108¾	34†	8 15/16	5	2¾	3	3
D10108	108	114¾	36†	8 15/16	5	2¾	3	3
D10114	114	120¾	38†	8 15/16	5	2¾	3	3
D10120	120	126¾	40†	8 15/16	5	2¾	3	3
D1230	30	36¾		10 13/16	5	2¾	3	3
D1236	36	42¾		10 13/16	5	2¾	3	3
D1242	42	48¾		10 13/16	5	2¾	3	3
D1248	48	54¾		10 13/16	5	2¾	3	3
D1254	54	60¾		10 13/16	5	2¾	3	3
D1260	60	66¾		10 13/16	5	2¾	3	3
D1266	66	72¾	33	10 13/16	5	2¾	3	3
D1272	72	78¾	36	10 13/16	5	2¾	3	3
D1278	78	84¾	39	10 13/16	5	2¾	3	3
D1284	84	90¾	42	10 13/16	5	2¾	3	3
D1290	90	96¾	30†	10 13/16	5	2¾	3	3
D1296	96	102¾	32†	10 13/16	5	2¾	3	3
D12102	102	108¾	34†	10 13/16	5	2¾	3	3
D12108	108	114¾	36†	10 13/16	5	2¾	3	3
D12114	114	120¾	38†	10 13/16	5	2¾	3	3
D12120	120	126¾	40†	10 13/16	5	2¾	3	3
D1630	30	37¼		14 9/16	5	2¾	3½	3½
D1636	36	43¼		14 9/16	5	2¾	3½	3½
D1642	42	49¼		14 9/16	5	2¾	3½	3½
D1648	48	55¼		14 9/16	5	2¾	3½	3½
D1654	54	61¼		14 9/16	5	2¾	3½	3½
D1660	60	67¼		14 9/16	5	2¾	3½	3½
D1666	66	73¼	33	14 9/16	5	2¾	3½	3½
D1672	72	79¼	36	14 9/16	5	2¾	3½	3½
D1678	78	85¼	39	14 9/16	5	2¾	3½	3½
D1684	84	91¼	42	14 9/16	5	2¾	3½	3½
D1690	90	97¼	45	14 9/16	5	2¾	3½	3½
D1696	96	103¼	32†	14 9/16	5	2¾	3½	3½
D16102	102	109¼	34†	14 9/16	5	2¾	3½	3½
D16108	108	115¼	36†	14 9/16	5	2¾	3½	3½
D16114	114	121¼	38†	14 9/16	5	2¾	3½	3½
D16120	120	127¼	40†	14 9/16	5	2¾	3½	3½
D16132	132	139¼	44†	14 9/16	5	2¾	3½	3½
D16144	144	151¼	48†	14 9/16	5	2¾	3½	3½
D16156	156	163¼	52†	14 9/16	5	2¾	3½	3½
D16168	168	175¼	42‡	14 9/16	5	2¾	3½	3½
D16180	180	187¼	45‡	14 9/16	5	2¾	3½	3½

Dimensions In Inches

† Two Intermediate Support Plates

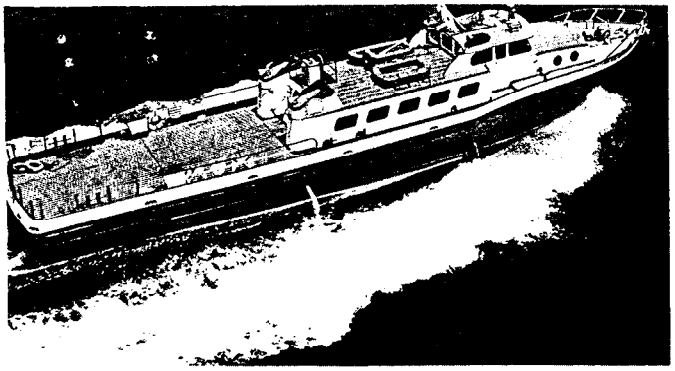
‡ Three Intermediate Support Plates

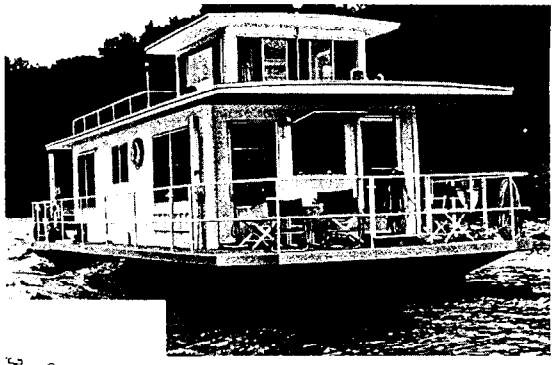
Specifications Subject To Change Without Notice

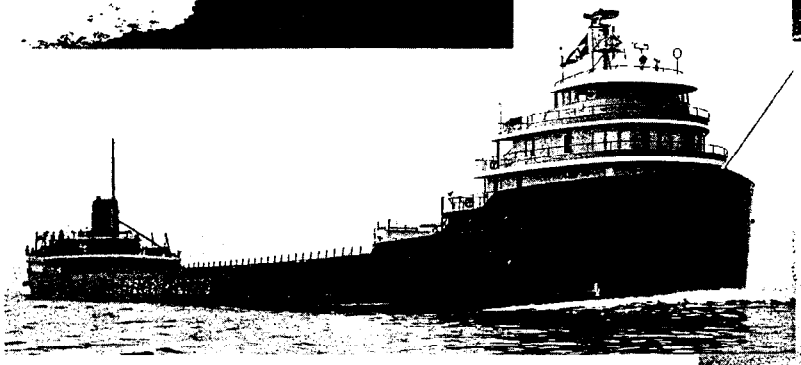


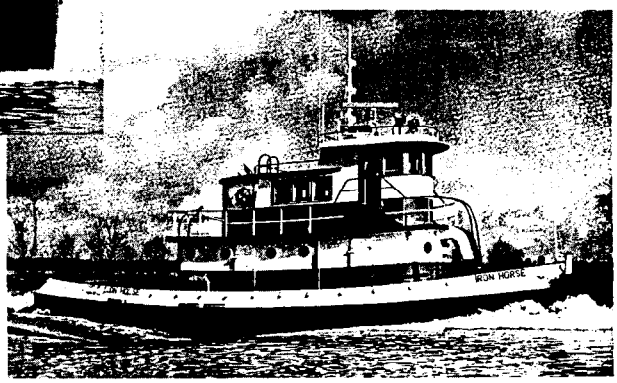
TWO PASS

MODEL	A	B	C	D	E	F	G	H
B824U	24	27		5⅜	3½	1¾	1	1
B830U	30	33		5⅜	3½	1¾	1	1
B836U	36	39		5⅜	3½	1¾	1	1
B842U	42	45		5⅜	3½	1¾	1	1
B848U	48	51	24	5⅜	3½	1¾	1	1
B854U	54	57	27	5⅜	3½	1¾	1	1
B860U	60	63	30	5⅜	3½	1¾	1	1
B866U	66	69	33	5⅜	3½	1¾	1	1
C830U	30	33½		7 1/16	3½	1 15/16	1½	1½
C836U	36	39½		7 1/16	3½	1 15/16	1½	1½
C842U	42	45½		7 1/16	3½	1 15/16	1½	1½
C848U	48	51½		7 1/16	3½	1 15/16	1½	1½
C854U	54	57½	27	7 1/16	3½	1 15/16	1½	1½
C860U	60	63½	30	7 1/16	3½	1 15/16	1½	1½
C866U	66	69½	33	7 1/16	3½	1 15/16	1½	1½
C872U	72	75½	36	7 1/16	3½	1 15/16	1½	1½
C878U	78	81½	39	7 1/16	3½	1 15/16	1½	1½
C884U	84	87½	42	7 1/16	3½	1 15/16	1½	1½
D1030U	30	36¾		8 15/16	4	2¾	2	2
D1036U	36	42¾		8 15/16	4	2¾	2	2
D1042U	42	48¾		8 15/16	4	2¾	2	2
D1048U	48	54¾		8 15/16	4	2¾	2	2
D1054U	54	60¾		8 15/16	4	2¾	2	2
D1060U	60	66¾		8 15/16	4	2¾	2	2
D1066U	66	72¾	33	8 15/16	4	2¾	2	2
D1072U	72	78¾	36	8 15/16	4	2¾	2	2
D1078U	78	84¾	39	8 15/16	4	2¾	2	2
D1084U	84	90¾	42	8 15/16	4	2¾	2	2
D1090U	90	96¾	30†	8 15/16	4	2¾	2	2
D1096U	96	102¾	32†	8 15/16	4	2¾	2	2
D10102U	102	108¾	34†	8 15/16	4	2¾	2	2
D10108U	108	114¾	36†	8 15/16	4	2¾	2	2
D10114U	114	120¾	38†	8 15/16	4	2¾	2	2
D10120U	120	126¾	40†	8 15/16	4	2¾	2	2
D1630U	30	37¼		14 9/16	5	2¾	2½	2½
D1636U	36	43¼		14 9/16	5	2¾	2½	2½
D1642U	42	49¼		14 9/16	5	2¾	2½	2½
D1648U	48	55¼		14 9/16	5	2¾	2½	2½
D1654U	54	61¼		14 9/16	5	2¾	2½	2½
D1660U	60	67¼		14 9/16	5	2¾	2½	2½
D1666U	66	73¼	33	14 9/16	5	2¾	2½	2½
D1672U	72	79¼	36	14 9/16	5	2¾	2½	2½
D1678U	78	85¼	39	14 9/16	5	2¾	2½	2½
D1684U	84	91¼	42	14 9/16	5	2¾	2½	2½
D1690U	90	97¼	45	14 9/16	5	2¾	2½	2½
D1696U	96	103¼	32†	14 9/16	5	2¾	2½	2½
D16102U	102	109¼	34†	14 9/16	5	2¾	2½	2½
D16108U	108	115¼	36†	14 9/16	5	2¾	2½	2½
D16114U	114	121¼	38†	14 9/16	5	2¾	2½	2½
D16120U	120	127¼	40†	14 9/16	5	2¾	2½	2½
D16132U	132	139¼	44†	14 9/16	5	2¾	2½	2½
D16144U	144	151¼	48†	14 9/16	5	2¾	2½	2½
D16156U	156	163¼	52†	14 9/16	5	2¾	2½	2½
D16168U	168	175¼	42‡	14 9/16	5	2¾	2½	2½
D16180U	180	187¼	45‡	14 9/16	5	2¾	2½	2½





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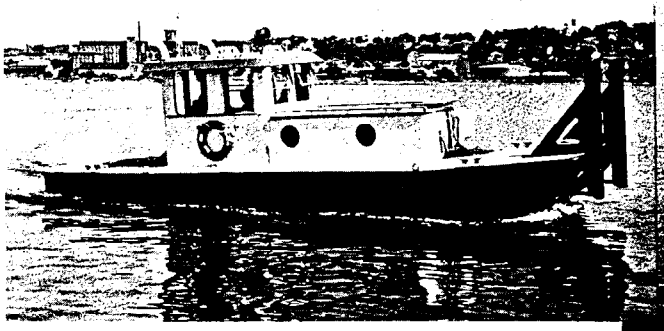

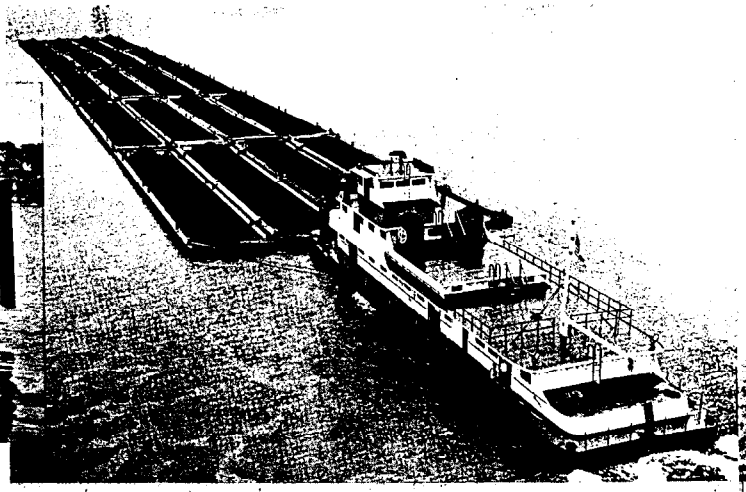

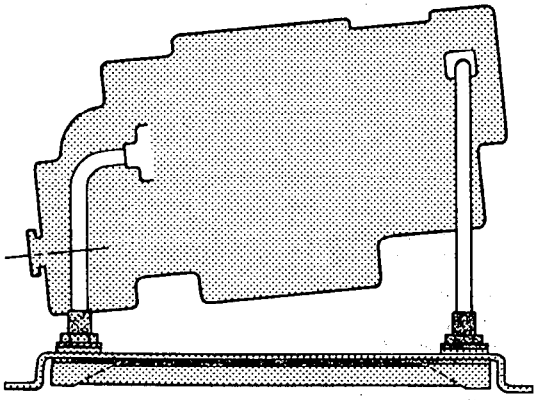

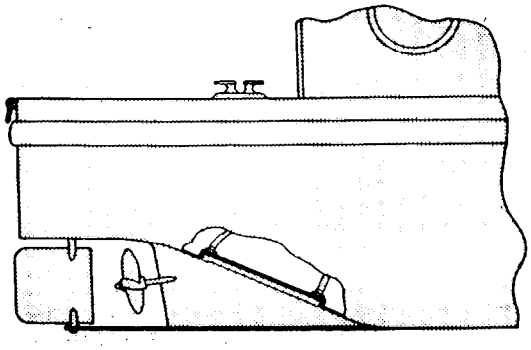

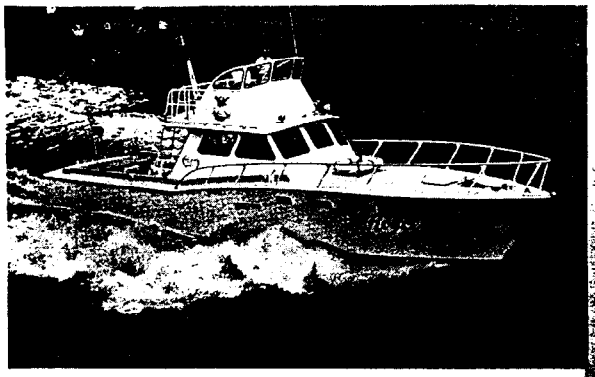

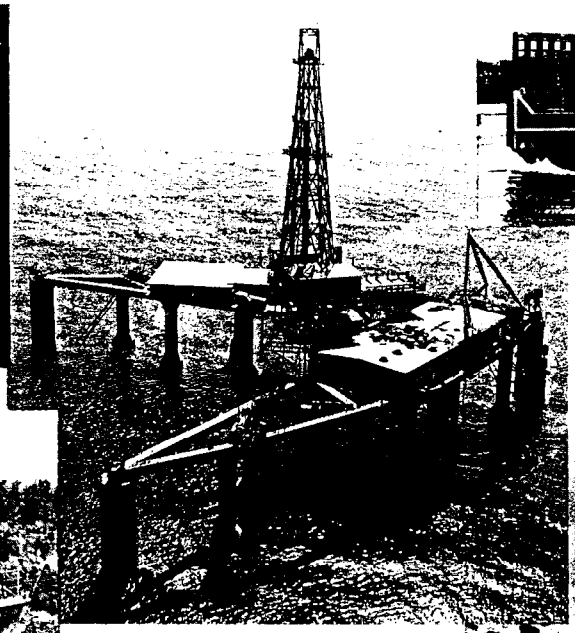

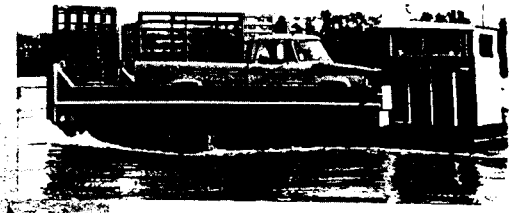

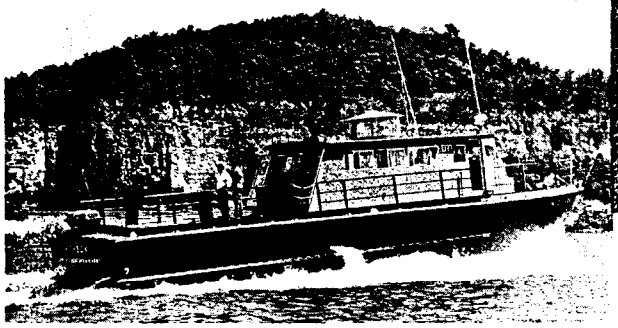

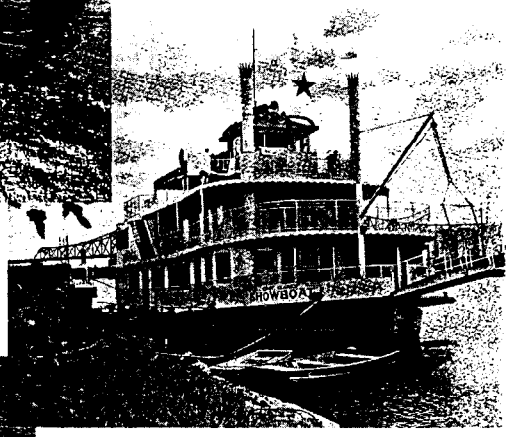

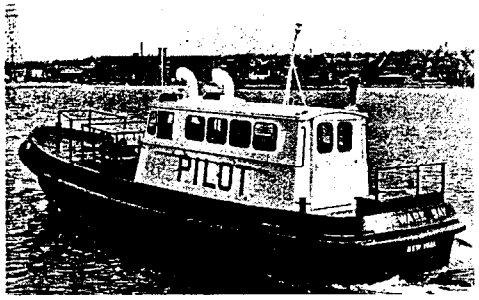

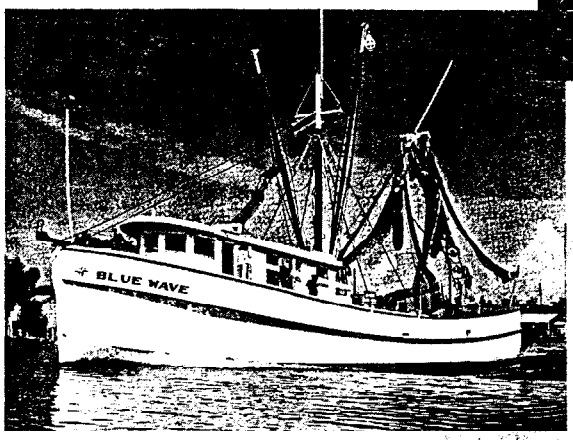

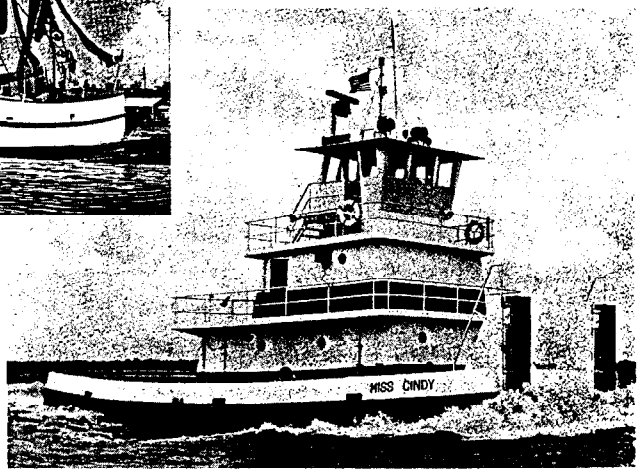

ENGINEERED KEEL COOLING

R. W. FERNSTRUM & COMPANY
MENOMINEE, MICHIGAN, U.S.A. 49858
Phone (906) 863-5553

PENGAD-Bayonne, N. J.
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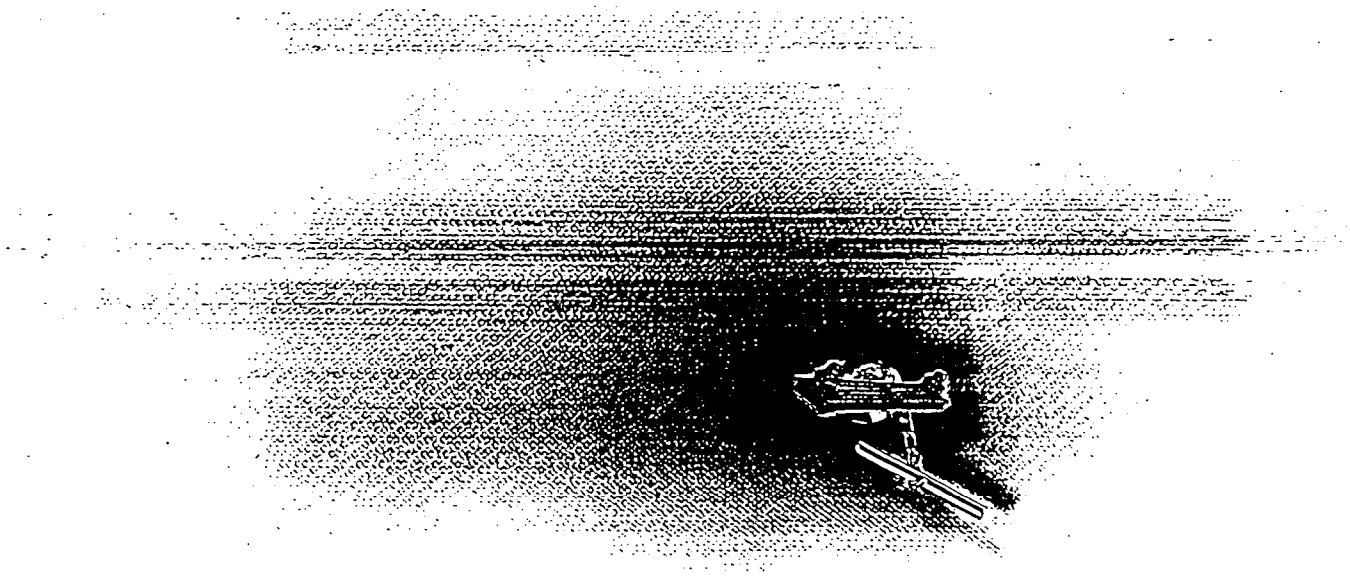

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GRIDCOOLER®

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GRIDCOOLER
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FERNSTRUM GRIDCOOLER WITH FLANGE MOUNTINGS

IMPORTANT INFORMATION FOR:

Architects
Shipyards: People who will determine location and installation

Extreme care must be taken in determining the correct location for a flange mounted cooler (which is an extremely rigid and fixed mounting). This particular type of mounting is extremely sensitive to any flexing of hull plates and/or recessed housings. An undetermined amount of vibration is also not permitted. In both cases this action will eventually damage a rigid – fixed position flange mounted Gridcooler. We suggest that all care possible be taken in determining the correct location when using flange mountings.

SUGGESTIONS – After determining the best location for flange mountings, we offer the following additional suggestions:

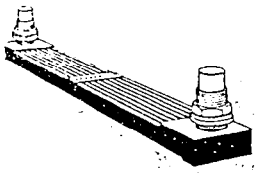
a. The recessed housing should be strengthened to prevent any vertical or horizontal flexing.

b. The area in which the housing is located should also be strengthened to eliminate any flexing of the side plates.

c. Gaskets of 5/8" to 3/4" thick neoprene, 60 durometer, should be used for flanges and support plate mountings.

For installations where flexing of plates and vibration cannot be eliminated to a safe degree for flange mountings, we suggest that they use our standard Gridcooler with nipple and hose connection.

R. W. FERNSTRUM & COMPANY
1716 ELEVENTH AVENUE PHONE: 906/863-5553
MENOMINEE, MICHIGAN U.S.A. 49858



R. W. FERNSTRUM & COMPANY

MENOMINEE, MICHIGAN U.S.A. 49858

BULLETIN

GRIDCOOLER RECOMMENDATIONS

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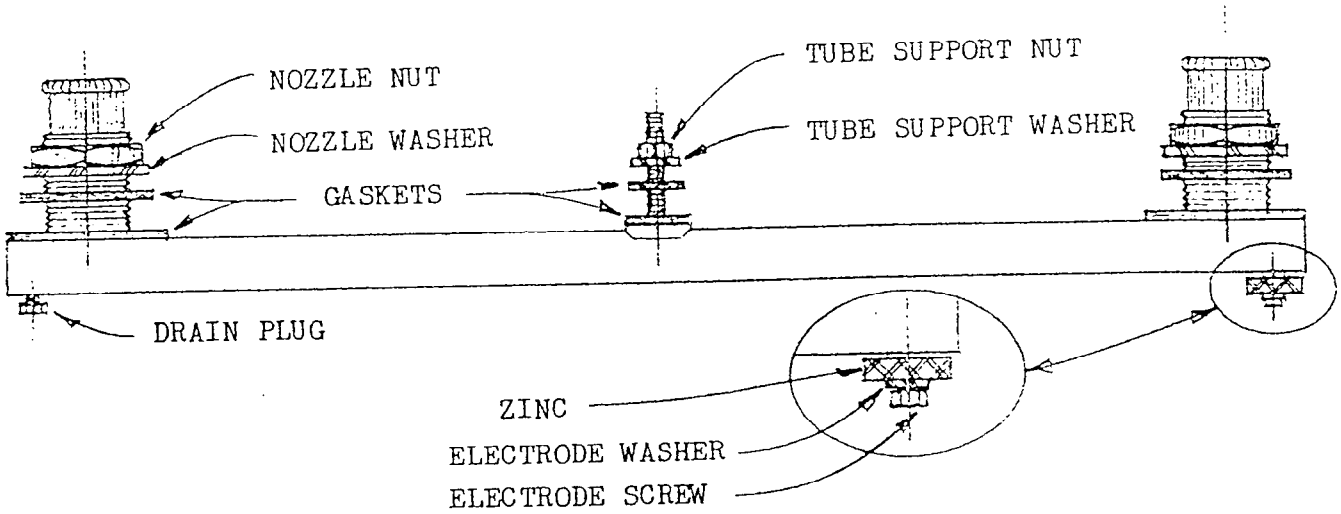
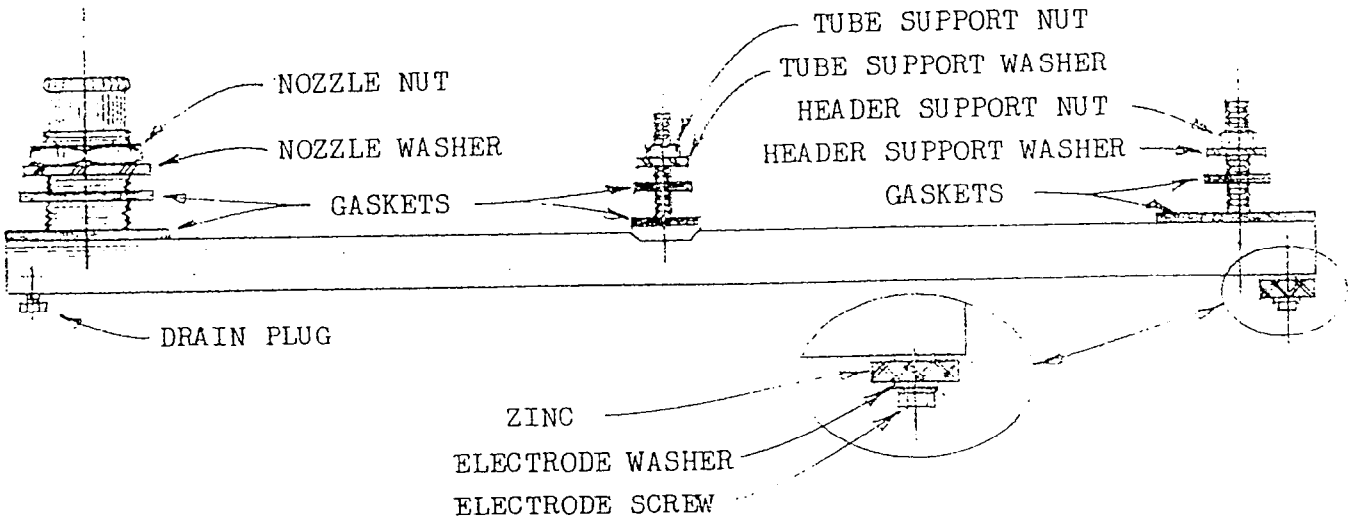
GRIDCOOLER
ENGINEERED
KEEL COOLING

REPLACEMENT PARTS LIST



SINGLE PASS GRIDCOOLER



TWO PASS (U FLOW) GRIDCOOLER

S/E

R. W. FERNSTRUM & COMPANY

BULLETIN 740215

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Memorandum from:

SUBJECT: May "N.F.I. CONVENTION" REPORT NUMBER

Fishing Gazette

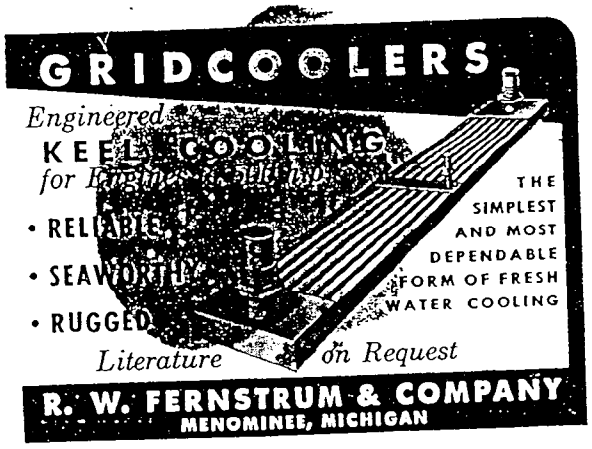
461 EIGHTH AVENUE, NEW YORK 1, N. Y.

Okay, FISHING GAZETTE,

( ) repeat the advertisement on this sheet (but make the changes indicated); or

( ) reserve_____space and we'll send you new plate.
(indicate size)

_____
Signature



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R. W. FERNSTRUM & COMPANY
1716 ELEVENTH AVENUE PHONE: 906/863-5553
MENOMINEE, MICHIGAN U.S.A. 49858

GRIDCOOLER
ENGINEERED
REEL COOLING

September 17, 1975

Marine Engineering/Log
350 Broadway
New York, New York 10013

Attention: Mr. Charles E. Keil

Dear Mr. Keil:

In reference to our phone conversation of September 10, we have enclosed an editorial giving the past and present history of the R. W. Fernstrum & Company in the United States and its operation in 40 other countries.

We have also supplied a glossy print which in our opinion would look nice at the beginning of the editorial. This will give everyone a clear idea of exactly what a Gridcooler looks like.

In our phone conversation we had agreed that this editorial would be placed in the November issue, which is mainly for the architects.

We appreciate all the things that you have done for our company and we sincerely hope that this editorial will help us all in future business.

Very truly yours,

R. W. FERNSTRUM & COMPANY

David J. Fernstrum

DJF:gb

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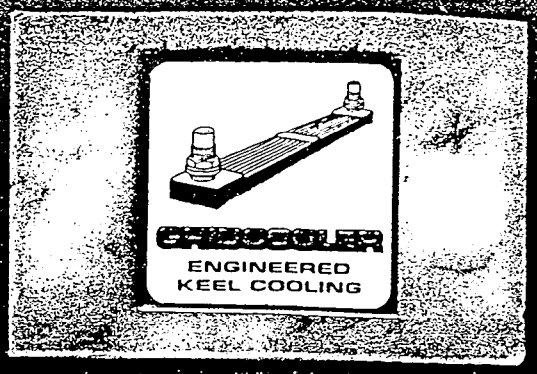

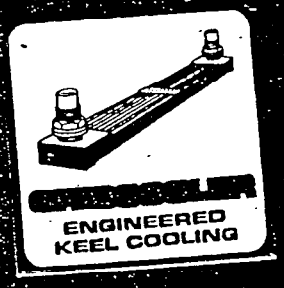

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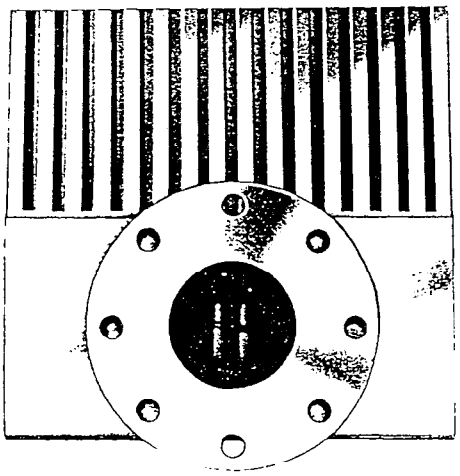
FERNSTRUM

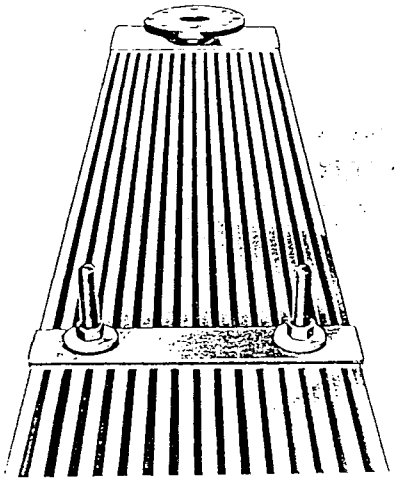
GRIDCOOLER
ENGINEERED
KEEL COOLING

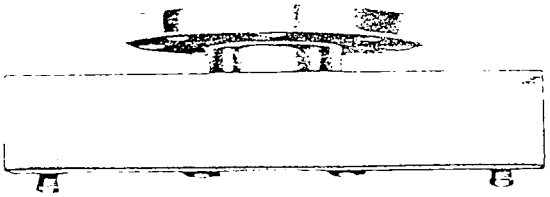
FLANGES

ONLY STANDARD FLANGES LISTED ARE AVAILABLE

Since there has been an increasing demand for flanges, they will be available in four sizes as shown in this bulletin. These flanges will be fabricated out of copper-nickel 90/10. The following information in this bulletin has been compiled to inform you as to what our standard flanges are. Any deviation from the standards shown will increase the cost of the flanges and may cause delay in shipment.







Due to the irregularity of the bottom of hull surfaces, in some cases, as to design and curvature, we believe that most boatyards would prefer to design and make their own spacers or hangers to make up the difference between the Gridcooler support plate and hull surface.

On the flange drawing on the reverse side, you will note that we have allowed a 1" space between the top of the Gridcooler header and the underside of the flange. This was done to accommodate the use of 5/8" lock nuts, if deemed necessary.

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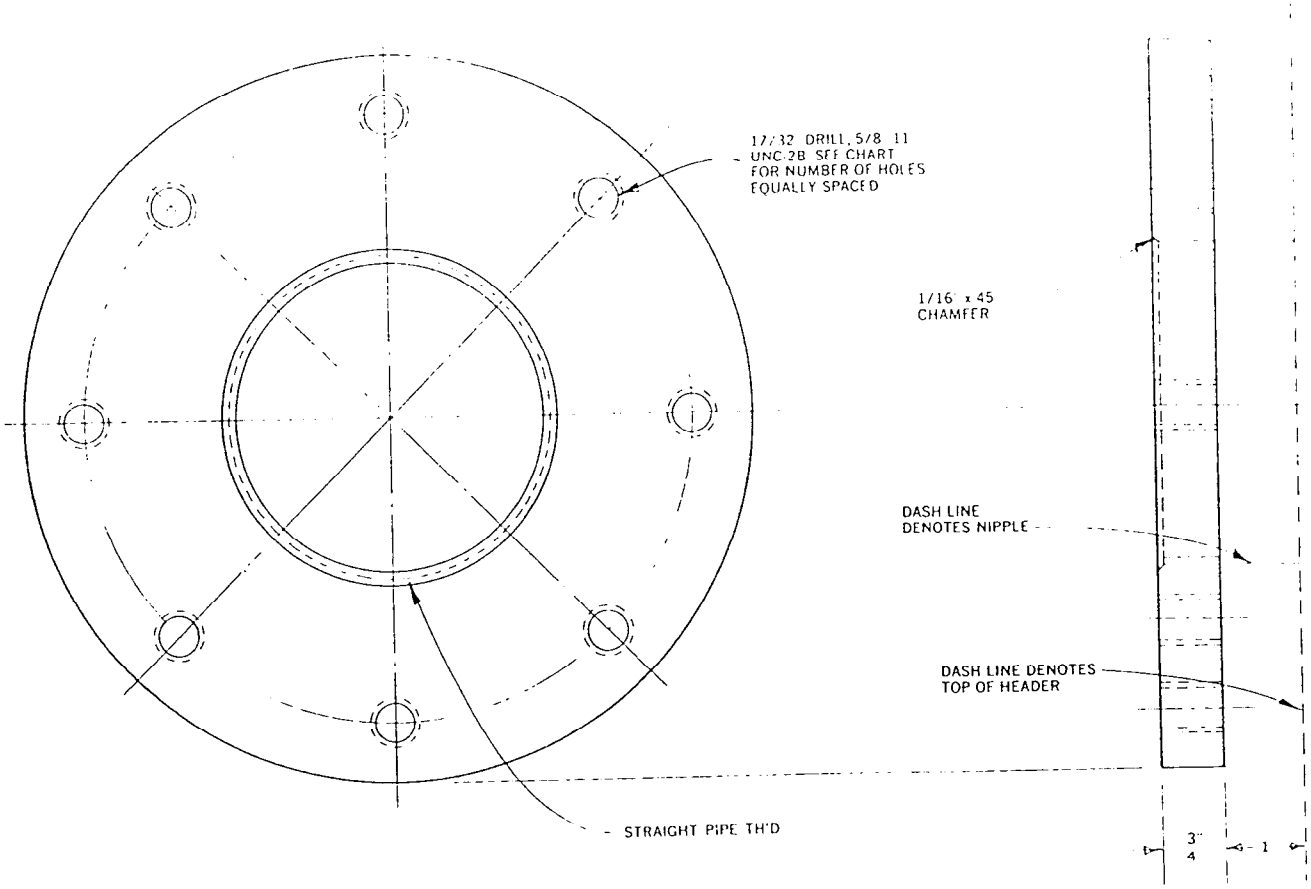
FLANGE BULLETIN 460
JUNE 1974



STANDARD FLANGE DETAILS

GRIDCOOLER SERIES	NOM. PIPE SIZE	STRAIGHT PIPE THREAD	FLANGE DIAMETER	DIA. OF BOLT CIRCLE	NUMBER OF BOLTS	DIAMETER OF BOLTS
C6 & C8	2"	2"	6"	4 3/4"	4	5/8"
D8	2 1/2"	2 1/2"	7"	5 1/2"	4	5/8"
D10 & D12	3"	3"	7 1/2"	6"	4	5/8"
D16	3 1/2"	3 1/2"	9"	7 1/2"	8	5/8"

RECOMMENDED INSTALLATION

In order to line up the mating flanges, we suggest that you mount the flange to the Gridcooler then raise the Gridcooler to the hull and tack weld the mating flange. Remove the Gridcooler and finish welding the flange into position. Should there be more than one Gridcooler of the same size, these Gridcoolers and their respective mountings should be numbered to eliminate the possible interchanging of Gridcoolers.

Should not the above be followed, then we suggest that the shipyards check to make sure their mating flanges are centered, in line, and in a parallel position to meet the flanges of the Gridcooler to be installed.

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ENGINEERED KEEL COOLING

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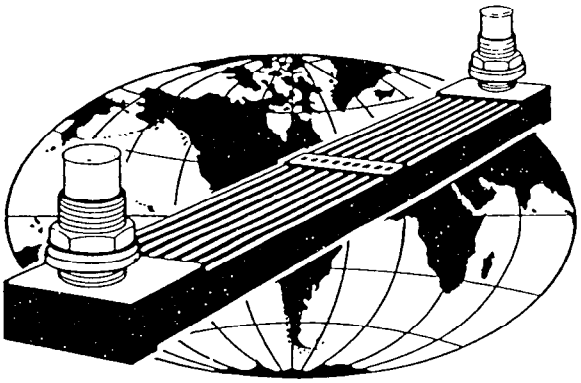

ENGINEERED KEEL COOLING

FERNSTRUM GRIDCOOLER

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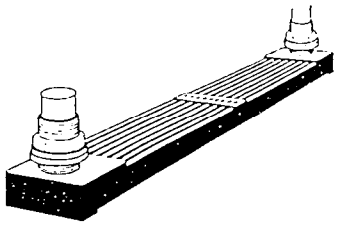
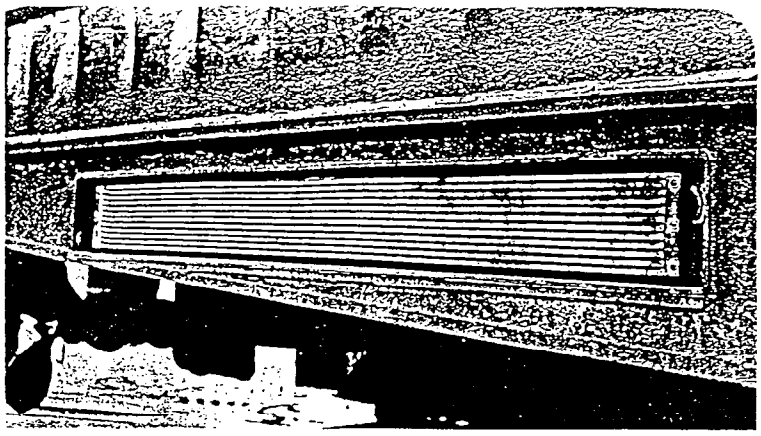
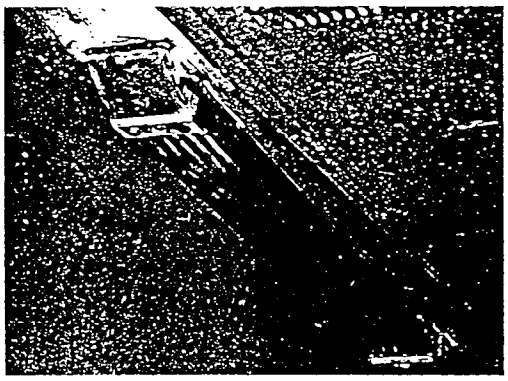
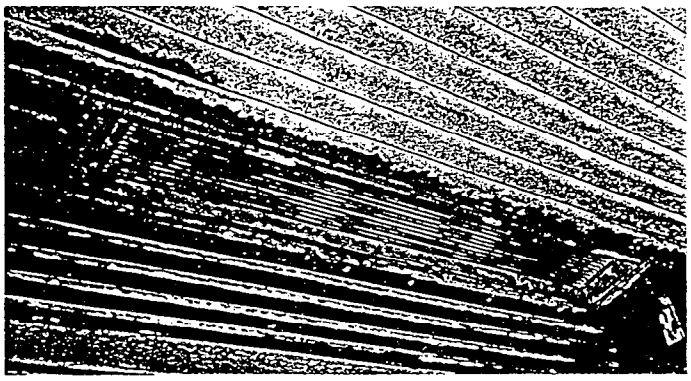


GRIDCOOLER INSTALLATION INSTRUCTIONS

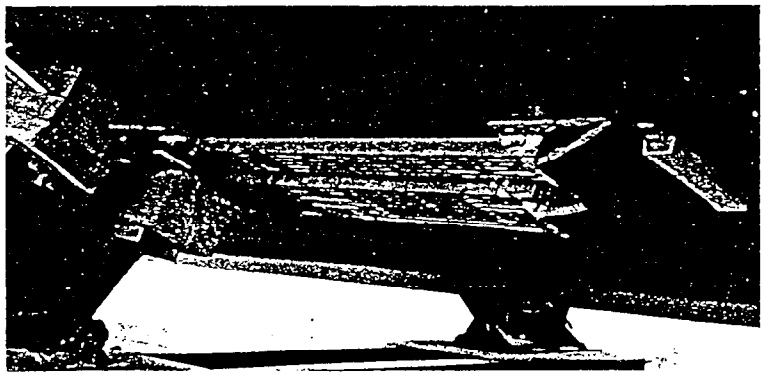


Gridcooler recessed — side mount

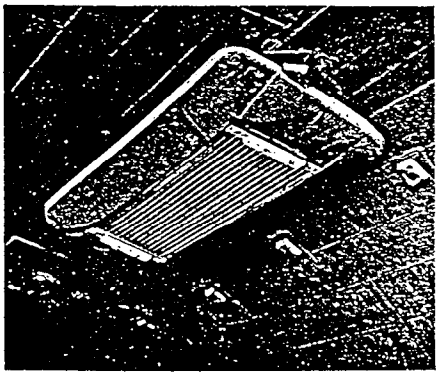




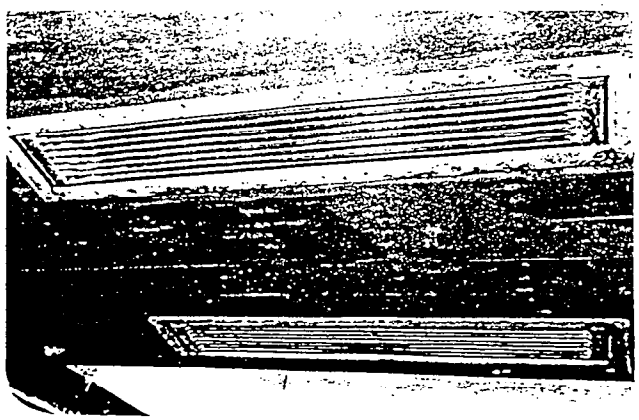
Gridcooler recessed in old channel

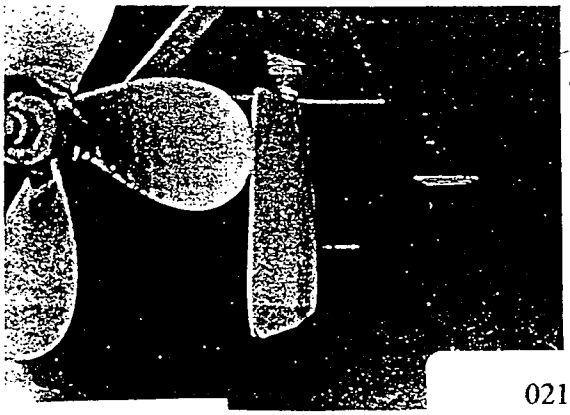


Using fairing blocks — steel hull



Using fairing blocks — wooden hull





Gridcoolers recessed in wooden vessel.
Gridcoolers parallel with keel.

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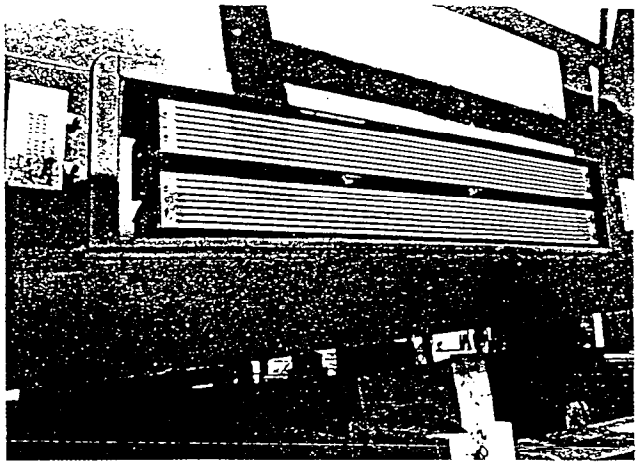
Top left. Fast-moving vessel. Fernstrum Gridcoolers cooling the propulsion engines and generator units.

Bottom left: Side recessed mounted Gridcooler also showing placement of zinc electrodes by shipyard.

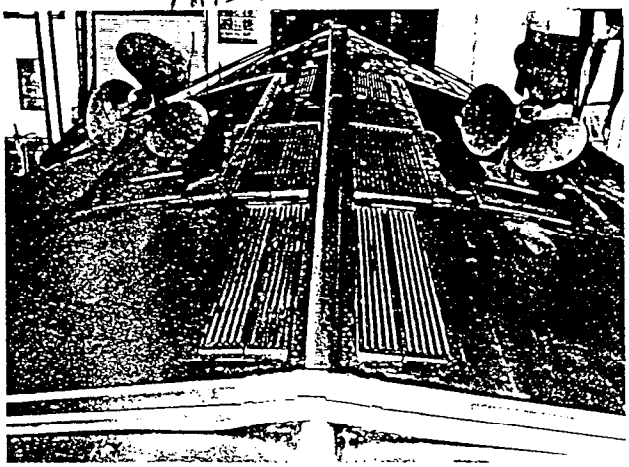
Top right: Side recessed mounted Gridcoolers also showing placement of zinc electrodes by shipyard.

