## (19) World Intellectual Property Organization International Bureau





(43) International Publication Date 3 May 2001 (03.05.2001)

### PCT

# (10) International Publication Number WO 01/31273 A3

(51) International Patent Classification<sup>7</sup>: F28F 1/04, F28D 1/04

B63H 21/10,

(21) International Application Number: PCT/US00/41624

(22) International Filing Date: 26 October 2000 (26.10.2000)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

09/427,166

26 October 1999 (26.10.1999) US

- (71) Applicant: DURAMAX MARINE, LLC [US/US]; 15986 Valplast Road, Middlefield, OH 44062-0250 (US).
- (72) Inventors: LEESON, Jeffrey, S.; 4488 Mackall Road, South Euclid, OH 44122 (US). PEOPLES, Eric, K.; 1076 Sunnywood Lane, Ravenna, OH 44266 (US). BRAKEY, Michael, W.; 3309 Glencairn Road, Shaker Heights, OH 44122 (US).

- (74) Agent: HOCHBERG, D., Peter; D. Peter Hochberg Co., L.P.A., 6th Floor, 1940 East Sixth Street, Cleveland, OH 44114-2294 (US).
- (81) Designated States (national): AU, BR, CA, CN, IN, IS, JP, KR, MX, NZ, PL, SG, TR, ZA.
- (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

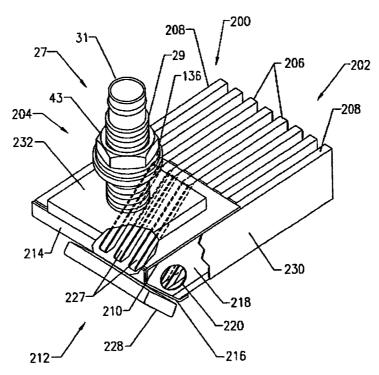
#### Published:

with international search report

(88) Date of publication of the international search report: 1 November 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: IMPROVED HEAT EXCHANGER



(57) **Abstract:** A keel cooler (200) having a beveled bottom wall (216)) with orifices (220) on the inner wall of the exterior tubes (208) extending into the header (204), the orifices (220) being in the natural flow path of coolant flow. The orifices (220) are sufficiently large so as not to restrict the flow of coolant. The anode assemblies (222) and drain plugs (224) are mounted on the beveled bottom wall (216).



01/31273 A3

### INTERNATIONAL SEARCH REPORT

International application No. PCT/US00/41624

A. CLASSIFICATION OF SUBJECT MATTER  IPC(7) :B63H 21/10; F28F 1/04; F28D 1/04  US CL :165/44; 440/88  According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols)				
U.S. : 165/41, 44; 440/88				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
NONE				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)				
NONE				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages		Relevant to claim No.	
Y	US 2,382,218 (FERNSTRUM) 14 August 1945,		1-3, 6-22	
<u>'</u>	see entire document, particularly Figure 5.			
Y	US 5,299,635 (ABRAHAM) 05 April 1994,		1-5, 6-22	
	see entire document.			
Y	US 4,484,622 (SATCHWELL) 27 November 1984,		1-3, 6-22	
_	see entire document.	,		
Y	US 5,529,117 (VOSS ET AL.) 25 June 1996,		4. 5	
^	see entire document.		7, 3	
Y	US 2,415,154 (WALTER) 04 February 1947,		14-17	
1	see entire document.		1111	
Further documents are listed in the continuation of Box C. See patent family annex.				
*A* Special categories of cited documents:  "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention				
to be of particular relevance  "X" document of particular relevance; the claimed invention cannot be				
*L* do	cument which may throw doubts on priority claim(s) or which is sed to establish the publication date of another citation or other	considered novel or cannot be conside when the document is taken alone	red to involve an inventive step	
special reason (as specified)  *O*  document of particular relevance; the claimed invention cannot considered to involve an inventive step when the document of motion of the combined with one or more other such document, such combinate.			step when the document is	
means being obvious to a person skilled in		the art		
the priority date claimed				
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Box PCT JOHN K. FORD			2	
Washington, D.C. 20231 Facsimile No. (703) 305-3230		Telephone No. (703) 308-2636	Telephone No. (703) 308-2636	