Nov. 24, 1959 J. W. GODFREY ET AL 2,914,012

MARINE HEAT EXCHANGER

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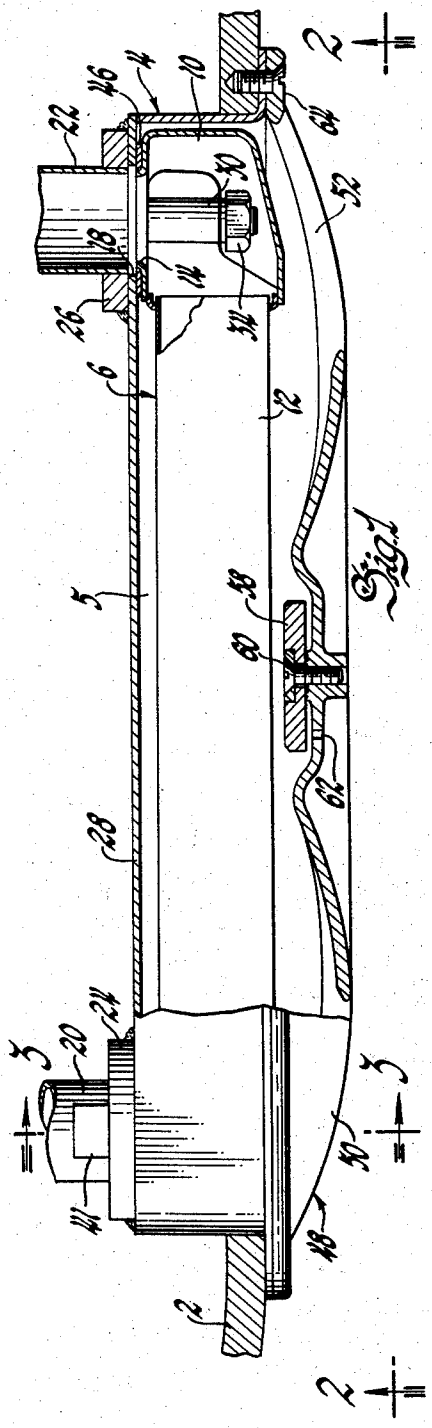