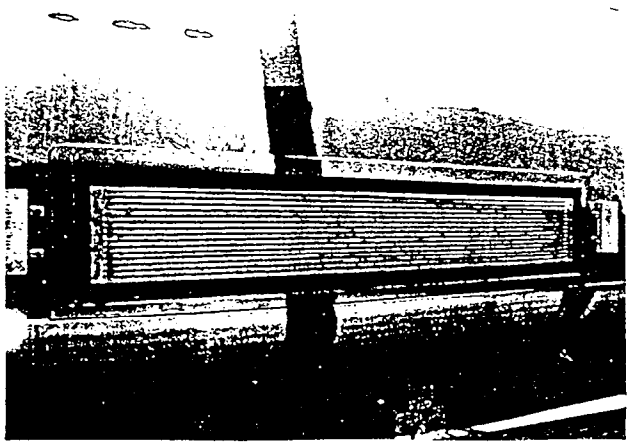
Center right: Recessed Gridcoolers on slight incline on bottom of vessel.

Bottom right: Side mounted Gridcooler with rub rails.



IS THERE A REASON FOR THIS BEING UPSIDE-DOWN?





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GRIDCOOLERS are constructed of the finest and most suitable materials obtainable. They are assembled, thoroughly tested and inspected by lled craftsmen. Properly installed, the GRIDCOOLER will give you the utmost in performance and satisfaction.

PLEASE NOTE: In addition to our standard 3/4" gaskets, we can offer 1/4" gaskets for all "D" series Gridcoller models. When ordering, please state if 1/4" gaskets are prefered.

LOCATION: The following general information is recommended.

(A.) In determining a location for installing the Gridcooler, it is essential to choose an area where there is not a severe problem of vibration or hull flexing.

(B.) Install adjacent to skeg or keel if possible for maximum protection. See Figures 1 and 2.

(C.) Towboat installation should be made as near the propeller as possible to benefit from the slip-stream in extreme towing operations. See Figure 3.

(D.) When side installation is made, the Gridcooler should be positioned well below the water line to avoid aerated water to flow past cooler tubes. Aerated water reduces the heat transfer rate and can result in overheating.

(E.) GENERATORS and AUXILIARY UNITS that operate at dockside or in still water, the Gridcooler should be so installed as to permit free circulation of water past cooler tubes by convection. Installing Gridcooler on an incline is recommended. For this type of application do not recess Gridcooler horizontally as overheating will result due to lack of circulation of water past cooler tubes.

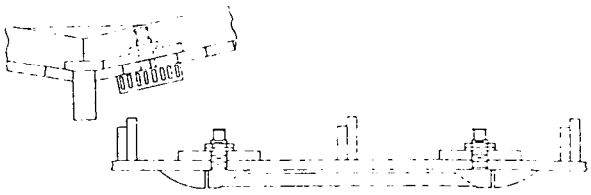
INSTALLATION: Before installing your Gridcooler check the following.

(A.) Check the center to center of Gridcooler nozzles (also center of support studs when applicable) before drilling ship's hull for same.

On steel hull motor vessels, we suggest the through hull hole for the nozzles be 1/4" diameter oversized. Should these holes be burned out, then the hole perimeter must be ground smooth.

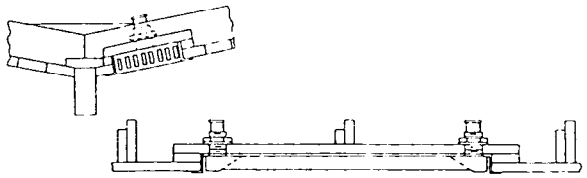
(B.) Make certain that all Gridcooler mounting surfaces on the hull are smooth and in alignment so gaskets will seal properly and prevent any undue stress to the Gridcooler.

(C.) To prevent unnecessary and excessive tightening of supporting nuts for all Gridcoolers in normal installations, we suggest that you use the following torques.



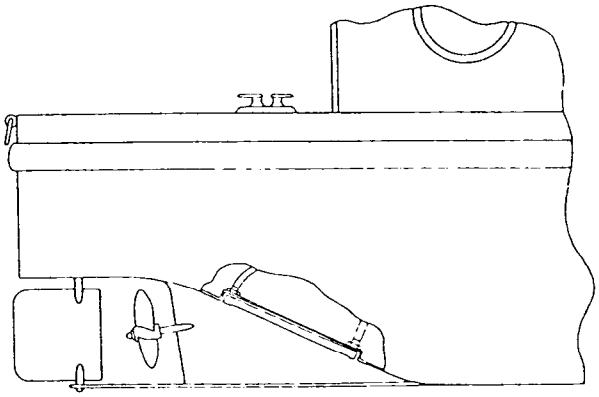
External type installation. Use fairing blocks for protection and streamlining.

FIGURE 1



Flush type installation. In wood hulls flanged housing is recessed for added strength and sealing.

FIGURE 2



Shallow draft steel river work boat. Flush type installation is made by welding in box shaped recess in underside of hull.

FIGURE 3

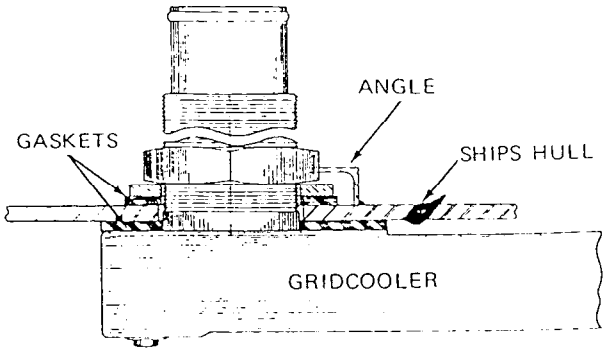


FIGURE 4

Gridcooler Series	Nozzle Nut Foot-Pounds	Support Bolt Nut Foot-Pounds	Header Stud Nut Foot-Pounds
B8U	50 to 60	20 to 25	25 to 30
B	75 to 100	20 to 25	-0-
C8U	75 to 100	25 to 30	35 to 40
C	125 to 150	25 to 30	-0-
D	200 to 250	25 to 30	50 to 60

Tack-weld small angle iron against flat of mounting nuts to prevent loosening of nuts due to vibration. Use GE Marine Seal (silicone rubber) or equal around gaskets, washers, and where nozzles and support bolts penetrate hull for sealing.

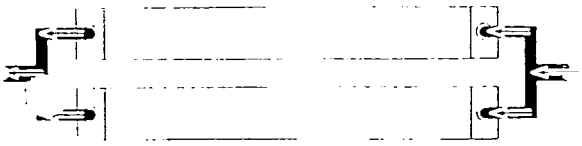
(D.) The compression of the mounting gaskets provides a tension to the nozzle nuts (and support bolt nuts when applicable) preventing them from working loose under normal conditions. If a more positive method is desired to secure nuts (especially hulls subject to vibration) a clip angle can be secured to hull with the other face in contact with flat of hexagon nut. See Figure 4.

(E.) When installing a U-flow (two-pass type) Gridcooler in an inclined position, make sure nozzles are at the high end. Piping between engine and Gridcooler should be self-draining to avoid air pockets which would restrict jacket water flow rate and cause overheating.

(F.) See Figure 7. When piping, do not use smaller size tubing or fittings than connections on engine or Gridcooler, as this will restrict the circulation of jacket water. Piping can be of tubing, using hose and clamps at engine and Gridcooler connections to eliminate engine vibrations to hull. Arrange piping for minimum use of elbows. After installation is made, check connections for leaks. When water testing the Gridcooler, do not exceed 35 PSI.

(G.) When using a reducing bell-housing (coffer-dam type construction) in piping to and from the Gridcooler, a good grade of sealer such as GE Marine Seal should be used around the gaskets, washers, and nuts to prevent fresh water from seeping down the threads.

(H.) Gridcooler piping diagrams for multiple Gridcooler installations.



Gridcoolers connected in parallel. FIGURE 5

Gridcoolers connected in series. FIGURE 6

OVERHEATING: Should overheating occur, use this check list to try and find the problem.

(A.) Check water level in expansion tank.

(B.) Sticking thermostat.

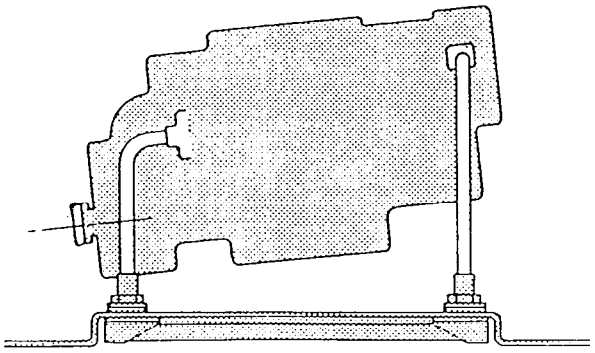
(C.) Check piping for air lock. Add bleeder line if necessary.

(D.) Check circulating pump for wear or adjustment.

(E.) Check to make sure Gridcooler has not been painted or any other coating applied to the cooler. These coatings or paint have an insulating effect and will greatly reduce heat transfer rate.

(F.) Check to make sure there is no aerated water around the Gridcooler. This too will help slow the heat transfer rate.

(G.) If temperature rises when moored to dock, and the Gridcooler has been installed close to the propeller, engage propeller to provide circulation of water past cooler.



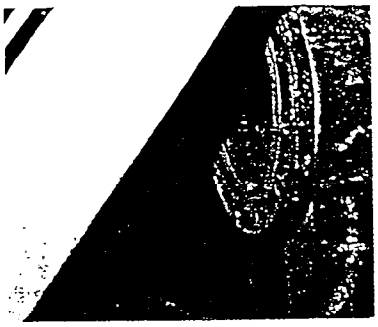
Engine jacket water is piped directly to and from GRIDCOOLER which is in contact with sea water for transfer of heat. FIGURE 7

ZINC ELECTRODE PLATES are standard equipment with sea (salt) water type Gridcoolers. Their purpose is to minimize the effects of galvanic corrosion, and should be replaced when deteriorated. Life of zinc plates varies with localities. Rapid deterioration can result from stray electrical currents induced by electrical equipment in craft, which should be corrected.

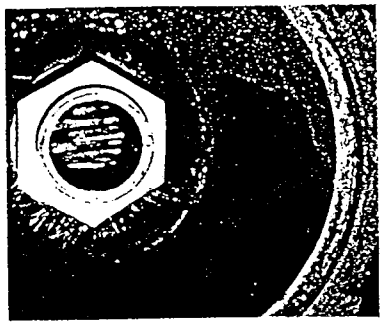
(Continued on back page)

COFFERDAMS

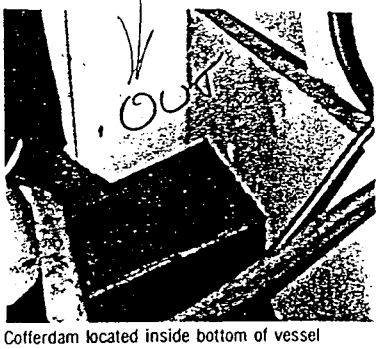
Occasionally, specially designed vessels require cofferdams. These pictures show a commonly used type of cofferdam.



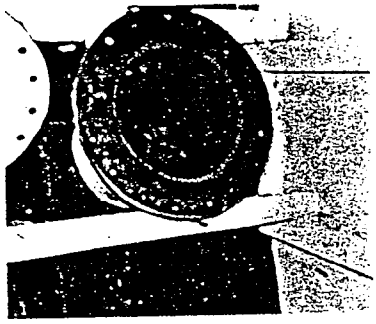
Side mounted cofferdam

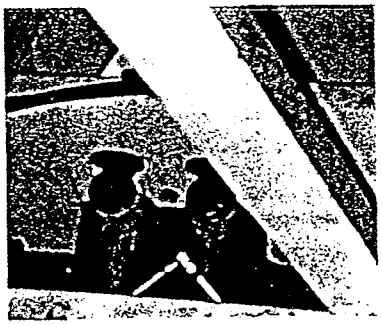


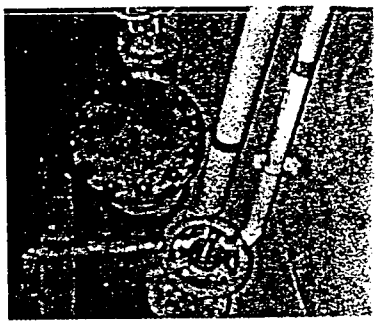
Side mounted cofferdam



Cofferdam located inside bottom of vessel



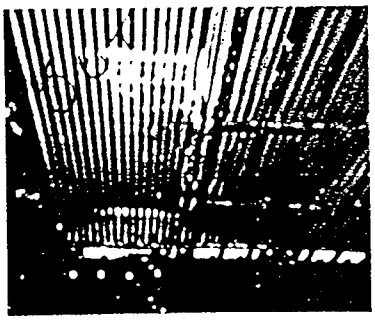




Cofferdams located inside bottom of vessel

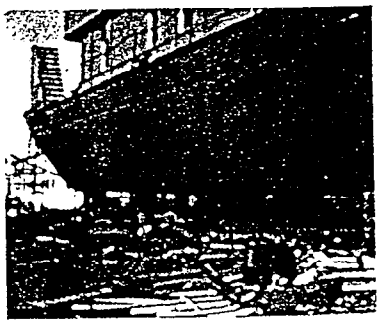
PROTECTIVE GUARDS:

In extreme cases where logs, debris or dragging the bottom of the boat may endanger the bottom of the vessel, a protective guard may be employed over a Gridcooler recess. The following photographs show different types of protective guards.

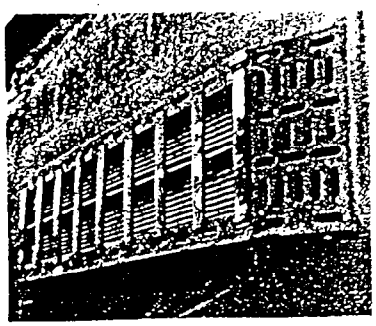


Guard on one side

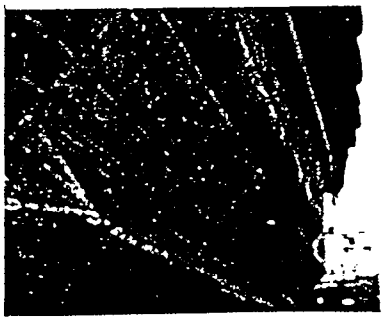
Protective guard made of bar stock

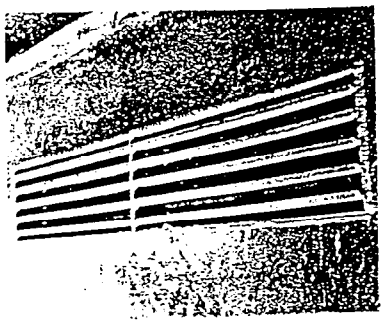


Recessed with rub rails to protect Gridcooler



Bar and sheet stock protects external Gridcooler





Side mounted

DAMAGED GRIDCOOLER: In the event of accidental damage in use, it is recommended that the following materials and steps be taken to make minor shipyard repairs.

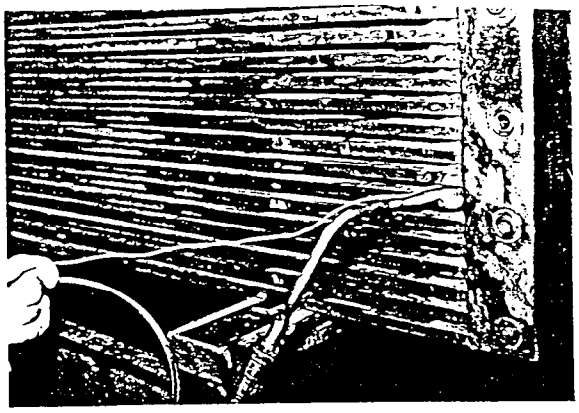
(A.) **BRAZING:** Drain Gridcooler before brazing. Make certain that the joint or area to be brazed is thoroughly cleaned, using a good degreasing solvent followed by wire brushing. The silver alloy used in the manufacture of Gridcoolers is "Handy & Harman", 3/32" diameter Easy Flow ~~No. 4~~ wire, having a melting point of 1160 degrees F. Use "Handy & Harman" Flux, low temperature brazing type. Source of brazing wire and flux is HANDY & HARMAN, 850 Third Avenue, New York, New York 10022 U.S.A. who have many distributor outlets.

(B.) In the event the tubes are accidentally bent and out of alignment, they can be straightened by using a hard wood block and mallet. Gridcoolers are constructed of ductile materials not subject to fracture.

TEMPORARY REPAIR: For temporary repairs, an epoxy compound similar to Devcon UW for above and under water repairs or Red Hand for above water repairs may be used when liberally applied.

Before applying the epoxy compound, the surface must be clean and any internal pressure on the Gridcooler must be removed.

Devcon UW is available from the Devon Corporation, Danvers, Massachusetts 01923. Red Hand is available from International Paint Company, New York, New York.



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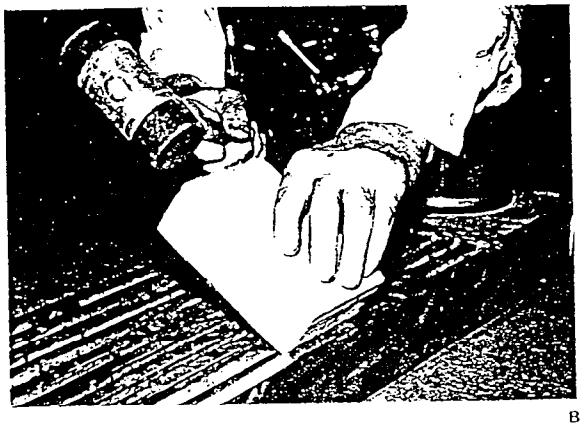

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WARRANTY: The R.W. Fernstrum & Company, manufacturer, carefully tests and inspects each Gridcooler before it leaves the point of manufacture. The manufacturer makes no representations or warranties, express or implied, statutory or otherwise, except those herein expressly contained and shall not be held liable on any account except for repair or replacement under the terms following.

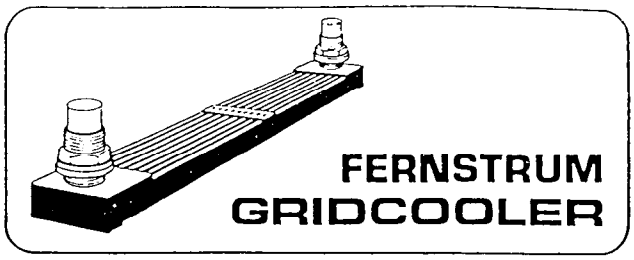
The manufacturer will, as to each Gridcooler registered with it by the purchaser, repair or replace free of charge, such Gridcooler as is found upon inspection to be defective because of material or workmanship providing the same has been returned to the manufacturer's factory, or a more convenient point as designated by the manufacturer, transportation prepaid, within ninety (90) days from date of installation for use. The manufacturer's obligation hereunder shall be limited to such time period and to the direct cost of repair and replacement and shall not include labor, transportation or other such expenses incurred by purchaser.

This warranty shall not be effective with respect to Gridcoolers to which repairs or alterations have been made unless authorized by the manufacturer, nor to defects arising because of improper installation, misuse, accident, or other causes beyond the control of the manufacturer.

R. W. FERNSTRUM & COMPANY

MENOMINEE, MICHIGAN U.S.A. 49858

MISTAKES

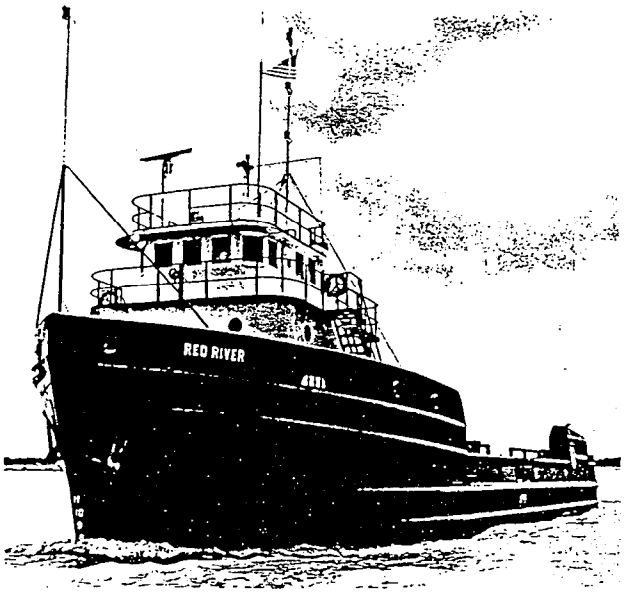


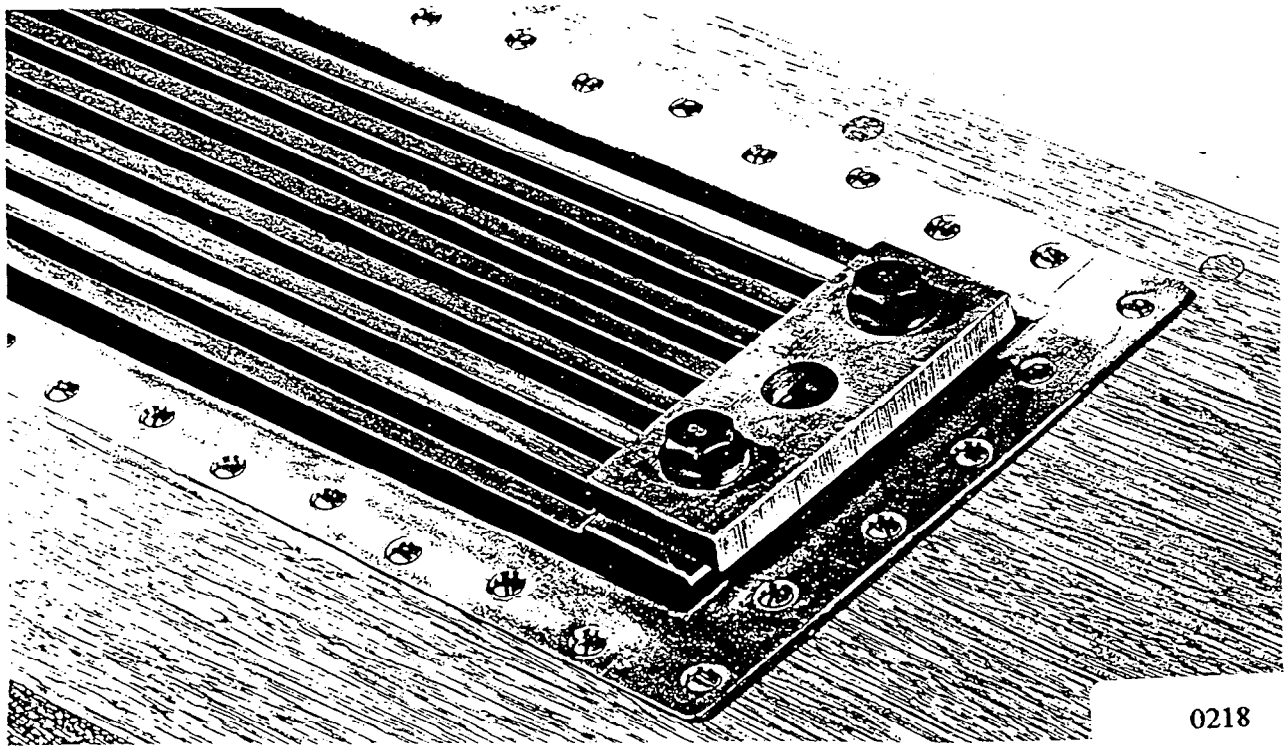
APPLICATIONS

WHY KEEL COOLING?

Keel cooling first appeared in the early 1800's, when someone hung a copper tube over the edge of a boat to condense steam. It later evolved into pieces of channel welded onto the hull. These channel cooling systems offered important advantages over raw water cooling. They eliminated silt and sand buildup in engine jackets and protected engines against salt water corrosion. Unfortunately, their sheer bulk reduced a ship's capacity and increased its drag. They were also prone to seaweed foulup. Clearly, a more compact and streamlined cooler was needed. This led to packaged keel coolers, and the FERNSTRUM success story.

FERNSTRUM GRIDCOOLERS are simple, dependable, packaged keel coolers tailored to fit everything from patrol boats to icebreakers. They incorporate the advantages of channel coolers without their bulk, drag or fouling problems. In many cases, a GRIDCOOLER requires only one twentieth of the space needed for channel cooling. With its streamlined design, a recessed GRIDCOOLER creates almost no drag and stays free of seaweed and debris.





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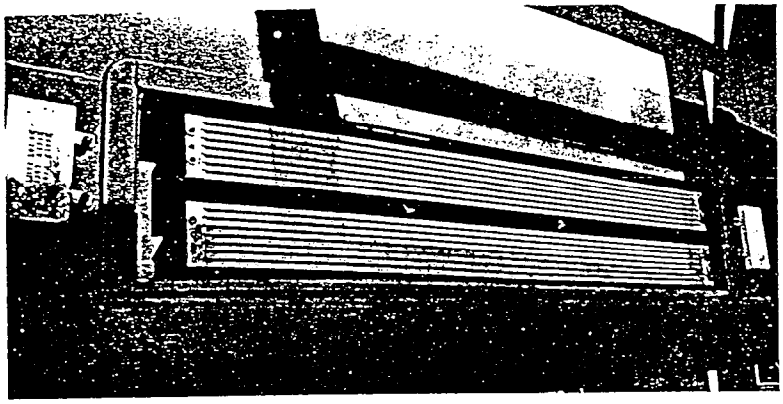
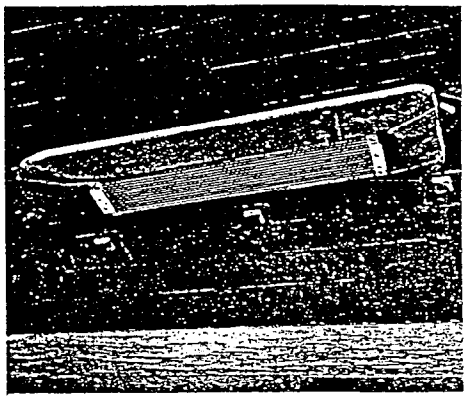
A compact, modular unit, the GRIDCOOLER can be mounted almost anywhere on a ship's hull. This gives you flexibility to match the installation to the hull design and operating conditions. On shallow draft river work boats, for instance, the GRIDCOOLER may be mounted on the side of the hull or beside the skeg. On towboats, the GRIDCOOLER may be installed near the propeller to take advantage of its slip-stream during heavy towing. On fast moving vessels, the unit is normally recessed alongside the keel.

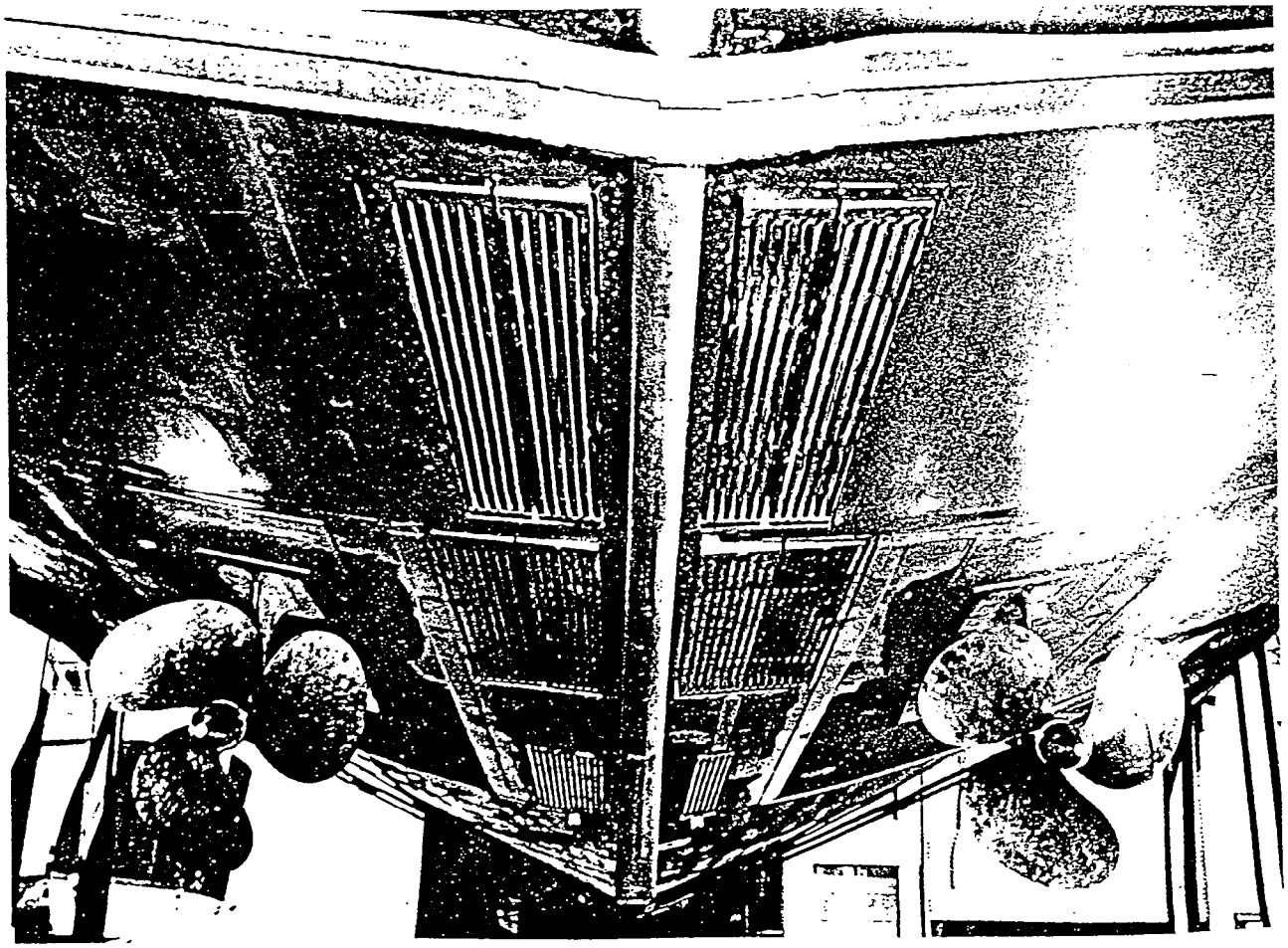
Two or more GRIDCOOLERS can be installed parallel or in series. For maximum protection and minimum drag, recess them so they are flush with the hull. They may be, however, installed on the surface of the hull with fairing blocks for streamlining. FERNSTRUM GRIDCOOLERS are versatile. Here are some ways they have been installed:



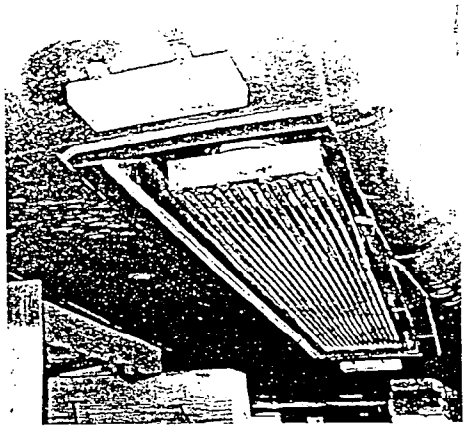
Side recessed GRIDCOOLERS with zinc electrodes.



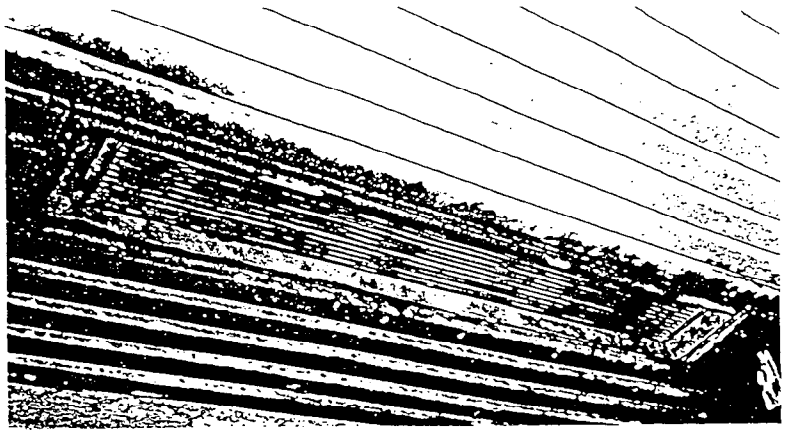
Using fairing blocks - wooden hull.



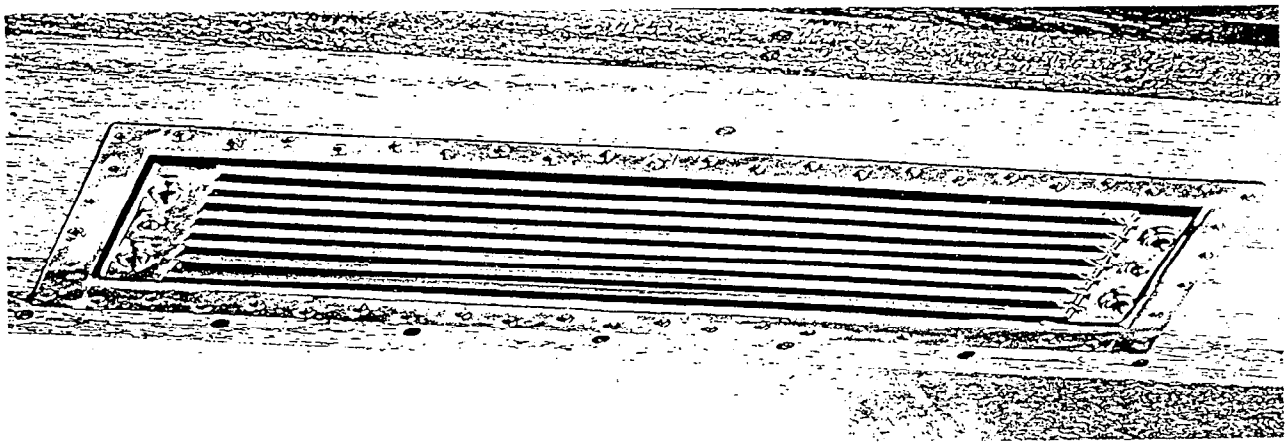
Fast-moving vessel. GRIDCOOLERS cooling propulsion engines and generator units.



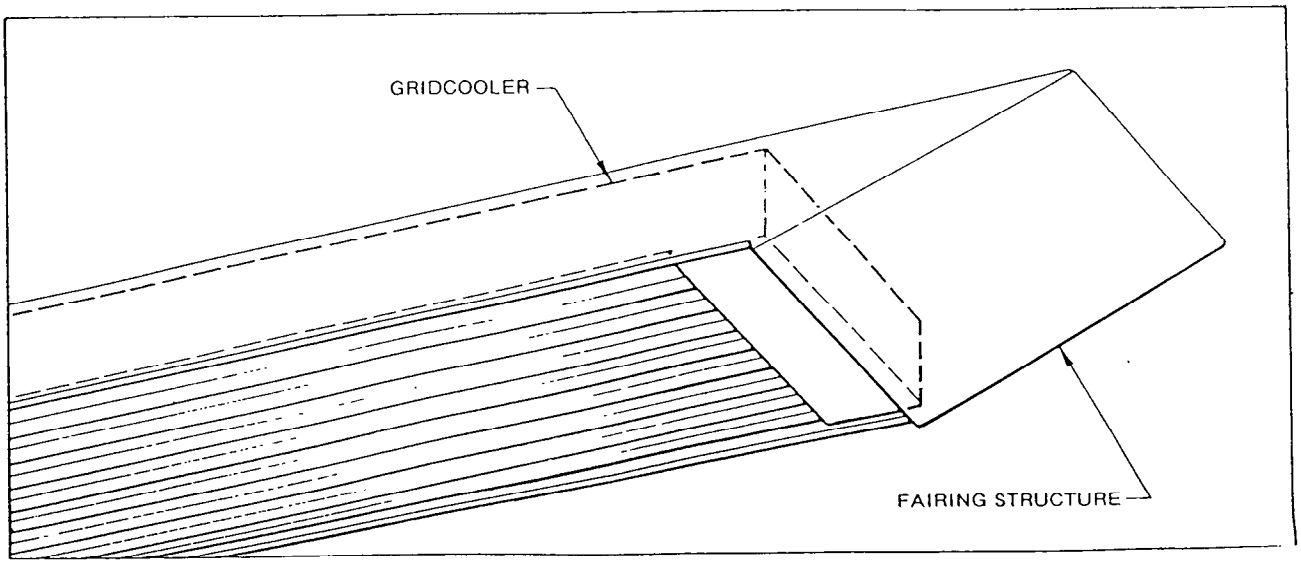
Recessed GRIDCOOLERS on slight incline on bottom of vessel.



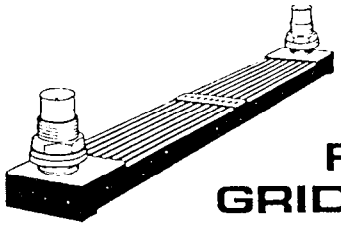
GRIDCOOLER recessed in old channel.



GRIDCOOLER recessed in wooden hull.



Using fairing blocks - steel hull.



FERNSTRUM GRIDCOOLER

INSTALLATION INSTRUCTIONS

FERNSTRUM GRIDCOOLERS are made of the finest, most suitable materials available. They are assembled, thoroughly tested and inspected by skilled craftsmen. Properly installed, the GRIDCOOLER should perform to your complete satisfaction.

NOTE: In addition to our standard 3/4 in. (19 mm) gaskets, we offer 1/4 in. (6.4 mm) gaskets for all "D" series GRIDCOOLER models. Please state your preference when ordering.

LOCATION

To function properly, the GRIDCOOLER must be properly located on your vessel's hull. Please consider the following before locating your GRIDCOOLER.

A. Sea water must flow over the entire length of the GRIDCOOLER.

B. The area of the hull where the GRIDCOOLER is installed must not vibrate or flex severely.

C. Always install the unit parallel, not transverse, to the skeg or keel. See Figures 1 and 2.

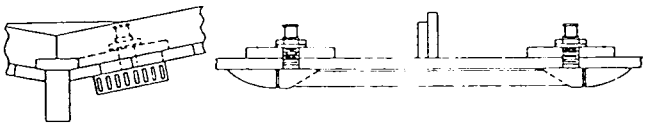


FIGURE 1 *External type installation. Use fairing blocks for protection and streamlining.*

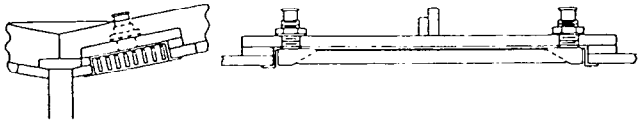


FIGURE 2 *Flush type installation. In wooden hulls flanged housing is recessed for added strength and sealing.*

D. On towboats, install the GRIDCOOLER as near to the propeller as possible to take advantage of its slip-stream during extreme towing operations. See Figure 3.

E. When installing a unit on the side of a hull, position it well below the water line to avoid aerated surface water. Aeration reduces heat transfer and can cause overheating. See Figure 4.

F. If the GRIDCOOLER is boxed in or installed in a recess, make sure that it has a 1½ in. (38 mm) clearance on all sides. If fairing blocks and side plates are used, make sure that the side plates are scalloped out so they will not entrap water.

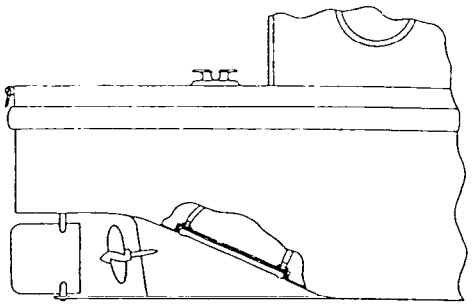


FIGURE 3 *Shallow draft steel river work boat. Flush type installation is made by welding in box-shaped recess in underside of hull.*

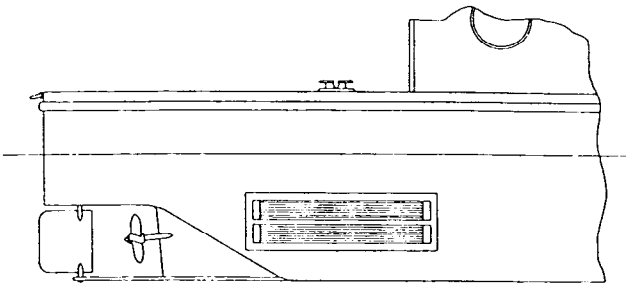


FIGURE 4 *Side mounted GRIDCOOLERS well below water line.*

G. If a grill guard is mounted over a unit that is boxed in or installed in a recess, make sure that the grill guard does not exceed 25% of the opening.

H. When the GRIDCOOLER is used on a generator set or if it is sized for a hull speed of 0 knots, make sure that sea water can freely circulate past the cooler tubes. A 1/2 mph (0.8 km/hr) convection current must flow over the cooler tubes to maintain proper cooling. Do not recess a generator set unit on the bottom of a flat bottom boat unless the hull section where the GRIDCOOLER will be mounted inclines a minimum of 20° (from forward to aft). See Figure 3.

I. Make sure that hot water is not discharged near the GRIDCOOLER.

J. When converting an engine from raw water cooling to keel cooling, do not pipe the GRIDCOOLER to a heat exchanger. Bypass the heat exchanger.

INSTALLATION

Check the following before installing your GRIDCOOLER.

A. Measure the distance between the GRIDCOOLER nozzles from center to center (also measure to the centers of the support studs when applicable) before cutting holes for them in the ship's hull.

On steel hull motor vessels make the nozzle holes through the hull 1/4 in. (6.4 mm) diameter oversized. If you burn the holes, grind the edges smooth afterwards.

B. Make sure that the hull surfaces where the GRIDCOOLER will be mounted are smooth and

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properly aligned so that the gaskets will seal properly and no undue stress will be placed on the GRIDCOOLER.

C. To avoid over-tightening supporting nuts, we recommend the following torques for all normal installations.

GRIDCOOLER SERIES	NOZZLE NUT FT-LBS (KG-M)	SUPPORT BOLT NUT FT-LBS(KG-M)	HEADER STUD NUT FT-LBS(KG-M)
B8U	50- 60(7- 8)	20-25(3-3.5)	25-30(3.5-4)
B	75-100(10-14)	20-25(3-3.5)	0
C8U	75-100(10-14)	25-30(3.5-4)	35-40(5-5.5)
C	125-150(17-21)	25-30(3.5-4)	0
D	200-250(28-35)	25-30(3.5-4)	50-60(7-8)

D. Under normal conditions, the compression of the mounting gaskets puts sufficient tension on the nozzle nuts (and support bolt nuts when applicable) to prevent them from working loose. If you want to secure them more positively (especially on hulls subject to vibration), attach a clip angle to the hull so that it butts against one flat of the hexagon nut. See Figure 5. To seal out water apply GE Marine Seal (silicone rubber) or equal around the gaskets, washers and the points where the nozzles and support bolts penetrate the hull.

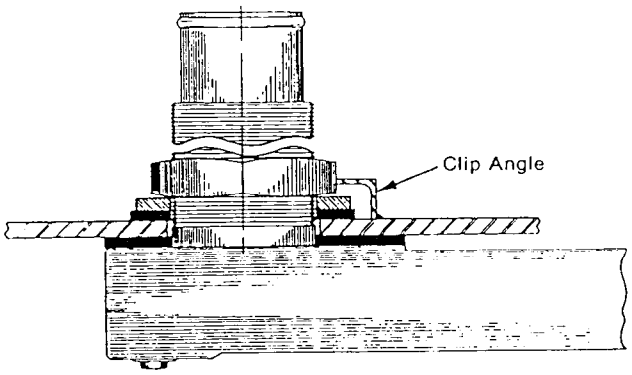

FIGURE 5

E. When installing a U-flow (two-pass type GRIDCOOLER) on an incline, make sure that the nozzles are at the high end. To avoid air pockets that would restrict water flow through the jacket and cause overheating, install the piping between the engine and the GRIDCOOLER so that it is self-draining.

F. See Figure 6. When piping, do not use tubing or fittings smaller than the engine or GRIDCOOLER connections. If those on the engine are larger than those on the GRIDCOOLER, reduce the piping at the engine, not at the GRIDCOOLER. To avoid transmitting engine vibrations to the hull, use tubing with hoses and clamps at the engine and GRIDCOOLER connections. Use a minimum of elbows. Check all connections for leaks. When testing with water, do not exceed 35 psi (2.46 kg/cm^2).

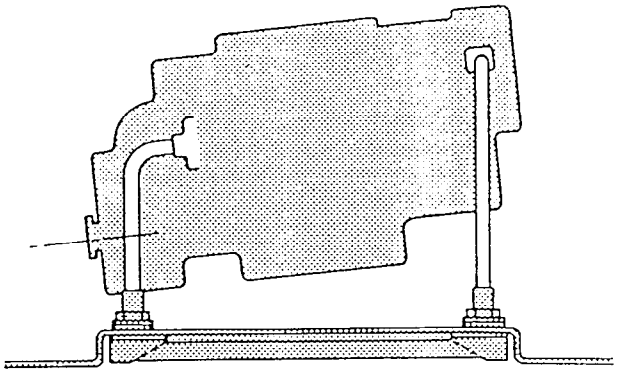

FIGURE 6 *Engine jacket water is piped directly to and from GRIDCOOLER which is in contact with sea water for transfer of heat.*

G. When using a reducing bell-housing (cofferdam type construction) in the piping to and from the GRIDCOOLER, apply a good grade of sealant such as GE Marine Seal around the gaskets, washers, and nuts to prevent fresh water from seeping down the threads.

H. See Figures 7, 8, 9 and 10 for piping diagrams for multiple GRIDCOOLER installations.

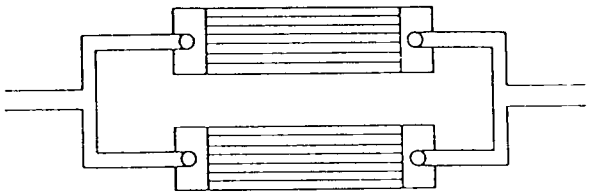

FIGURE 7 *GRIDCOOLERS connected in parallel.*

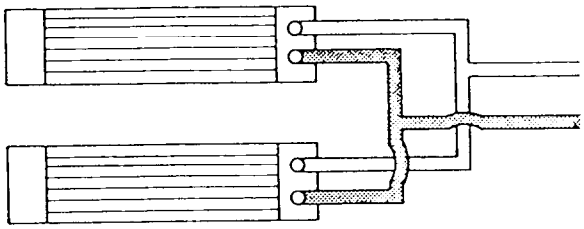

FIGURE 8 *GRIDCOOLERS connected in parallel.*

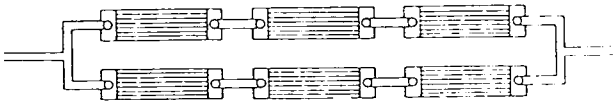

FIGURE 9 *GRIDCOOLERS connected in series.*

PARALLEL

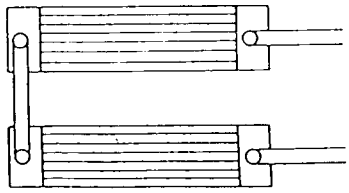

FIGURE 10 *GRIDCOOLERS connected in series.*

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OVERHEATING PROBLEMS

Determining the cause of overheating can be difficult. Here are some things to look for:

A. Collapsed rubber hose.

B. Check the piping between the GRIDCOOLER and the engine. Make sure that the piping is as large or larger than the GRIDCOOLER nozzles. The piping should also be arranged so that a minimum number of elbows is used.

C. Make sure that the jacket water is circulating through the GRIDCOOLER and not taking a path of least resistance through the bypass.

D. Stuck thermostat or improper thermostat used.

E. Jacket water pump not working properly.

F. Air lock. Make sure all air is bled from the system. When U-flow (two-pass) GRIDCOOLERS are mounted on the rake of the vessel, make sure that the nozzles are mounted in the up or high position. See Figure 11.

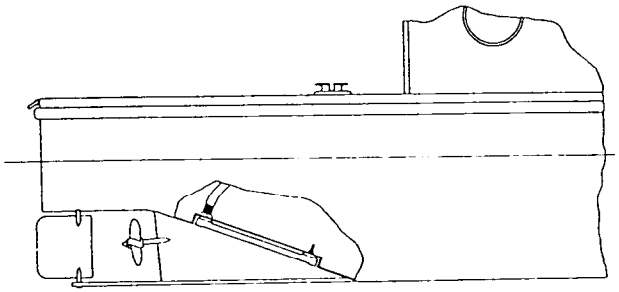


FIGURE 11 *U-flow GRIDCOOLER mounted on rake of vessel.*

G. All GRIDCOOLERS are shipped with orange plastic cap plugs covering the ends of the hose connectors. Make sure that these plugs were removed and that no foreign matter, such as sticks, rags, and so on, was dropped into the cooler nozzles.

H. Check the water level in the expansion tank.

I. Check the circulating pump for wear or misadjustment.

J. Make sure that the GRIDCOOLER has not been painted or covered with any other coating. This would have an insulating effect and will greatly reduce the heat transfer rate of the unit.

K. Make sure that the water around the GRIDCOOLER is not aerated in any way. Aeration also will reduce the heat transfer rate of the GRIDCOOLER.

L. If, on vessels with the GRIDCOOLER installed near the propeller, the engine temperature rises while the vessel is moored in dock, engage the propeller to circulate water past the GRIDCOOLER.

CLEAN GRIDCOOLER

A GRIDCOOLER that is reasonably clean inside and out will dissipate heat well. However, any of the following will drastically cut its heat transfer rate:

A. Paint. Was the GRIDCOOLER painted when the hull was? Paint can cut the heat dissipation capacity of the GRIDCOOLER in half.

B. Marine growth. Has your vessel been in dock for several months? You may find marine growth on the GRIDCOOLER. This too will reduce its heat transfer rate.

C. Oil or calcium deposits. Check the inside of the GRIDCOOLER for these. If you have had engine problems, oil may have gotten into the fresh water system and collected in the GRIDCOOLER, coating it with an oil film.

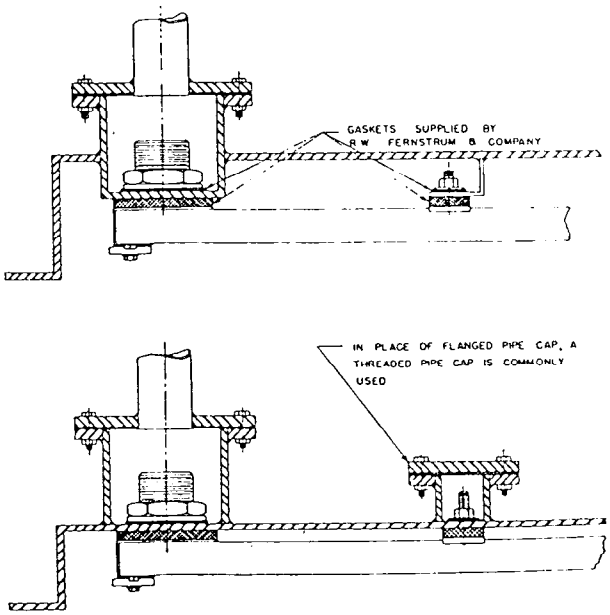
D. If an aftercooler circuit is overheating, make sure that the GRIDCOOLERS cooling this circuit are mounted forward of the jacket water coolers.

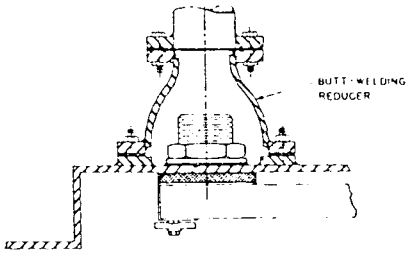
ZINC ELECTRODE PLATES

Zinc electrode plates are standard equipment with sea (salt) water type GRIDCOOLERS. They minimize the effects of galvanic corrosion, and should be replaced when deteriorated. The life of these plates varies with localities. Rapid deterioration can result from stray electrical currents induced by improperly grounded electrical equipment. These should be corrected.

COFFERDAMS

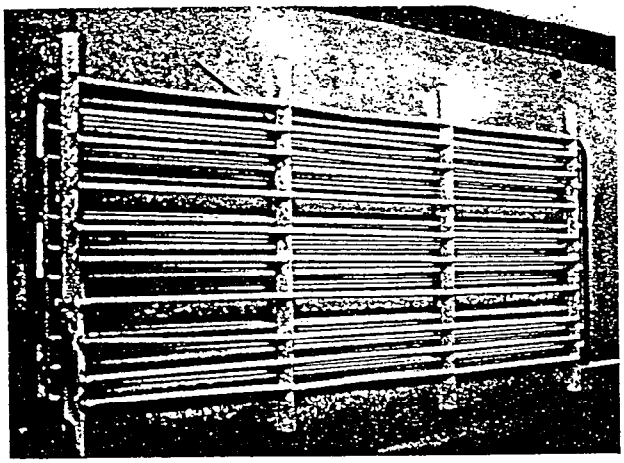
Occasionally, specially designed vessels require cofferdams. These drawings show commonly used types of cofferdams.



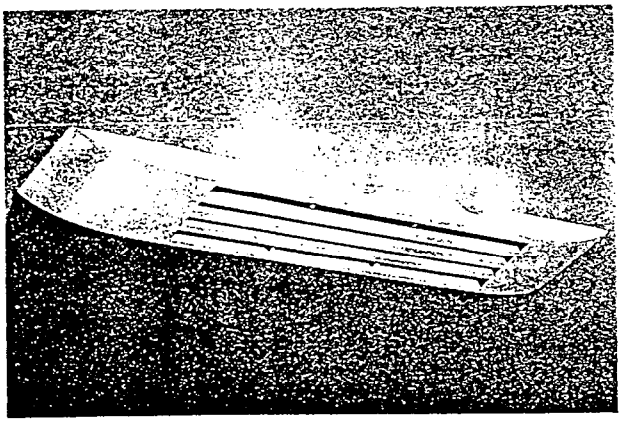


PROTECTIVE GUARDS

In extreme cases where logs, debris or dragging bottom may endanger the GRIDCOOLER, a protective guard may be mounted over the GRIDCOOLER recess. The following are two types of protective guards.



Protective guard made of bar stock protects recessed GRIDCOOLERS.

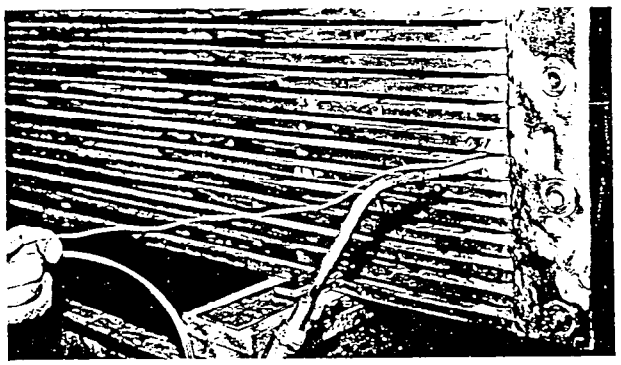


Protective guard made of bar and sheet stock protects external GRIDCOOLER.

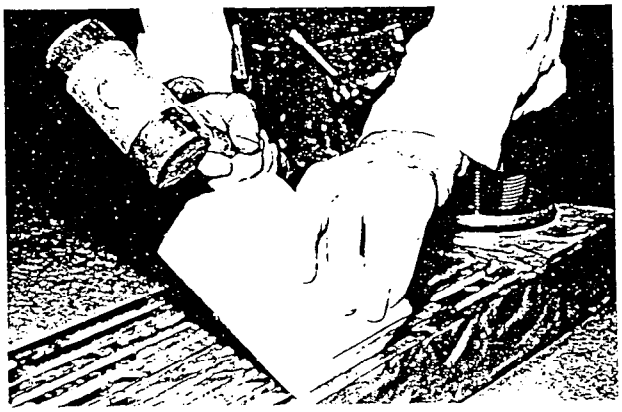
DAMAGED GRIDCOOLER

If the GRIDCOOLER is accidentally damaged while in use, you can make minor shipyard repairs as follows:

A. BRAZING: Drain the GRIDCOOLER before brazing. Clean the area or joint to be brazed thoroughly with a good degreasing solvent followed by wire brushing. The silver alloy used in the GRIDCOOLER is "Handy & Harman", 3/32 in. (2.4 mm) diameter Easy Flow wire, which has a melting point of 1160° F. (627° C.) and a flow point of 1175° F. (635°C.). Use "Handy & Harman" Flux, the low temperature brazing type. This is available at the numerous distributor outlets of Handy & Harman, 850 Third Avenue, New York, NY 10022.



B. If the tubes are accidentally bent, they can be straightened with a hard wood block and a mallet.



TEMPORARY REPAIR

For temporary repairs, liberally apply an epoxy compound similar to Devcon UW for above and underwater repairs, or Red Hand for above water repairs.

Before applying the epoxy compound, clean the surface of the GRIDCOOLER and relieve any internal pressure.

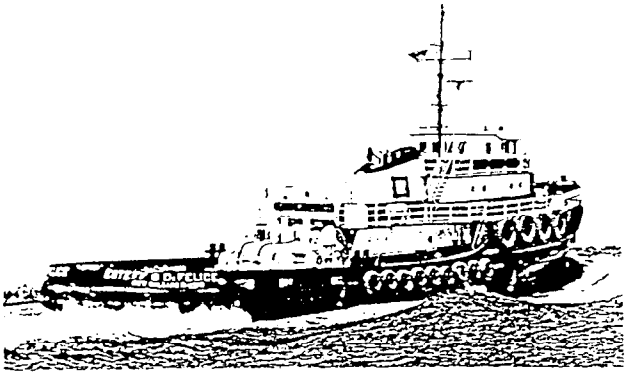
Devcon UW is available from the Devcon Corporation, Danvers, MA 01923. Red Hand is available from the International Paint Company, New York, NY.

For major repairs not covered by our Limited Warranty, contact us at (906) 863-5553 or Telex 26 3493. Give us a complete description of the damage, and we'll tell you if and how your unit can be repaired.

ENGINEERED KEEL COOLING

When you buy a FERNSTRUM GRIDCOOLER, you're getting more than well-built hardware. You're getting the most efficient, dependable form of keel cooling available - backed by decades of experience. We're proud of our reputation, and we're working hard to keep it.

To ensure that you get precisely what you need, we begin by asking a lot of questions. We'll need to know your engine make and model number, horsepower and rpm rating, heat rejection, fresh water flow rate, and the temperature requirements of the water entering and leaving the cooler. If you don't have all this information at your fingertips, we can get it for you - we maintain current files on all major marine engine manufacturers. We'll also ask about your vessel's hull design, its minimum speed at full rated power, and the maximum temperature of the water in which it will operate. With this data we can determine exactly what size GRIDCOOLER or GRIDCOOLERS your vessel will need - under its most severe operating conditions.



If your vessel has unusual features, we can custom-build a GRIDCOOLER to fit it.

Interested? Please call us today at the number below.

LIMITED WARRANTY

The R.W. Fernstrum & Company, manufacturer, carefully tests and inspects each GRIDCOOLER before it leaves the point of manufacture. The manufacturer makes no representations or warranties, express or implied, statutory or otherwise, except those herein expressly contained and shall not be held liable on any account except for repair or replacement under the terms following.

The manufacturer will, as to each GRIDCOOLER registered with it by the purchaser, repair or replace free of charge, such GRIDCOOLER as is found upon inspection to be defective because of material or workmanship providing the same has been returned to the manufacturer's factory, or a more convenient point as designated by the manufacturer, transportation prepaid, within ninety (90) days from date of installation for use. The manufacturer's obligation hereunder shall be limited to such time period and to the direct cost of repair and replacement and shall not include labor, transportation or other such expenses incurred by purchaser.

This warranty shall not be effective with respect to GRIDCOOLERS to which repairs or alterations have been made unless authorized by the manufacturer, nor to defects arising because of improper installation, misuse, accident, or other causes beyond the control of the manufacturer.

FERNSTRUM GRIDCOOLER

ENGINEERED KEEL COOLING

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TO CONTACT US:

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Phone: (906) 863-5553 • Telex: 26-3493 • Answer Back: FERNSTRUM MNOM

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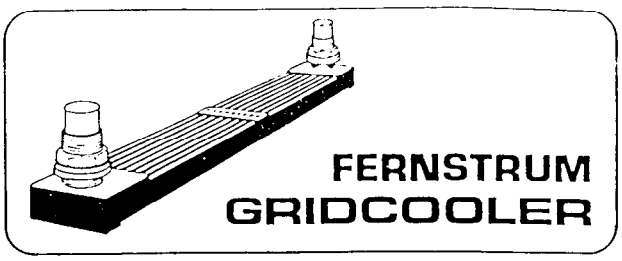
INSTALLATION AND APPLICATION FORM 140

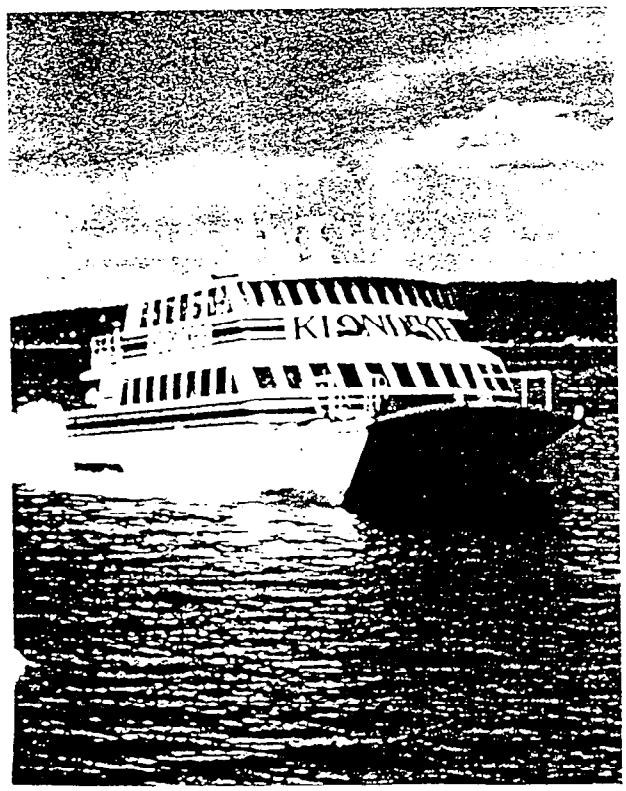


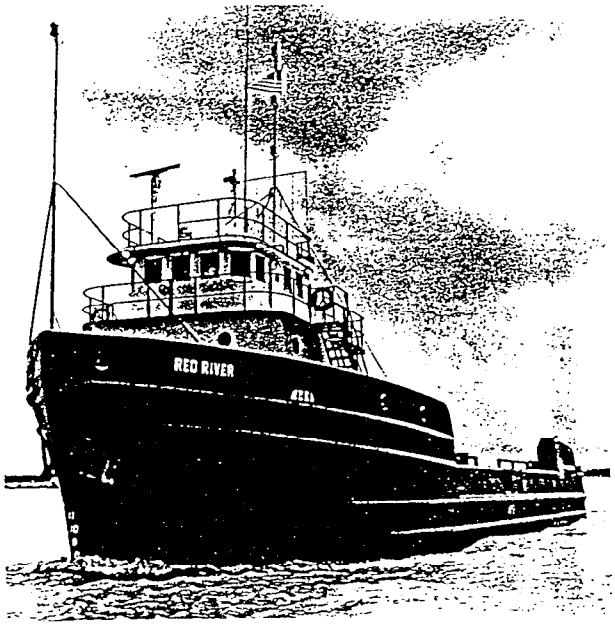
APPLICATIONS

WHY KEEL COOLING?

Keel cooling first appeared in the early 1800's, when someone hung a copper tube over the edge of a boat to condense steam. It later evolved into pieces of channel welded onto the hull. These channel cooling systems offered important advantages over raw water cooling. They eliminated silt and sand buildup in engine jackets and protected engines against salt water corrosion. Unfortunately, their sheer bulk reduced a ship's capacity and increased its drag. They were also prone to seaweed foulup. Clearly, a more compact and streamlined cooler was needed. This led to packaged keel coolers, and the FERNSTRUM success story.

FERNSTRUM GRIDCOOLERS are simple, dependable, packaged keel coolers tailored to fit everything from patrol boats to icebreakers. They incorporate the advantages of channel coolers without their bulk, drag or fouling problems. In many cases, a GRIDCOOLER requires only one twentieth of the space needed for channel cooling. With its streamlined design, a recessed GRIDCOOLER creates almost no drag and stays free of seaweed and debris.





Every FERNSTRUM GRIDCOOLER is computer designed for your exact operating conditions. This allows us to custom build a GRIDCOOLER to fit your needs.

A compact, modular unit, the GRIDCOOLER can be mounted almost anywhere on a ship's hull. This gives you flexibility to match the installation to the hull design and operating conditions. On shallow draft river work boats, for instance, the GRIDCOOLER may be mounted on the side of the hull or beside the skeg. On towboats, the GRIDCOOLER may be installed near the propeller to take advantage of its slip-stream during heavy towing. On fast moving vessels, the unit is normally recessed alongside the keel.

Two or more GRIDCOOLERS can be installed in parallel or in series. For maximum protection and minimum drag, recess them so they are flush with the hull. They may be, however, installed on the surface of the hull with fairing blocks for streamlining. FERNSTRUM GRIDCOOLERS are versatile. The following page illustrates some ways they have been installed:

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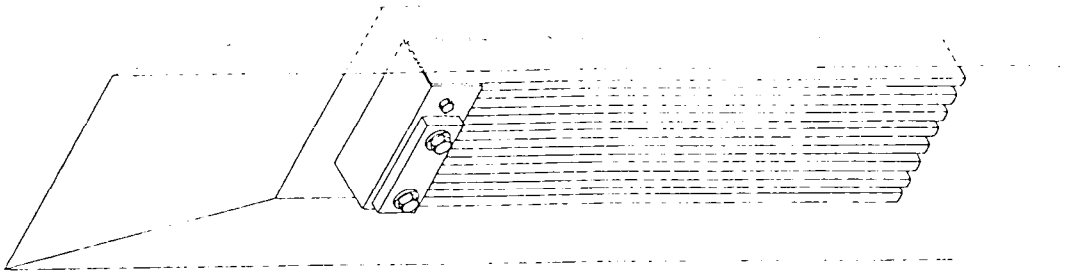
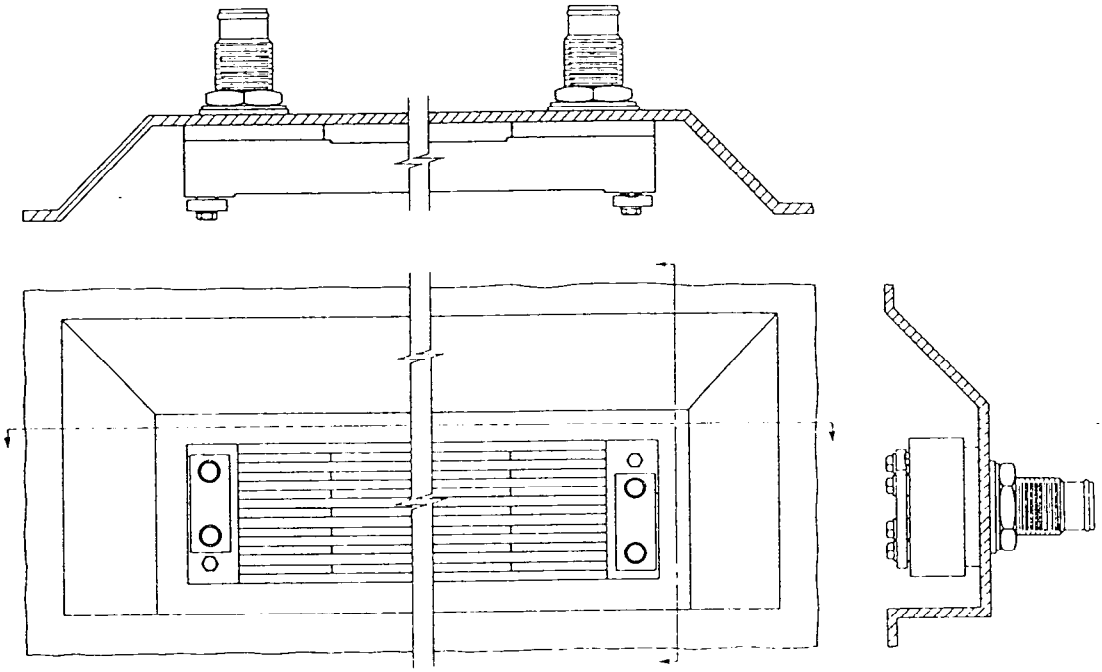
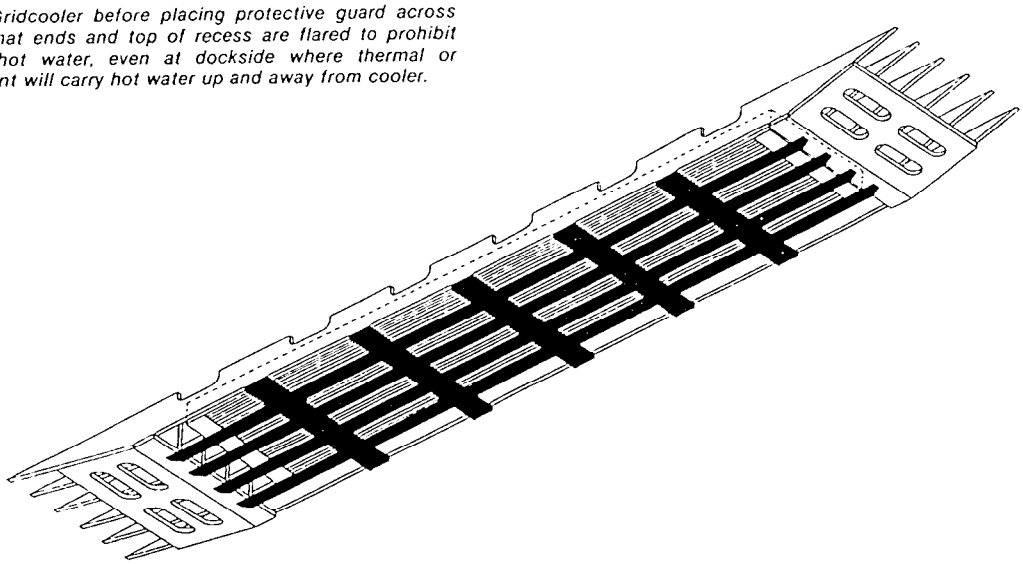


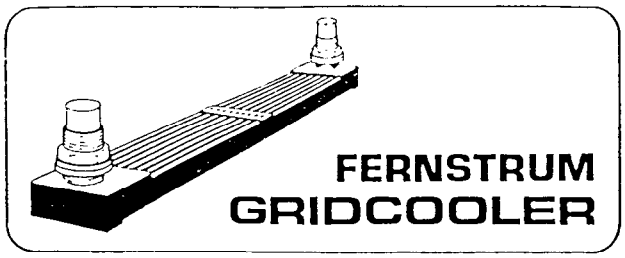
Gridcooler installed in a recess on a steel hull, before placing protective guard across opening. Note how end of recess is flared to permit free flow of water over cooler tubes.



Side recessed Gridcooler before placing protective guard across opening. Note that ends and top of recess are flared to prohibit entrapment of hot water, even at dockside where thermal or convection current will carry hot water up and away from cooler.



Gridcooler Installed using fairing blocks and side plates on steel hull with protective guard in place. Note that side plates and fairing structure are scalloped to allow free circulation of water across cooler.



FERNSTRUM GRIDCOOLERS are made of the finest, most suitable materials available. They are assembled, thoroughly tested and inspected by skilled craftsmen. Properly installed, the GRIDCOOLER should perform to your complete satisfaction.

LOCATION

To function properly, the GRIDCOOLER must be properly located on your vessel's hull. Please consider the following before locating your GRIDCOOLER:

A. Sea water must flow over the entire length of the GRIDCOOLER.

B. The area of the hull where the GRIDCOOLER is installed must not vibrate or flex severely.

C. Always install the unit parallel, not transverse, to the skeg or keel. See Figures 1 and 2.

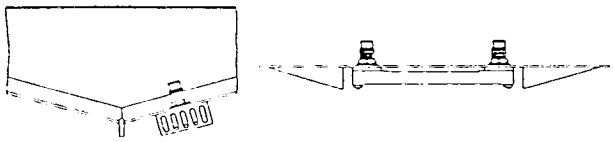


FIGURE 1 *External type installation. Use fairing blocks for protection and streamlining.*

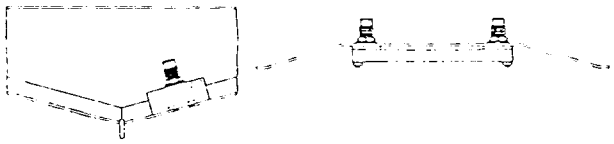


FIGURE 2 *Flush type installation.*

D. On towboats, install the GRIDCOOLER as near to the propeller as possible to take advantage of its slip-stream during extreme towing operations. See Figure 3.

E. When installing a unit on the side of a hull, position it well below the water line to avoid aerated surface water. Aeration reduces heat transfer and can cause overheating. See Figure 4.

F. When using a two-circuit cooling system, consisting of a high temperature or jacket water cooler and a low temperature or aftercooler circuit, make certain the low temperature or aftercooler circuit is placed forward of the high temperature or jacket water cooler, when applicable. When room allows, they can be installed side by side.

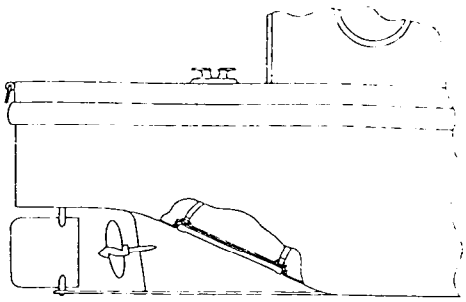


FIGURE 3 *Shallow draft steel river work boat. Flush type installation is made by welding in box-shaped recess in underside of hull.*

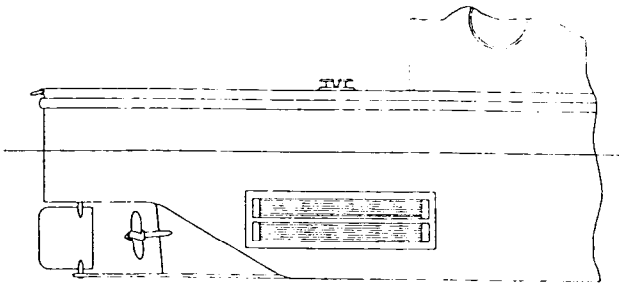


FIGURE 4 *Side mounted GRIDCOOLERS well below water line.*

G. If the GRIDCOOLER is boxed in or installed in a recess, make sure that it has a 1½ in. (38 mm) clearance on all sides. If possible, flare the ends of the recess to allow free flow of water over entire cooler. See Figure 5.

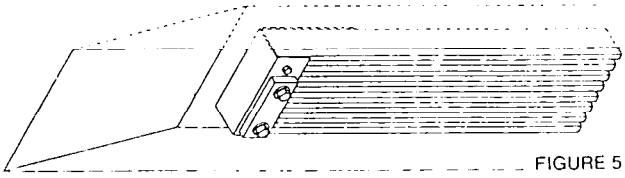


FIGURE 5

H. If side plates and fairing blocks are used, make sure that the side plates are scalloped out so they will not entrap water. Fairing blocks are most effective when installed on a 4 to 1 slope. See Figure 6.

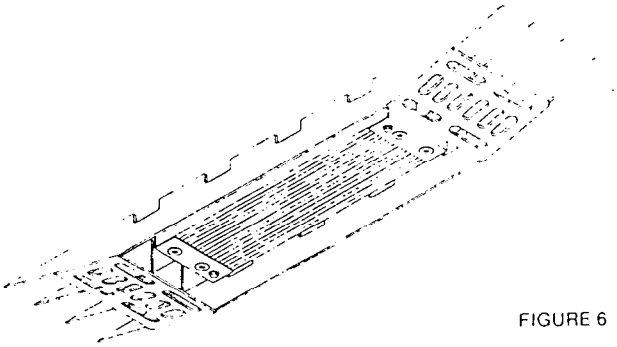


FIGURE 6

I. If a grill guard is mounted over a unit that is boxed in or installed in a recess, make sure that the grill guard does not exceed 25% of the opening.

J. When the GRIDCOOLER is used on a generator set or if it is sized for a hull speed of 0 knots, make

sure that sea water can freely circulate past the cooler tubes. A 1/2 mph (0.8 km/hr) convection current must flow over the cooler tubes to maintain proper cooling. Do not recess a generator set unit on the bottom of a flat bottom boat unless the hull section where the GRIDCOOLER will be mounted inclines a minimum of 20° (from forward to aft). See Figure 3.

K. Make sure that hot water is not discharged near the GRIDCOOLER.

L. When converting an engine from raw water cooling to keel cooling, do not pipe the GRIDCOOLER to a heat exchanger. Bypass the heat exchanger.

INSTALLATION

Once you have decided on the correct location, use the following steps as a guideline for properly installing your GRIDCOOLER:

A. Measure the distance between the GRIDCOOLER nozzles from center to center (also measure to the centers of the support studs when applicable) before cutting holes for them in the ship's hull.

On steel hull motor vessels make the nozzle holes through the hull 1/4 in. (6.4 mm) diameter oversized. If you burn the holes, grind the edges smooth afterwards.

B. Make sure that the hull surfaces where the GRIDCOOLER will be mounted are smooth and properly aligned so that the gaskets will seal properly and no undue stress will be placed on the GRIDCOOLER.

C. Mounting gaskets supplied with the GRIDCOOLER must be used to provide proper spacing between the GRIDCOOLER and the ship's hull.

NOTE: In addition to our standard 3/4 in. (19 mm) gaskets, we offer 1/4 in. (6.4 mm) gaskets for all "D" series GRIDCOOLER models. Please state your preference when ordering.

D. Under normal conditions, the compression of the mounting gaskets puts sufficient tension on the nozzle nuts (and support bolt nuts when applicable) to prevent them from working loose. To seal out water apply GE Marine Seal (silicone rubber) or equivalent around the gaskets, washers and the points where the nozzles and support bolts penetrate the hull before assembly.

E. To avoid over-tightening supporting nuts, we recommend the following torques for all normal installations.

GRIDCOOLER SERIES	NOZZLE NUT FT-LBS(KG-M)	SUPPORT BOLT NUT FT-LBS(KG-M)	HEADER STUD NUT FT-LBS(KG-M)
B6U & B8U	50- 60(7- 8)	20-25(3-3.5)	25-30(3.5-4)
B	75-100(10-14)	20-25(3-3.5)	0
C8U	75-100(10-14)	25-30(3.5-4)	35-40(5-5.5)
C	125-150(17-21)	25-30(3.5-4)	0
D8U	75-100(10-14)	25-30(3.5-4)	35-40(5-5.5)
D10U	125-150(17-21)	25-30(3.5-4)	35-40(5-5.5)
D	200-250(28-35)	25-30(3.5-4)	50-60(7-8)

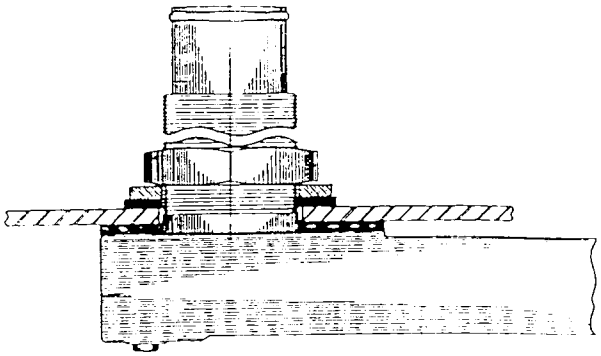


FIGURE 7 *Proper placement of mounting gaskets, washer and nut in relation to ship's hull.*

F. See Figure 8. When piping, do not use tubing or fittings smaller than the engine or GRIDCOOLER connections. If those on the engine are larger than those on the GRIDCOOLER, reduce the piping at the GRIDCOOLER, not at the engine. To avoid transmitting engine vibrations to the hull, use tubing with hoses and clamps at the engine and GRIDCOOLER connections. Use a minimum of elbows. Check all connections for leaks. When testing with water, do not exceed 35 psi (2.46 kg/cm^2).

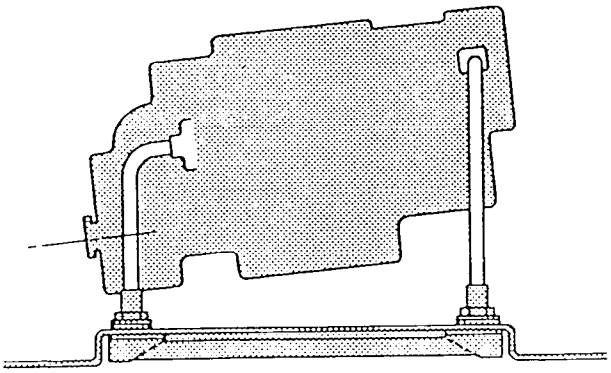


FIGURE 8 *Engine jacket water is piped directly to and from GRIDCOOLER which is in contact with sea water for transfer of heat.*

G. When installing a U-Flow (two-pass type GRIDCOOLER) on an incline, make sure that the nozzles are at the high end. To avoid air pockets that would restrict water flow through the cooling system and cause overheating, install the piping between the engine and the GRIDCOOLER so that it is self-draining. See Figure 9.

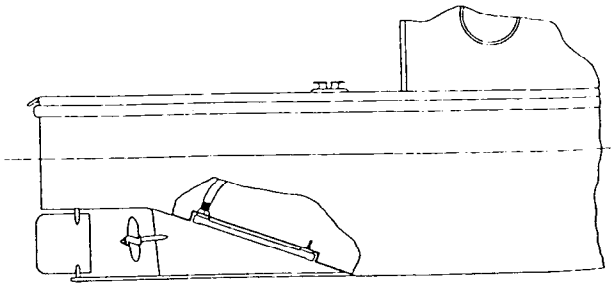


FIGURE 9 *U-Flow GRIDCOOLER mounted on rake of vessel.*

H. When installing a GRIDCOOLER in a side mounted postion it is important that the unit is completely filled with water before launching the vessel. This can be accomplished by using the following procedure:

At the outlet end of the GRIDCOOLER, see Figure 10, remove the upper drain plug and fill unit with fresh water. When water runs out of the upper drain, replace the plug. Your GRIDCOOLER is now filled with water. If the system is ever drained you must repeat the above procedure.

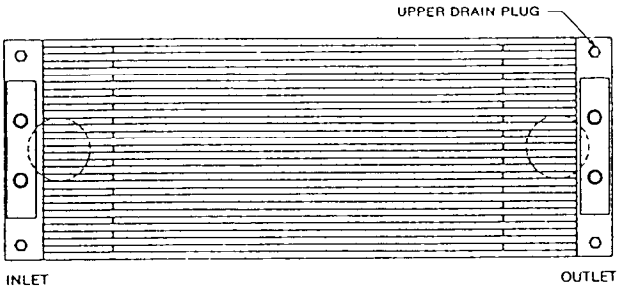


FIGURE 10.

I. When installing a U-Flow (two-pass type GRIDCOOLER) in a side mounted position, your inlet line should be connected to the lower nozzle to force air up and out of your system.

J. Occasionally specially designed vessels require cofferdams. Figure 11 shows a typical cofferdam installation.

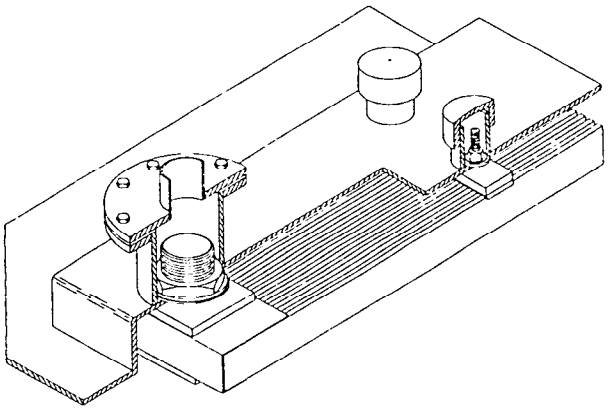


FIGURE 11

K. When using a cofferdam type installation, see Figure 11, on the piping to and from the GRIDCOOLER apply a good grade of sealant such as GE Marine Seal around the gaskets, washers, and nuts to prevent fresh water from seeping down the threads.

L. See Figures 12, 13, 14, and 15 for piping diagrams for multiple GRIDCOOLER installations.

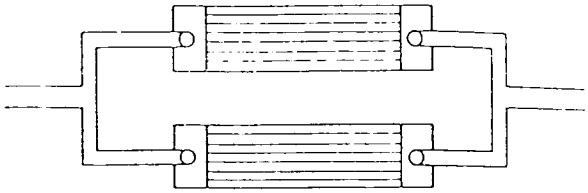


FIGURE 12 *GRIDCOOLERS connected in parallel.*

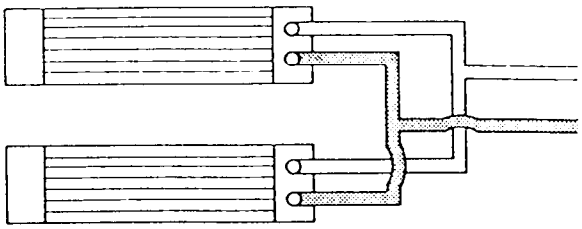


FIGURE 13 *U-Flow (2 Pass) GRIDCOOLERS connected in parallel.*

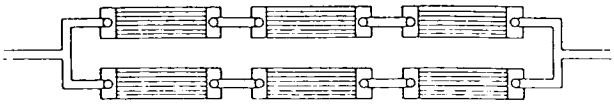


FIGURE 14 *GRIDCOOLERS connected in series parallel.*

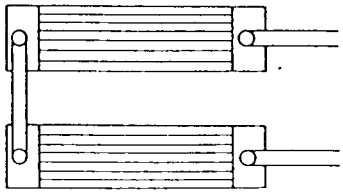


FIGURE 15 *GRIDCOOLERS connected in series.*

M. Attach the zinc electrode plates using the special bolts and washers supplied with the GRIDCOOLER. See Figure 16. Zinc replacement kits, including zinc electrodes, screws, and washers, can be ordered from the factory. Just give us the model number of your GRIDCOOLER.

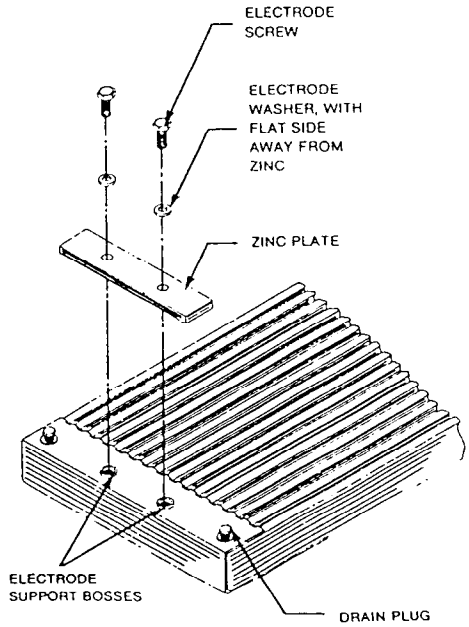


FIGURE 16.

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N. Zinc electrode plates are standard equipment with sea (salt) water type GRIDCOOLERS. They minimize the effects of galvanic corrosion, and should be replaced when deteriorated. The life of these plates varies with localities. Rapid deterioration can result from stray electrical currents induced by improperly grounded electrical equipment. These should be corrected.

OVERHEATING PROBLEMS

Determining the cause of overheating can be difficult. Here are some things to look for:

A. Collapsed rubber hose.

B. Check the piping between the GRIDCOOLER and the engine. Make sure that the piping is as large or larger than the GRIDCOOLER nozzles. The piping should also be arranged so that a minimum number of elbows is used.

C. Make sure that the jacket water is circulating through the GRIDCOOLER and not taking a path of least resistance through the bypass.

D. Stuck thermostat or improper thermostat used.

E. Jacket water pump not working properly.

F. Air lock. Make sure all air is bled from the system. When U-Flow (two pass) GRIDCOOLERS are mounted on the rake of the vessel, make sure that the nozzles are mounted in the up or high postion. See Figure 9.

G. All GRIDCOOLERS are shipped with orange plastic cap plugs covering the ends of the hose connectors. Make sure that these plugs were removed and that no foreign matter, such as sticks, rags, and so on, was dropped into the cooler nozzles.

H. Check the water level in the expansion tank.

I. Check the circulating pump for wear or misadjustment.

J. Make sure that the GRIDCOOLER has not been painted or covered with any other coating. This would have an insulating effect and will greatly reduce the heat transfer rate of the unit.

K. Make sure that the water around the GRIDCOOLER is not aerated in any way. Aeration also will reduce the heat transfer rate of the GRIDCOOLER.

L. If, on vessels with the GRIDCOOLER installed near the propeller, the engine temperature rises while the vessel is moored in dock, engage the propeller to circulate water past the GRIDCOOLER.

M. If an aftercooler circuit is overheating, make sure that the GRIDCOOLERS cooling this circuit are mounted forward of the jacket water coolers.

N. The mounting gaskets supplied with the GRIDCOOLER must be used to provide adequate spacing between the GRIDCOOLER and the ship's hull. This will allow water to flow freely over the cooler tubes.

O. How much glycol (antifreeze) is in the system? Perhaps the GRIDCOOLER was not sized for use of glycol in the system.

P. Have the rectangular tubes on the GRIDCOOLER been crushed or pinched where the internal water flow could be restricted?

Q. Could the rectangular tubes on the GRIDCOOLER have been blown or bulged by unusually high pressures? If so, the exterior water flow past the GRIDCOOLER tubes could be impaired.

CLEAN GRIDCOOLER

A GRIDCOOLER that is reasonably clean inside and out will dissipate heat well. However, any of the following will drastically cut its heat transfer rate:

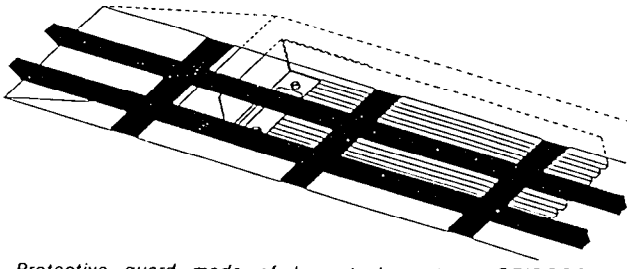
A. Paint. Was the GRIDCOOLER painted when the hull was? Paint can cut the heat dissipation capacity of the GRIDCOOLER in half.

B. Marine growth. Has your vessel been in dock for several months? You may find marine growth on the GRIDCOOLER. This too will reduce its heat transfer rate.

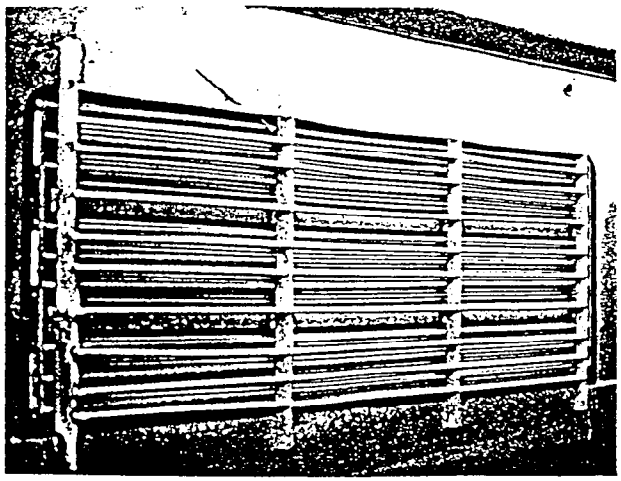
C. Oil or calcium deposits. Check the inside of the GRIDCOOLER for these. If you have had engine problems, oil may have gotten into the fresh water system and collected in the GRIDCOOLER, coating it with an oil film.

PROTECTIVE GUARDS

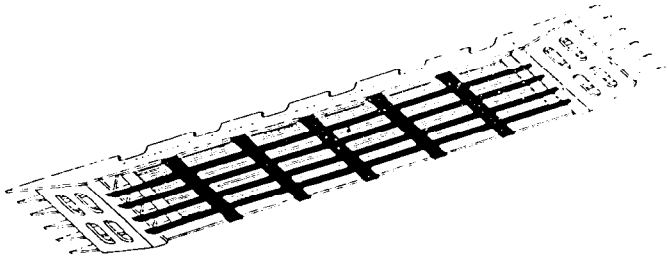
In extreme cases where logs, debris or dragging bottom may endanger the GRIDCOOLER, a protective guard may be mounted over the GRIDCOOLER recess. Make certain the grill guard does not exceed 25% of the opening. The following are examples of protective guards.



Protective guard made of bar stock protects GRIDCOOLER recessed on bottom of vessel.



Protective guard made of bar stock protects recessed side mounted GRIDCOOLERS.

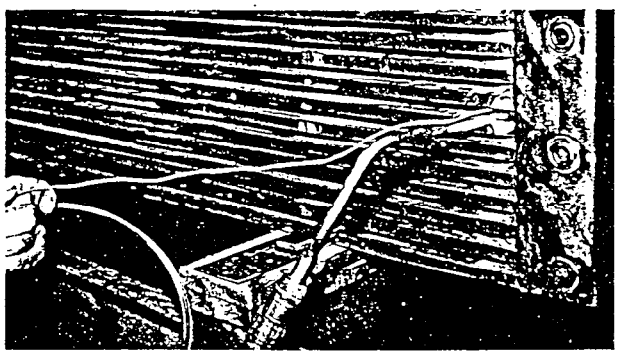


Protective guard made of bar and sheet stock protects external GRIDCOOLER.

DAMAGED GRIDCOOLER

If the GRIDCOOLER is accidentally damaged while in use, you can make minor shipyard repairs as follows:

A. BRAZING: Drain the GRIDCOOLER before brazing. Clean the area or joint to be brazed thoroughly with a good degreasing solvent followed by wire brushing. The silver alloy used in the GRIDCOOLER is "Handy & Harman", 3/32 in. (2.4 mm) diameter Easy Flow wire, which has a melting point of 1160 °F. (627 °C.) and a flow point of 1175 °F. (635 °C.). Use "Handy & Harman" Flux, the low temperature brazing type. This is available at the numerous distributor outlets of Handy & Harman, 850 Third Avenue, New York, NY 10022.



B. If the tubes are accidentally bent, they can be straightened with a hard wood block and a mallet.

TEMPORARY REPAIR

For temporary repairs, liberally apply an epoxy compound similar to Devcon UW for above water repairs.

Before applying the epoxy compound, clean the surface of the GRIDCOOLER and relieve any internal pressure.

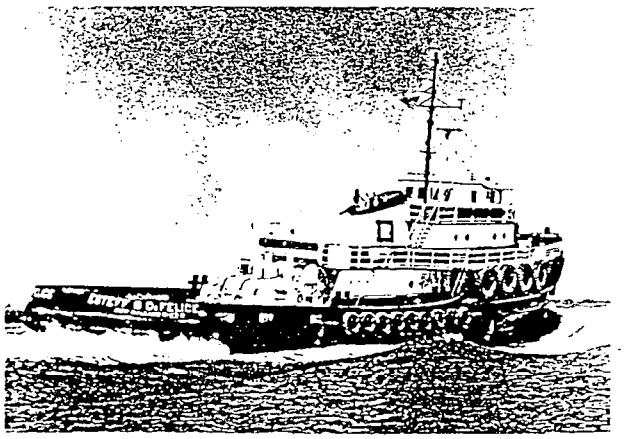
Devcon UW is available from the Devcon Corporation, Danvers, MA 01923. Red Hand is available from the International Paint Company, New York, NY.

For major repairs not covered by our Limited Warranty, contact us at (906) 863-5553 or Telex 26-3493. Give us a complete description of the damage, and we'll tell you if and how your unit can be repaired.

ENGINEERED KEEL COOLING

When you buy a FERNSTRUM GRIDCOOLER, you're getting more than well-built hardware. You're getting the most efficient, dependable form of keel cooling available — backed by decades of experience. We're proud of our reputation, and we're working hard to keep it.

To ensure that you get precisely what you need, we begin by asking a lot of questions. We'll need to know your engine make and model number, horsepower and rpm rating, heat rejection, fresh water flow rate, and the temperature requirements of the water entering and leaving the cooler. If you don't have all this information at your fingertips, we can get it for you — we maintain current files on all major marine engine manufacturers. We'll also ask about your vessel's hull design, its minimum speed at full rated power, and the maximum temperature of the water in which it will operate. With this data we can determine exactly what size GRIDCOOLER or GRIDCOOLERS your vessel will need — under its most severe operating conditions.



If your vessel has unusual features, we can custom-build a GRIDCOOLER to fit it.

Interested? Please call us today at the number shown on the back page.

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LIMITED WARRANTY

The R.W. Fernstrum & Company, manufacturer, carefully tests and inspects each GRIDCOOLER before it leaves the point of manufacture. The manufacturer makes no representations or warranties, express or implied, statutory or otherwise, except those herein expressly contained and shall not be held liable on any account except for repair or replacement under the terms following.

The manufacturer will, as to each GRIDCOOLER registered with it by the purchaser, repair or replace free of charge, such GRIDCOOLER as is found upon inspection to be defective because of material or workmanship providing the same has been returned to the manufacturer's factory, or a more convenient point as designated by the manufacturer, transportation prepaid, within ninety (90) days from date of installation for use. The manufacturer's obligation hereunder shall be limited to such time period and to the direct cost of repair and replacement and shall not include labor, transportation or other such expenses incurred by purchaser.

This warranty shall not be effective with respect to GRIDCOOLERS to which repairs or alterations have been made unless authorized by the manufacturer, nor to defects arising because of improper installation, misuse, accident or other causes beyond the control of the manufacturer.

FERNSTRUM GRIDCOOLER

ENGINEERED KEEL COOLING

TO CONTACT US:

R.W. FERNSTRUM & COMPANY
MENOMINEE, MICHIGAN, U.S.A. 49858
Phone: (906) 863-5553
Telex: 26-3493 • Answer Back: FERNSTRUM MNOM

EXPORT DEPARTMENT:

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MENOMINEE, MICHIGAN, U.S.A. 49858
Phone: (906) 863-5553
Telex: 26-3493 • Answer Back: FERNSTRUM MNOM

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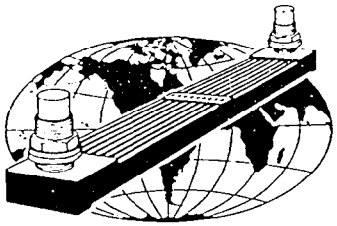
INSTALLATION and MAINTENANCE FORM 155



FERNSTRUM **GRIDCOOLER®**

A compact, modular unit, the GRIDCOOLER can be mounted almost anywhere on a ship's hull. This gives you flexibility to match the installation to the hull design and operating conditions. On shallow draft river work boats, for instance, the GRIDCOOLER may be mounted on the side of the hull or beside the skeg. On towboats, the GRIDCOOLER may be installed near the propeller (but not directly above it) to take advantage of its slip-stream during heavy towing. On fast moving vessels, the unit is normally recessed alongside the keel.

If drag is a factor you need to consider in your particular application, recessing a GRIDCOOLER has been found to add a negligible amount of drag if any at all. An independent tank testing study conducted by Schiffbautechnische Verzuchzanztalt (model basin, Vienna, Austria) found that GRIDCOOLER units "fitted in a respective recess, practically do not influence the resistance (drag) of a ship." More information is available upon request.

For larger engines, two or more GRIDCOOLER units can be installed in parallel or in series. For maximum protection and minimum drag, recess them so they are flush with the hull. They may be, however, installed on the surface of the hull with fairing blocks for stream-lining. The FERNSTRUM GRIDCOOLER is quite versatile.

The FERNSTRUM GRIDCOOLER is made of the finest, most suitable materials available. They are assembled, thoroughly tested, and inspected by skilled craftsmen. When properly installed, the GRIDCOOLER will perform to your complete satisfaction.

LOOK FOR THE GRID . . . FIND FERNSTRUM QUALITY

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Appendix A Cleaning .....Page 9

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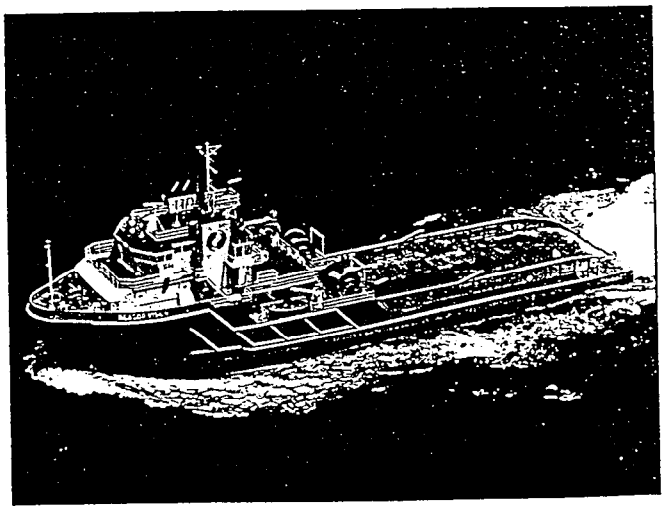
Recommendation Form.....Page 12



TO CONTACT US:

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Website: www.fernstrum.com

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To function properly, the GRIDCOOLER must be properly located on your vessel's hull. Please consider the following before installing your GRIDCOOLER:

1.1 GOOD LOCATIONS

1.1.1 Sea water must flow over the entire length of the GRIDCOOLER.

1.1.2 Always install the unit parallel, not transverse, to the skeg or keel. See Figures 1 & 2.

1.1.3 On towboats, install the GRIDCOOLER as near to the propeller as possible (but not directly above it) to take advantage of its slip-stream during extreme towing operations. See Figure 4.

1.1.4 When installing a unit on the side of a hull, position it well below the water line to avoid aerated surface water. Aeration reduces heat transfer and can cause overheating. See Figure 3.

1.1.5 When using a **two-circuit** cooling system, consisting of a high temperature jacket water circuit and a low temperature aftercooler circuit, make certain the aftercooler circuit cooler is placed forward of the jacket water circuit cooler. When room allows, they can be installed side by side with the aftercooler circuit lower on the hull (i.e. closer to the skeg or keel) and a divider plate between the high and low temperature GRIDCOOLER units.

1.1.6 When the GRIDCOOLER is used on a generator set or if your application requires sizing for a hull speed of 0 knots, make sure that sea water can freely circulate past the cooler tubes. A 1/2 mph (0.8 km/hr) minimum convection current must flow over the cooler tubes to maintain proper cooling. Do not recess a generator set unit on the bottom of a flat bottom boat unless the hull section where the GRIDCOOLER will be mounted inclines a minimum of 20 degrees (from forward to aft) to avoid entrapping raw hot water around the GRIDCOOLER tubes. See Figure 4.

1.1.7 In high speed applications (10+ knots), locate the GRIDCOOLER as far aft as possible to avoid aeration.

1.1.8 Keep the GRIDCOOLER close to the keel.

1.2 BAD LOCATIONS

1.2.1 The area of the hull where the GRIDCOOLER is installed must not vibrate or flex severely.

1.2.2 Make sure that hot water is not discharged near the GRIDCOOLER.

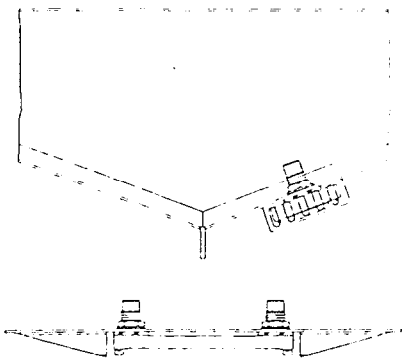

FIGURE 1 *External type installation. Use fairing blocks for protection and streamlining.*

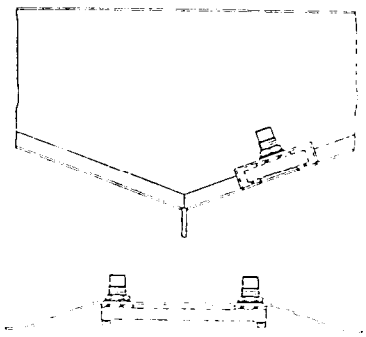

FIGURE 2 *Recess type installation.*

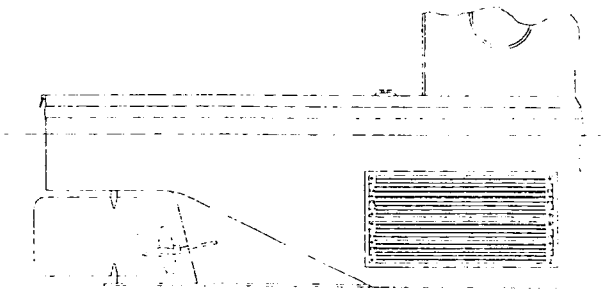

FIGURE 3 *Side mounted coolers well below water line.*

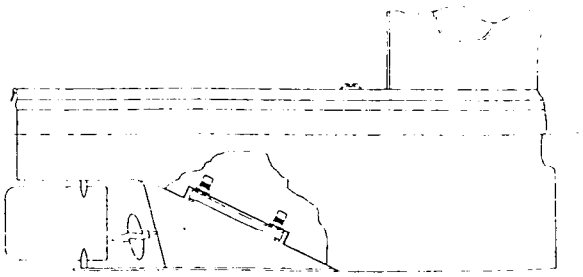

FIGURE 4 *Shallow draft steel river work boat. Flush type installation is made by welding in box-shaped recess in underside of hull.*

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1.2.3 To eliminate unnecessary stress and vibration on the cooler, do not locate your GRIDCOOLER directly below engine mounts.

1.2.4 To eliminate unnecessary stress and vibration on the cooler, do not locate your GRIDCOOLER directly above the propeller(s).

1.2.5 Do not locate your GRIDCOOLER on the front 1/3 of the hull for displacement hulls. For planing hull vessels, mount the GRIDCOOLER aft of midships.

INSTALLATION

Once you have decided on the correct location, use the following steps as a guideline for installing your GRIDCOOLER:

NOTE: Do not exceed 35 PSI (2.41 Bar) when pressure testing a GRIDCOOLER.

2.1 COFFERDAM INSTALLATION

Some classed vessels (ABS or Coast Guard, for example) may require cofferdams, check with your local officials for more information. For this type of installation, see Cofferdam Installation on Page 7.

2.2 MAKING HOLES

2.2.1 Measure the distance between the GRIDCOOLER nozzles from center to center (also measure to the centers of the support studs when applicable) before cutting holes for them in the ship's hull.

2.2.2 Make the nozzle holes through the hull 1/4 in. (6.4 mm) diameter oversized.

2.2.3 Make sure that the hull surfaces where the GRIDCOOLER will be mounted are smooth and properly aligned (on steel hulls, if you burn the holes, grind the edges smooth afterwards). This will allow the gaskets to seal properly and insure that no undue stress will be placed on the GRIDCOOLER.

2.3 MOUNTING

2.3.1 A GRIDCOOLER can be canted from the hull (sideways) to vertically align the nozzles. This can reduce interference problems with stringers on cofferdam installations. See Figure 5.

2.3.2 If you aren't sure as to whether or not you should recess your GRIDCOOLER, we recommend using a recess on planing hulls and vessels moving at 10 or more knots. Owners of vessels with displacement hulls moving at less than 10 knots may find an external mounting with fairing blocks to their advantage; provided there isn't much chance of the unit being damaged in such an environment.

2.3.3 If the GRIDCOOLER is recessed into the hull, make sure that it has a 1-1/2 in. (38 mm) minimum clearance on all sides (this does not include between the hull and the top of the cooler). The recess should be no deeper than 1/2 in. (13 mm) plus the hull projection (listed on installation drawing) of the cooler.

2.3.4 High speed applications (10+ knots) can reduce the 1-1/2 in. clearance in section 2.3.3 to 1/2 in. minimum due to increased raw water flow over the cooler at high speed.

2.3.5 When recessing a GRIDCOOLER into the side of the hull for generator sets and/or equipment operating at dockside, angle the top of the recess box to allow convection current over the GRIDCOOLER. See Figure 6.

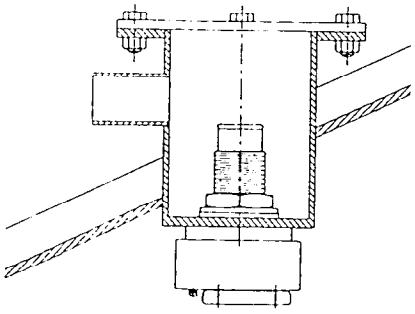

FIGURE 5 *Canted Installation with Cofferdam.*

NOTE:
Recess box with angled top suggested for generator set and equipment operating at dock side only. **NOT** required for propulsion engines.

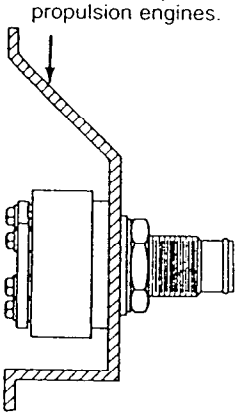

FIGURE 6 *Side Mounted Recess.*

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2.3.6 When installing a U-Flow (two-pass type GRIDCOOLER) on an incline, make sure that the nozzles are at the high end to avoid air entrapment. See Figure 7.

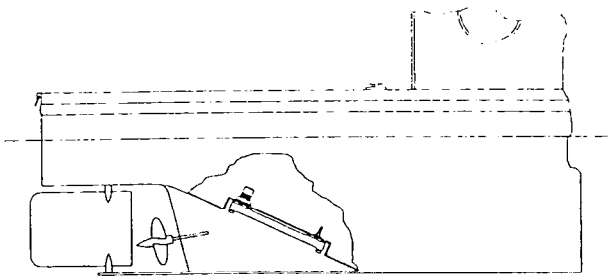

FIGURE 7 *U-Flow GRIDCOOLER mounted on rake of vessel.*

2.3.7 High speed applications and others that use "E1" series coolers should take into consideration the removal and replacement of zinc electrodes when sizing the length of a recess.

2.3.8 If side plates and fairing blocks are used, make sure that the side plates are scalloped out so they will not entrap water. Fairing blocks are most effective when installed on a 4 to 1 slope. See Figure 8.

2.3.9 A GRIDCOOLER can be bent to conform to the hull. The bending can be done at the yard or by R. W. Fernstrum & Company. Contact us if you are considering bending a GRIDCOOLER. See Bending – Page 8.

2.3.10 In extreme cases, where logs, debris, or dragging bottom may endanger the GRIDCOOLER, a protective guard may be mounted over the GRIDCOOLER recess. Make certain the grill guard does not exceed 25% of the opening. Figures 8 and 9 are examples of protective guards and different installations that have been used.

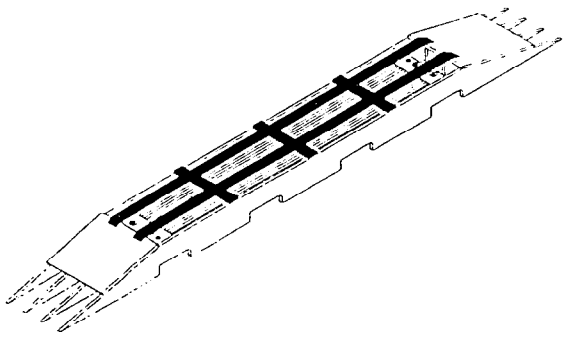

FIGURE 8

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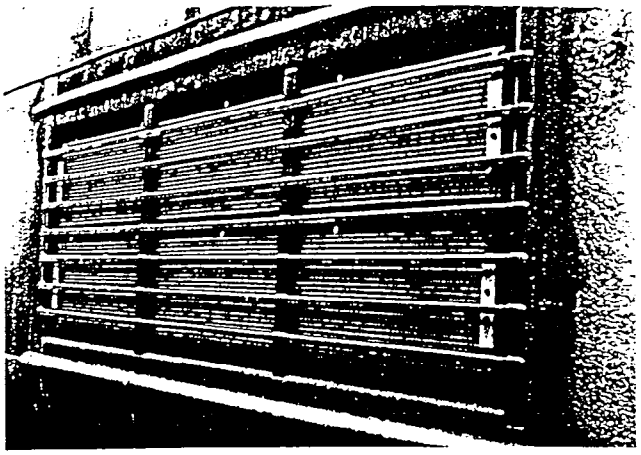

FIGURE 9 *Side mounted coolers.*

2.4 FITTING UP

Under normal conditions, the compression of the mounting gaskets puts sufficient tension on the nozzle nuts (and support bolt nuts when applicable) to prevent them from working loose. To seal out water, apply a polysulfide rubber sealant like BoatLIFE Caulk or 3M Marine Sealant 101 around the gaskets, washers, and the points where the nozzles and support bolts penetrate the hull before assembly. Remember to tighten the nuts a second time, after the caulking has set.

NOTE: BoatLIFE is available from Life Industries, call (803) 566-1225 for a dealer near you. Marine Sealant 101 is available from 3M, call (612) 737-6362 for a dealer near you.

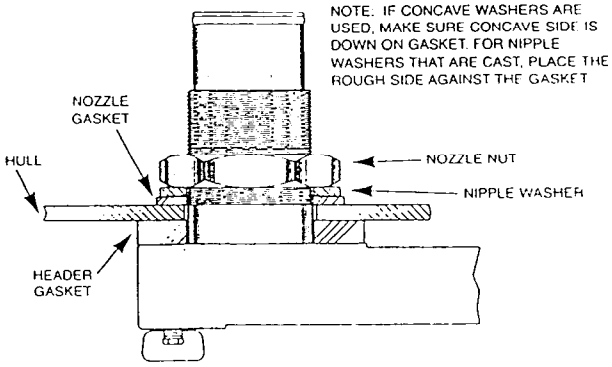

FIGURE 10 *Mounting Parts Placement*

2.5 COPPER/NICKEL INSTALLATION

NOTE: **Do not exceed 35 PSI (2.41 Bar) when pressure testing a GRIDCOOLER.**

2.5.1 Mounting gaskets supplied with the GRIDCOOLER must be used to provide proper spacing between the GRIDCOOLER and the ship's hull.

NOTE: All "B" & "C" series models have 1/4 in. (6.4 mm) gaskets standard. The "D" series models have 3/4 in. (19 mm) gaskets standard, but 1/4 in. gaskets are available upon request for "D" series units.

2.5.2 To avoid over-tightening any of the supporting nuts, we recommend the following torques for all standard installations:

COPPER/NICKEL GRIDCOOLER NUT TORQUES FT.-LBS. (KG-M)			
NOZZLE THREAD SIZE			
.75" 19mm	1 - 1.5" 25 - 38mm	2" 51mm	2.5 - 3.5" 63 - 89mm
50 - 60 (7 - 8)	75 - 100 (10 - 14)	125 - 150 (17 - 21)	200 - 250 (28 - 35)
HEADER STUD		SUPPORT BOLT	
.625 - .75" 16 - 19mm	1" 25.4mm	.5 - .75" 13 - 19mm	
35 - 40 (5 - 5.5)	50 - 60 (7 - 8)	20 - 25 (3 - 3.5)	

2.5.3 Attach the zinc electrode plates using the special bolts and washers supplied with the GRIDCOOLER. See Figure 11. They can be found in a cardboard box inside the GRIDCOOLER shipping box.

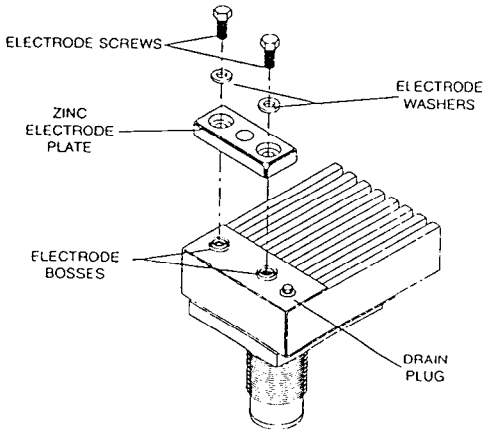

FIGURE 11 *Zinc Attachment Detail*

2.5.4 Zinc replacement kits, including zinc electrodes, screws, and washers, can be ordered from the factory. Just give us the model number of your GRIDCOOLER.

2.5.5 Zinc electrode plates are standard equipment with most copper/nickel GRIDCOOLER models. They minimize the effects of galvanic corrosion, and should be replaced when deteriorated. The life of these plates varies with localities. Rapid deterioration can result from stray electrical currents induced by improperly grounded electrical equipment. These problems should be corrected.

2.6 ALUMINUM INSTALLATION

2.6.1 An Aluminum GRIDCOOLER should be installed on **unpainted aluminum hulls only**.

2.6.2 The 1/4 in. mounting gaskets supplied with the GRIDCOOLER must be used to provide proper spacing between the GRIDCOOLER and the ship's hull.

2.6.3 To avoid over-tightening any of the supporting nuts, we recommend the following torques for all normal installations:

ALUMINUM GRIDCOOLER NUT TORQUES FT-LBS (KG-M)		
NOZZLE THREAD		SUPPORT BOLT
1" 25.4mm	1.5 - 3" 38 - 76mm	.625" 16mm
75 - 100 (10 - 14)	125 - 150 (17 - 21)	20 - 25 (3 - 3.5)

2.6.4 Most aluminum units have tapered threads on the nipples and no hose connectors (see installation drawing), these units can be piped directly to the engine, provided flexible couplings are used to remove engine vibration between the engine and the GRIDCOOLER.

2.6.5 If a wire reinforced rubber hose is used to connect the GRIDCOOLER to the engine, put a screw-on coupling over the GRIDCOOLER nozzle threads.

2.6.6 Aluminum GRIDCOOLER models do not use zinc electrodes.

2.7 PLUMBING

2.7.1 Remove the orange nozzle plugs from the GRIDCOOLER before hooking up the plumbing to the cooler.

2.7.2 When converting an engine from inboard heat exchanger cooling to keel cooling, do not pipe the GRIDCOOLER to a heat exchanger, bypass the heat exchanger and pipe the GRIDCOOLER directly to the engine. See Figure 12.

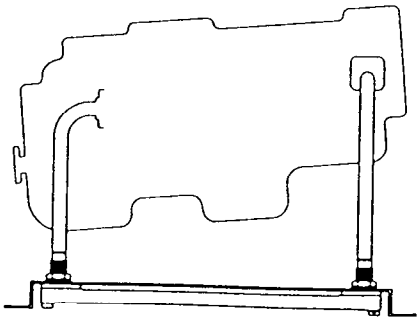

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FIGURE 12

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2.7.3 As a rule-of-thumb, the expansion tank for your cooling system should be be able to hold approximately 10% of the total cooling system coolant. Contact your engine dealer for the exact size.

2.7.4 When piping, do not use tubing or fittings smaller than the engine or GRIDCOOLER connections. If those on the engine are larger than those on the GRIDCOOLER, reduce the piping at the GRIDCOOLER, not the engine. Use a minimum of elbows, and check all connections for leaks. All high areas in piping must be vented.

2.7.5 To avoid transmitting engine vibrations to the GRIDCOOLER, use wire reinforced rubber hoses and clamps at the engine and GRIDCOOLER connections.

2.7.6 When installing a U-Flow (two-pass type GRIDCOOLER) in a side mounted position, your inlet line should be connected to the lower nozzle to force air up and out of the cooling system.

2.7.7 To avoid air pockets that would restrict water flow through the cooling system and cause overheating, install the piping between the engine and the GRIDCOOLER so that it is self-venting.

2.7.8 For piping diagrams for multiple GRIDCOOLER installations, see Figures 13 through 16.

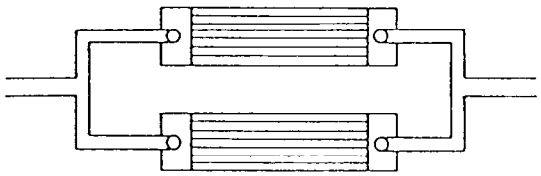

FIGURE 13 *Coolers connected in parallel.*

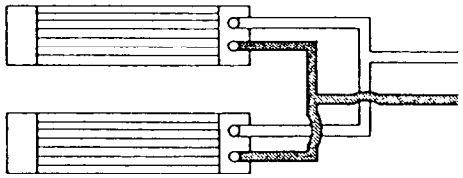

FIGURE 14 *U-Flow (2 Pass) Coolers connected in parallel*

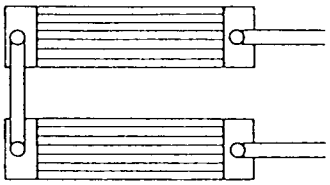

FIGURE 15 *Coolers connected in series.*

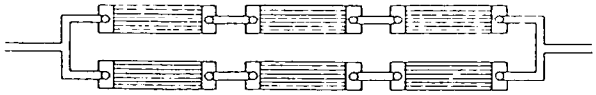

FIGURE 16 *Coolers connected in series parallel.*

2.8 FILLING & TESTING

2.8.1 Always premix ethylene glycol (antifreeze) with water before adding it to the cooling system. Contact your engine dealer for the proper antifreeze type and percentage for your engine. We do not recommend the use of propylene glycol in your cooling system.

2.8.2 Never mix ethylene and propolyene glycol based antifreezes in your cooling system.

2.8.3 When installing a GRIDCOOLER in a side mounted position, it is important that the unit is completely filled with water before launching the vessel. This can be accomplished by using the following procedure:

1. At the outlet end of the GRIDCOOLER (see Figure 17), remove the upper drain plug and fill the unit with cooling water.
2. When water runs out of the upper drain, replace the plug.
3. Your GRIDCOOLER is now filled with water. If the system is ever drained, you must repeat this procedure.

NOTE: When pressure testing the cooling system, do not exceed 35 PSI (2.41 BAR).

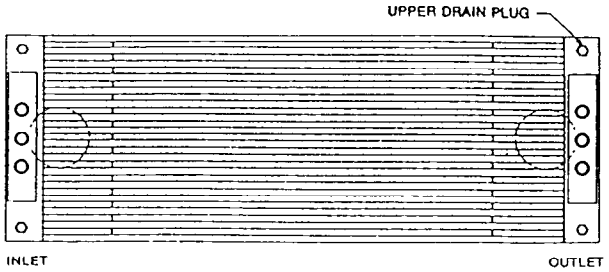

FIGURE 17

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SPECIAL INSTALLATIONS

3.1 COFFERDAM INSTALLATION WITH COMPRESSION GASKETS – SEE FIGURE 18.

3.1.1 Place a 1/4" continuous bead of sealant around the header gasket that separates the GRIDCOOLER from the outer hull. Do not use silicone sealants. We recommend polysulfide rubber sealants such as 3M Marine Sealant 101 or BoatLIFE Caulk.

3.1.2 Hoist the GRIDCOOLER up into the mounting position. The exterior header gasket must be in full contact with the hull.

3.1.3 Place a second continuous 1/4" bead of sealant on the inner hull around the nipple. This bead must be in contact with the hull and the nipple.

3.1.4 Place the nipple gasket (harder of the two interior gaskets) down over the nozzle as far as possible.

3.1.5 Place the unfinished cast washer down over the nipple as far as possible. The side of the washer marked "up" must face away from the hull.

3.1.6 Place the compression gasket (softer of the two interior gaskets) down over the nipple as far as possible.

3.1.7 Place the semi finished washer down over the nipple, finished side away from the hull.

3.1.8 Run the nut down over the nipple and torque to spec. (See chart on Page 5)

3.1.9 Torque the nut to spec a second time after the sealant has set.

NOTE: For ease of installation and maintenance, pipe to the side of the cofferdams. (See Figure 19.)

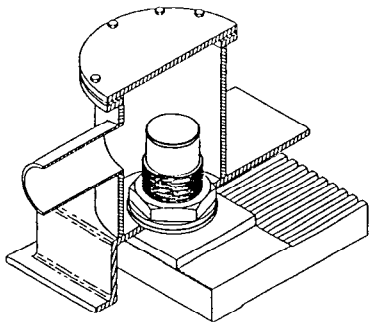

FIGURE 19 *Pipe from side of Cofferdam*

NOTE: BoatLIFE is available from Life Industries, call (803) 566-1225 for a dealer near you. Marine Sealant 101 is available from 3M, call (612) 737-6362 for a dealer near you.

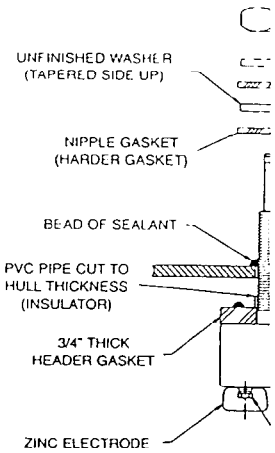

FIGURE 18

3.2 MOUNTING CO
ALUMINUM HUL

An electrical barrier r
GRIDCOOLER and the h
does not formally appr
copper/nickel GRIDCOOI
However, the following
hundreds of boats.

3.2.1 Sandblast the
GRIDCOOLER w

3.2.2 Coat the sandbla
resin like Boat Ai
part resin.

3.2.3 Spray the resin c
use any matting
enough so that it

3.2.4 After spraying or
resin is still tacky,
priming paint use

3.2.5 Apply the final b
GRIDCOOLER.

3.1 COFFERDAM INSTALLATION WITH COMPRESSION GASKETS – SEE FIGURE 18.

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NOTE: For ease of installation and maintenance, pipe to the side of the cofferdams. (See Figure 19.)

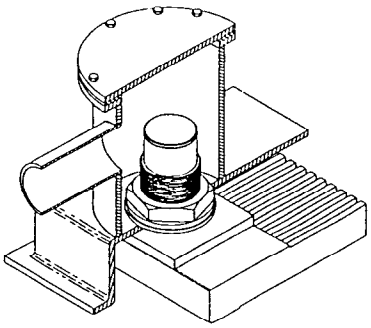

FIGURE 19 *Pipe from side of Cofferdam*

NOTE: BoatLIFE is available from Life Industries, call (803) 566-1225 for a dealer near you. Marine Sealant 101 is available from 3M, call (612) 737-6362 for a dealer near you.

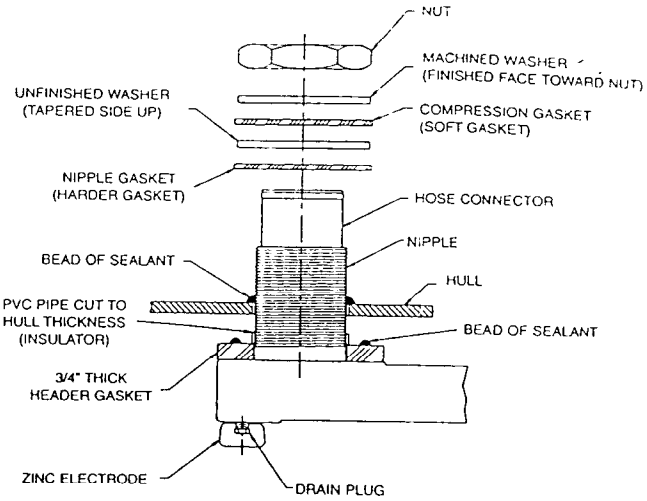

FIGURE 18

3.2 MOUNTING COPPER/NICKEL COOLERS ON ALUMINUM HULLS

An electrical barrier must be placed between the GRIDCOOLER and the hull. R. W. Fernstrum & Company does not formally approve any method of installing a copper/nickel GRIDCOOLER on aluminum hulled vessels. However, the following technique has been used on hundreds of boats.

3.2.1 Sandblast the area of the hull where the GRIDCOOLER will be installed.

3.2.2 Coat the sandblasted area with a fiberglass epoxy resin like Boat Armor #643 (5712) which is a two part resin.

3.2.3 Spray the resin on in four separate coats. Don't use any matting. Spray each coat just heavy enough so that it doesn't start to run off.

3.2.4 After spraying on the fourth coat, and while the resin is still tacky, prime the entire area with the hull priming paint used on the rest of the vessel's hull.

3.2.5 Apply the final bottom paint, and then install the GRIDCOOLER.

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4.1 BENDING A GRIDCOOLER

When bending a cooler in a press, support the cooler from underneath with wood blocking across the entire width of the GRIDCOOLER. Blocking is also placed on top of the cooler, centrally located between the wood blocking underneath the cooler. The location of the wood blocking on the top of the cooler will determine the location of the bend. Since this method of bending exerts pressure on only a small area, the cooler will need to be repositioned multiple times to produce an even bend over the length of the cooler. Care must be taken to ensure that the unit is not bent too far at any one point. A tape measure or other measuring instrument, along with a template of the hull profile can be used to measure your progress. (See Figures 20 and 21).

4.2 TWISTING A GRIDCOOLER

To produce a twist, first fabricate a hook onto the end of a short length of pipe using barstock. Hook this bar across the header as close to the nipple or stud as possible. The cooler may be secured in a press or placed on sawhorses with a man at each end. By placing your weight on the end of the pipe, you can produce a twist in the cooler. (See Figures 22 and 23).

NOTE: **Do Not Bend** greater than 1" over 12" of cooler length.

Do Not Twist beyond 1 degree over 12" of cooler length.

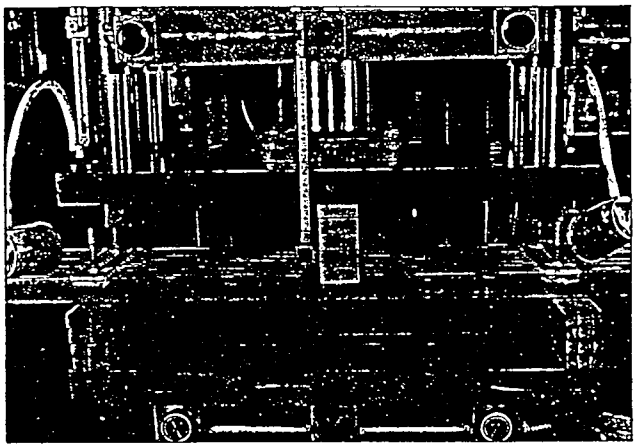

Figure 20

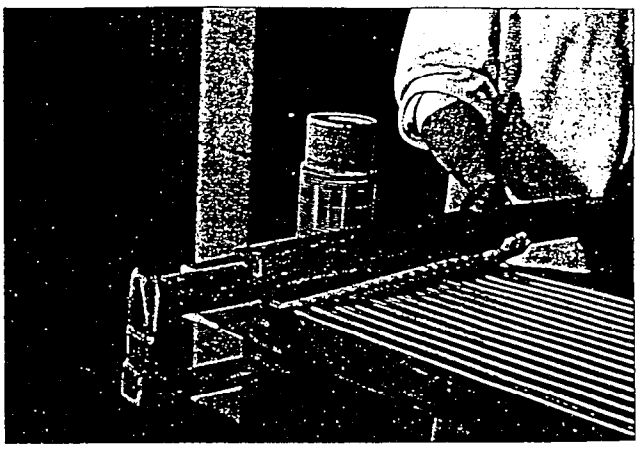

Figure 22

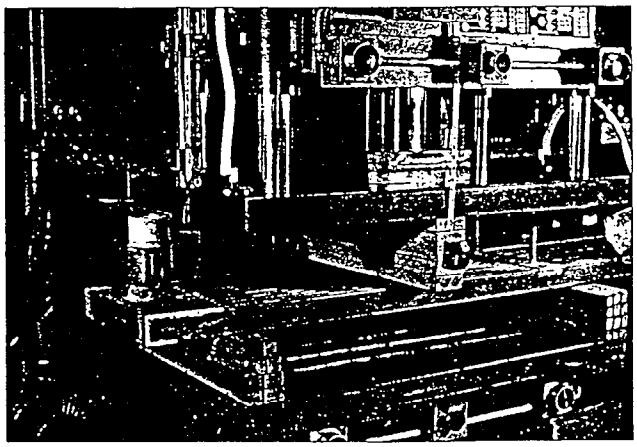

Figure 21

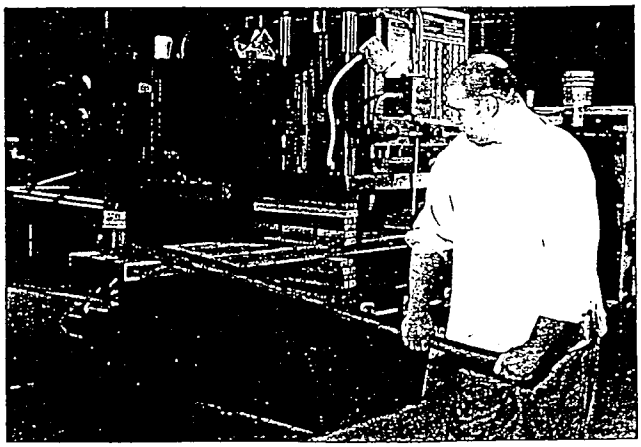

Figure 23

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APPENDIX A – CLEANING

A GRIDCOOLER that is clean inside and out will dissipate heat most efficiently. To keep your unit clean, a periodic check of the cooling system is recommended. What follows are some ways to clean your GRIDCOOLER.

EXTERIOR

If your GRIDCOOLER is used regularly, the 90/10 copper/nickel alloy in conjunction with the unit's operating temperature will tend to keep the exterior of the unit relatively free of marine growth. However, if the GRIDCOOLER is not in operation for extended periods of time, marine growth may result. Below are some ways of removing marine growth, paint, etc. from the exterior of your GRIDCOOLER:

A1. **Scrape:** Scraping is an effective way of removing larger matter from a GRIDCOOLER. The use of a rectangular instrument works best.

A2. **High Pressure Water Blast:** This cleaning method is effective in cleaning many things off of a GRIDCOOLER (paint is a notable exception).

A3. **Sandblast:** Sandblasting a GRIDCOOLER is also very effective, but very fine sand such as 40 to 60 grit blasting media at a maximum blast pressure of 90 psi (6.21 BAR) should be used.

NOTE: Never sandblast an ALUMINUM GRIDCOOLER.

INTERIOR

The interior of your GRIDCOOLER may need periodic cleaning to remove oil, old glycol, mineral deposits, etc. The easiest and most convenient way of doing this is the use of a radiator flush. Contact your engine dealer for the proper radiator flush type for your engine.

APPENDIX B – OVERHEATING

Determining the cause of overheating can be difficult. Here are some things to look for:

B1. **Wire Reinforced Rubber Hose:** Could the rubber hose part of the piping between the engine and the GRIDCOOLER be collapsed? This could cut the cooling water supply to the GRIDCOOLER and reduce its efficiency. Be sure you are using wire reinforced rubber hose.

B2. **Piping:** Is the piping between the engine and the GRIDCOOLER as large or larger than the engine and GRIDCOOLER connections? (See section 2.7.4 under plumbing.) The piping should also be self-venting and arranged so that a minimum number of elbows are used.

B3. **Jacket Water:** Is the jacket water circulating through the GRIDCOOLER? It may be taking a path of least resistance through the bypass (if one exists).

B4. **Thermostat:** Could the thermostat be stuck or could the wrong thermostat be in use? If so, it could give you a faulty temperature.

B5. **Jacket Water Pump:** Is the jacket water pump working properly? If not, it could reduce the cooling systems efficiency.

B6. **Air in the System:** Was the GRIDCOOLER installed in a way to allow all the air in the system to escape? When a U-Flow (two-pass) GRIDCOOLER is mounted on the rake of the vessel, make sure that the nozzles are mounted in the up or high position. See sections 2.3.6 – 2.7.6 – 2.7.7 – 2.8.3 under Installation. See Figure 7 page 4.

B7. **Foreign Matter:** Could anything have gotten into the cooler nozzles? Make sure that the orange plastic cap plugs covering the ends of the hose connectors were removed and that no foreign matter, such as a rag, was dropped into the cooler nozzles.

B8. **Expansion Tank:** Could the water level be too low in the expansion tank? This can reduce the cooling system's efficiency.

B9. **Coated GRIDCOOLER:** Is the GRIDCOOLER painted or covered with any other coating? This would have an insulating effect and will greatly reduce the heat transfer rate of the unit.

B10. **Water Aeration:** Could the water around the GRIDCOOLER be aerated in any way? Aeration will reduce the heat transfer rate of the GRIDCOOLER.

B11. **Moored at Dock:** Is the engine temperature rising while the vessel is moored in dock? If the GRIDCOOLER is installed near the propeller, engage the propeller to circulate water past the GRIDCOOLER, **after taking the proper safety precautions.**

B12. **GRIDCOOLER Placement:** Is an aftercooler circuit overheating? Make sure that the GRIDCOOLER cooling this circuit is mounted forward of or closer to the skeg or keel than the jacket water coolers.

B13. **Mounting Gaskets:** Were the mounting gaskets put in place when the GRIDCOOLER was installed? The mounting gaskets supplied with the GRIDCOOLER must be used to provide adequate spacing between the GRIDCOOLER and the ship's hull. This will allow water to flow freely over the cooler tubes.

B14. **Glycol:** How much glycol (antifreeze) is in the system? Perhaps the GRIDCOOLER was not sized for the use of glycol in the system.

NOTE: Always premix glycol with water before adding it to the cooling system.

B15. **Crushed Tubes:** Have the rectangular tubes on the GRIDCOOLER been crushed or pinched? This could restrict the internal water flow.

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B16. **Blown Tubes:** Could the rectangular tubes on the GRIDCOOLER have been blown or bulged by unusually high pressures? If so, the exterior water flow past the GRIDCOOLER tubes could be impaired, retarding heat transfer.

NOTE: **Maximum GRIDCOOLER test pressure is 35 PSI (2.41 BAR).**

B17. **Marine Growth:** Has your vessel been in dock for several months? You may find marine growth on the GRIDCOOLER which will hinder the unit's heat transfer rate. See Appendix A – Cleaning.

B18. **Oil Deposits:** Have you had engine problems? Oil may have gotten into the cooling water system and collected in the GRIDCOOLER, coating it with an oil film. See Appendix A – Cleaning.

B19. **Mineral Deposits:** Could you be using hard water in the system? Mineral Deposits will collect on the tube in the GRIDCOOLER, lining the inside with lime, calcium, etc. See Appendix A – Cleaning.

APPENDIX C – DAMAGED GRIDCOOLER

For a GRIDCOOLER in warranty, attempt no repairs without first contacting the manufacturer, otherwise your warranty will be void.

For a GRIDCOOLER out of warranty, if the unit is accidently damaged while in use, you can make minor shipyard repairs as follows:

C1. **Straightening:** If the tubes are accidentally bent, they can be straightened with a hard wood block and a mallet. See Figure 24.

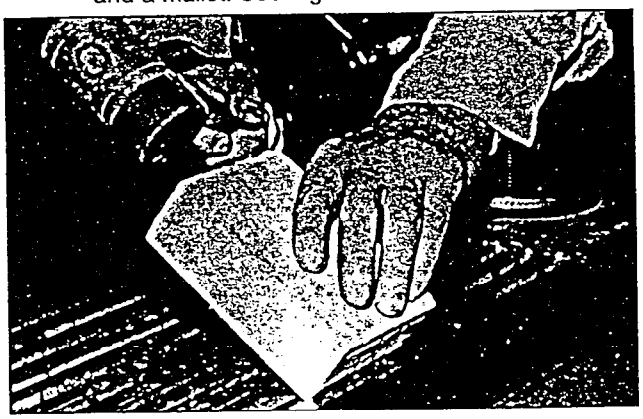


FIGURE 24

COPPER/NICKEL GRIDCOOLER REPAIRS

C2. **Brazing:** Drain the GRIDCOOLER before brazing. Clean the area or joint to be brazed thoroughly with a good degreasing solvent followed by wire brushing and or sandblasting. (See section A3 under Appendix A – Cleaning.) The silver alloy used in the GRIDCOOLER is "Handy & Harman," 3/32 in. (2.24 mm) diameter Braze 560 wire. Use "Handy & Harman" Flux, the low temperature brazing type. See Figure 25.

NOTE: Braze 560 wire and Flux are available from Lucas Milhaupt, call (414) 769-6000 for a dealer near you.

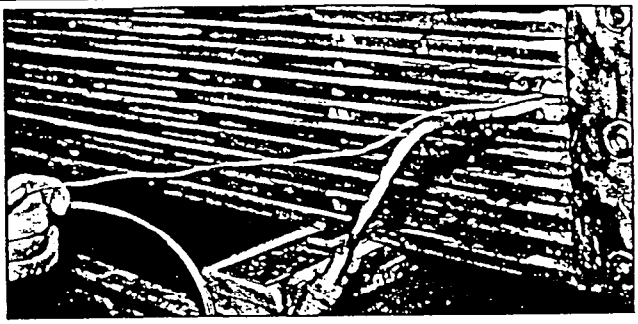


FIGURE 25

ALUMINUM GRIDCOOLER REPAIRS

C3. **Tig Weld:** Drain the GRIDCOOLER before welding. Clean the area or joint to be welded thoroughly with a good degreasing solvent followed by stainless steel wire brushing. The aluminum filler rod used in the GRIDCOOLER is R 5554 series aluminum, 3/32 in. (2.24 mm) diameter wire.

TEMPORARY REPAIR

For temporary repairs, liberally apply an epoxy compound similar to Devcon UW for under water and Red Hand for above water repairs.

Before applying the epoxy compound, clean the surface of the GRIDCOOLER and relieve any internal pressure.

Devcon UW is available from the Devcon Corporation, call (508) 777-1100 for a dealer near you. Red Hand is available from the International Paint Company, call (504) 943-8871 for a dealer near you.

For major repairs not covered by our Limited Warranty, contact us by Phone (906) 863-5553 or Fax (906) 863-5634. Give us a complete description of the damage, and we'll tell you if and how your unit can be repaired.

R.W. FERNSTRUM & COMPANY • PO BOX 97 • MENOMINEE, MI 49858 • PHONE (906) 863-5553 • FAX: (906) 863-5634

LIMITED WARRANTY

The R.W. Fernstrum & Company, manufacturer, carefully tests and inspects each GRIDCOOLER before it leaves the point of manufacture. The manufacturer makes no representations or warranties, express or implied, statutory or otherwise, except those herein expressly contained and shall not be held liable on any account except for repair or replacement under the terms following.

The manufacturer will, as to each GRIDCOOLER registered with it by the purchaser, repair or replace free of charge, such GRIDCOOLER as is found upon manufacturer's inspection to be defective because of material or workmanship providing the same has been returned to the manufacturer's factory, or a more convenient point as designated by the manufacturer, transportation prepaid, and received by the manufacturer within ninety (90) days from date of delivery, with respect to the aluminum GRIDCOOLER, and within one (1) year with respect to the copper/nickel GRIDCOOLER. The manufacturer's obligation hereunder shall be limited to such time period and to the direct cost of repair and replacement and shall not include labor, transportation, haul-out, launch, towing or storage charges, mechanic travel time, inconvenience, loss of time or income, removal and replacement and/or modification of any boat parts to facilitate repairs or other such expenses incurred by purchaser.

This limited warranty shall not be effective with respect to a GRIDCOOLER to which repairs or alterations have been made unless authorized or performed by the manufacturer, nor to defects arising because of improper installation, misuse, accident or other causes beyond the control of the manufacturer.

Should any disputes arise with regard to their respective rights, duties and responsibilities under this Limited Warranty, all such disputes shall be governed by the laws of the State of Michigan to the extent that the same do not conflict with the laws of the United States and any litigation growing out of any such dispute shall be commenced in Circuit Court for Menominee County, in the State of Michigan, U.S.A.

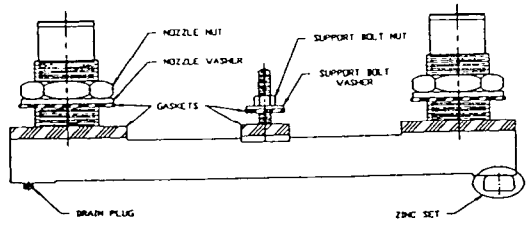
IMPORTANT INFORMATION

PLEASE KEEP THIS FORM ON THE VESSEL FITTED WITH THE GRIDCOOLER UNITS. THE INFORMATION BELOW WILL BE OF USE FOR FUTURE REFERENCE.

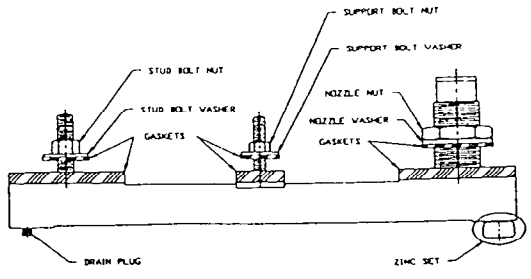
ENGINE INFORMATION			GRIDCOOLER INFORMATION	
MAKE OF ENGINE	MODEL OF ENGINE	HP/RPM (KW/RPM)	MODEL OF GRIDCOOLER	QUANTITY

GRIDCOOLER REPLACEMENT PARTS

SINGLE PASS GRIDCOOLER



TWO PASS GRIDCOOLER



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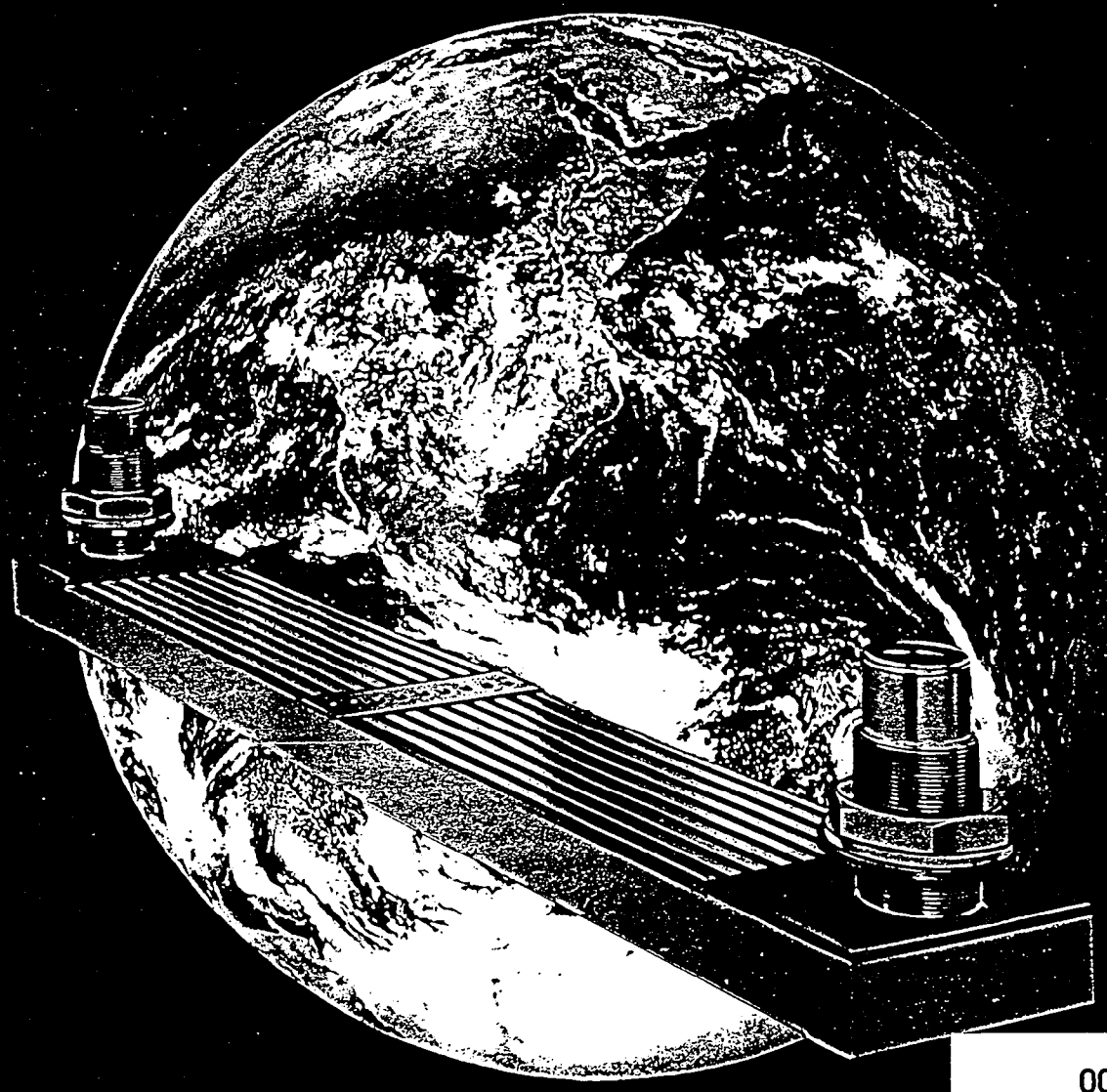
FERNSTRUM GRIDCOOLER®



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ENGINEERED KEEL COOLING

COMPUTER SELECTED • COMPLETELY ASSEMBLED • FACTORY TESTED

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5/R

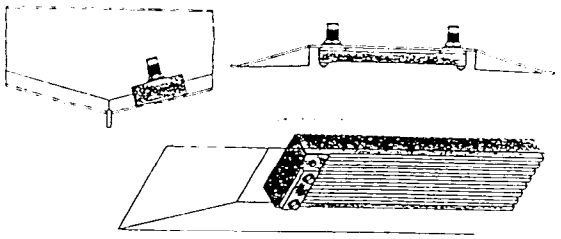
FERNSTRUM

GRIDCOOLER®

COMMON INSTALLATIONS

RECESSED

Recessing a GRIDCOOLER cuts down on drag and greatly increases the protection from damage. If possible, the ends of the recess should be flared to allow free flow of water over the entire cooler.



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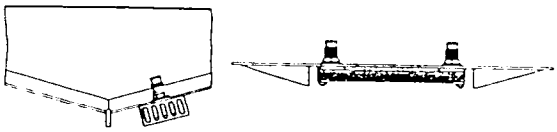
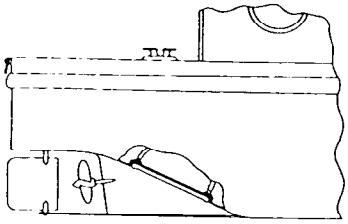
If the GRIDCOOLER can't be recessed for some reason, fairing blocks and side plates can be used for protection and streamlining.



SHALLOW DRAFT

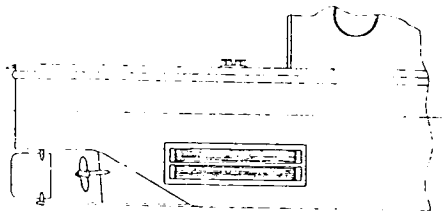
Due to the compact size of a GRIDCOOLER, it can be mounted along the keel or skeg, or even in the rake or tunnel of shallow draft river boats to take advantage of the additional water current created by the propeller.

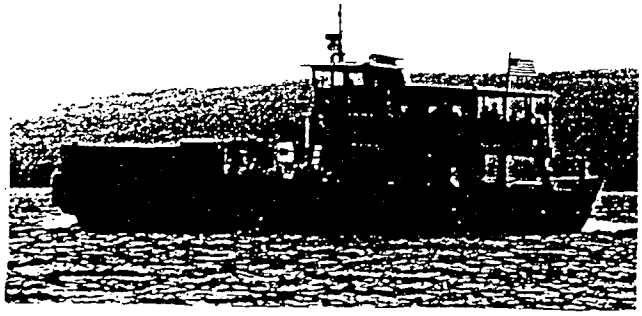


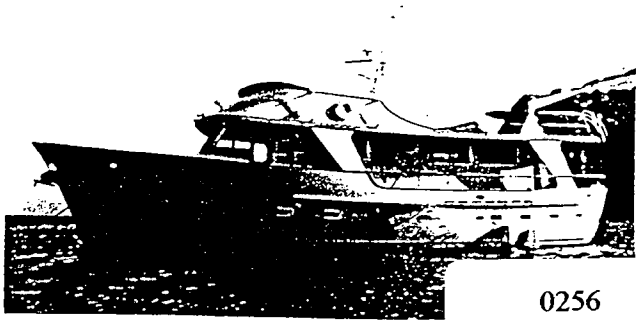
SIDE MOUNTED

A GRIDCOOLER can be side mounted to avoid damage caused by running your vessel aground or if your vessel doesn't have room on the bottom of the hull.

NOTE: For additional details see installation bulletins.







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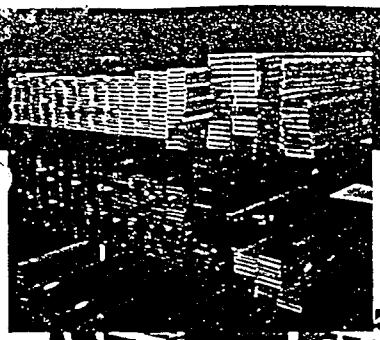
LOOK AT FERNS
MANUFACTURING A



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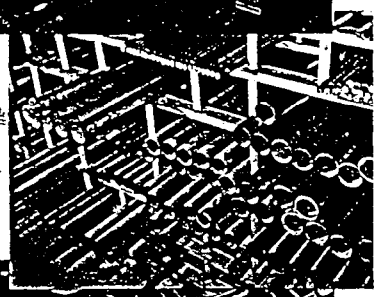

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QUALITY WORK

Tailored to your exact specifications, the GRIDCOOLER is designed as a complete assembly . . . the only such unit on the market. There's nothing to add . . . nothing to assemble. Simply attach the GRIDCOOLER to any ship's hull on site.

To make a product that will fit that description, you have to have quality, and quality is something we don't take lightly. As soon as we receive our raw material and parts, our quality control people go into action. All parts and materials being used in the GRIDCOOLERS are 100% inspected. This gives the person who buys a GRIDCOOLER the knowledge that they bought a product with the finest quality available.

But to have high quality you have to do more than check the raw materials and parts. At R.W. FERNSTRUM & COMPANY

---

1. & 2. Only the finest quality materials are used in manufacturing the FERNSTRUM GRIDCOOLER.

3. Finished parts are in stock at all times for quick delivery when needed.

4. & 5. Quality control begins as soon as the material is received. All material is 100% inspected. No random sampling methods are used.

6. To obtain a proper bond, each piece is degreased and sandblasted before assembly.

7. For customer protection, each GRIDCOOLER is assigned its own serial number and Inspection Sheet.

8. Experienced craftsmen, at work in the final brazing stage, use only the finest silver alloys. Less expensive materials do not meet FERNSTRUM's high quality standards.

9. Each unit is soaked and flushed out at high temperatures during two different intervals of manufacture.

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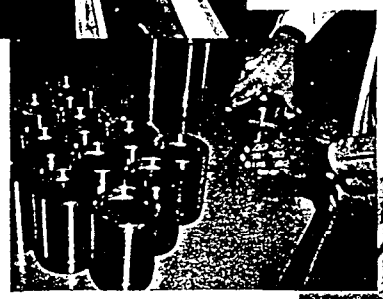

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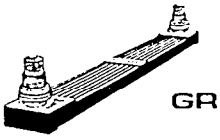
FERNSTRUM GRIDCOOLERS ARE CUSTOM-ENGINEERED

RUM'S QUALITY
D TESTING METHODS:



FERNSTRUM
GRIDCOOLER

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GRIDCOOLERS are repairable, should anything happen to your unit, please give us a call. Each unit has its own serial number and Inspection Sheet on file, so we can quickly reference your unit and help you if you should have any problems.

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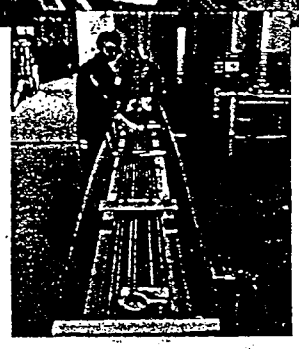
10. After being soaked and flushed, each unit is inspected by running it through a separate underwater air test to assure the integrity of braised or welded joints.
11. Clean-up by sandblasting is done in a specially constructed 40' long, semi-automatic blasting cabinet.
12. Ultra-sonic testing is used to check the brazed joints of each unit so we can assure every customer of a GRIDCOOLER of superior strength.
13. In all respects, the unit must be square and true.
14. On successful completion of all quality checks, each unit receives its own O.K. tag . . . a mark of quality.
15. Each unit is carefully boxed in "Tri-Wall," a triple corrugated, weather-resistant fiberboard. Special wood crating is available for long-term storage upon request.
16. Each GRIDCOOLER is shipped with all the gaskets, washers, and nuts needed to install the unit, as well as with installation suggestions.

16.



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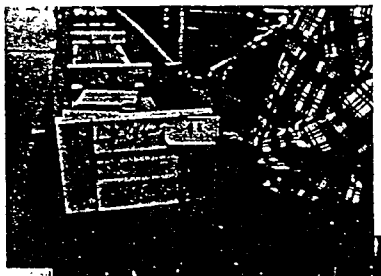

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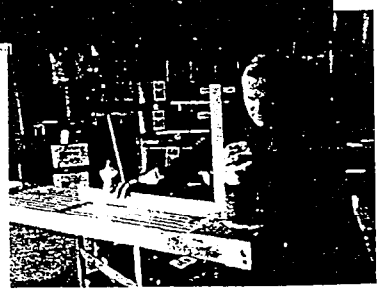

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FOR ALL TYPES OF VESSELS AND MARINE SERVICE

FERNSTRUM

GRIDCOOLER®

APPLICATIONS

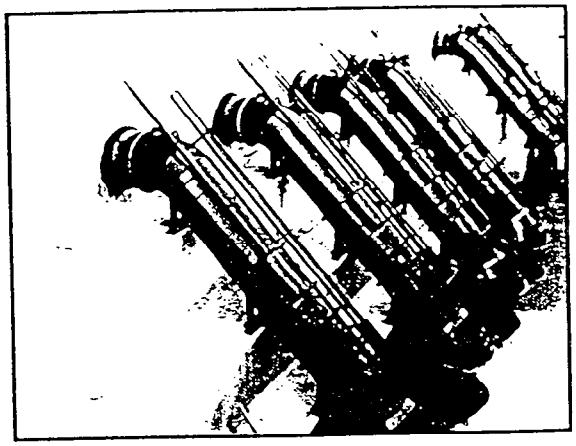
FERNSTRUM GRIDCOOLERS are simple, dependable, packaged keel coolers tailored to fit everything from patrol boats to icebreakers. They incorporate the advantages of channel coolers, but the GRIDCOOLERs' compact, streamlined design doesn't have the bulk, drag, or fouling problems of channel coolers.

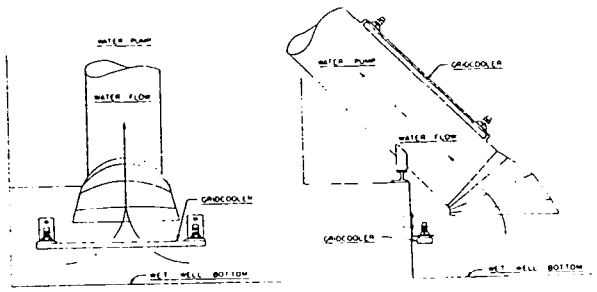
A GRIDCOOLER can be mounted almost anywhere on a ship's hull; which gives you the flexibility to match the installation to the hull design and operating conditions of your boat. On shallow draft river work boats, for instance, the GRIDCOOLER may be mounted on the side of the hull or beside the skeg. On towboats, the GRIDCOOLER may be installed near the propeller to take advantage of its slipstream during heavy towing. On fast moving vessels, the unit is normally recessed alongside the keel. See our installation bulletin for more information.

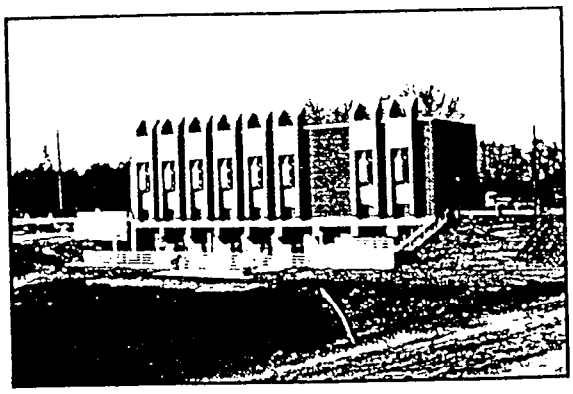
PUMP STATIONS

Where equipment must be reliable, dependable, and always ready for emergency situations, as well as their everyday workload; whether it be a drainage system, sewage treatment plant, storm sewer system, lift station, or irrigation system, they play a vital role in our daily lives. These are demanding conditions, yet this is the environment that is often called home for the FERNSTRUM GRIDCOOLER. The reputation that the GRIDCOOLER has gained through over 40 years experience in cooling marine engines can, and has, been well applied to the pump station field.

In pump station applications, the GRIDCOOLER gives you the choice of being able to mount the units in one of several locations. They can be mounted in the suction or discharge sump, or inside of the flow chamber itself. Such flexibility often allows for simplified piping schemes to and from the unit.



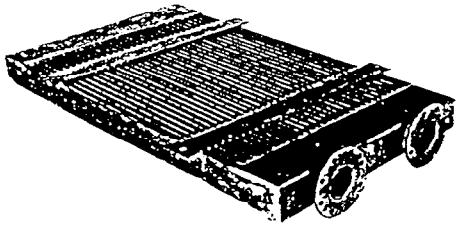




DRILL RIGS AND PRODUCTION PLATFORMS

A copper-nickel rectangular tubed GRIDCOOLER has been designed for drill rigs and production platforms. Through extensive research and testing, we have developed a tube that will withstand the higher pressures encountered in keel cooling auxiliary engines used in the offshore industry.

This series (TB series) GRIDCOOLER is simple in design with the engine fresh water directed to and from the unit while in direct contact with sea water, thereby freeing up limited deck space. Substantial horsepower is saved by eliminating the cooling fan or sea water pump. The TB series GRIDCOOLER is cost effective through the horsepower savings and elimination of radiators and/or onboard heat exchangers.



FERNSTRUM

GRIDCOOLER®

SPECIAL GRIDCOOLERS

While our standard GRIDCOOLERS will normally work in almost all applications; some applications may lead to a difficult installation. We can make the modifications needed for any easy installation in any application. Some of those modifications are illustrated below.

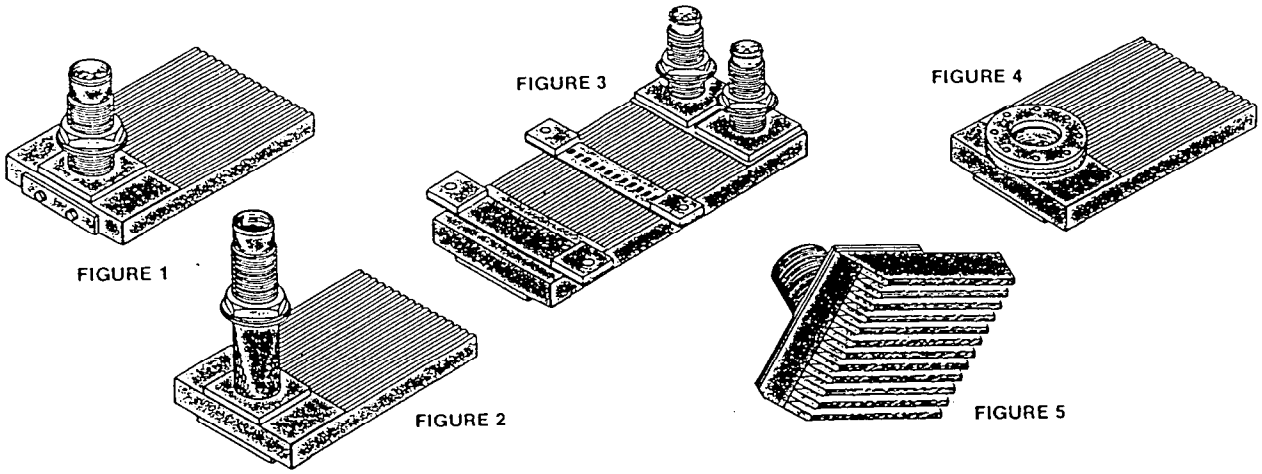


FIGURE 1

E Series GRIDCOOLERS have the zinc anodes at the ends of the unit. This modification works well for fishing vessels working nets.

FIGURE 2

GRIDCOOLERS can be ordered with extra long nozzles for vessels with thick hulls. (I.E. double and triple hulls.)

FIGURE 3

L Series GRIDCOOLERS with long support plates eliminate hull penetrations.

FIGURE 4

F Series GRIDCOOLERS with flange connections can eliminate use of cofferdams.

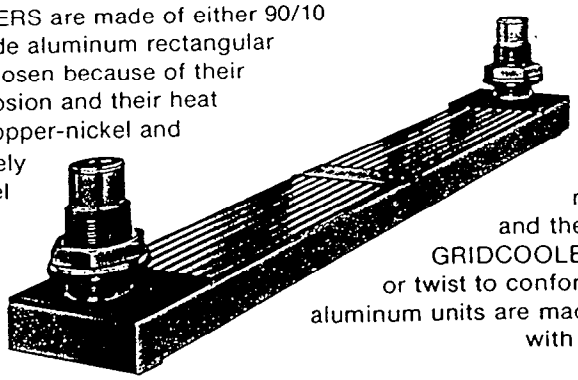
FIGURE 5

LP Series GRIDCOOLERS with shallow headers are good for fast-moving craft.

The FERNSTRUM COMPANY is ready to work with you at any time to fulfill your exact keel-cooling requirements.

MATERIALS

Standard series GRIDCOOLERS are made of either 90/10 copper-nickel or marine grade aluminum rectangular tubing. These alloys were chosen because of their resistance to salt water corrosion and their heat transfer abilities. Both the copper-nickel and aluminum units are completely assembled; the copper-nickel units are silver brazed, and the aluminum units are welded.



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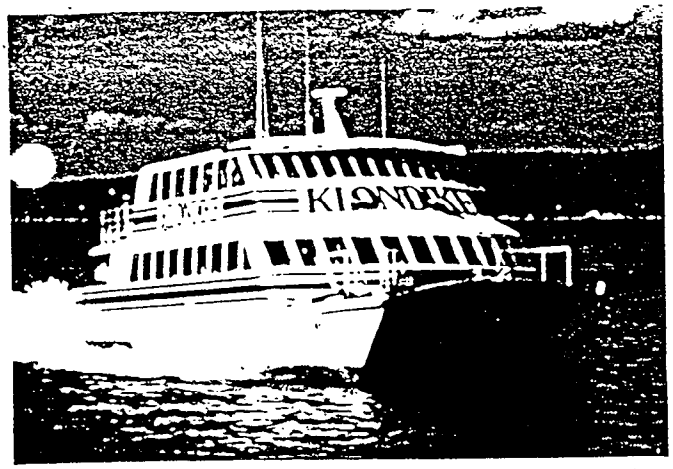
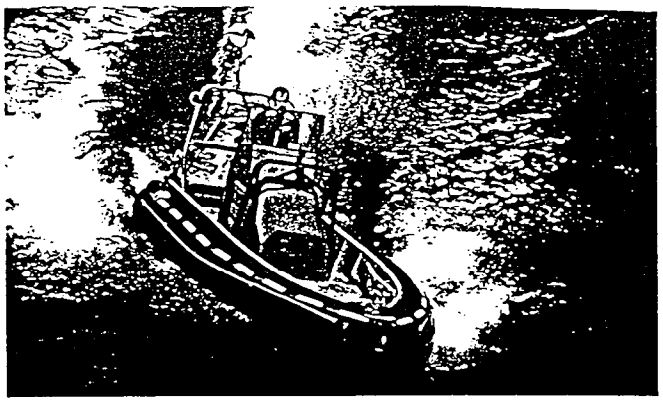
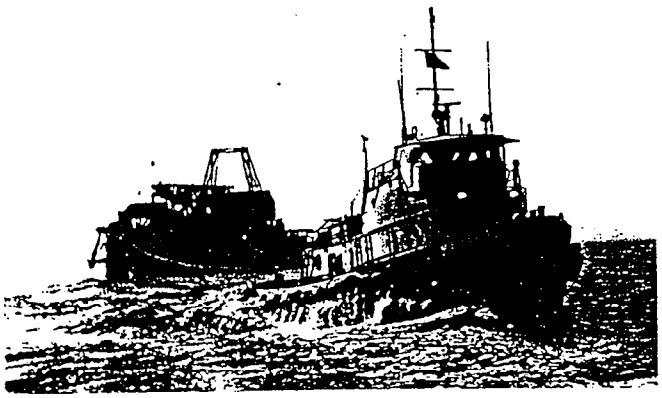
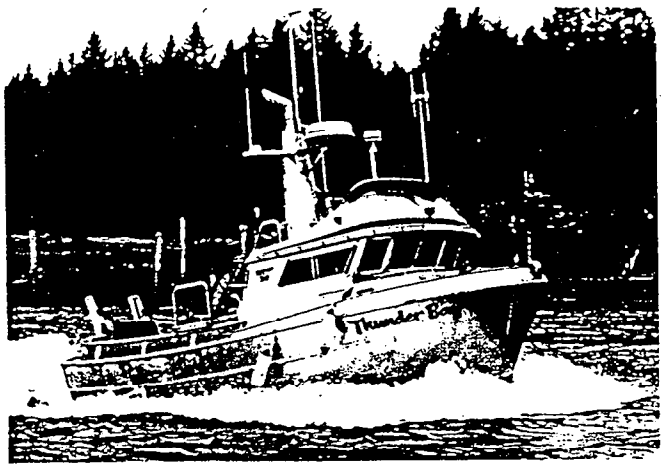
The copper-nickel units have natural anti-foulant capabilities, and the tubing is very ductile, so your GRIDCOOLER could be given a slight bend or twist to conform to the hull of your craft. The aluminum units are made of alloys that are compatible with vessels having aluminum hulls.

GRIDCOOLER® THE SIMPLEST AND MOST DEPENDABLE FORM OF FRESH WATER COOLING









With the installation of a GRIDCOOLER, operational safety is improved when navigating in ice or debris laden waters, and you will no longer have a loss of power at critical times due to raw water pump failure, or strainers clogged with sandwich wrappers, silt, sand, sea weed, and other debris.

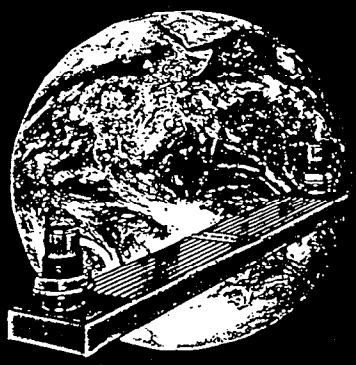
Thousands of GRIDCOOLERS are in operation with splendid success, proving their seaworthiness and reliability in years of operation by the U.S. Navy, Coast Guard, Army, and a variety of commerical and pleasure craft.

The improved performance and extended engine life saves you the cost of a GRIDCOOLER many times over. The Army's life expectancy for a GRIDCOOLER is 20 years (which is longer than the boat using the GRIDCOOLER).

The FERNSTRUM COMPANY is ready to work with you at any time to achieve your exact keel-cooling requirements. Let us ship you the FERNSTRUM GRIDCOOLER . . . the best product of this type on the market today.

The photos are typical of ships featuring Fernstrum GRIDCOOLERS for engineered keel cooling.

FERNSTRUM GRIDCOOLER



ENGINEERED KEEL COOLING

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TO CONTACT US:

R. W. FERNSTRUM & COMPANY
MENOMINEE, MICHIGAN, U.S.A. 49858
Phone: (906) 863-5553 • Telex: 26-3493 • Fax: (906) 863-5634
Answer Back: FERNSTRUM MNOM

EXPORT DEPARTMENT:

R. W. FERNSTRUM & CO., EXPORT DEPT.
MENOMINEE, MICHIGAN, U.S.A. 49858
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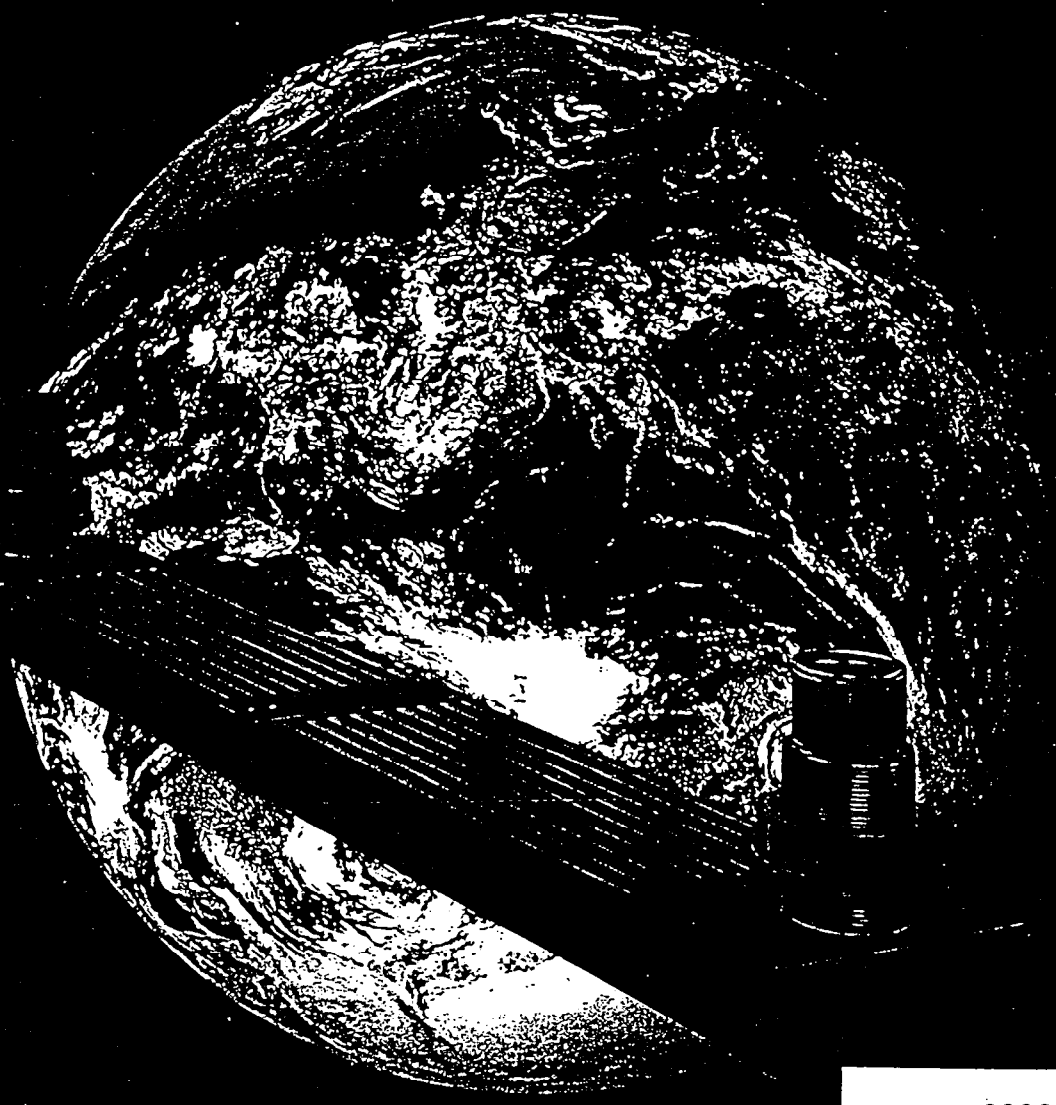

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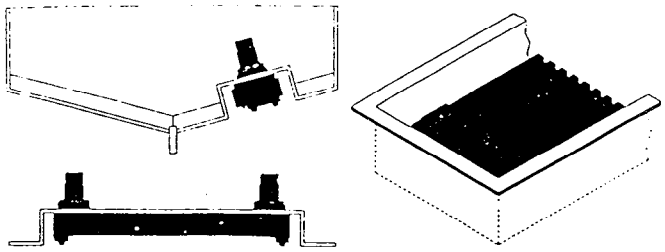

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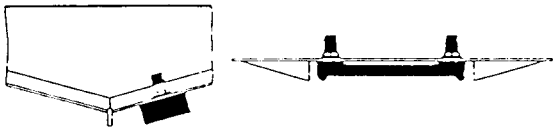

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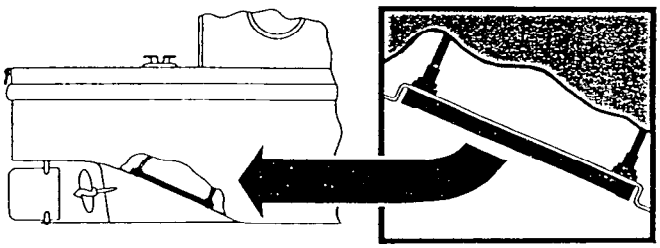

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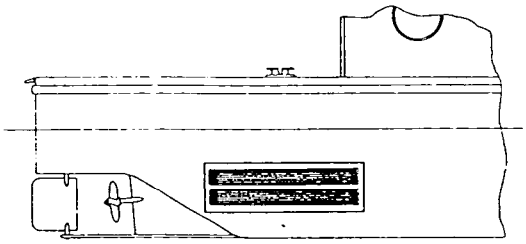

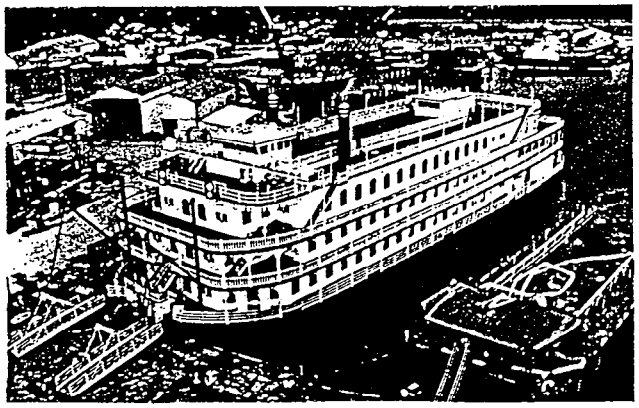

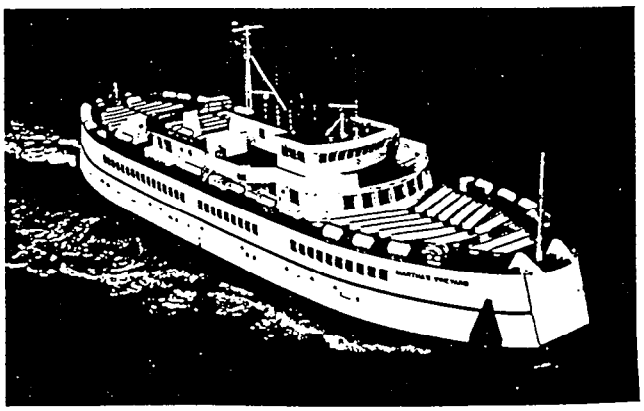

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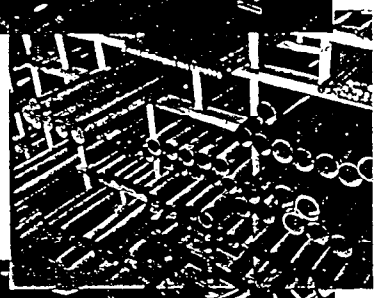

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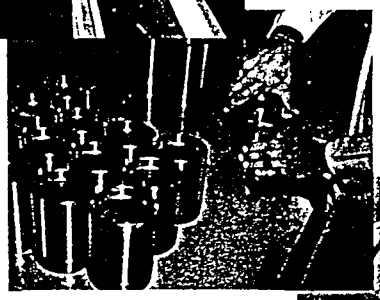

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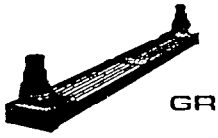
RUM'S QUALITY
TESTING METHODS:



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12. Ultra-sonic testing is used to check the brazed joints of each unit so we can assure every consumer of a GRIDCOOLER of superior strength.

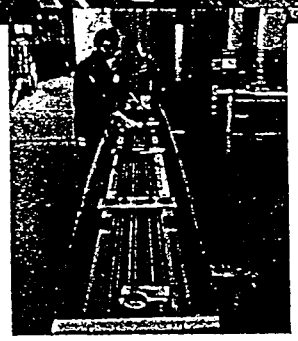
13. In all respects, the unit must be square and true.

14. On successful completion of all quality checks, each unit receives its own O.K. tag . . . a mark of quality.

15. Each unit is carefully boxed in a triple corrugated, weather-resistant fiberboard. Special wood crating is available for long-term storage upon request.

16. Each GRIDCOOLER is shipped with all the gaskets, washers, and nuts needed to install the unit, as well as with installation suggestions.

16.



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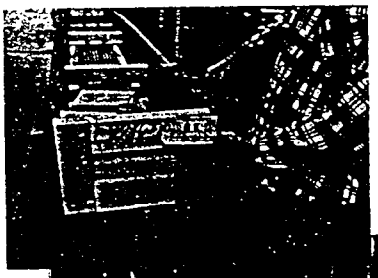

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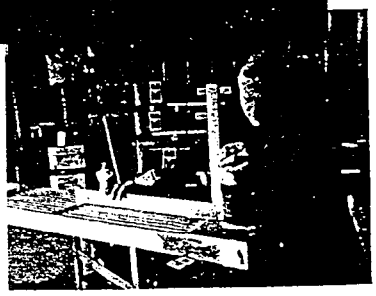

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ALL FILTER CAPACITIES ARE MAXIMUM CHANGE

FERNSTRUM

GRIDCOOLER®

APPLICATIONS AND MATERIALS

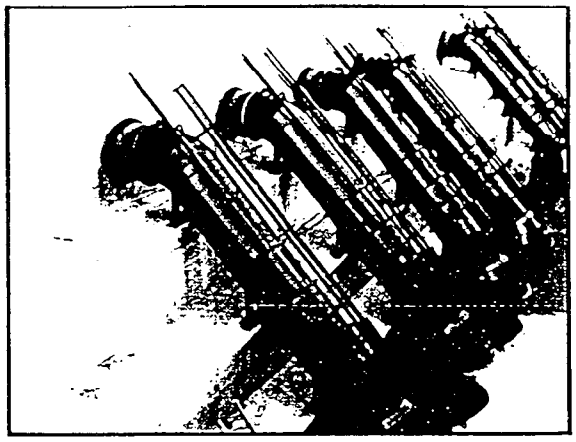
FERNSTRUM GRIDCOOLERS are simple, dependable, packaged keel coolers tailored to fit everything from patrol boats to icebreakers. They incorporate the advantages of channel coolers, but the GRIDCOOLERS' compact, streamlined design doesn't have the bulk, drag, or fouling problems of channel coolers.

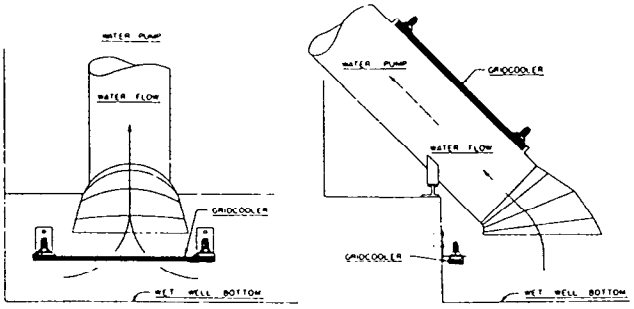
A GRIDCOOLER can be mounted almost anywhere on a ship's hull; which gives you the flexibility to match the installation to the hull design and operating conditions of your boat. On shall draft river work boats, for instance, the GRIDCOOLER may be mounted on the side of the hull or beside the skeg. On towboats, the GRIDCOOLER may be installed near the propeller to take advantage of its slipstream during heavy towing. On fast moving vessels, the unit is normally recessed alongside the keel. See our installation bulletin for more information.

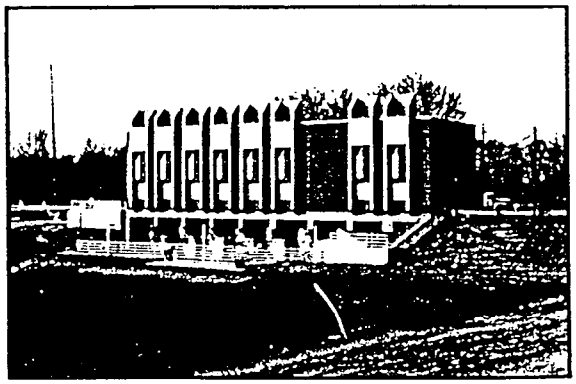
PUMP STATIONS

Where equipment must be reliable, dependable, and always ready for emergency situations, as well as their everyday workload; whether it be a drainage system, sewage treatment plant, storm sewer system, lift station, or irrigation system, they play a vital role in our daily lives. These are demanding conditions, yet this is the environment that is often called home for the FERNSTRUM GRIDCOOLER. The reputation that the GRIDCOOLER has gained through over 50 years experience in cooling marine engines can, and has, been well applied to the pump station field.

In pump station applications, the GRIDCOOLER gives you the choice of being able to mount the units in one of several locations. They can be mounted in the suction or discharge sump, or inside of the flow chamber itself. Such flexibility often allows for simplified piping schemes to and from the unit.



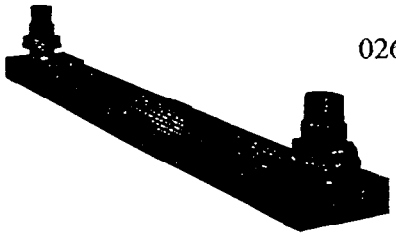




MATERIALS

Standard series GRIDCOOLERS are made of either 90/10 copper-nickel or marine grade aluminum rectangular tubing. These alloys were chosen because of their resistance to salt water corrosion and their heat transfer abilities. Both the copper-nickel and aluminum units are completely assembled; the copper-nickel units are silver brazed, and the aluminum units are welded.

The copper-nickel units have natural anti-foulant capabilities, and the tubing is very ductile, so your GRIDCOOLER could be given a slight bend or twist to conform to the hull of your craft. The aluminum units are made of alloys that are compatible with vessels having aluminum hulls.



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FERNSTRUM

GRIDCOOLER®

SPECIAL GRIDCOOLERS

While our standard GRIDCOOLERS will normally work in almost all applications; some applications may lead to a difficult installation. We can make the modifications needed for any easy installationin any application. Some of those modifications are illustrated below.

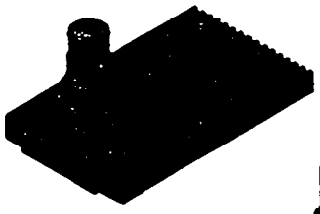


FIGURE 1

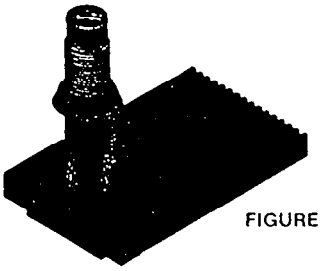


FIGURE 2

FIGURE 3

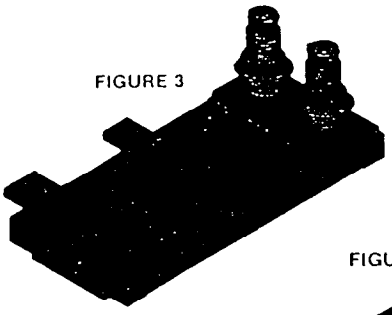


FIGURE 4

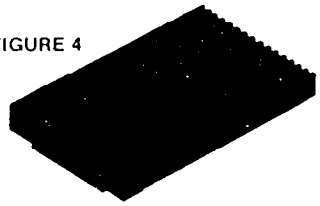


FIGURE 1
E Series GRIDCOOLERS have the zinc anodes at the ends of the unit. This modification works well for fishing vessels working nets.

FIGURE 2
GRIDCOOLERS can be ordered with extra long nozzles for vessels with thick hulls. (I.E. double and triple hulls.)

FIGURE 3
L Series GRIDCOOLERS with long support plates eliminate hull penetrations.

FIGURE 4
F Series GRIDCOOLERS with flange connections can eliminate use of cofferdams.

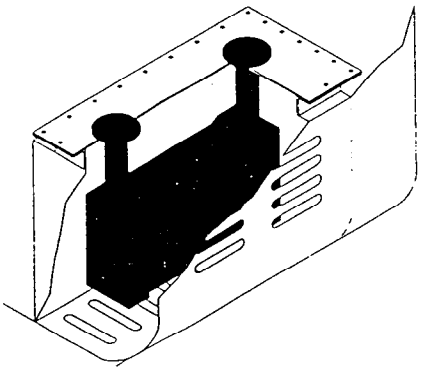
The FERNSTRUM COMPANY is ready to work with you at any time to fulfill your exact keel-cooling requirements.

FERNSTRUM

FERNCOOL®

BOXCOOLERS

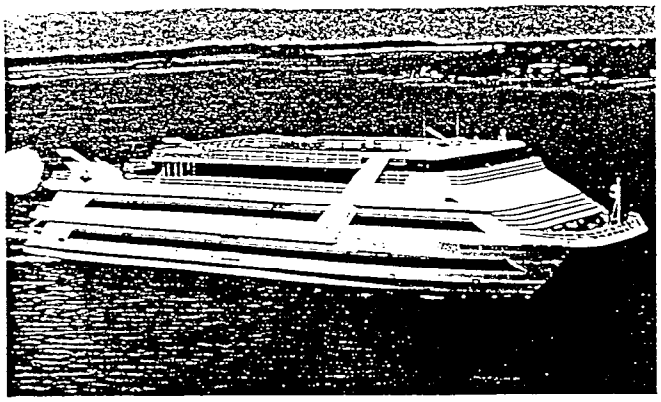
TYPICAL FERNSTRUM FERNCOOL® INSTALLATION

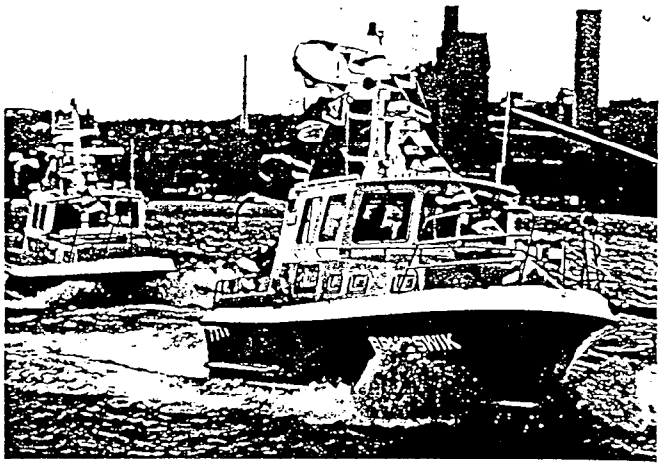


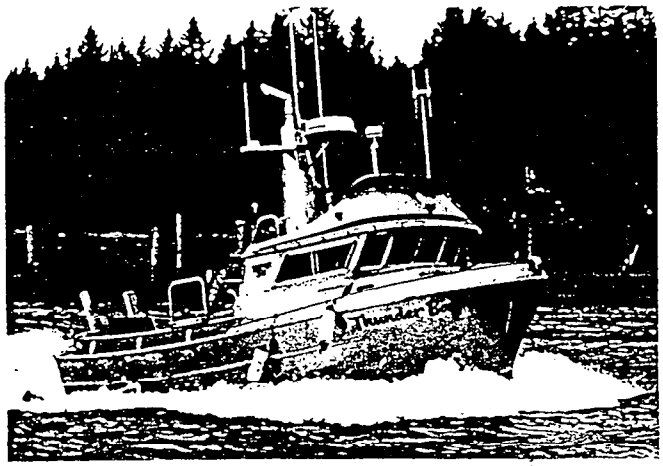
A boxcooler, like our GRIDCOOLERS, is a cooling unit that operates below the water line. Unlike the GRIDCOOLER, the boxcooler is placed in a sea chest instead of outside of the hull in a recess or flush mounted to the hull. This gives the boxcooler a greater amount of protection, and allows us greater flexibility in sizing one or multiple units for your specific needs.

For example, instead of changing just the length of tubes, or the number of tubes the cooler uses in width, we can stack the tubes that are used in a boxcooler. We currently have GRIDCOOLERS that are two tubes deep, but the box units can be two, ten, fourteen or more tubes deep as well as any number in between.

Built with the same materials and construction techniques as our FERNSTRUM GRIDCOOLERS, FERNSTRUM FERNCOOL units are the only boxcoolers built for both fresh water and sea water use.







With the installation of a GRIDCOOLER, operational safety is improved when navigating in ice or debris laden waters, and you will no longer have a loss of power at critical times due to raw water pump failure, or strainers clogged with sandwich wrappers, silt, sand, sea weed, and other debris.

Thousands of GRIDCOOLERS are in operation with splendid success, proving their seaworthiness and reliability in years of operation by the U.S. Navy, Coast Guard, Army, and a variety of commerical and pleasure craft.

The improved performance and extended engine life saves you the cost of a GRIDCOOLER many times over. The Army's life expectancy for a GRIDCOOLER is 20 years (which is longer than the boat using the GRIDCOOLER).

The FERNSTRUM COMPANY is ready to work with you at any time to achieve your exact keel-cooling requirements. Let us ship you the FERNSTRUM GRIDCOOLER . . . the best product of this type on the market today.

The photos are typical of ships featuring Fernstrum GRIDCOOLERS for engineered keel cooling.

FERNSTRUM GRIDCOOLER®

ENGINEERED KEEL COOLING

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TO CONTACT US:

R. W. FERNSTRUM & COMPANY
1716 11TH AVENUE • P.O. BOX 97
MENOMINEE, MICHIGAN, U.S.A. 49858
Phone: (906) 863-5553 • Fax: (906) 863-5634
Internet Website: http://www.fernstrum.com

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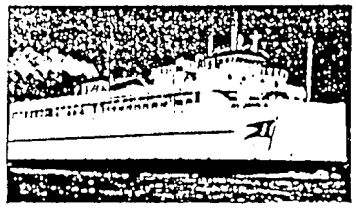
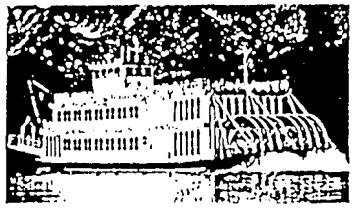
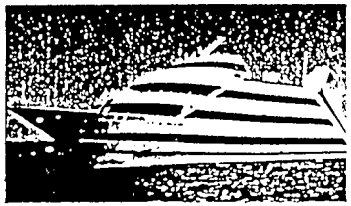
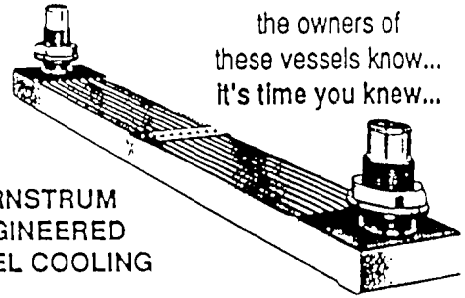
WORK BOAT







the owners of
these vessels know...
it's time you knew...



FERNSTRUM
ENGINEERED
KEEL COOLING

"The FERNSTRUM GRIDCOOLER® is the simplest and most dependable form of fresh water cooling available."

Ask any of our thousands of customers; they'll say the same thing. You can't find a better fresh water cooling system anywhere.
Call us... we'll let you know which of our over 8000 different Gridcoolers is right for you.

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation.

Silver brazed and welded joints form a rugged keel cooler, no slip joints or "O" rings to leak.

Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements.

The most compact form of keel cooling, can be recessed for a flush with hull installation.

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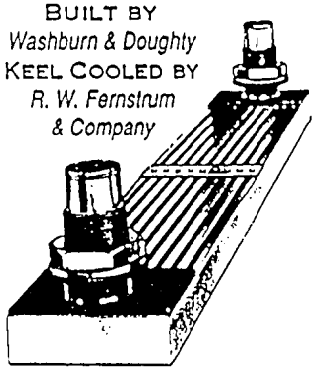
Maritime Directory magazine

4-1/2 W x 4-7/8 H

BUILT FOR
Winslow Marine
BUILT BY
Washburn & Doughty
KEEL COOLED BY
R. W. Fernstrum & Company

Tug Photo by: Eben Brown



You want the best of everything on your boat...as long as it's affordable...right? Then why don't you give us a call? For the cost of a phone call, we'll figure out which of over 8000 different Gridcoolers® is right for cooling your engine in your boat. How can you go wrong? Get the best cooling system you can...get a Fernstrum Gridcooler.

OVER 40 YEARS EXPERIENCE IN KEEL COOLING

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- The most compact form of keel cooling

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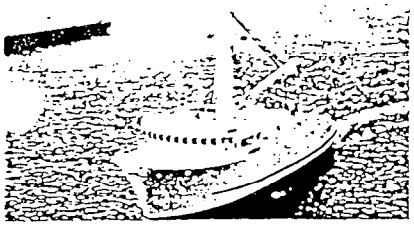
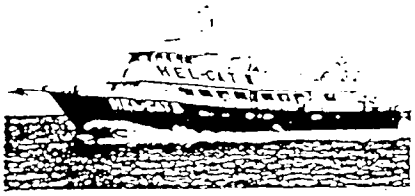
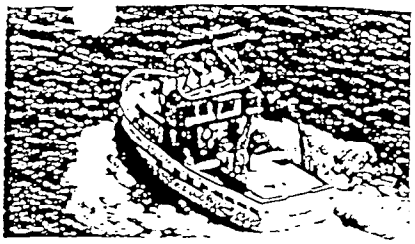

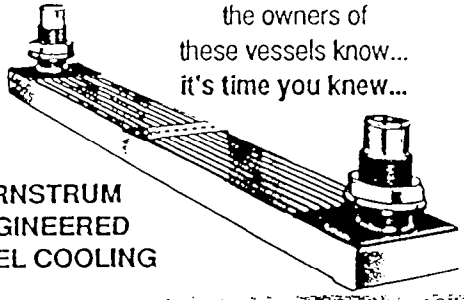

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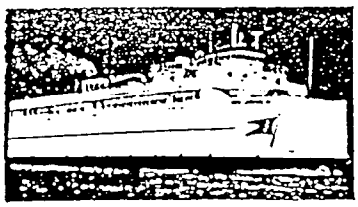
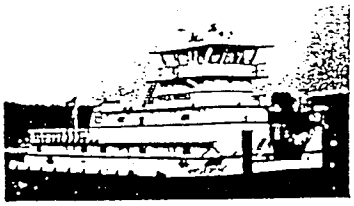
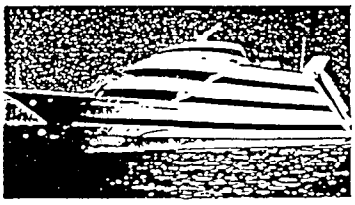

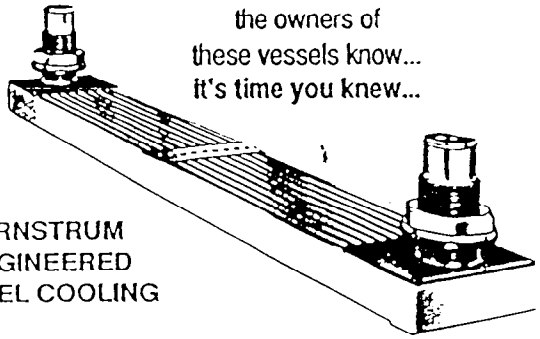

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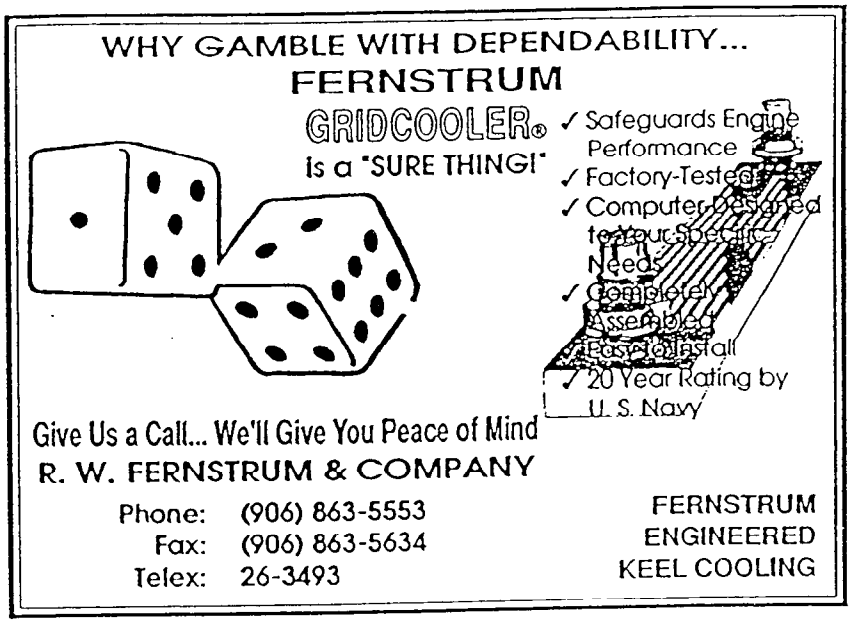
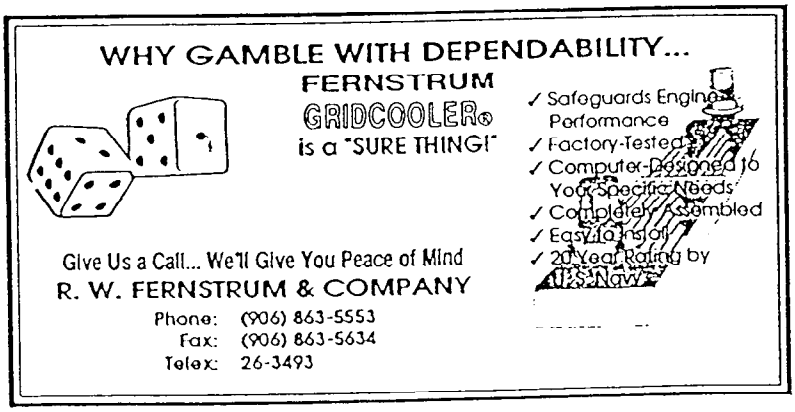
National Fisherman 4-7/8 W x 3-1/2 H

NEWSPAPER



Workboat 4-9/16 W x 2-5/16 H

MAGAZINE



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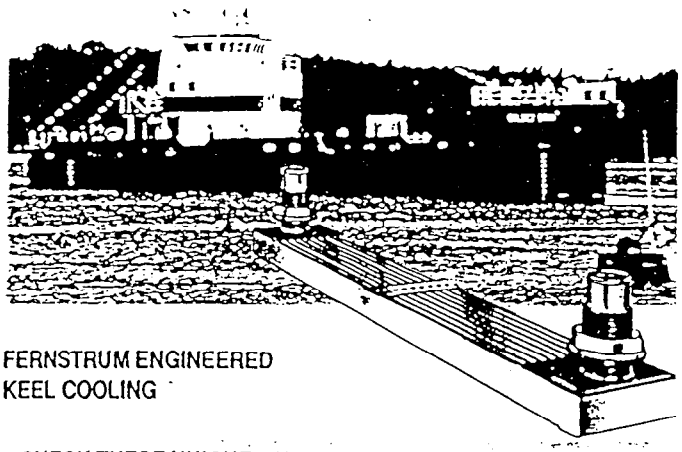

FERNSTRUM ENGINEERED
KEEL COOLING

The Valdez Star...
Built by Goudy & Stevens
Designed by JBF Scientific
Owned by Alyeska Pipeline
Keel Cooled by R. W. Fernstrum & Company

Why Fernstrum Gridcoolers on an oil skimmer? Because Fernstrum Gridcoolers have been proven durable, reliable, economical and lightweight in over 40 years of actual use by the military and many facets of the commercial marine industry.

Why Fernstrum Gridcoolers on the Valdez Star? Because JBF Scientific wanted to design the most reliable vessel they could to clean up oil spils. For that reason, they chose the most reliable keel cooling system available.

If you have an oil skimmer that needs to operate effectively in or near an oil spill, call us... we'll let you know which of our over 8000 different Gridcoolers is right for your vessel.

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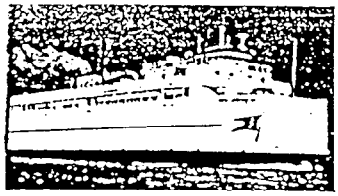
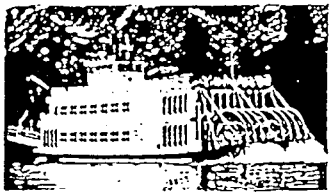
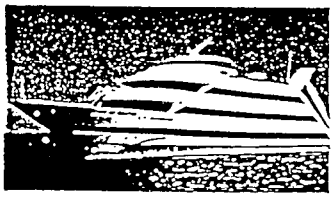
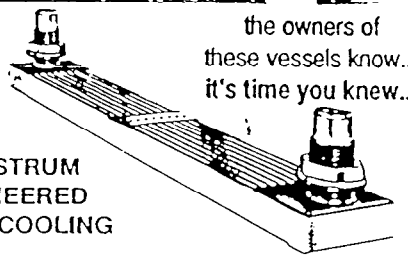
Workboat march/april









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KEEL COOLING

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Ask any of our thousands of customers; they'll say the same thing. You can't find a better fresh water cooling system anywhere.
Call us... we'll let you know which of our over 8000 different Gridcoolers is right for you.

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation.

Silver brazed and welded joints form a rugged keel cooler, no slip joints or "O" rings to leak.

Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube, structurally stronger with more cooling surface, and twice the wall thickness of other package kit type keel coolers with round tube.

Custom designed to meet owner's operating conditions and the engine manufacturer's exact cooling requirements.

The most compact form of keel cooling, can be recessed for a flush with hull installation.

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pleasure craft is a craft
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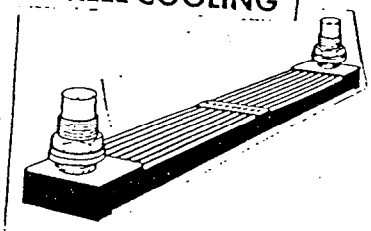
- Safeguards Engine Performance
- The Most Efficient and Economical Keel Cooling in the Maritime Industry



- Computer-designed to your specific needs
- Factory-tested
- Completely assembled

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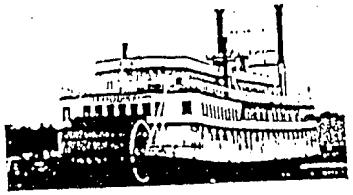
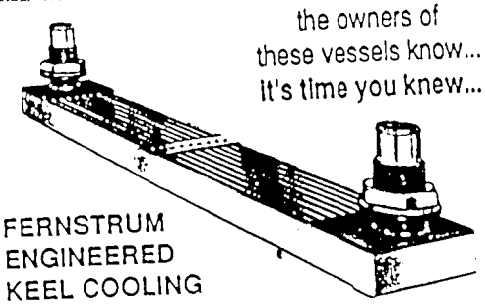


the owners of
these vessels know...
it's time you knew...



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OVER 40 YEARS EXPERIENCE IN KEEL COOLING

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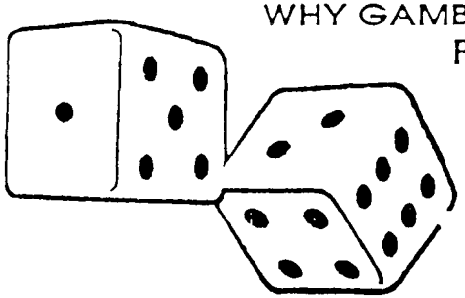
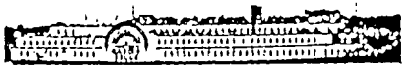
FERNSTRUM

GRIDCOOLER®

is a "SURE THING!"





Dubuque Casino Belle
Built by
Patti Shipyard
Keel Cooled by
R. W. Fernstrum
& Company

For over 40 years, we've been making cooling systems for all types of marine engines... and that's all we make. Our product is so durable, efficient and easy to install that the U. S. Navy wrote their keel cooling specifications around our Gridcoolers.
Why take chances when it comes to your engines' dependability? Do it right the first time... get Fernstrum Gridcoolers.

CHECK THESE UNIQUE QUALITIES ONLY FOUND IN THE GRIDCOOLER:

Completely assembled and factory tested to assure reliability. No complicated, time consuming assembly before installation. **Silver brazed and welded joints** form a rugged keel cooler, no slip joints or "O" rings to leak.

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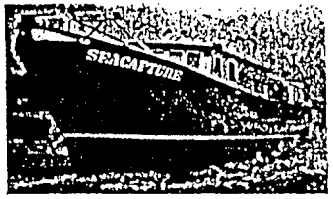

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Washburn & Doughty
BUILT BY
Washburn & Doughty
KEEL COOLED BY
R. W. Fernstrum & Company

OVER 40 YEARS EXPERIENCE IN KEEL COOLING

CHECK THESE UNIQUE QUALITIES FOUND IN THE GRIDCOOLER:

- Completely assembled and factory tested to assure reliability
- Silver brazed and welded joints form a rugged keel cooler
- Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube
- Custom designed to meet owner's operating conditions and the engine manufacturer's exact requirements
- The most compact form of keel cooling

You want the best of everything on your boat...as long as it's affordable...right? Then why don't you give us a call? For the cost of a phone call, we'll figure out which of over 8000 different Gridcoolers is right for cooling your engine in your boat. How can you go wrong? Get the best cooling system you can...get a Fernstrum Gridcooler.

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"The FERNSTRUM GRIDCOOLER® is the simplest and most dependable form of fresh water cooling available."

You want the best of everything on your boat...as long as it's affordable...right? Fernstrum Gridcoolers® have proved to be durable, reliable, economical and lightweight on vessels of all sizes in over 40 years of actual use by the military and many facets of the commercial marine industry.

If you're buying or repowering a boat, talk to us. For the cost of a phone call, we'll figure out which of over 8000 different Gridcooler models is right for cooling your engine in your application.

How can you go wrong?

Get the best cooling system you can...get a Fernstrum Gridcooler.

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- Completely assembled and factory tested to assure reliability
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- Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube
- Custom designed to meet the needs of both you and your engine
- The most compact form of keel cooling

FERNSTRUM ENGINEERED KEEL COOLING FOR OVER 40 YEARS

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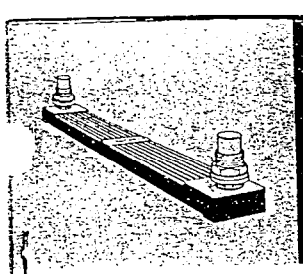


R. W. FERNSTRUM & COMPANY

MENOMINEE, MICHIGAN U.S.A. 49858

BULLETIN 870701

GRIDCOOLER RECOMMENDATIONS

JULY 1, 1987

ELECTRO - MOTIVE DIESEL MARINE ENGINES

COPY

POINTS TO CONSIDER BEFORE USING THIS GUIDE

ALL RECOMMENDATIONS SUBJECT TO CHANGE WITHOUT NOTICE

THIS IS A REFERENCE GUIDE DESIGNED TO ASSIST YOU IN THE SELECTION OF A FERNSTRUM GRIDCOOLER. THE RECOMMENDATIONS THAT THIS GUIDE CONTAINS WILL MEET MOST APPLICATIONS. HOWEVER, SITUATIONS MAY ARISE THAT ARE NOT COVERED IN THIS BULLETIN. UPON YOUR REQUEST, R. W. FERNSTRUM & COMPANY WILL MAKE RECOMMENDATIONS BASED UPON YOUR SPECIFIC NEEDS.

BEFORE USING THIS BULLETIN, MAKE SURE THAT YOU HAVE THE PROPER INFORMATION. KNOWING THE FULL ENGINE MODEL NUMBER, HORSE POWER AND RPM IS PART OF IT, BUT YOU MUST KNOW THE EXACT MINIMUM HULL SPEED AT FULL RATED POWER AND THE MAXIMUM SEA WATER TEMPERATURE.

THE 2 KNOT, 5 KNOT, AND 10 KNOT RAW WATER FLOWS SHOWN IN THESE RECOMMENDATIONS ARE THE ACTUAL WATER FLOW OVER THE GRIDCOOLER TUBES. IN MOST CASES, THIS WOULD BE THE MINIMUM HULL SPEED AT FULL RATED POWER. ONE EXCEPTION WOULD BE IF THE GRIDCOOLER CAN BE INSTALLED ON THE RAKE OF THE HULL, CLOSE TO THE PROPELLER, IT COULD INCREASE THE RAW WATER FLOW OVER THE TUBES CONSIDERABLY ON PROPULSION ENGINES.

IT MAY BE POSSIBLE TO DECREASE MULTIPLE GRIDCOOLERS RECOMMENDED TO COOL A SINGLE ENGINE. THIS COULD BE ACCOMPLISHED BY SETTING-UP A BY-PASS COOLING CIRCUIT EXTERNAL TO THE ENGINE. PLEASE CONTACT FERNSTRUM OFFICE FOR MORE INFORMATION.

ALWAYS USE THE MAXIMUM SEA WATER TEMPERATURE IN WHICH THE VESSEL WILL OPERATE. BE SURE TO CONSIDER SEA TRIALS AND THE ROUTE BY WHICH THE VESSEL WILL REACH ITS FINAL DESTINATION.

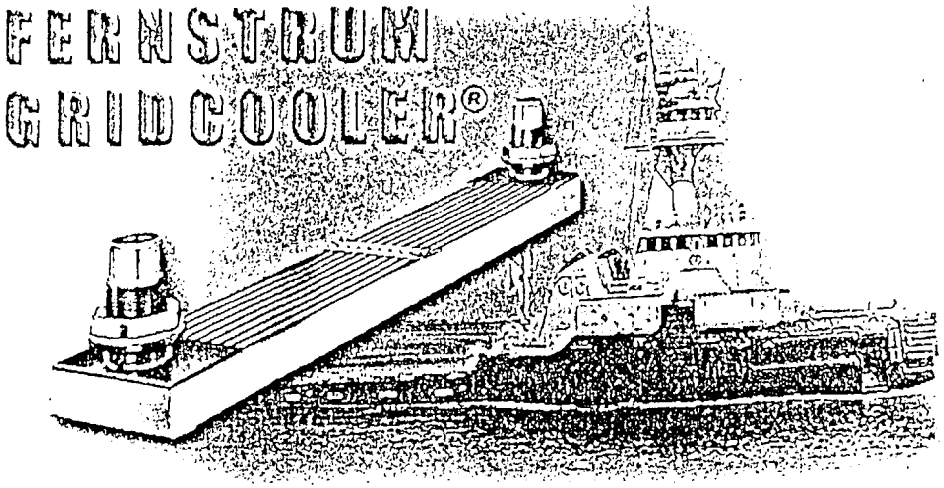
FOR COOLING GENERATOR SET ENGINES, PLEASE CONTACT FERNSTRUM OFFICE.

FRESH WATER TEMPERATURE LEAVING THE GRIDCOOLER WILL VARY WITH WATER TREATMENT, ACTUAL FRESH WATER FLOW, AND SEA WATER FLOW.

IF GLYCOL (ANTI-FREEZE) IS TO BE ADDED TO THE FRESH WATER CIRCUIT, PLEASE CONTACT OUR OFFICE FOR SPECIAL RECOMMENDATIONS. ADDING 50% GLYCOL COULD INCREASE LENGTH OF A GRIDCOOLER BY 13%.

1. ALL RECOMMENDATIONS ARE BASED ON LOADING THE GRIDCOOLER AND/OR GRIDCOOLERS 75% OF THEIR CAPACITY. THIS GIVES A 33.3% SAFETY FACTOR FOR SYSTEM AGING, MARINE GROWTH, AND IMPELLER WEAR.

2. THIS BULLETIN IS TO BE USED ON THE NEWER EMD ENGINES ONLY. DO NOT TRY TO USE IT TO COOL OLD ENGINES.



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SITE MAP

Welcome to www.fernstrum.com!

This site map is provided for your convenience. It allows a quick glance at all the pages available on our website.

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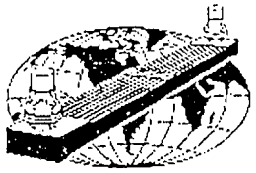

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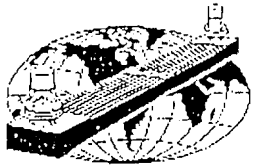
COMPANY

R. W. Fernstrum & Company, Inc. Designs and manufactures heat exchangers for the marine and industrial markets. Over 50 years of success in these fields allows us to provide our customers with standard systems to fit nearly any application as well as custom units for special applications.

Now in our third generation of family ownership, R. W. Fernstrum & Company continues in its tradition of unsurpassed quality and innovation in the marine industry. Each year, countless hours are spent in research and development allowing us to continually enhance the durability, function and efficiency of our products.



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History

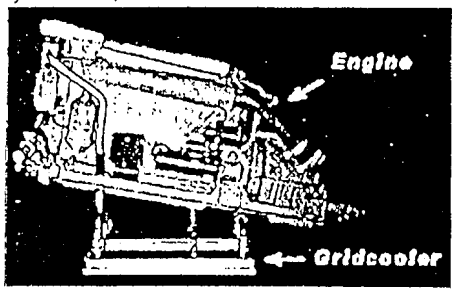
Brief History of Keel Cooling

Keel cooling first appeared in the early 1800's when someone hung a copper tube over the edge of a boat to condense steam. It later evolved into pieces of channel welded onto the hull. These channel-cooling systems offered important advantages over raw water cooling. They eliminated silt and sand buildup in engine jackets and protected engines against salt-water corrosion. Unfortunately, their sheer bulk reduced a ship's capacity and increased its drag. They were also prone to seaweed foul-up. Clearly, a more compact and streamlined cooler was needed. This led to packaged keel coolers, and the FERNSTRUM success story.

History of R. W. Fernstrum & Company

During WW II, Robert Fernstrum was chief engineer for Grey Marine Motor Company. At 8:00 one morning, he got a call from the receptionist who said there was a gentleman from the military in the office who wanted to see the chief engineer The gentleman said it was very important. It turned out that the U. S. Military was having a problem with their planned occupation of Iceland. They wanted to occupy Iceland so the Germans couldn't get a foothold there. The problem with the occupation occurred while transporting the troops to the island by landing craft. It seemed that only half the landing craft made it to the beaches. The other half had engine-overheating problems because of the shell ice common to the area. The shell ice clogged the water intakes that sent water to the inboard heat exchangers. Clogged heat exchangers meant overheated engines. Overheated engines meant landing craft with no propulsion. This was a problem that the military was very concerned about. They wanted answers to this problem. The simple answer was keel cooling, but keel cooling in those days was not acceptable, due to size. The large keel coolers were subject to fracture during beaching. That opened up the door for a new concept in keel cooling. That was the start of Robert's invention called the ***GRIDCOOLER®*** keel cooler.

After doing a study on keel coolers, Robert concluded that the new heat exchangers should be highly efficient, so as to minimize the size. A smaller unit would allow more flexibility for placement on the hull; unlike the standard keel coolers these new coolers could be easily protected by placing them near the skeg, toward the rear of the vessel. But how could the keel cooler be made more efficient? He concluded that by using rectangular instead of round tubing, he could gain both strength and increased surface area in a defined space (maximum cooling surface to a minimum cross-sectional area). Placement by the skeg offered protection, but the unit was still too exposed. For further protection, Robert decided to place the unit in a hull recess, thereby giving him a flush mounting. However, he wasn't sure that a recess would work properly. To prove or disprove the hull recess, he made a flow box. Basically, the flow box was a hull recess with a ***GRIDCOOLER*** keel cooler in it submerged in a tank of water. The water in the tank could be given a flow rate to simulate actual "vessel" movement. The box was made of Lucite, so he could observe the water flow results. Robert was concerned that a vacuum effect from the upper front edge of the recess would create a pocket of air next to the cooler. Fortunately, the vacuum effect that was there was actually just enough to pull water into the recess and along the cooler; not enough to create the pocket of air. The Navy was very



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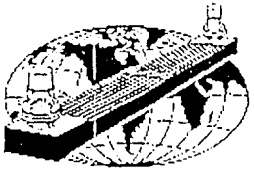
interested in what he had to offer. They had him install a *GRIDCOOLER* unit in a small landing craft that held about 40 troops. The *GRIDCOOLER*-cooled landing craft was shipped to the West Coast for tests. Basically, the Navy wanted to see if they could knock the unit off the landing craft. They gave up trying after between 4 and 5 hundred beachings. The *GRIDCOOLER* unit was still in place and doing its job. The next test order was for 25 *GRIDCOOLER* keel coolers in kit form. 12 were sent to the Pacific, 12 to the Atlantic and the 25th unit went to Annapolis, MD for further experimental tests and studies.

With the end of WWII and the design phase of Robert's keel cooler completed, he went out to sell this new product of his to the Navy and anyone who would listen to him. He started working on this type of heat exchanger for the U. S. Navy before the attack on Pearl Harbor. The initial project extended throughout WWII. At the War's end, he was told by someone in procurement that the Bureau of Ships had placed a change order. The order was to retrofit 60,000 landing craft with *GRIDCOOLER* keel coolers. Fortunately, the War ended and the order was put on hold. We say "fortunately" because he had the capability of building a dozen or so a week, if everything went well, not anywhere near what the Bureau of Ships wanted. But the heat exchangers had been accepted. With the coming of the Korean War, the military wanted a lot of resources put into landing craft. They built thousands and used the *GRIDCOOLER* keel cooler as a standard. As for commercial sales, we started out on shrimp boats in the Gulf of Mexico and with boats on the Mississippi and Missouri rivers. They were having trouble with sand and silt deposits in their engines. There was a lot of gear pump wear and some cracked blocks. One of the first people to start using the *GRIDCOOLER* keel cooler was a civilian engineer who was with the U.S. Army Corps of Engineers, a Mr. Bonjour, from the Kansas City District. He was interested in repowering a couple of his boats because their blocks had cracked from silt buildup. Robert just happened to have a *GRIDCOOLER* keel cooler in the office, so he showed him the unit. Being a fully closed system, the *GRIDCOOLER* system would eliminate his problems. Mr. Bonjour was a bit skeptical, so Robert ran some tests while he was there. He said, "It works fine here, but will it work in a boat?" Robert assured him it would, because if it didn't it wouldn't cost him a nickel. That got him to agree, so they set up the boats with the new engines and equipped them with *GRIDCOOLER* units. When the boats were ready, Mr. Bonjour ran time trials. He was very pleased with the results. He was so pleased that he had all the Kansas City District boats fitted with *GRIDCOOLER* keel coolers. Shortly after that, the Omaha District heard about the Kansas City boats and they ordered coolers for their fleet.



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Frequently Asked Questions

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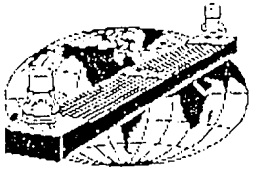

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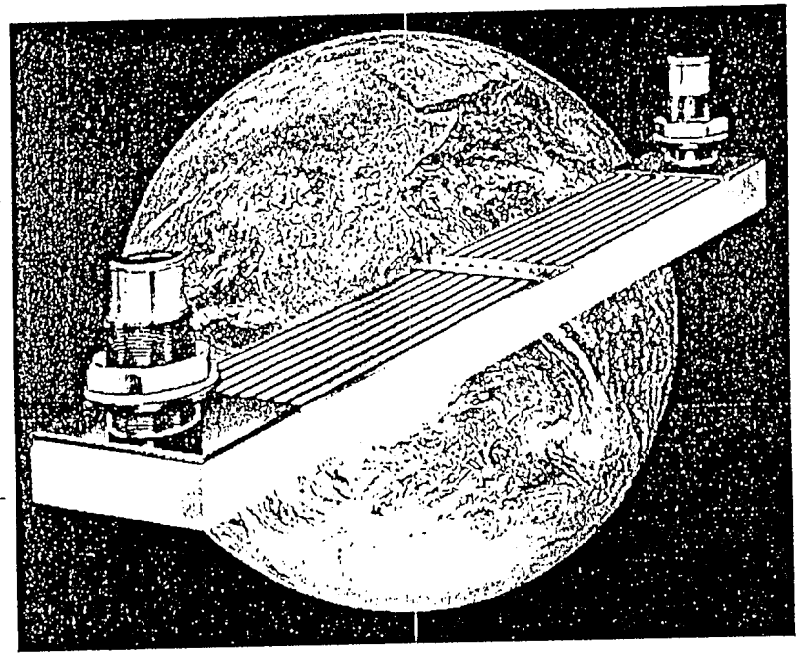

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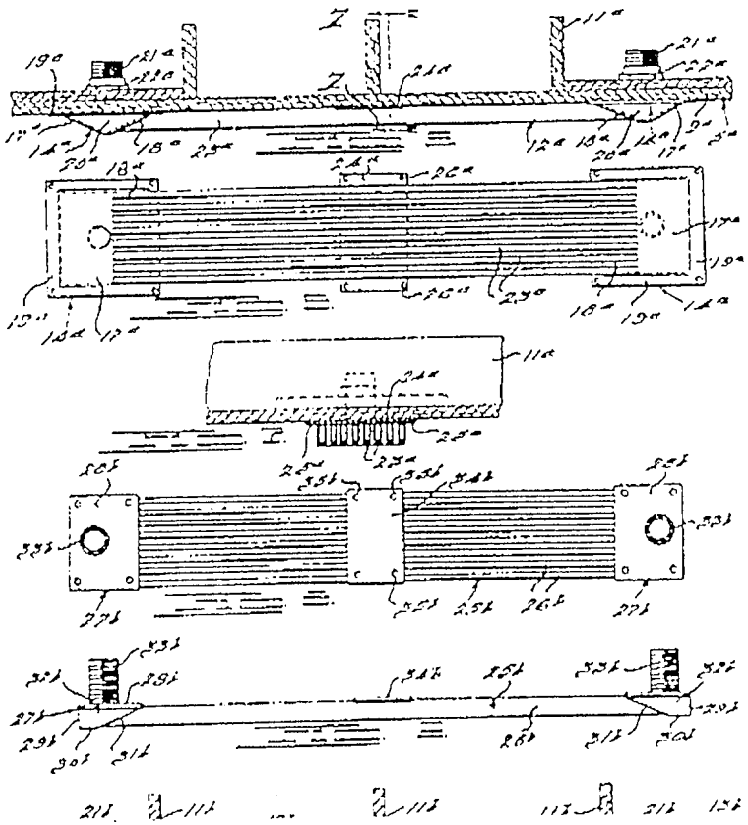
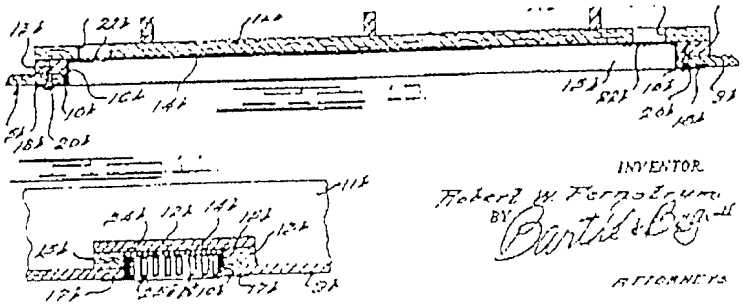
Original Patent

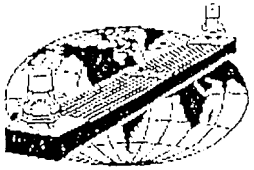
Aug. 14, 1945. R. W. FERNSTRUM 2,382,218

OUTBOARD MARINE HEAT EXCHANGER

Filed Sept. 10, 1943 2 Sheets-Sheet 2







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For additional information, pricing or application assistance:

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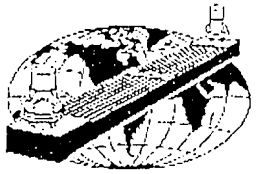
Frank Bjorkman, National Sales Manager	frankb@fernstrum.com
Dale Gusick, Export Sales Manager	daleg@fernstrum.com
Corporate Office & Manufacturing Facilities 1716 11th Avenue - P.O. Box 97 - Menominee, MI 49858	



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Suquamish, WA 98392
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Wilmington, NC 28409-4154
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New Orleans, LA 70130
JOHN RICE
Phone: 504-525-7137

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Fax: 504-525-6303

HUMCO MARINE PRODUCTS

1074 Kenran Industrial Blvd.

St. Louis, MO 63137

KURT HOLTGREWE

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Fax: 1-314-388-0068

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Fax: 44 1502 589693

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2931 AB Krimpen a/d Lek
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Central & South America

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MIGUEL VASALLO

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Fax: 61 8 9336 7920

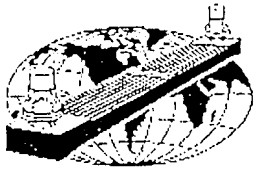
Melbourne Office

Office 9, 79 Manningham Road
Bulleen VIC 3105 Australia

ALFONS GRAAF

Phone: 61 3 9852 1100

Fax: 61 3 9852 2377



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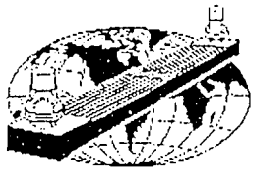
CUSTOMERS

TESTIMONIALS

At R. W. Fernstrum & Company our customer base is as varied as our *GRIDCOOLER®* product line. Our cooling systems can be found working for recreational boat owners on everything from sailboats on the Great Lakes to expeditionary yachts on the Amazon River.

Commercial vessels from the fishing fleets in Alaska to the workboats on the Mississippi and Gulf of Mexico have counted on the quality and reliability of the *GRIDCOOLER* keel cooler for decades. Pumping stations located in several countries make use of our coolers. A Florida theme park uses our coolers on one of their attractions. Our keel coolers have also been used on submarines. We even have coolers operating in the ballast tanks of some vessels. In other words, if you have water to put a *GRIDCOOLER* keel cooler into, we can cool your application.

Our customers come from a wide range of industries, governments and private individuals. Our coolers can be found in operation worldwide.



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PRODUCTS

FERNSTRUM GRIDCOOLER® KEEL COOLERS

The *GRIDCOOLER* keel cooler is a heat exchanger of the outboard or hull type. The *GRIDCOOLER* keel cooler eliminates sand and silt deposits in engine jackets, and protects your engine from corrosion and deposits in salt water operation.

The unique design of the *GRIDCOOLER* keel cooler eliminates the objections associated with keel cooling - such as bulkiness, drag, fouling, and weight. In many cases, a GRIDCOOLER unit requires only one twentieth of the space needed for channel cooling.

LOW DRAG - Independent tests run at the Vienna Model Test Basin have shown that additional drag is negligible or almost nonexistent when *GRIDCOOLER* units are recessed in a ship's hull. On our high speed test boats, we found that the difference between rolling and brushing regular antifoulant hull paint on the hull of the boats created more drag than our *GRIDCOOLER* keel cooler.

PRESSURE DROP - Because the pressure drop over the *GRIDCOOLER* unit is extremely low, it does not restrict the flow of jacket water, making possible the use of a centrifugal circulating pump, as well as displacement types.

EASILY INSTALLED - The design of the *GRIDCOOLER* keel cooler presents no greater problem than ordinary through - hull fittings. The *GRIDCOOLER* unit eliminates the seawater pump, strainer, scoop, and seacock (except for wet type exhaust systems, which usually require a small capacity pump). The *GRIDCOOLER* keel cooler is a completely assembled unit ready for installation, complete with heavy neoprene gaskets for sealing the inside and outside of the hull.

VARIETY - *GRIDCOOLER* keel coolers are available in over 20,000 models to meet your operating conditions and the engine manufacturer's exact cooling requirements for your engine.

FERNSTRUM BOX COOLERS

A box cooler, like our *GRIDCOOLER* keel cooler, is a cooling unit that operates below the water line. Unlike the *GRIDCOOLER* keel cooler, the box cooler is placed in a sea chest instead of outside of the hull in a recess or flush mounted to the hull. This gives the box cooler a greater amount of protection, and allows us greater flexibility in sizing one or multiple units for your specific needs. For example, rather than changing only the length of the tubes, or the number of tubes the cooler uses in width, we can stack the tubes that are used in a box cooler. While we currently offer *GRIDCOOLER* keel coolers that are two tubes deep, the BOX COOLER can be two, ten, fourteen or more tubes

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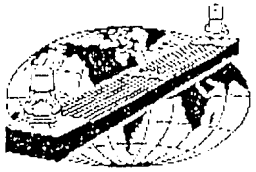
deep as well as any number in between. The main drawback to box coolers is space. Because they are placed in a sea chest, space must be set aside within the hull for the sea chest, unlike our *GRIDCOOLER* keel coolers, which need only space outside of the hull (unless they are recessed).



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STANDARDS

Quality Work

Tailored to your exact specifications, the *GRIDCOOLER®* keel cooler is designed as a complete assembly. There's nothing to add... nothing to assemble. Simply attach the *GRIDCOOLER* unit to your ship's hull on site.

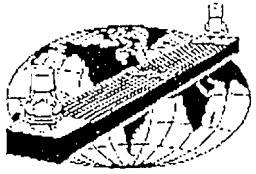
To make a product that will fit that description, you have to have quality, and quality is something we don't take lightly. As soon as we receive our raw material and parts, our quality control people go into action. All parts and materials being used in the *GRIDCOOLER* line are 100% inspected. This gives the person who buys a *GRIDCOOLER* keel cooler the knowledge that they bought a product with the finest quality available. Inspection and testing assures the dependability of performance that can be found in every unit. That's why, with proper installation and normal use, *GRIDCOOLER* keel coolers have commonly been in service for over 30 years.

GRIDCOOLER keel coolers are repairable. Should anything happen to your unit, please give us a call. Each unit has its own serial number and Inspection Sheet on file, so we can quickly reference your unit and help you should any problems occur.

Quality Materials

Standard series *GRIDCOOLER* are made of either 90/100 copper-nickel or marine grade aluminum rectangular tubing. These alloys were chosen because of their resistance to salt water corrosion and their heat transfer abilities. Both the copper-nickel and aluminum units are completely assembled; the copper-nickel units are silver brazed, and the aluminum units are welded.

The copper-nickel units have natural anti-foulant capabilities, and the tubing is very ductile, so your *GRIDCOOLER* could be given a slight bend or twist to conform to the hull or your craft. The aluminum units are made of alloys that are compatible with vessels having aluminum hulls.



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WHAT'S NEW

Fernstrum Introduces New Z-Series™ GRIDCOOLER® Keel Cooler

R. W. Fernstrum and Company, Inc. A world leader in marine cooling systems intrduces the Z-series *GRIDCOOLER* keel cooler. This patend pending keel cooler was designed for installations where mounting hardware cannot be easily accessed from the interior of the hull. The Z-series *GRIDCOOLER* unit replaces the typical through-hull nozzle connecting means with a copper-nickel flange fused to the top of the header. A mating ASTM steel flange, which is supplied with the unit, is welded to a pipe stub extending from the hull of the vessel. Intermediate supports along the length of the cooler are secured by welding the appropriate size angle to the hull in the necessary locations. This configuration lends itself to double hulled vessels and also eliminates the need for cofferdams in USCG certification of passenger vessels.

THE BEST MADE BETTER! Fernstrum introduces tubing enhancement

R. W. Fernstrum & Company, Inc. has introduced their new line of enhanced *GRIDCOOLER®* keel coolers. Believed to be the most significant technological advance in packaged keel cooling in over fifty years, the enhanced *GRIDCOOLER* keel cooler allows up to a 30% decrease in overall size over previous smooth tube designs.

Utilizing an enhanced surface on the tubing interior, the enhanced *GRIDCOOLER* keel cooler offers an increase in surface area while producing more turbulent coolant flow. This translates into greater heat transfer efficiency, as well as a reduction in the coating effect encountered in systems using ethylene glycol.

Fernstrum's extensive use of computers in the design process coupled with their custom fabrication capabilities allows an enhanced *GRIDCOOLER* keel cooler to be manufactured to meet the needs of any marine application. Customers may request special mounting hardware, special tubing and header configurations, additional fittings, bending, etc. to add to the ease of installation and maintenance of their system.

Fernstrum extends warranty protection

The quality of materials and workmanship that go into the *GRIDCOOLER* product line is unmatched by any other manufacturer. Fernstrum is so confident in their copper nickel *GRIDCOOLER* keel coolers that they are extending their limited warranty period from one to two years. Beginning January 1 st 2000 all copper nickel units shipped will be covered under a standard 2-year limited warranty on material and workmanship. This level of confidence comes from 50 years of manufacturing experience combined with the proven superior durability of the

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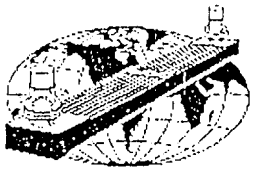
Fernstrum *GRIDCOOLER*.



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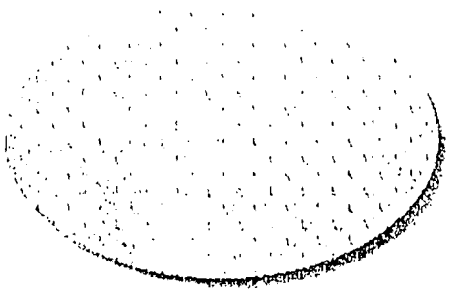
PRODUCTS

Product Info

ENHANCED GRIDCOOLER® PRODUCT INFO

[TOP]

For the latest improvement in efficiency, we have added an enhanced surface to the interior of our tubing. This new design allows us to increase the heat transfer capability of a *GRIDCOOLER* keel cooler by up to 30%. On larger installations, this increase in efficiency may reduce the number of coolers required for an application. It also allows us to fit keel coolers in spaces that previously, were too small.



When repowering a vessel, the increase in efficiency give the enhanced *GRIDCOOLER* unit the ability to handle a greater heat-load. In some cases, major modifications to the vessel's piping are unnecessary. Also, if it becomes necessary to modify an older vessel for a new use that requires additional cooling, (i.e. warmer sea water temperatures, slower hull speeds or adding antifreeze) we may be able to supply your vessel with an enhanced cooler of the same size as your existing unit.

This new advancement shows our commitment to innovation in a field where we've long been the leader. If you need a solution to a cooling problem, give us a call. We will gladly work with you to design a keel cooling system to meet your needs.

GRIDCOOLER PRODUCT INFO

[TOP]

With the installation of a *GRIDCOOLER* keel cooler, operational safety is improved when navigating in ice or debris laden waters. Also, you will no longer have a loss of power at critical times due to raw water pump failure, or strainers clogged with sandwich wrappers, silt, sand, sea weed, and other debris. Thousands of *GRIDCOOLER* units are in operation with splendid success, proving their seaworthiness and reliability in years of operation by the U.S. Navy, Coast Guard, Army, and a variety of commercial and pleasure craft.

The improved performance and extended engine life saves you the cost of a *GRIDCOOLER* keel cooler many times over. The Army's life expectancy for a *GRIDCOOLER* keel cooler is 20 years, which is typically longer than the boat using the *GRIDCOOLER* unit! The Fernstrum

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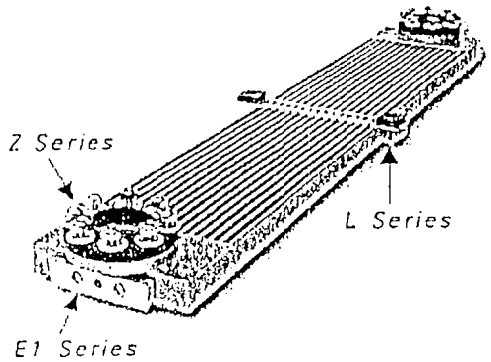
Company is ready work with you at any time to achieve the best possible design for your exact keel-cooling requirements.

For marine applications requiring unique or custom cooling systems, ***FERNSTRUM GRIDCOOLER*** keel coolers are always a perfect fit. We have design flexibility unmatched by any other manufacturer. Because approximately 30% of all units we manufacture are custom designs, we can easily tailor a unit to your specific application. This is possible through our desire to meet your individual needs and our utilization of extensive computer technology throughout the design process.

GRIDCOOLER units can be factory customized in many different ways. If you have a given area in which to place a cooler, we will work with you to custom design a unit to meet those requirements. We can bend units to conform to your hull's profile, add special fittings or even stack tubing to fit your application. Such special requests have led to several special series of units.

¥ Our L SERIES support plates are designed to eliminate intermediate support bolt hull penetrations.
¥ Our E1 SERIES units place the zinc anodes and drain bosses on the end of the keel cooler, a benefit to high-speed craft and fishermen.
¥ Our Z SERIES flanges simplify keel cooler installation on double hulled vessels and eliminate hull penetrations. Patent #6,099,373



These examples are only a few of the many special needs we have met for our customers. If you have a unique marine cooling application, give us a call. We will gladly work with you to design a keel cooling system to meet your needs.

BOX COOLER PRODUCT INFO

[TOP]

Why Box Coolers? While the keel cooler is widely accepted in the Americas, The European marine industry prefers the box cooler design. So we set out to design a box cooler that would meet all of the standards we had set for our ***GRIDCOOLER*** keel coolers. After months of research and development, we came up with a box cooler good enough to bear our name. But why use a box cooler in the states? What's the big advantage over Keel cooling?

The box cooler enhances our ***GRIDCOOLER*** product line by offering better protection against damage from logs and other heavy debris than

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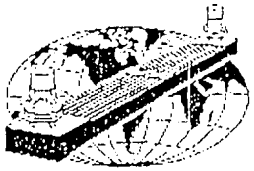
a recessed *GRIDCOOLER* installation. However, the cost of this added protection is a sea chest inside the hull. At this time, we don't recommend using box coolers in areas with heavy pounding seas.



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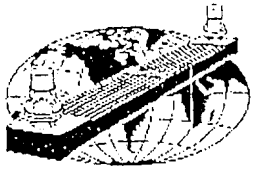
PRODUCTS

Technical Info

FERNSTRUM GRIDCOOLER® AND BOX COOLER TECHNICAL INFO

The technical information on *FERNSTRUM GRIDCOOLER* and *BOX COOLER* available in the following links can also be found in our product brochures that can be downloaded or can be sent by mail upon request.

BOX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER



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PRODUCTS

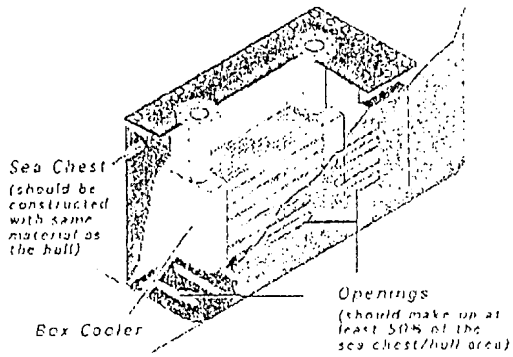
Technical Info - Box Cooler Info

BOX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

Traditionally in the construction of box coolers, steel, brass or bronze materials have been used. The new Fernstrum box cooler construction uses the same materials as our *GRIDCOOLERS®*, 90-10 copper-nickel. The tube used is our "D" series tubing or a small diameter round tube. Approximate size of the units is the same as that of our Gridcoolers sized for a 1/2 mph flow, except for the fact that the tubes are mounted differently.

Installation

When installing box coolers, use the following guidelines:



1. The interior Sea chest walls and cover plate should be at least as thick as the hull plating.

2. There should be a gap at least 6" between the box coolers and the sea chest walls.

3. The sea chest openings in the hull must cover at least 50% of the hull/sea chest area.

4. The box coolers must be mounted parallel to the hull for the greatest efficiency.

5. Use angle iron as thick as the hull plating to construct the lip that the cover plate attaches to.

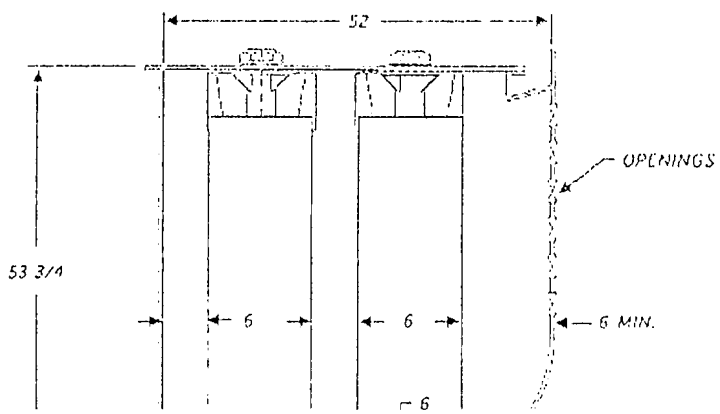
- Installation Example-

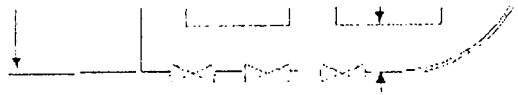
The following example is for a dredge using box coolers for its generator and propulsion systems.
The installation drawing below is for the generator's box coolers.

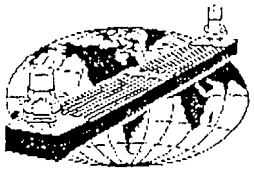
0315

- Propulsion Engine-	- Generator Engine-
Rating: 1970KW/1000rpm	Rating: 1970KW/1000rpm
Temp into Cooler: 147"F	Temp into Cooler: 147"F
Temp out of Cooler: 121.95"F	Temp out of Cooler: 121.95"F
Sea Water Temp: 85"F	Sea Water Temp: 85"F
Box Cooler	Box Cooler
Model: D11x10x54-5P-G	Model: 2/D11x11x54-11P-G in parallel
Element	Element
Height: 32.5"	Height: 41.5"
Width: 14"	Width: 14"
Length: 71"	Length: 71"
Overall Dimensions Sea Chest	Overall Dimensions Sea Chest
Height: 44.75"	Height: 53.75"
Width: 26" minimum	Width: 46" minimum (52" shown)
Length: 83"	Length: 83"
Approx. Weight: 990 lbs	Approx. Weight/Element: 1160lbs
	Total Approx. Weight: 2320 lbs

| TOP |







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PRODUCTS

Technical Info - Gridcooler Installation Info

BOX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

GRIDCOOLER® INSTALLATION INFO

A compact, modular unit, the *GRIDCOOLER* can be mounted almost anywhere on a ship's hull. This gives you flexibility to match the installation to the hull design and operating conditions. On shallow draft river work boats, for instance, the *GRIDCOOLER* may be mounted on the side of the hull or beside the skeg. On towboats, the *GRIDCOOLER* may be installed near the propeller (but not directly above it) to take advantage of its slipstream during heavy towing. On fast moving vessels, the unit is normally recessed alongside the keel. If drag is a factor you need to consider in your particular application, recessing a *GRIDCOOLER* has been found to add a negligible amount of drag if any at all. An independent tank testing study conducted by Schiffbautechnische Verzuchzanztalt (model basin, Vienna, Austria) found that *GRIDCOOLER* units "fitted in a respective recess, practically do not influence the resistance (drag) of a ship." More information is available upon request. For larger engines, two or more *GRIDCOOLER* units can be installed in parallel or in series. For maximum protection and minimum drag, recess them so they are flush with the hull. They may be, however, installed on the surface of the hull with fairing blocks for streamlining. The FERNSTRUM *GRIDCOOLER* is quite versatile. The FERNSTRUM *GRIDCOOLER* is made of the finest, most suitable materials available. They are assembled, thoroughly tested, and inspected by skilled craftsmen. When properly installed, the *GRIDCOOLER* will perform to your complete satisfaction.

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LOCATION OF INSTALL

To function properly, the *GRIDCOOLER* must be properly located on your vessel's hull. Please consider the following before installing your *GRIDCOOLER*:

1.1 GOOD LOCATIONS

1.1.1 Sea water must flow over the entire length of the *GRIDCOOLER*.

1.1.2 Always install the unit parallel, not transverse, to the skeg or keel. See Figures 1 & 2.

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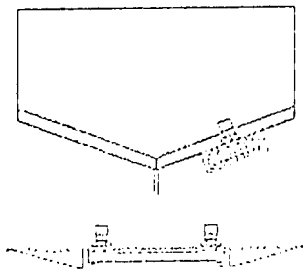


Figure 1

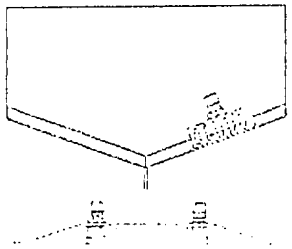
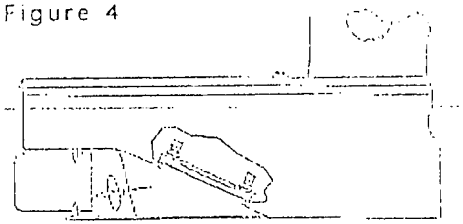


Figure 2

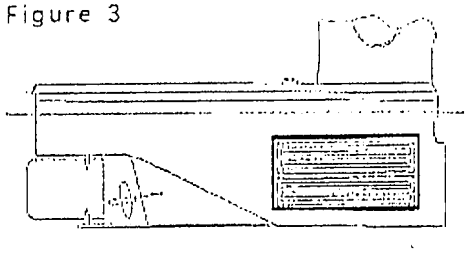
Figure 4



1.1.3 On towboats, install the *GRIDCOOLER* as near to the propeller as possible (but not directly above it) to take advantage of its slip-stream during extreme towing operations. See Figure 4.

1.1.4 When installing a unit on the side of a hull, position it well below the water line to avoid aerated surface water. Aeration reduces heat transfer and can cause overheating. See Figure 3.

Figure 3



1.1.5 When using a two - circuit cooling system, consisting of a high temperature jacket water circuit and a low temperature aftercooler circuit, make certain the aftercooler circuit cooler is placed forward of the jacket water circuit cooler. When room allows, they can be installed side by side with the aftercooler circuit lower on the hull (i.e. closer to the skeg or keel) and a divider plate between the high and low temperature *GRIDCOOLER* units.

1.1.6 When the *GRIDCOOLER* is used on a generator set or if your application requires sizing for a hull speed of 0 knots, make sure that sea water can freely circulate past the cooler tubes. A 1/2 mph (0.8 km/hr) minimum convection current must flow over the cooler tubes to maintain proper cooling. Do not recess a generator set unit on the bottom of a flat bottom boat unless the hull section where the *GRIDCOOLER* will be mounted inclines a minimum of 20 degrees (from forward to aft) to avoid entrapping raw hot water around the *GRIDCOOLER* tubes. See Figure 4.

1.1.7 In high speed applications (10+ knots), locate the *GRIDCOOLER* as far aft as possible to avoid aeration.

1.1.8 Keep the GRIDCOOLER close to the keel.

1.2.3 To eliminate unnecessary stress and vibration on the cooler, do not locate your GRIDCOOLER directly below engine mounts.

1.2.4 To eliminate unnecessary stress and vibration on the cooler, do not locate your GRIDCOOLER directly above the propeller(s).

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1.2.5 Do not locate your GRIDCOOLER on the front 1/3 of the hull for displacement hulls. For planing hull vessels, mount the GRIDCOOLER aft of midships.

INSTALLATION

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Once you have decided on the correct location, use the following steps as a guideline for installing your *GRIDCOOLER*:

NOTE: Do not exceed 35 PSI (2.41 Bar) when pressure testing a *GRIDCOOLER*.

2.1 COFFERDAM INSTALLATION

Some classed vessels (ABS or Coast Guard, for example) may require cofferdams, check with your local officials for more information. For this type of installation, see Cofferdam Installation.

2.2 MAKING HOLES

2.2.1 Measure the distance between the GRIDCOOLER nozzles from center to center (also measure to the centers of the support studs when applicable) before cutting holes for them in the ship's hull.

2.2.2 Make the nozzle holes through the hull 1/4 in. (6.4 mm) diameter oversized.

2.2.3 Make sure that the hull surfaces where the *GRIDCOOLER* will be mounted are smooth and properly aligned (on steel hulls, if you burn the holes, grind the edges smooth afterwards). This will allow the gaskets to seal properly and insure that no undue stress will be placed on the *GRIDCOOLER*.

2.3 MOUNTING

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2.3.1 A *GRIDCOOLER* can be canted from the hull (sideways) to vertically align the nozzles. This can reduce interference problems with stringers on cofferdam installations. See Figure 5.

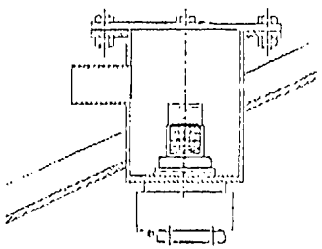

Figure 5

2.3.2 If you are not sure as to whether or not you should recess your *GRIDCOOLER*, we recommend using a recess on planing hulls and vessels moving at 10 or more knots. Owners of vessels with displacement hulls moving at less than 10 knots may find an external mounting with fairing blocks to their advantage; provided there is not much chance of the unit being damaged in such an environment.

2.3.3 If the *GRIDCOOLER* is recessed into the hull, make sure that it has a 1-1/2 in. (38 mm) minimum clearance on all sides (this does not include between the hull and the top of the cooler). The recess should be no deeper than 1/2 in. (13 mm) plus the hull projection (listed on installation drawing) of the cooler.

2.3.4 High speed applications (10+ knots) can reduce the 1-1/2 in. clearance in section 2.3.3 to 1/2 in. minimum due to increased raw water flow over the cooler at high speed.

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2.3.5 When recessing a *GRIDCOOLER* into the side of the hull for generator sets and/or equipment operating at dockside, angle the top of the recess box to allow convection current over the *GRIDCOOLER*. See Figure 6.

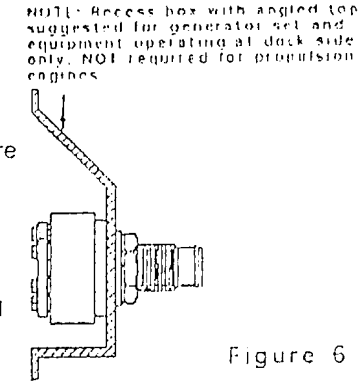

Figure 6

2.3.6 When installing a U-Flow (two-pass type *GRIDCOOLER*) on an incline, make sure that the nozzles are at the high end to avoid air entrapment. See Figure 7.

2.3.7 High speed applications and others that use "E1" series coolers should take into consideration the removal and replacement of zinc electrodes when sizing the length of a recess.

2.3.8 If side plates and fairing blocks are used, make sure that the side plates are scalloped out so they will not entrap water. Fairing blocks are most effective when installed on a 4 to 1 slope. See Figure 8.

2.3.9 A *GRIDCOOLER* can be bent to conform to the hull. The bending can be done at the yard or by R. W. Fernstrum & Company. Contact us if you are considering bending a *GRIDCOOLER*. See Bending.

2.3.10 In extreme cases, where logs, debris, or dragging bottom may endanger the *GRIDCOOLER*, a protective guard may be mounted over the *GRIDCOOLER* recess. Make certain the grill guard does not exceed 25% of the opening. Figures 8 and 9 are examples of protective guards and different installations that have been used.

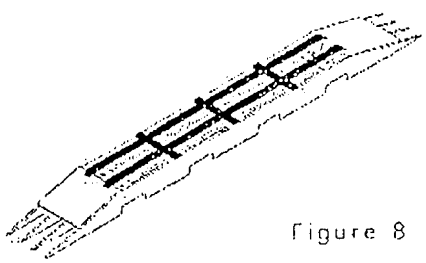
Figure 8

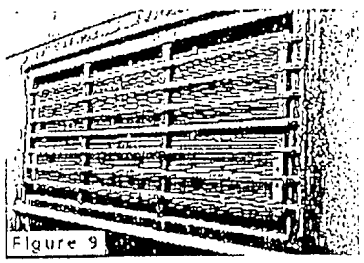
Figure 9

2.4 FITTING UP

[TOP]

Under normal conditions, the compression of the mounting gaskets puts sufficient tension on the nozzle nuts (and support bolt nuts when applicable) to prevent them from working loose. To seal out water, apply a polysulfide rubber sealant like BoatLIFE Caulk or 3M Marine Sealant 101 around the gaskets, washers, and the points where the nozzles and support bolts penetrate the hull before assembly. Remember to tighten the nuts a second time, after the caulking has set.

NOTE: BoatLIFE is available from Life Industries, call (803) 566-1225 for a dealer near you. Marine Sealant 101 is available from 3M, call (612) 737-6362 for a dealer near you.

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2.5 COPPER/NICKEL INSTALLATION

NOTE: Do not exceed 35 PSI (2.41 Bar) when pressure testing a *GRIDCOOLER*.

2.5.1 Mounting gaskets supplied with the *GRIDCOOLER* must be used to provide proper spacing between the *GRIDCOOLER* and the ship's hull.

NOTE: All "B" & "C" series models have 1/4 in. (6.4 mm) gaskets standard. The "D" series models have 3/4 in. (19 mm) gaskets standard, but 1/4 in. gaskets are available upon request for "D" series units.

2.5.2 To avoid over-tightening any of the supporting nuts, we recommend the following torques for all standard installations:

COPPER/NICKEL GRIDCOOLER NUT TORQUES FT.-LBS. (KG-M)			
NOZZLE THREAD SIZE			
.75" 19mm 50 - 60 (7 - 8)	1 - 1.5" 25 - 38mm 75 - 100 (10 - 14)	2" 51mm 125 - 150 (17 - 21)	2.5 - 3.5" 63 - 89mm 200 - 250 (28 - 35)
HEADER STUD		SUPPORT BOLT	
.625" - .75" 16 - 19MM 35-40 (5 - 5.5)	1" 25.4mm 50- 60 (7 - 8)	.5 - .75" 13 - 19mm 20 - 25 (3 - 3.5)	

2.5.3 Attach the zinc electrode plates using the special bolts and washers supplied with the *GRIDCOOLER*. See Figure 11. They can be found in a cardboard box inside the GRIDCOOLER shipping box.

2.5.4 Zinc replacement kits, including zinc electrodes, screws, and washers, can be ordered from the factory. Just give us the model number of your *GRIDCOOLER*.

2.5.5 Zinc electrode plates are standard equipment with most copper/nickel *GRIDCOOLER* models. They minimize the effects of galvanic corrosion, and should be replaced when deteriorated. The life of these plates varies with localities. Rapid deterioration can result from stray electrical currents induced by improperly grounded electrical equipment. These problems should be corrected.

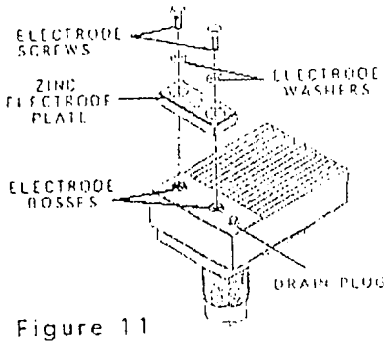

Figure 11

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2.6 ALUMINUM INSTALLATION

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2.6.1 An Aluminum *GRIDCOOLER* should be installed on unpainted aluminum hulls only.

2.6.2 The 1/4 in. mounting gaskets supplied with the *GRIDCOOLER* must be used to provide proper spacing between the *GRIDCOOLER* and the ship's hull.

2.6.3 To avoid over-tightening any of the supporting nuts, we recommend the following torques for all normal installations:

ALUMINUM *GRIDCOOLERS* NUT TORQUES FT-LBS (KG-M)		
NOZZLE THREAD		SUPPORT BOLT
1" 25.4mm 75 - 100 (10 - 14)	1.5 - 3" 38 - 76mm 125 - 150 (17 - 21)	.625" 16mm 20 - 25 (3 - 3.5)

2.6.4 Most aluminum units have tapered threads on the nipples and no hose connectors (see installation drawing), these units can be piped directly to the engine, provided flexible couplings are used to remove engine vibration between the engine and the *GRIDCOOLER*.

2.6.5 If a wire reinforced rubber hose is used to connect the *GRIDCOOLER* to the engine, put a screw-on coupling over the *GRIDCOOLER* nozzle threads.

2.6.6 Aluminum *GRIDCOOLER* models do not use zinc electrodes.

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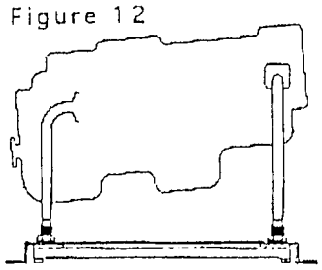
2.7 PLUMBING

2.7.1 Remove the orange nozzle plugs from the *GRIDCOOLER* before hooking up the plumbing to the cooler.

Figure 12



2.7.2 When converting an engine from inboard heat exchanger cooling to keel cooling, do not pipe the *GRIDCOOLER* to a heat exchanger, bypass the heat exchanger and pipe the *GRIDCOOLER* directly to the engine. See Figure 12.

2.7.3 As a rule-of-thumb, the expansion tank for your cooling system should be be able to hold approximately 10% of the total cooling system coolant. Contact your engine dealer for the exact size.

2.7.4 When piping, do not use tubing or fittings smaller than the engine or *GRIDCOOLER* connections. If those on the engine are larger than those on the *GRIDCOOLER*, reduce the piping at the *GRIDCOOLER*, not the engine. Use a minimum of elbows, and check all connections for leaks. All high areas in piping must be vented.

2.7.5 To avoid transmitting engine vibrations to the *GRIDCOOLER*, use wire reinforced rubber hoses and clamps at the engine and

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GRIDCOOLER connections.

2.7.6 When installing a U-Flow (two-pass type *GRIDCOOLER*) in a side mounted position, your inlet line should be connected to the lower nozzle to force air up and out of the cooling system.

2.7.7 To avoid air pockets that would restrict water flow through the cooling system and cause overheating, install the piping between the engine and the *GRIDCOOLER* so that it is self-venting.

2.7.8 For piping diagrams for multiple *GRIDCOOLER* installations, see Figures 13 through 16.

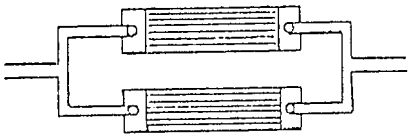

Figure 13

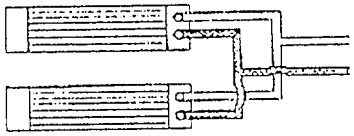

Figure 14

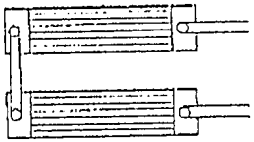

Figure 15

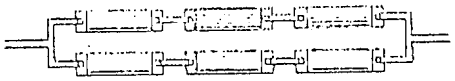

Figure 16

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2.8 FILLING & TESTING

2.8.1 Always premix ethylene glycol (antifreeze) with water before adding it to the cooling system. Contact your engine dealer for the proper antifreeze type and percentage for your engine. We do not recommend the use of propylene glycol in your cooling system.

2.8.2 Never mix ethylene and propolyene glycol based antifreezes in your cooling system.

2.8.3 When installing a *GRIDCOOLER* in a side mounted position, it is important that the unit is completely filled with water before launching the vessel. This can be accomplished by using the following procedure: 1. At the outlet end of the *GRIDCOOLER* (see Figure 17), remove the upper drain plug and fill the unit with cooling water. 2. When water runs out of the upper drain, replace the plug. 3. Your *GRIDCOOLER* is now filled with water. If the system is ever drained, you must repeat this procedure.

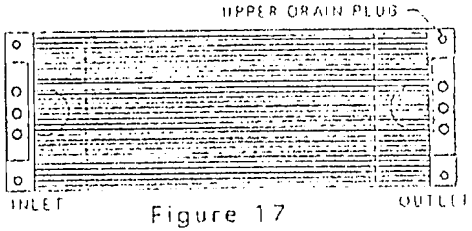

Figure 17

NOTE: When pressure testing the cooling system, do not exceed 35 PSI (2.41 BAR).

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SPECIAL INSTALLATIONS

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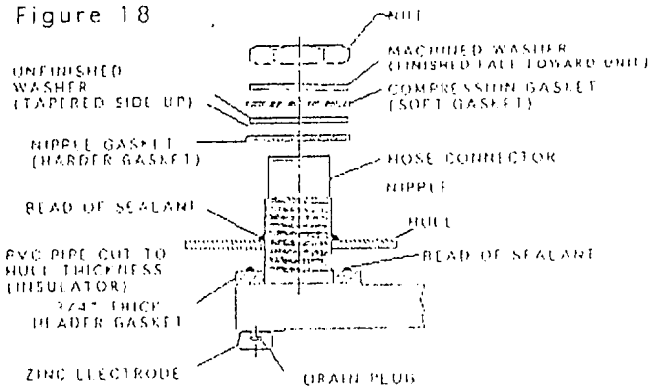
3.1 COFFERDAM INSTALLATION WITH COMPRESSION GASKETS - SEE FIGURE 18.

Figure 18



3.1.1 Place a 1/4" continuous bead of sealant around the header gasket that separates the *GRIDCOOLER* from the outer hull. Do not use silicone sealants. We recommend polysulfide rubber sealants such as 3M Marine Sealant 101 or BoatLIFE Caulk.

3.1.2 Hoist the *GRIDCOOLER* up into the mounting position. The exterior header gasket must be in full contact with the hull.

3.1.3 Place a second continuous 1/4" bead of sealant on the inner hull around the nipple. This bead must be in contact with the hull and the nipple.

3.1.4 Place the nipple gasket (harder of the two interior gaskets) down over the nozzle as far as possible.

3.1.5 Place the unfinished cast washer down over the nipple as far as possible. The side of the washer marked "up" must face away from the hull.

3.1.6 Place the compression gasket (softer of the two interior gaskets) down over the nipple as far as possible.

3.1.7 Place the semi finished washer down over the nipple, finished side away from the hull.

3.1.8 Run the nut down over the nipple and torque to spec. (See chart)

3.1.9 Torque the nut to spec a second time after the sealant has set.

NOTE: For ease of installation and maintenance, pipe to the side of the cofferdams. (See Figure 19.)

NOTE: BoatLIFE is available from Life Industries, call (803) 566-1225 for a dealer near you. Marine Sealant 101 is available from 3M, call (612) 737-6362 for a dealer near you.

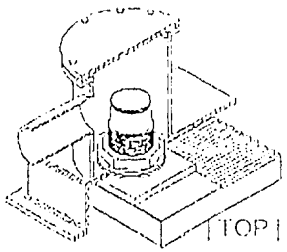


Figure 19

3.2 MOUNTING COPPER/NICKEL COOLERS ON ALUMINUM HULLS

An electrical barrier must be placed between the *GRIDCOOLER* and the hull. R. W. Fernstrum & Company does not formally approve any method of installing a copper/nickel *GRIDCOOLER* on aluminum hulled vessels. However, the following technique has been used on hundreds of boats.

3.2.1 Sandblast the area of the hull where the *GRIDCOOLER* will be installed.

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3.2.2 Coat the sandblasted area with a fiberglass epoxy resin like Boat Armor #643 (5712) which is a two part resin.

3.2.3 Spray the resin on in four separate coats. Don't use any matting. Spray each coat just heavy enough so that it does not start to run off.

3.2.4 After spraying on the fourth coat, and while the resin is still tacky, prime the entire area with the hull priming paint used on the rest of the vessel's hull.

3.2.5 Apply the final bottom paint, and then install the *GRIDCOOLER*.

[TOP]

4.1 BENDING A *GRIDCOOLER*

When bending a cooler in a press, support the cooler from underneath with wood blocking across the entire width of the *GRIDCOOLER*. Blocking is also placed on top of the cooler, centrally located between the wood blocking underneath the cooler. The location of the wood blocking on the top of the cooler will determine the location of the bend. Since this method of bending exerts pressure on only a small area, the cooler will need to be repositioned multiple times to produce an even bend over the length of the cooler. Care must be taken to ensure that the unit is not bent too far at any one point. A tape measure or other measuring instrument, along with a template of the hull profile can be used to measure your progress. (See Figures 20 and 21).

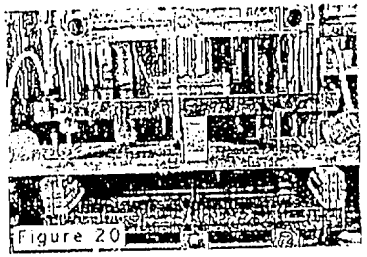
Figure 20

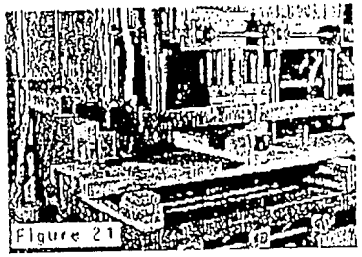
Figure 21

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4.2 TWISTING A *GRIDCOOLER*

To produce a twist, first fabricate a hook onto the end of a short length of pipe using barstock. Hook this bar across the header as close to the nipple or stud as possible. The cooler may be secured in a press or placed on sawhorses with a man at each end. By placing your weight on the end of the pipe, you can produce a twist in the cooler. (See Figures 22 and 23).

NOTE: Do Not Bend greater than 1" over 12" of cooler length.
NOTE: Do Not Twist beyond 1 degree over 12" of cooler length.

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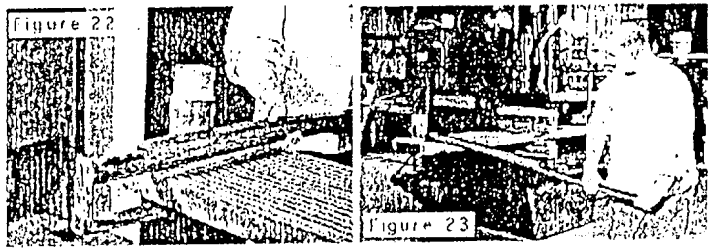

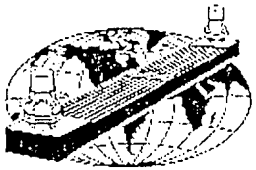

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PRODUCTS

Technical Info - Gridcooler Drag Test II

BOX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

GRIDCOOLER® DRAG TEST II

Our second test boat was a new 1987 Cruisers model 337 Esprit which we named GRID II. This test boat had an overall length of 36 feet an a beam of 11 foot 8 inches with a displacement of 12,500 pounds. This type of vessel was chosen for its greater size and displacement than GRID I.

The original propulsion was provided by two 350 Crusader raw water cooled engines producing a total of 700hp at 4400rpm.

After an adequate break-in and boat familiarization period, our speed trials began on October 20, 1986 with the original raw water cooling and factory painted hull. The tests were conducted over the same measured mile as GRID I's, and were made at the same four RPM settings (2500, 3000, 3500, and 4000). Every attempt was made to standardize the environments in which the tests were made so that the comparison of test results would be meaningful. We found the craft without *GRIDCOOLERS* capable of sustaining 31.61 knots @ 4000 RPM and 13.02 knots @ 2500 RPM.

In the spring of 1987, the raw water cooled engines were converted to a closed fresh water cooling for the engine jacket water system. This was accomplished by adding a *GRIDCOOLER*, expansion tank, and manifold baffles (separators). The raw water pump was retained to cool the exhaust elbow and muffler. Initially we wanted dry exhaust, however, this would have been complicated to install in the existing engine compartment.

Speed trials during 1988 were with *GRIDCOOLERS* mounted on the hull with fairing blocks fore and aft of the *GRIDCOOLERS*. The *GRIDCOOLERS* were mounted directly forward of the propellers. We would have preferred to mount them farther out on the sides of the boat, but the fuel tanks blocked that kind of installation. The *GRIDCOOLERS* also could not be recessed on this boat due to the lack of space for a recess in the pre-configured engine room. To recess the *GRIDCOOLERS* in the proper location, the recesses would have to be formed when the fiberglass hull was laid up.

The mounting of the *GRIDCOOLERS* aided the speed of the boat at lower RPM settings by directing the flow of water towards the propellers. Unfortunately, this location also starved the propellers for water at higher RPM settings. This lowered the speed more than would be expected with *GRIDCOOLER*S mounted away from the propellers.

Over the testing period the following effects to hull speed were noted.

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RPM	HULL SPEED MPH	GRIDCOOLER W/FAIRING BLOCKS MPH
2500	13.02	13.51
SPEED CHANGE		+0.49
PERCENT CHANGE		+3.61%
3000	19.49	19.28
SPEED CHANGE		-0.21
PERCENT CHANGE		-1.08%
3500	26.77	25.43
SPEED CHANGE		-1.34
PERCENT CHANGE		-4.99%
4000	31.61	30.19
SPEED CHANGE		-1.42
PERCENT CHANGE		-4.52%

All speeds listed have been averaged over several runs on a measured mile. All speeds are in miles per hour.

Since we couldn't recess the ***GRIDCOOLERS***, and because we wanted an independent appraisal, we also had drag tests run by the Vienna Model Test Basin. The test results we received from them are available upon request. The next boat we test, GRID III, will be a 40+ foot vessel with diesel engines and a dry exhaust system. The design of the vessel will have to be more closely monitored than GRID II, due to the incompatibilities encountered when we considered recessing ***GRIDCOOLERS***. GRID III will allow us to recess ***GRIDCOOLERS*** and place them closer to the sides of the boat, away from the propellers. It will also allow us to test a boat with a dry exhaust system.

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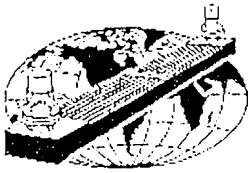

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PRODUCTS

Technical Info - Gridcooler In Pump Station Application

BOX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DREG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

TYPICAL INSTALLATIONS OF THE GRIDCOOLER® IN PUMP STATION APPLICATIONS

In pump station applications, the Fernstrum *GRIDCOOLER* gives you the choice of being able to mount the units in one of several locations. They can be mounted in the sump or inside of the flow chamber itself. (See following diagrams.) A variety of different connections can be used to meet your needs (i.e. flanges, hose connectors or tapered pipe thread). Such flexibility often allows for simplified piping schemes to and from the *GRIDCOOLER*.

There are numerous advantages in choosing the Fernstrum *GRIDCOOLER* system over other methods of engine cooling. These include:

Ease of installation - Just use the nuts, washers, and gaskets supplied with the cooler to attach it securely to your mounting brackets. If our standard units present an installation problem, we can design a special unit to accommodate your application. There are many installation savings effected with the use of the Fernstrum *GRIDCOOLER*. For example, the tube and bundle or plate type heat exchanger, auxiliary pump, strainers, and centrifuge are eliminated.

Compact design - The highly efficient rectangular tube makes the unit very compact. This allows the unit to be mounted within the flow chamber without restricting the water flow to the pump. The *GRIDCOOLER* can also be easily recessed into the wall of the flow chamber.

Lower maintenance cost - Once installed, the GRIDCOOLER eliminates the problems of plugged strainers and the need to disassemble the heat exchanger assembly for cleaning. The design of the *GRIDCOOLER* is such that it is unlikely for debris to become attached to the unit. It is always free of foreign matter as the motion of the raw water keeps it flushed clean, thereby giving continuous service without interruption.

Closed circuit cooling system - The closed circuit allows for the use of a glycol solution and eliminates the need to drain the system in cold weather. There is no need to worry about priming the system before starting the pump engine.

Increased engine life - Fernstrum *GRIDCOOLERS* are designed to meet the engine manufacturer's exact cooling requirements. This enables the engine to operate at the optimum temperatures, increasing engine life. All of these factors make the Fernstrum GRIDCOOLER a very cost effective method of pump engine cooling.

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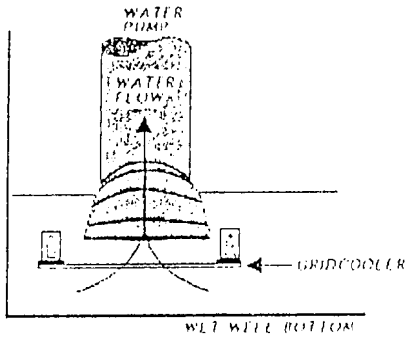

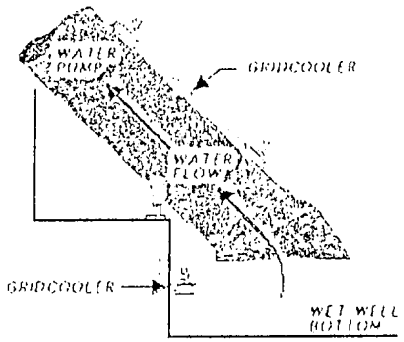

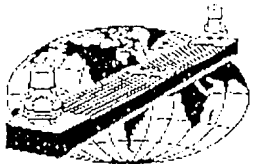

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PRODUCTS

Technical Info - Cleaning Gridcoolers

POX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

CLEANING GRIDCOOLERS®

A *GRIDCOOLER* that is clean inside and out will dissipate heat most efficiently. To keep your unit clean, a periodic check of the cooling system is recommended. What follows are some ways to clean your *GRIDCOOLER*.

EXTERIOR

If your *GRIDCOOLER* is used regularly, the 90/10 copper/nickel alloy in conjunction with the unit's operating temperature will tend to keep the exterior of the unit relatively free of marine growth. However, if the *GRIDCOOLER* is not in operation for extended periods of time, marine growth may result. Below are some ways of removing marine growth, paint, etc. from the exterior of your *GRIDCOOLER*:

1. Scrape:

   Scraping is an effective way of removing larger matter from a *GRIDCOOLER*. The use of a rectangular instrument works best.

2. High Pressure Water Blast:

   This cleaning method is effective in cleaning many things off of a *GRIDCOOLER* (paint is a notable exception)

3. Sandblast:

   Sandblasting a *GRIDCOOLER* is also very effective, but very fine sand such as 40 to 60 grit blasting media at a maximum blast pressure of 90 psi (6.21 BAR) should be used.

NOTE: Never sandblast an ALUMINUM *GRIDCOOLER*.

INTERIOR

The interior of your *GRIDCOOLER* may need periodic cleaning to remove oil, old glycol, mineral deposits, etc. The easiest and most convenient way of doing this is the use of a radiator flush. Contact your engine dealer for the proper radiator flush type for your engine.

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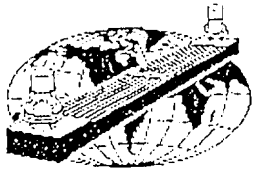

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PRODUCTS

Technical Info - Gridcooler Overheating

BOX COOLER INFO | GRIDCOOLER INSTALLATION INFO
GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

GRIDCOOLER® OVERHEATING

Determining the cause of overheating can be difficult. Here are some things to look for:

1. Wire Reinforced Rubber Hose:

   Could the rubber hose part of the piping between the engine and the *GRIDCOOLER* be collapsed? This could cut the cooling water supply to the *GRIDCOOLER* and reduce its efficiency. Be sure you are using wire reinforced rubber hose.

2. Piping:

   Is the piping between the engine and the *GRIDCOOLER* as large or larger than the engine and *GRIDCOOLER* connections? (See section 2.7.4 under plumbing.) The piping should also be self-venting and arranged so that a minimum number of elbows are used.

3. Jacket Water:

   Is the jacket water circulating through the *GRIDCOOLER*? It may be taking a path of least resistance through the bypass (if one exists).

4. Thermostat:

   Could the thermostat be stuck or could the wrong thermostat be in use? If so, it could give you a faulty temperature.

5. Jacket Water Pump:

   Is the jacket water pump working properly? If not, it could reduce the cooling systems efficiency.

6. Air in the System:

   Was the *GRIDCOOLER* installed in a way to allow all the air in the system to escape? When a U-Flow (two-pass)

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GRIDCOOLER is mounted on the rake of the vessel, make sure that the nozzles are mounted in the up or high position. See sections 2.3.6 - 2.7.6 - 2.7.7 - 2.8.3 under Installation. See Figure 7 of installation.

7. Foreign Matter:

Could anything have gotten into the cooler nozzles? Make sure that the orange plastic cap plugs covering the ends of the hose connectors were removed and that no foreign matter, such as a rag, was dropped into the cooler nozzles.

8. Expansion Tank:

Could the water level be too low in the expansion tank? This can reduce the cooling system's efficiency.

9. Coated *GRIDCOOLER*:

Is the *GRIDCOOLER* painted or covered with any other coating? This would have an insulating effect and will greatly reduce the heat transfer rate of the unit.

10. Water Aeration:

Could the water around the *GRIDCOOLER* be aerated in any way? Aeration will reduce the heat transfer rate of the *GRIDCOOLER*.

11. Moored at Dock:

Is the engine temperature rising while the vessel is moored in dock? If the *GRIDCOOLER* is installed near the propeller, engage the propeller to circulate water past the *GRIDCOOLER*, after taking the proper safety precautions.

12. *GRIDCOOLER* Placement:

Is an aftercooler circuit overheating? Make sure that the *GRIDCOOLER* cooling this circuit is mounted forward of or closer to the skeg or keel than the jacket water coolers.

13. Mounting Gaskets:

Were the mounting gaskets put in place when the *GRIDCOOLER* was installed? The mounting gaskets supplied with the *GRIDCOOLER* must be used to provide adequate spacing between the *GRIDCOOLER* and the ship's hull. This will allow water to flow freely over the cooler tubes.

14. Glycol:

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How much glycol (antifreeze) is in the system? Perhaps the *GRIDCOOLER* was not sized for the use of glycol in the system.

NOTE: Always premix glycol with water before adding it to the cooling system.

15. Crushed Tubes:

Have the rectangular tubes on the *GRIDCOOLER* been crushed or pinched? This could restrict the internal water flow

16. Blown Tubes:

Could the rectangular tubes on the *GRIDCOOLER* have been blown or bulged by unusually high pressures? If so, the exterior water flow past the *GRIDCOOLER* tubes could be impaired, retarding heat transfer. NOTE: Maximum *GRIDCOOLER* test pressure is 35 PSI (2.41 BAR).

17. Marine Growth:

Has your vessel been in dock for several months? You may find marine growth on the *GRIDCOOLER* which will hinder the unit's heat transfer rate. See Cleaning.

18. Oil Deposits:

Have you had engine problems? Oil may have gotten into the cooling water system and collected in the *GRIDCOOLER*, coating it with an oil film. See Cleaning.

19. Mineral Deposits:

Could you be using hard water in the system? Mineral Deposits will collect on the tube in the *GRIDCOOLER*, lining the inside with lime, calcium, etc. See Cleaning.

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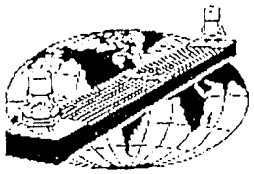

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PRODUCTS

Technical Info - Damaged Gridcooler

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GRIDCOOLER DRAG TEST II | GRIDCOOLER IN PUMP STATION APPLICATIONS
CLEANING GRIDCOOLERS | GRIDCOOLER OVERHEATING | DAMAGED GRIDCOOLER | PRODUCTS MAIN PAGE

DAMAGED GRIDCOOLER®

For a *GRIDCOOLER* in warranty, attempt no repairs without first contacting the manufacturer, otherwise your warranty will be void. For a *GRIDCOOLER* out of warranty, if the unit is accidentally damaged while in use, you can make minor shipyard repairs as follows:

1. Straightening:

   If the tubes are accidentally bent, they can be straightened with a hard wood block and a mallet. See Figure 24.

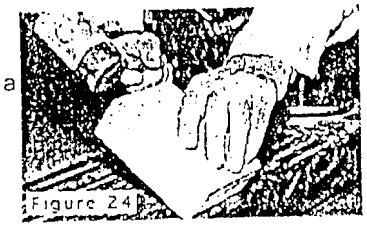
Figure 24

COPPER/NICKEL *GRIDCOOLER* REPAIRS

2. Brazing:

   Drain the *GRIDCOOLER* before brazing. Clean the area or joint to be brazed thoroughly with a good degreasing solvent followed by wire brushing and or sandblasting. (See section 3 under Cleaning.) The silver alloy used in the *GRIDCOOLER* is "Handy & Harman," 3/32 in. (2.24 mm) diameter Braze 560 wire. Use "Handy & Harman" Flux, the low temperature brazing type. See Figure 25.

NOTE: Braze 560 wire and Flux are available from Lucas Milhaupt, call (414) 769-6000 for a dealer near you.

Figure 25

ALUMINUM *GRIDCOOLER* REPAIRS

3. Tig Weld:

   Drain the *GRIDCOOLER* before welding. Clean the area or joint to be welded thoroughly with a good degreasing solvent followed by stainless steel wire brushing. The aluminum filler rod used in the *GRIDCOOLER* is R 5554 series aluminum, 3/32 in. (2.24 mm) diameter wire.

TEMPORARY REPAIRS

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For temporary repairs, liberally apply an epoxy compound similar to Devcon UW for under water and Red Hand for above water repairs.

Before applying the epoxy compound, clean the surface of the *GRIDCOOLER* and relieve any internal pressure. Devcon UW is available from the Devcon Corporation, call (508) 777-1100 for a dealer near you. Red Hand is available from the International Paint Company, call (504) 943-8871 for a dealer near you.

For major repairs not covered by our Limited Warranty, contact us by Phone (906) 863-5553 or Fax (906) 863- 5634. Give us a complete description of the damage, and we'll tell you if and how your unit can be repaired.

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PRODUCTS

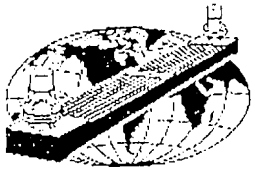
Limited Warranty

The R. W. Fernstrum & Company, manufacturer, carefully tests and inspects each *GRIDCOOLER®* keel cooler before it leaves the point of manufacture. The manufacturer makes no representations or warranties, express or implied, statutory or otherwise, except those herein expressly contained and shall not be held liable on any account except for repair or replacement under the terms following.

The manufacturer will, as to each *GRIDCOOLER* unit registered with it by the purchaser, repair or replace free of charge, such *GRIDCOOLER* unit as is found upon manufacturer's inspection to be defective because of material or workmanship providing the same had been returned to the manufacturer's factory, or a more convenient point as designated by the manufacturer, transportation prepaid, and received by the manufacturer within ninety (90) days from the date of delivery, with respect to the aluminum *GRIDCOOLER* units, and within two (2) years with respect to the copper/nickel *GRIDCOOLER* units. The manufacturers obligation hereunder shall be limited to such time period and to the direct cost of replacement and shall not include labor, transportation, haul-out, launch, towing or storage charges, mechanic travel time, inconvenience, loss of time or income, removal and replacement and/or modification of any boat parts to facilitate repairs or other such expenses incurred by purchaser.

This limited warranty shall not be effective with respect to *GRIDCOOLER* units to which repairs or alterations have been made unless authorized or performed by the manufacturer, not to defects arising because of improper installation, misuse, accident or other causes beyond the control of the manufacturer.

Should any disputes arise with regard to their respective rights, duties and responsibilities under the Limited Warranty, all such disputes shall be governed by the laws of the State of Michigan to the extent that the same do not conflict with the laws of the United States and any litigation growing out of any such dispute shall be commenced in Circuit Court for Menominee County, in the State of Michigan, U.S.A.



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PRODUCTS

Brochures

The following is a list of PDF files about Fernstrum *GRIDCOOLER®* products that you can download. These products are also found for your convenience in HTML format in the technical info and product info menus. In order to view these PDF files you will need to install a free version of Adobe Acrobat Reader. After you download and install Acrobat Reader, click on the links below to view or download our PDF files.

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1000.pdf	Introductory Product Information	4,344 kb
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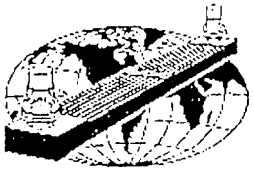
boxcooler.pdf	Box Cooler Information	394 kb
ferry.pdf	Ferryboat Application	257 kb
pumpstation.pdf	Pumping Station Application	1,373 kb



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Alaska Fisherman's
NEWSPAPER

ferry operators know...
the Navy knows...
the owners of
TEMPEST know...
it's time you knew...

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ENGINEERED
KEEL COOLING

"The FERNSTRUM GRIDCOOLER® is the simplest and most dependable form of fresh water cooling available."

Ask any of our thousands of customers; they'll say the same thing. You can't find a better fresh water cooling system anywhere. Call us... we'll let you know which of our over 8000 different Gridcoolers is right for you.

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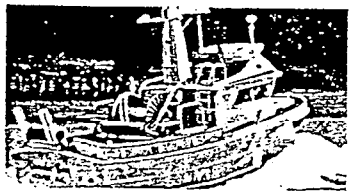
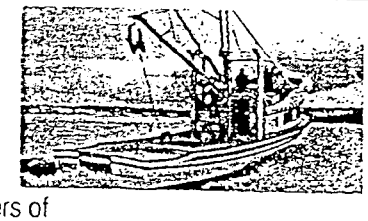
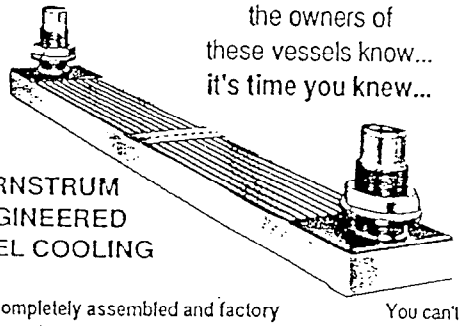
Pacific Fishing MAGAZINE #5-91





the owners of
these vessels know...
it's time you knew...



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Call us... we'll let you know which of our over 8000 different Gridcoolers is right for you.

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ENGINEERED
KEEL COOLING

- Completely assembled and factory tested to assure reliability
- Silver brazed and welded joints form a rugged keel cooler
- Heavy guage 90/10 copper-nickel or 5000 series aluminum rectangular tube
- Custom designed to meet owner's operating conditions and the engine manufacturer's exact requirements
- The most compact form of keel cooling

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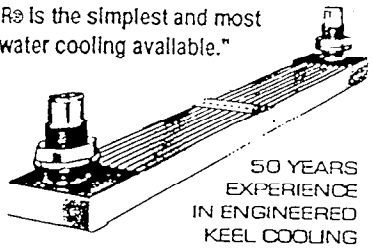

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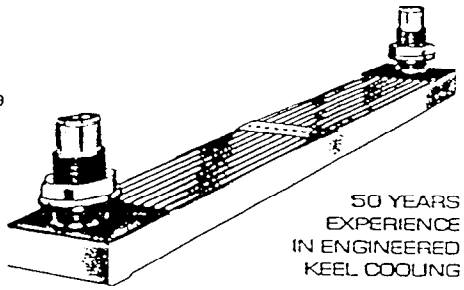

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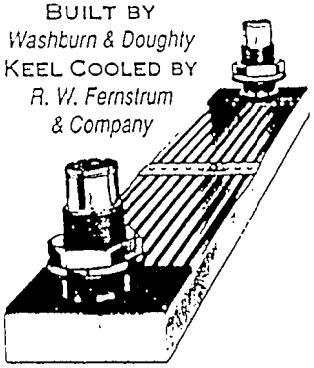

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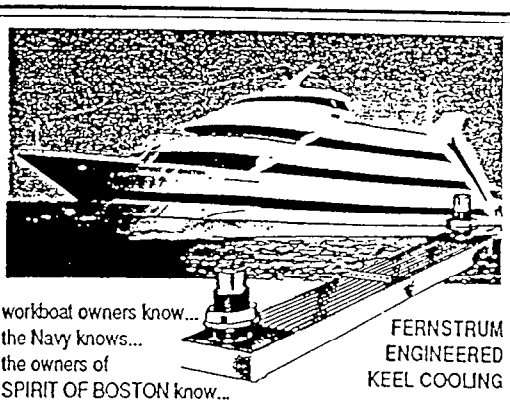

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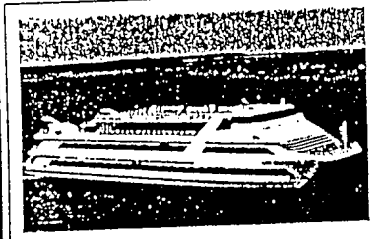

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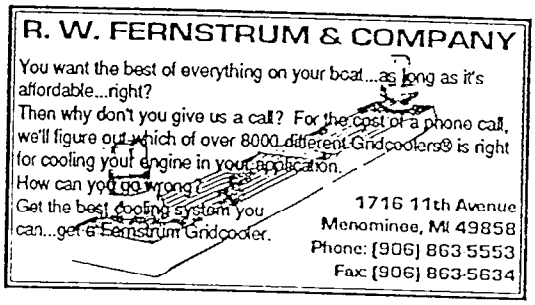

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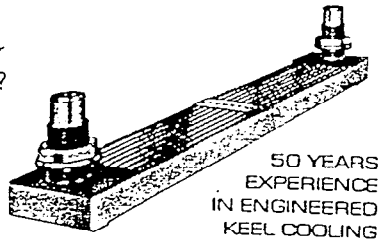

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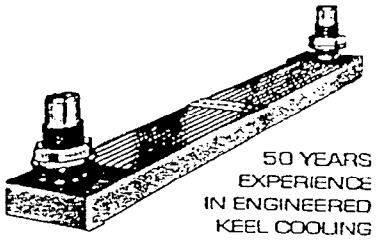

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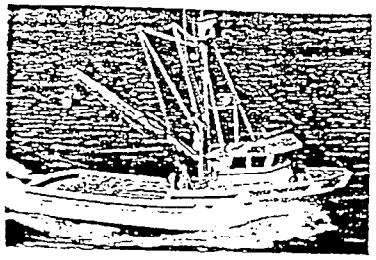

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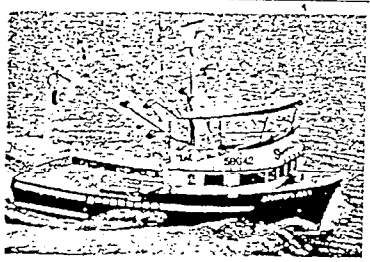
Designed by LeClercq Marine
Keel Cooled by R. W. Fernstrum & Company



Sharon Ann...
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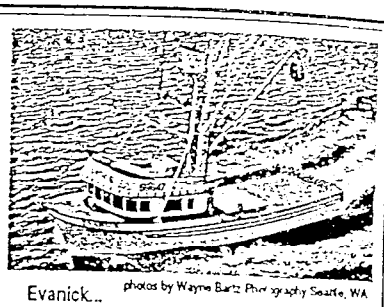
Designed by Beck
Keel Cooled by R. W. Fernstrum & Company



photos by Wayne Bartz Photography Seattle, WA

Evanick...
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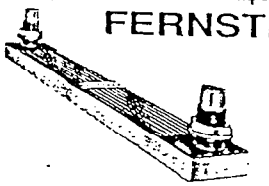

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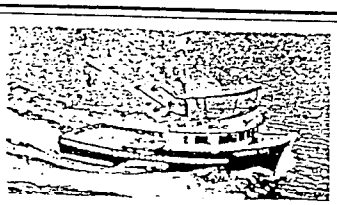

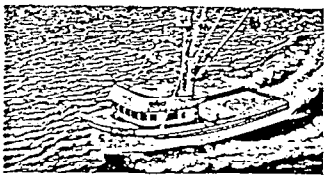

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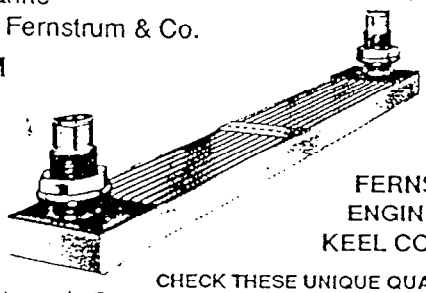

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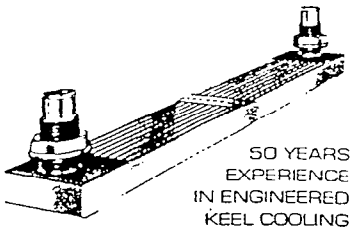

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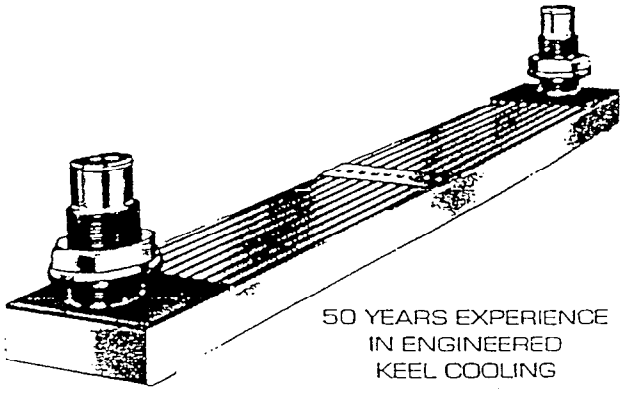

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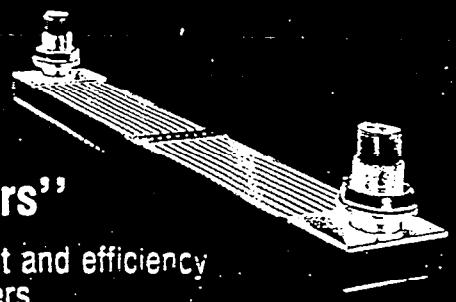

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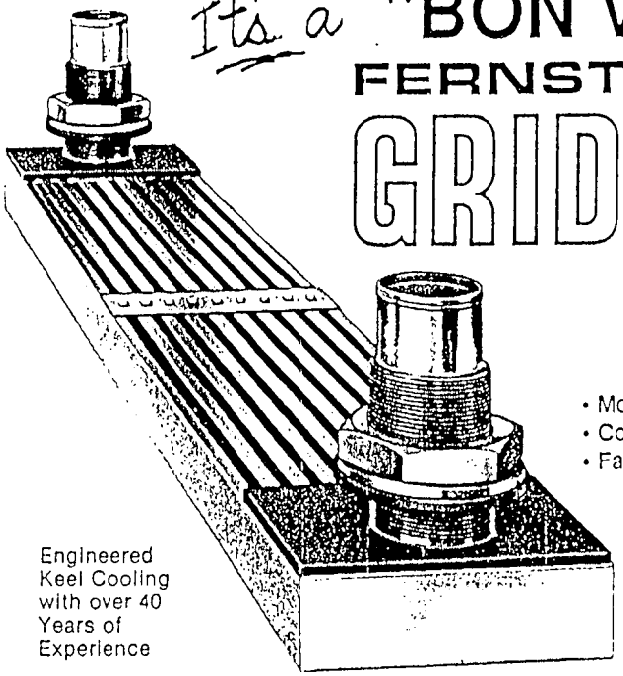

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Aug. 14, 1945. R. W. FERNSTRUM 2,382,218

OUTBOARD MARINE HEAT EXCHANGER

Filed Sept. 18, 1943 2 Sheets-Sheet 1

FIG. 1.

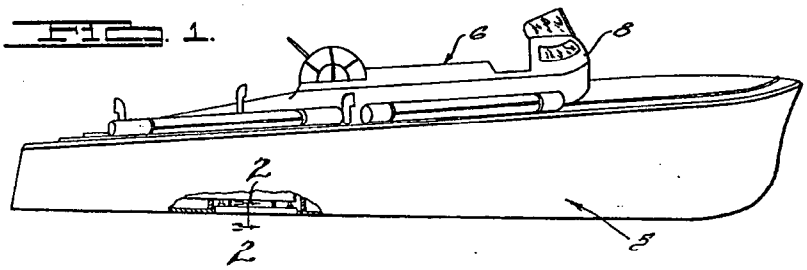
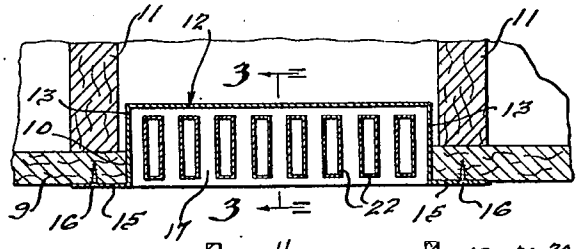


FIG. 2.



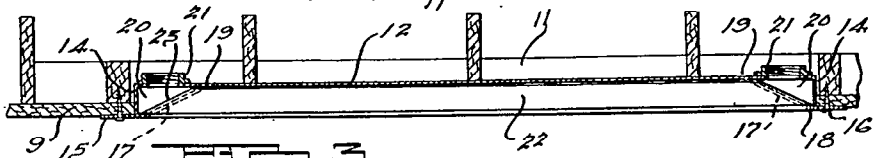


FIG. 3.

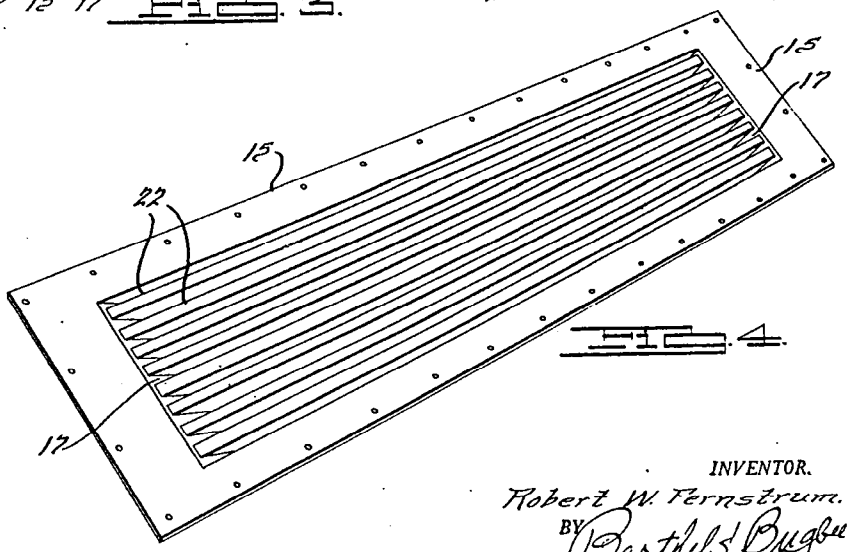


FIG. 4.

INVENTOR.
Robert W. Fernstrum.
BY Barthel & Bugbee
ATTORNEYS.

Δ π EXHIBIT 6
Deponent Brabey
Date 4-22-04 Rptr. LK
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OUTBOARD MARINE HEAT EXCHANGER

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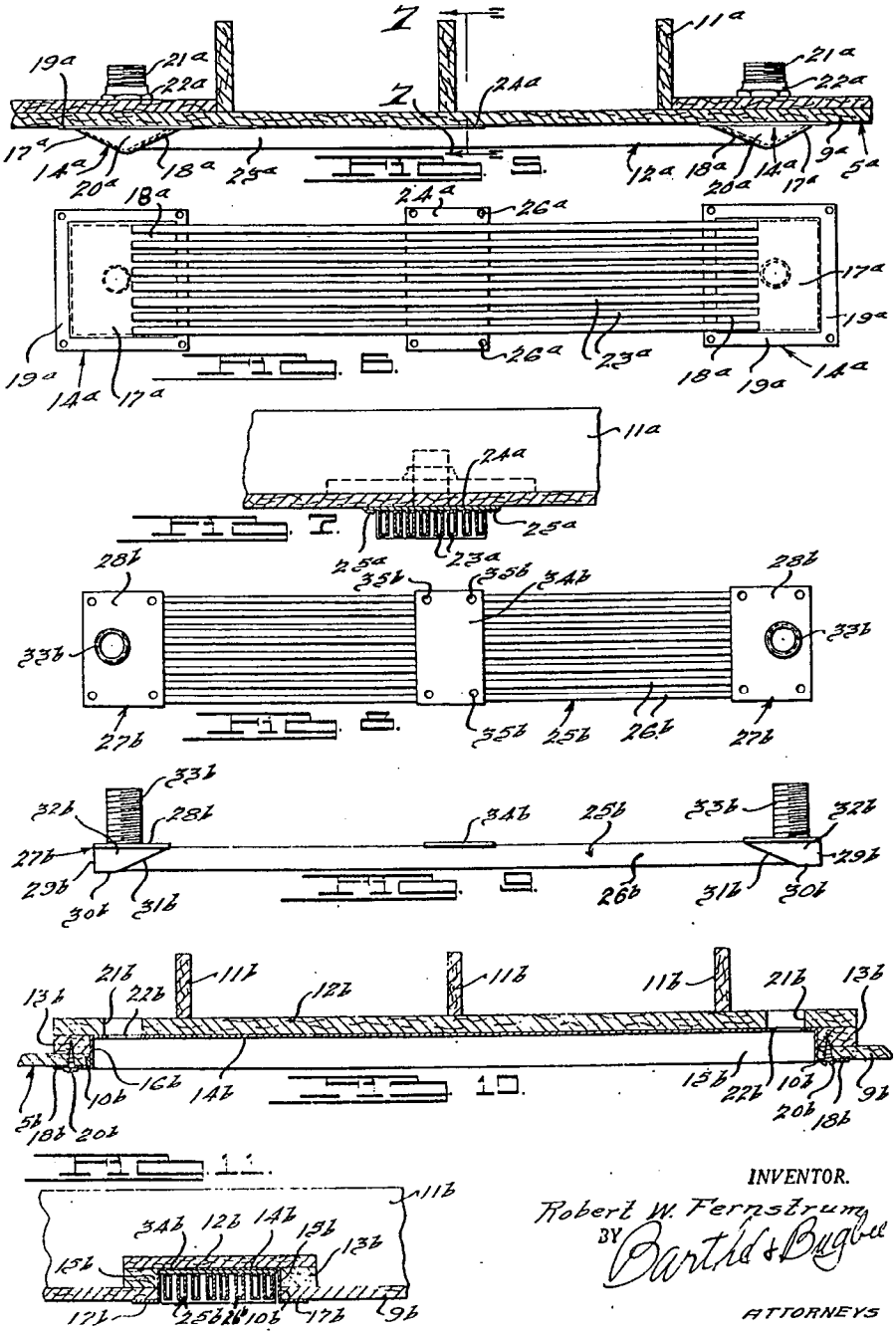


INVENTOR.

Robert W. Fernstrum

BY Barth & Bugbee

ATTORNEYS

Patented Aug. 14, 1945 2,382,218

UNITED STATES PATENT OFFICE

2,382,218

OUTBOARD MARINE HEAT EXCHANGER

Robert W. Fernstrum, Detroit, Mich.

Application September 18, 1943, Serial No. 502,859

14 Claims. (Cl. 115—0.5)

The present invention relates to improvements in heat exchanges, and more particularly, to a heat exchanger for water craft and vessels.

The primary object of the invention is to facilitate circulatory movement of the engine cooling fluid in a closed system to exclude foreign matter from the cooling system of the vessel's power plant or prime mover and to exclude corrosive forming chemicals which would otherwise be pumped through the water cooling jacket of the engine.

Another object of the invention is to provide an outboard heat exchanger for connection with the water jacket of an engine cooling system including a series of tubes, rectangular in cross-section and extending longitudinally of the keel of the vessel to give a greatly increased thermal capacity so as to maintain the coolant in the water jacket at a substantially constant temperature.

Another object of the invention is to provide an outboard heat exchanger adapted to be located in a recess in the key of a hull so as to be removed from the path of obstruction and so as to present little or no resistance to the water path during its motion through the water.

Another object of the invention is to provide an outboard type heat exchanger for water craft and other vessels including a pair of headers mounted in spaced relation along the keel of the boat or vessel with relatively flat heat conduction tubes extending therebetween with their sides of greatest width extending in a vertical plane so as to greatly increase the heat conduction surface and the general efficiency of the heat exchanger.

Another object of the invention is to provide the headers with slightly bevelled surfaces to prevent the water in which the vessel is travelling from becoming pocketed in the space between the longitudinally extending tubes so as to insure proper heat conduction and the resultant continuous cooling of the liquid in the closed circulatory system.

Another object of the invention is to provide an outboard heat exchanger for water craft in which the heat exchanger is received in a longitudinally extending recess in the keel of the boat, and said recess is sealed by means of a sheathing of relatively thin metal to prevent water from finding its way between the joints of the heat exchanger and into the boat.

Another object of the invention is to provide an intermediate support for the longitudinal heat conduction tubes to prevent sagging thereof and distortion when contacting floating objects in the water.

Other objects and advantages of the invention will become apparent during the course of the following description forming a part of the specification, wherein:

Figure 1 is a side elevational view of a small water craft or motor boat illustrating a portion broken away to show the manner in which the heat exchanger is installed;

Figure 2 is a vertical cross sectional view taken on line 2—2 of Figure 1 looking in the direction of the arrows illustrating the structural details of the heat exchanger and the manner of mounting the same;

Figure 3 is a longitudinal cross-sectional view taken on line 3—3 in Figure 2 looking in the direction of the arrows further illustrating the details of construction and the manner of mounting the heat exchanger in a recess formed in the keel of the boat;

Figure 4 is a perspective view of the heat exchanger showing the underside thereof and the longitudinal heat conduction tubes connecting the headers at each end of the frame;

Figure 5 is a longitudinal cross sectional view of a small boat keel illustrating a modified form of the invention in side elevation and showing the same extending longitudinally of the keel;

Figure 6 is a bottom plan view of the modified form of the invention further illustrating the headers at each end of the heat exchanger and the central supporting strut therefor;

Figure 7 is a vertical cross sectional view taken on line 7—7 in Figure 5 looking in the direction of the arrows and illustrating the manner in which the heat exchanger tubes project slightly below the bottom of the boat in the modification;

Figure 8 is a plan view of a still further modified form of the invention showing the arrangement of the longitudinal tubes and illustrating the manner in which they are connected to the headers at each end of the heat exchanger;

Figure 9 is a side elevational view of the modified form of the invention shown in Figure 8 further illustrating the structural details and the general arrangement;

Figure 10 is a longitudinal cross sectional view of a boat hull taken along the keel line illustrating the packing sheathing received in the recess prior to the installation of the heat exchanger shown in Figures 8 and 9; and

Figure 11 is a vertical cross sectional view extending transversely of the keel line, illustrating

the manner in which the heat exchanger is received in the recess shown in Figure 10.

In the drawings, attention is directed to Figures 1 to 4 inclusive wherein there is shown a preferred embodiment, and in Figure 1 the reference character 5 will generally be employed to designate the hull of a small boat or water craft having a power plant such as an internal combustion engine. The boat 5 is provided with a super-structure 6 having a windshield 8 and the hull 5 is provided with a bottom wall 9 which is relatively flat for a portion of its length and tapers to the bow of the boat in a V-shaped formation.

Formed in the bottom of the hull 9 is a cutaway portion 10 and said cutaway portion is of elongated rectangular shape and extends longitudinally along the keel line of the hull. The elongated opening 10 may be formed between certain pairs of longitudinally extending hull members 11 as is clearly shown in Figure 2.

Mounted within the recess 10 is a box-like casing 12 having side and end walls 13 and 14, and said end walls are provided with a marginal flange 15 held in place by screws or the like as at 16, extending into the hull 9. Each end of the elongated casing is provided with a diagonal wall 17 extending transversely of the casing with its end welded or otherwise secured to the side walls 13. The edges of the diagonal walls 17 are welded or otherwise secured to the end walls 14 and the bottom wall of the casing as at 18 and 19 respectively, thus forming header chambers 20 for the free circulation of liquid. Each header has formed integral therewith or secured thereto a threaded nipple 21 for receiving the circulatory water pipe connected to the engine cooling system, not shown.

Interconnecting the header chambers 20 is a series of conduction tubes 22 having their ends bevelled as at 23 to coincide with the oblique wall 17 and said bevelled ends are welded in place to the oblique wall 17 so that water may circulate therethrough from one end to the other. Openings may be formed in the oblique walls 17 to establish communication between the tubes 22 and the header chambers 20 and said openings are spaced one from the other so that the conduction tubes 22 will be spaced a corresponding distance.

The conduction tubes 22 are preferably formed rectangular in cross-section, as is clearly illustrated in Figure 2 to increase the surface presented to the slipstream of the hull, resulting in a greater efficiency and increased heat conduction. Suitable piping may connect the threaded nipples 21 to the circulatory system of the boat engine and water-cooling jacket thereof.

In the modified form of the invention shown in Figures 5 to 7 inclusive, the boat hull is generally designated by the reference character 5a and likewise includes structural frame members including transverse ribs 11a. As in Figures 1 to 5 inclusive, the heat exchanger generally designated by the reference character 12a extends longitudinally of the hull 5a and is bolted to the bottom wall thereof 9a.

The heat exchanger comprises a pair of header members 14a having angular front and rear walls 17a and 18a conected to a header plate 19a. The diagonal walls 17a and 18a are connected at their ends by triangular-shaped end walls 20a thereby providing a closed header chamber within said diagonal walls. Threaded nipples 21a extend through suitable openings in the hull 5a and said threaded nipples are provided with gland nuts 22a to securely hold the headers in place. A series of longitudinally extending conduction tubes 23a have their ends bevelled similar to the ends 23 of the heat conduction tubes 22 shown in Figures 1 to 4 inclusive and said bevelled ends are welded about suitable openings formed in the oblique plates 18a. The tubes 23a are preferably rectangular in cross-section and have their interiors in communication with the header chambers of the headers 14a. The intermediate portions of said conduction tubes 23a may have welded thereto a plate 24a extending transversely thereof so that screws or the like as at 25a may be passed through openings 26a in the end portions of the anchoring plate 24a. The plate 24a is intended to prevent sagging of the conduction tubes 23a and to prevent vibration thereof when the boat is being propelled through the water.

The screw-threaded nipples 21a are adapted to be connected to the water cooling system or engine water jacket of the power plant so that circulatory movement of water or cooling medium through the conduction tubes will cool said water for being returned to the engine water cooling jacket.

In the further modified form of the invention shown in Figures 8 to 11 inclusive, the bottom wall 9b of the hull 5b (Figure 10) is built up to form a longitudinally extending recess adjacent the opening or cutaway portion 10b. The frame structure of the hull including the ribs 11b, is cut away so as to receive a longitudinal frame member 12b spaced from the hull 9b by suitable frame members 13b. The recess thus formed by the frame structures 12b and 13b is provided with a liner 14b of box-like form having side walls 15b connected by end walls 16b. The side and end walls 15b and 16b are provided with marginal flanges 17b and 18b respectively so that a series of wood screws 20b may be passed therethrough to securely hold the liner in place. The frame structure 12b is provided with a bore 21b at each end thereof and said bores are in alignment with openings 22b formed in the liner 14b.

The heat exchanger is generally designated by the reference character 25b and is constructed similar to the heat exchangers shown in Figures 1 to 7 inclusive in that it includes a series of longitudinally extending conduction tubes 26b the ends of which are connected to headers generally designated by the reference character 27b. The headers 27b include a top wall 28b having end walls 29b and relatively short bottom walls 30b. Interconnecting the top wall 28b and relatively short bottom wall 30b is an oblique wall 31b having a series of spaced openings for the reception of the bevelled ends of the heat conduction tubes 26b. Said bevelled ends may be welded or otherwise secured in place and are shaped similar to the ends 23 of the heat conduction tubes 22. End walls 32b complete the structure and form an enclosed header chamber in communication with each end of the conduction tubes 26b. Secured to the top walls 28b of the headers 27b is a threaded nipple 33b and said threaded nipples are adapted to extend through the openings 21b and 22b in the frame structure 12b and sheathing liner 14b respectively. Gland packing nuts may be threaded on the nipples 33b above the frame structure 12b to securely clamp the headers 27b in position and suitable pipes may be connected with the threaded nipples 33b for communication

with the cooling system of the engine or power plant.

The intermediate portions of the heat conduction tubes 26b may be provided with an anchor plate 34b having openings at the corner portions thereof as at 35b to facilitate anchoring the tubes against vibration when the heat exchanger is in the position shown in Fig. 11. In this position, the heat conduction tubes 26b are partially concealed so that the lower walls thereof are flush with the bottom wall 9b of the hull 5b. Obviously, the heat conduction tubes will be out of the path of floating obstructions and will be completely protected from striking floating objects and other debris.

While the invention is particularly applicable to small water craft, such as motor boats, it is to be understood that the same may be applied to larger vessels for cooling circulatory liquid or fluid for various purposes.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred embodiments of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim is:

1. In combination with a marine hull structure having a keel line, a heat exchanger extending longitudinally of said keel line, said heat exchanger comprising spaced headers secured to the hull and a plurality of flat heat conduction tubes rectangular in cross-section connecting and in communication with said headers said conduction tubes being located within the confines of said spaced headers.

2. In combination with a marine hull structure having a keel line, a heat exchanger extending longitudinally of said keel line, said heat exchanger comprising spaced headers secured to the hull in longitudinal alignment with the keel line, a threaded pipe connection on each of said headers for connection with a liquid circulatory system, and a series of flat heat conduction tubes extending between said headers and in communication therewith along said keel line, said tubes being located within the confines of the headers out of the path of obstructions.

3. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein and arranged in longitudinal alignment with said hull keel line, a plurality of heat conduction tubes connecting said headers and in fluid communication with said chambers, said heat conduction tubes being arranged and confined in the space between said headers, and means for fastening said heat exchanger in said recess.

4. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein and arranged in longitudinal alignment with the keel line of said hull, a series of relatively flat heat conduction tubes connecting said headers in fluid communication with said chambers, threaded pipe couplings on each header extending through opening in said hull, and means for securing said heat exchanger in said recess, said heat conduction tubes being arranged so as to lie within the confines of the headers so as to be removed from the path of obstructions.

5. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein, a plurality of heat conduction tubes connecting said headers and in fluid communication therewith, and means for fastening said heat exchanger in said recess, said conduction tubes being rectangular in cross-section with their side walls extending in a plane perpendicular to the bottom of said hull structure and being positioned between said headers to be removed from the path of obstructions.

6. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein and arranged at each end of said recess, a plurality of flat heat conduction tubes rectangular in cross section connecting said headers and in fluid communication therewith, said heat conduction tubes being arranged between said headers in said recess to be removed from the path of obstructions, and means for fastening said heat exchanger in said recess, said headers each having a wall inclined oppositely to that of the other to create a flow action around and between said heat conduction tubes when the marine hull is propelled through the water.

7. In combination with a marine hull structure having a keel line and a recess extending longitudnally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein arranged at each end of said recess, a series of relatively flat heat conduction tubes rectangular in cross section connecting said headers in fluid communication with said chambers, threaded pipe couplings on each header extending through openings in said hull, and threaded gland nuts on said pipe couplings to clamp said heat exchanger in said recess, said heat conduction tubes being arranged in said recesses and within the confines of said headers to be removed from the path of obstructions.

8. In combination with a marine hull structure having a keel line and a recess extending longitudinally thereof, a heat exchanger mounted in said recess comprising spaced headers having chambers therein located at each end of said recess, a plurality of flat heat conduction tubes connecting said headers and in fluid communication therewith, and means for fastening said heat exchanger in said recess, said heat exchanger being provided with a marginal flange portion for attachment to said hull structure and said flat conduction tubes being arranged within the confines of said recess to be removed from the path of obstructions.

9. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members in longitudinal alignment with the keel of said hull having chambers therein at each end of said recess, flat heat conduction tubes connecting and in fluid communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat conduction tubes being rectangular in cross section and arranged within the confines of said recess.

10. In combination with a marine hull struc-

ture having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat conduction tubes being substantially flat and rectangular in cross-section.

11. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat conduction tubes being substantially flat and rectangular in cross-section and being spaced a distance equal to their thickness.

12. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchange, each of said headers having a threaded coupling member adapted to extend through an opening in said hull to anchor said heat-exchanger within said recess.

13. In combination with a marine hull structure having a recess formed longitudinally of its keel line, a heat exchanger mounted in said recess substantially flush with the bottom of said hull, said heat exchanger comprising spaced header members having chambers therein at each end of said recess, heat conduction tubes connecting and in communication with said header chambers, and a sealing sheathing member located in said recess between the hull and said heat exchanger, said heat exchanger having a marginal flange adapted to overlie the edge of said recess for securing said heat exchanger in position.

14. In a marine craft, a heat exchanger comprising header members spaced along the keel line of said marine craft, relatively flat heat conduction tubes connecting said headers, threaded coupling nipples on each header for connection with a fluid circulatory system of said marine craft, and inclined front and back walls on said headers extending forwardly and rearwardly so that the slip stream of said marine craft will be uninterrupted, said heat conduction tubes being rectangular in cross-section with their sides of greatest width extending perpendicular to the bottom of said marine craft and arranged within the confines of said headers so as to be removed from the path of obstructions.

ROBERT W. FERNSTRUM.

United States Patent [19]

Fernstrum

[11] **4,338,993**

[45] **Jul. 13, 1982**

[54] **UNDERWATER OUTBOARD MARINE HEAT EXCHANGER**

[75] Inventor: **Paul W. Fernstrum**, Menominee, Mich.

[73] Assignee: **R. W. Fernstrum & Co.**, Menominee, Mich.

[21] Appl. No.: **123,888**

[22] Filed: **Feb. 22, 1980**

[51] **Int. Cl.**[3] **B60H 1/04**; F28D 7/02

[52] **U.S. Cl.** **165/44**; 165/165; 165/175

[58] **Field of Search** 165/44, 169, 170, 179, 165/165, 153, 175; 62/519, 524

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,382,218 8/1945 Fernstrum 165/44

FOREIGN PATENT DOCUMENTS

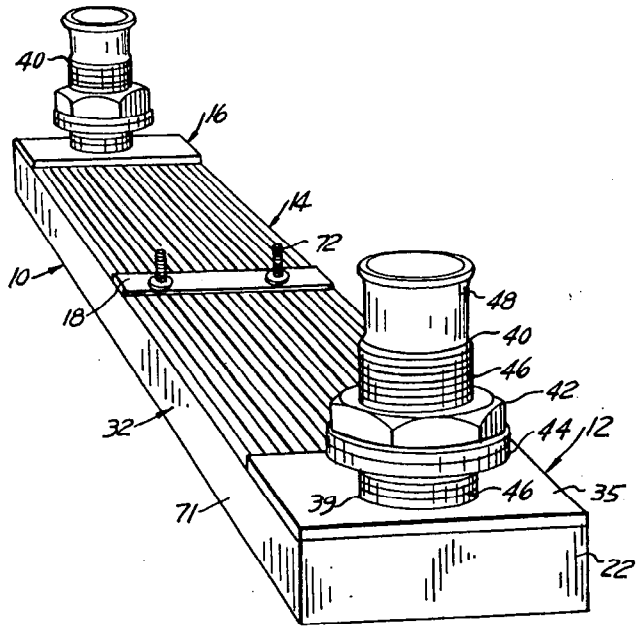
2259343 8/1975 France 165/165

Primary Examiner—Albert W. Davis
Assistant Examiner—Margaret A. Focarino
Attorney, Agent, or Firm—Barnes, Kisselle, Raisch & Choate

[57] **ABSTRACT**

A first water header is connected to a second water header by laterally-spaced multiple parallel composite tubes, each consisting of two or more component tubes of vertically-elongated rectangular cross-section welded to one another along their horizontal narrower adjoining faces, the height of each component tube being a multiplicity of times the width thereof. The thus welded faces form intermediate partitions or webs of doubled thickness running the entire length of the composite tube. This greatly strengthens the composite tube thus obtained and also divides the cooling water flow into vertically-spaced thin streams or bands of cooling liquid. Rising from the first and second headers are first and second fittings which serve not only to transmit the cooling water into and out of their respective headers but also serve to connect and attach the header to the keel or other underwater location of the heat exchanger to the hull of the boat or vessel. One or more intermediate supports are secured transversely to the upper faces of the conduit and have threaded stems which also pass upward through the keel or other underwater part of the hull to which the heat exchanger is attached.

1 Claim, 5 Drawing Figures



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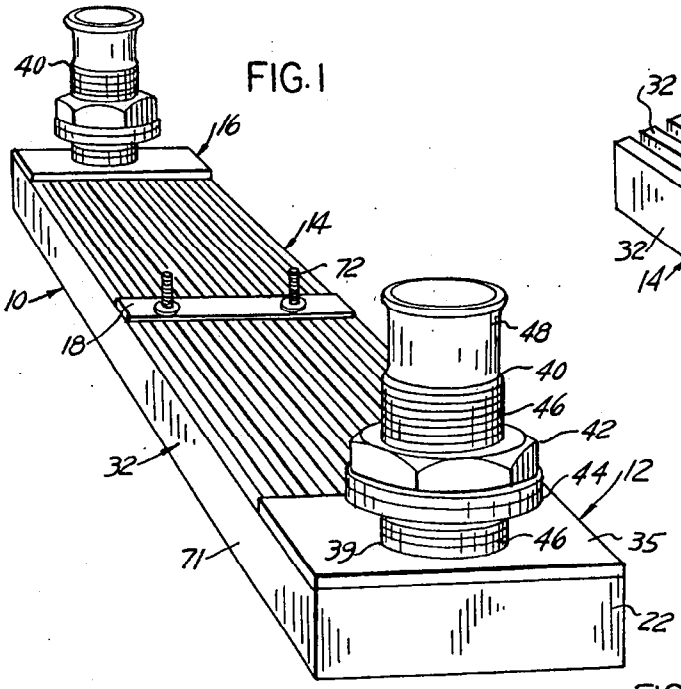


FIG. 1

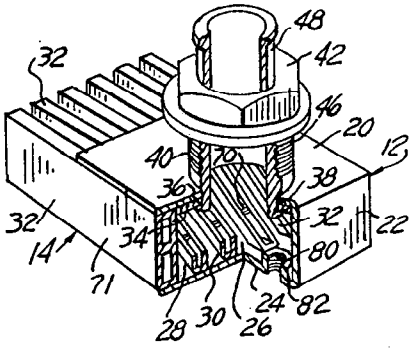


FIG. 2

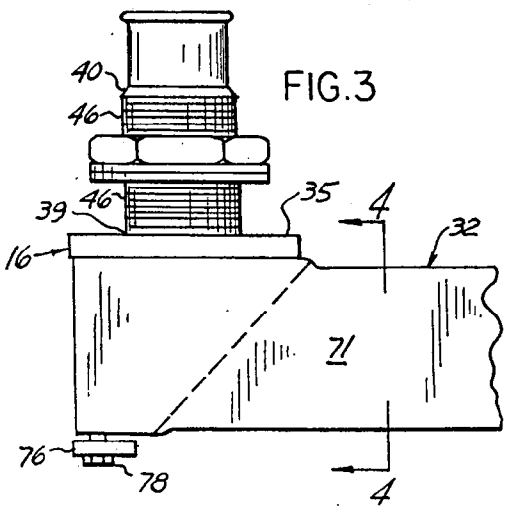


FIG. 3

FIG. 5

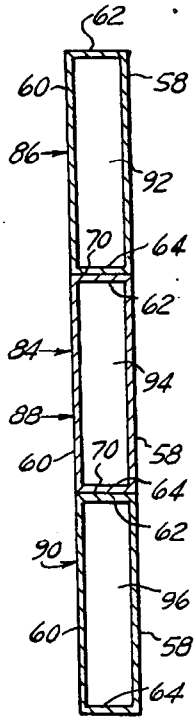
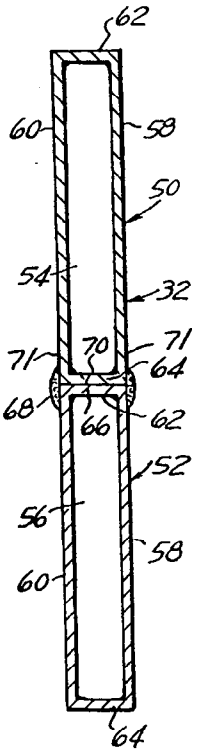


FIG. 4



UNDERWATER OUTBOARD MARINE HEAT EXCHANGER

BACKGROUND OF THE INVENTION

An outboard marine heat exchanger made in accordance with the thus-entitled Fernstrum U.S. Pat. No. 2,382,218 issued Aug. 14, 1945 has for many years successfully solved the cooling problems of marine engines of moderate size and power. More recently, however, such heat exchangers made in accordance with the Fernstrum patent have proved to be inadequate for large engines of high power. Attempts to produce the component thin rectangular hollow tubes have proved unsuccessful because of the inability, under the present state of the extruding art, to extrude tubes of rectangular cross-section from copper or copper alloys wherein the vertical dimension exceeds the horizontal dimension by a ratio of more than three to one, such factors in such tubes of up to five-to-one ratio resulting in a high percentage of defective and therefore wasted tubes. The present invention enables production of composite tubes of rectangular cross-section wherein the ratio of the height to the width can be ten times or more, the welded-together intermediate walls forming a doubly-thick partition or web which serves as a backbone to greatly strengthen the composite tube and to prevent collapse thereof under the pressure of water passing through the tubes.

SUMMARY OF THE INVENTION

The invention principally resides in the provision of composite tubes of rectangular cross-section interconnecting the first and second headers, the composite tubes consisting of a plurality of component tubes of vertically-elongated rectangular cross-section with their narrower horizontal walls welded to one another along their adjoining flat faces.

In the drawing,

FIG. 1 is a perspective view of an improved underwater outboard marine heat exchanger, according to a preferred form of the invention;

FIG. 2 is a perspective view of one of the headers and adjoining ends of the cooling tubes, partly broken away at one corner to show in section the internal construction of the headers and with the sealing gasket at the top omitted to avoid concealing the structure beneath it;

FIG. 3 is a side elevation, upon an enlarged scale, of one of the headers and the adjoining portion of the cooling tube;

FIG. 4 is a still further enlarged vertical section through one of the composite cooling tubes taken along the line 4—4 in FIG. 3; and

FIG. 5 is a view similar to FIG. 4, but showing a modification wherein the composite cooling tube is made up of three vertically-stacked inter-welded component tubes.

Referring to the drawing in detail, FIG. 1 shows an underwater outboard marine heat exchanger, generally designated 10, as consisting generally of a first header 12 connected by a heat exchange composite tube assembly 14 fo a second header 16, the composite tube assembly 14 being strengthened and additionally supported by one or more cross bars 18 welded or otherwise secured to the composite tube assembly 14 at an intermediate location between the headers 12 and 16. Each of the headers 12 and 16 includes a wide horizontal top plate 20, a vertical end plate 22 (FIG. 2), a narrow horizontal bottom plate 24 and an inclined bottom plate 26 welded at its upper end to the underside of the top plate 20. The inclined bottom plate 26 contains spaced parallel slots 28 through which project the inclined ends 30 of the composite tubes 32 of which the complete tube assembly 14 is made up. Welded beneath the top plate 20 is a nipple plate 34. A gasket 35 (omitted in FIG. 2) is mounted on the top plate 20. The nipple plate 34, top plate 20 and gasket 35 are bored centrally in alignment at 36, 38 and 39 respectively to receive the lower end of a fitting comprising a threaded vertical nipple 40 secured therein. A nut 42 and washer 44 are mounted on the nipple 40, the internal threads of the nut 42 threadedly engaging the threads 46 of the nipple 40, the upper end portion 48 of which is slightly reduced in diameter externally and smooth to receive conduits, such as hoses, leading to the water jacket connections or couplings of the engine to be cooled by the outboard marine heat exchanger 10, in the manner described below in connection with the operation of the invention.

Each composite tube 32 (FIG. 4) is made up of two or more vertically-stacked component tubes 50 and 52 respectively enclosing elongated vertically thin flow chambers or passageways 54 and 56 respectively. Each of the component tubes 50 and 52 is made up of parallel vertical side walls 58 and 60 which are approximately five times the width of the top and bottom walls 62 and 64. These proportions of approximately five-to-one represent the maximum ratio employed in this invention for component tubes 50 and 52 made of copper or copper alloy and exceeds the generally accepted maximum permissible ratio of three-to-one by manufacturers of such extruded metallic copper or copper alloy tubes. Since the five-to-one ratio of the present invention represents approximately the maximum permissable one for tubes capable of withstanding the hydraulic pressure of forty-five pounds per square inch prescribed for certain engine cooling systems and since such component tubes 50 and 52 are of individually-insufficient liquid-carrying capability to adequately cool a large internal combustion engine, the duplex or composite tube arrangement 32 shown in FIG. 4 was devised to solve this problem and has satisfactorily done so.

To achieve the construction of the composite tube shown in cross-section in FIG. 4, the narrower horizontal bottom wall 64 of the upper component tube 50 is welded along the plane 66 to the narrower horizontal top wall 62 of the lower component 52 with continuous beads 68, starting the weld from one end of the composite tube 32. The weld 68 is conventionally shown in section in FIG. 4 by the linear bulges or bead 68 along the opposite outer edges of the plane 66 according to mechanical drafting symbol 14 of the United States Patent Office standard drafting symbols. In actual practice, however, this bulge or bead 68 is almost imperceptible, hence is exaggerated at 68 in FIG. 4. The composite tube 32 just described, moreover, provides a double wall thickness at the adjoining single walls 62 and 64 along the linear plane 66, and thus obtains, in addition, a strong linear internal composite strut or web or partition 70 joining together the thus-formed composite side walls 71. This construction considerably strengthens and makes rigid support for the composite tubes 32 of the composite tube assembly 14 and the water flowing through the chambers or passageways 54 and 56 thereof by providing, in effect, a double-thickness "backbone" running down the middle of each composite tube 32.

Additional support and strengthening of the underwater heat exchanger **10** is provided by one or more of the intermediate cross bars **18** which also reduce the vibration set up in the operation of the engine which is cooled by the heat exchanger **10**. Welded or otherwise secured to the cross bars **18** are the lower ends of threaded attachment studs **72** (FIG. **1**). For saltwater installations, a zinc electrode plate **76** (FIG. **3**) is held by bolts **78** below each of the headers **12** and **16**. An internally-threaded collar **80** welded to the horizontal bottom plate **24** within a hole **82** therein is adapted to receive a drain plug (not shown) in the header **12**.

In the installation of the heat exchanger **10**, a recess is preferably provided in the keel of the boat or vessel of a depth sufficient to receive the composite tube assembly **14** flush therewith, longitudinally-spaced holes being bored in the keel of bottom plating to receive and pass the nipples **40** of the headers **12** and **16**. At the same time, laterally-spaced holes of smaller diameter are similarly provided for the studs **72** rising from the cross bar or cross bars **18**. The requisite nuts and washers are applied to the threads **46** of the various threaded nipples **40** and suitable nuts and washers (not shown) likewise applied to the studs **72** inside the hull of the boat or vessel. Suitable conduits or hose connections (not shown) to the engine cooling system are also applied to the upper end portions **48** of the nipples **40** and the heat exchanger **10** is then ready for use. If, however, it is not feasible to provide such a recess in the keel, a slightly modified header construction with inclined or "streamlined" opposite end walls **22** is provided to reduce the resistance of the heat exchanger **10** as it passes through the water while projecting downward from the keel.

The operation of the invention is believed to be adequately described by the foregoing description of the construction and installation thereof. As the boat or vessel travels through the water and the cooling water heated by the engine flows through the thin vertically-elongated chambers or passageways **54** and **56** (FIG. **4**) in the multiple composite tubes **32**, the sea water, lake water or river water constituting the body of water through which the boat or vessel is traveling passes between the composite side walls **71** of the composite tubes **32**, drawing off the heat conducted through the side walls **58**, **60** of the component tubes **50** and **52**.

In FIG. **5** there is shown, in cross-section and on a slightly reduced scale from FIG. **4**, but otherwise similar, a modified composite tube, generally designated **84**. The composite tube **84** is made up of three vertically-stacked component tubes **86**, **88** and **90** welded together along the edges of their narrower faces **62** and **64** and thereby providing triple liquid passageways **92**, **94** and **96** respectively. The above description pertaining to FIG. **4** similarly applies to the details of FIG. **5**, wherein similar parts are designated by the same reference numerals.

The construction described above wherein the header **12** is a liquid inlet header and the header **16** is a liquid outlet header constitutes a single pass heat exchanger. By separating the tube assembly **14** into two separate groups and providing partitions in the header **12**, and by omitting the outlet nipple **40** in the header **16** and placing it side-by-side with the similar nipple **40** in the header **12**, a double pass heat exchanger can be provided. In a similar manner, a triple pass heat exchanger can be provided by dividing the composite tube assembly **32** into three groups with corresponding partitions in the headers **12** and **16** and by providing a single nipple **40** for the header **16** and two nipples side-by-side for the header **12**, a triple pass heat exchanger can be provided.

I claim:

1. An underwater outboard marine heat exchanger for attachment to the outside of a hull of a water going vessel which comprises:

(a) a plurality of component tubes having a rectangular cross-section wherein each of said tubes has a broader wall at least three times the width of its narrower wall, said tubes being stacked vertically in multiples of two or more with the narrower walls adjacent and welded to each other, a multiplicity of said stacked tubes being arranged in parallel relation and spaced from each other to provide longitudinal passages between the components for contact with and flow of water in which a vessel is supported,

(b) a header at each end of said tubes comprising cross plates fastened to said tubes to form a manifold chamber open to each of said parallel component tubes and to space said tubes laterally, and

(c) a connector fitting rising from each said header in communication with said manifold chamber having a threaded exterior to serve to mechanically fasten said headers to a vessel hull and provide liquid connectors for water flow from within the vessel to said headers and the interior of said component tubes.

* * * * *