Fig. 1

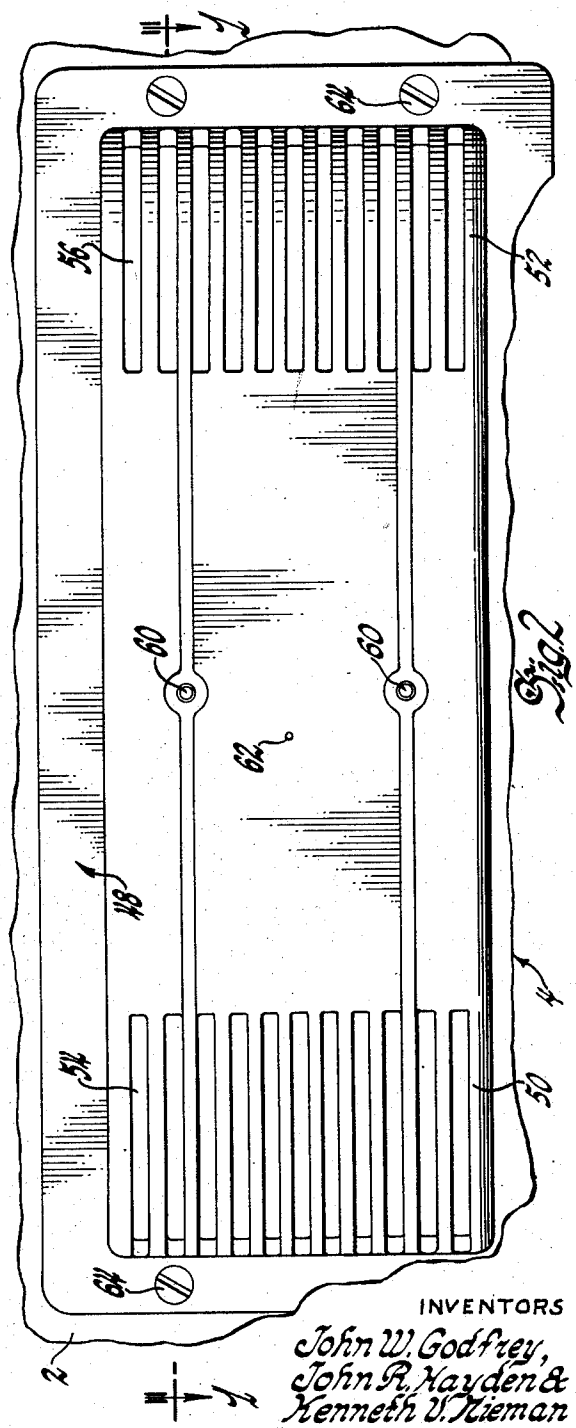


Fig. 2

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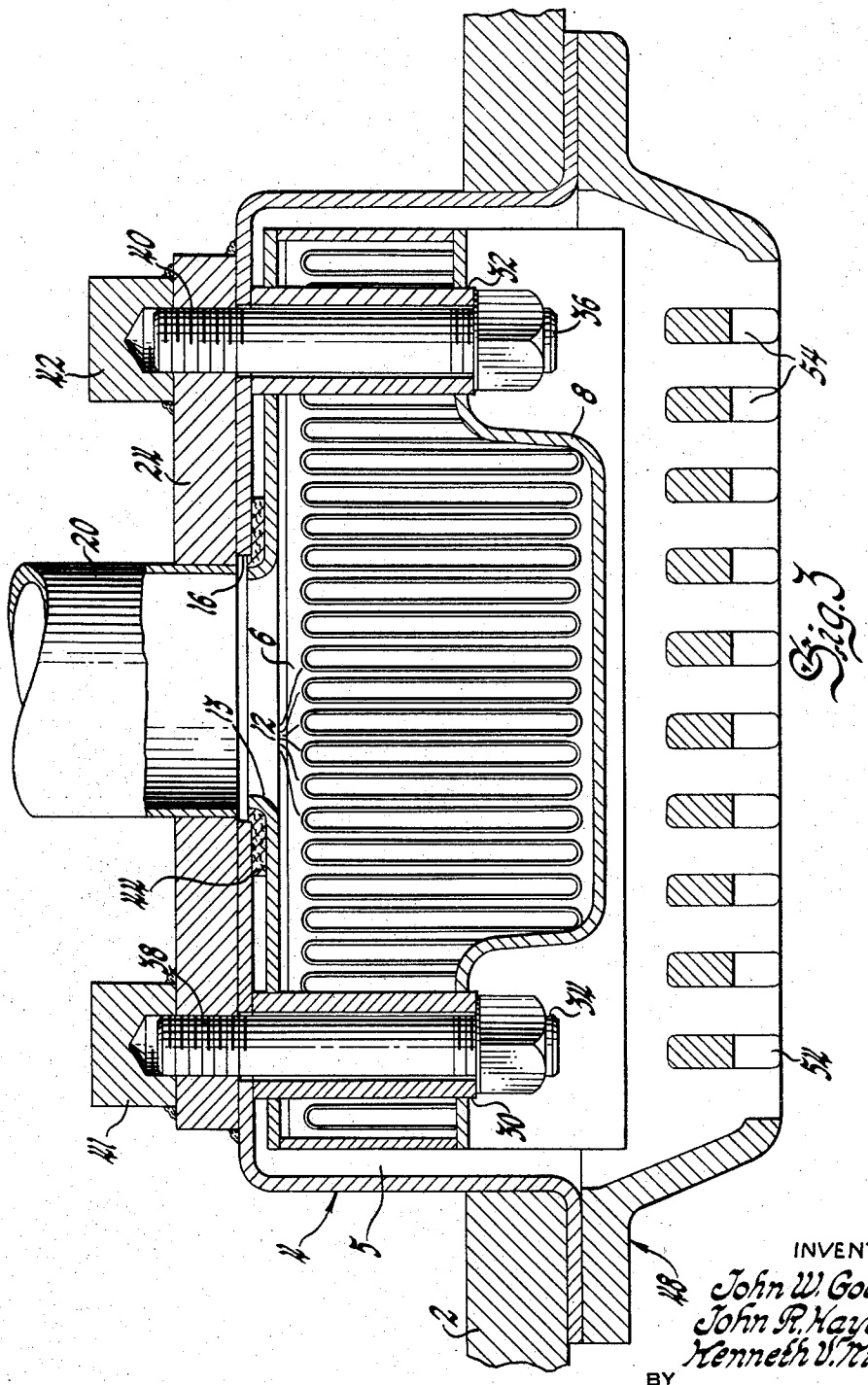


Fig. 3

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MARINE HEAT EXCHANGER

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3 Claims. (Cl. 114—.5)

This invention relates to heat exchangers and more particularly to outboard marine heat exchangers.

An object of the invention is to provide an outboard marine heat exchanger adapted to be mounted on the hull of a craft in communication with the water jacket of an engine cooling system, wherein mounting and dismounting may be accomplished entirely from the outside of the hull.

Another object is to provide an outboard marine heat exchanger structure having means for preventing damage thereto resulting from contact with underwater obstacles.

A further object is to provide an outboard heat exchanger which is adapted to be mounted in a recess of a marine hull, and having a removable protective plate or grille secured over the recess in substantially flush relation with the surface of the hull.

A still further object is to provide a structure of the type described wherein the protective plate affords maximum resistance to underwater obstacles while permitting substantially unobstructed flow of water over the heat exchanger.

Still a further object is to provide a device of the type described which is readily assembled and disassembled.

Yet another object is to provide a device of the stated character having a sacrificial corrosion inhibiting element enclosed therein, and means for determining exhaustion of said inhibiting element without removing the protective plate.

These and other objects and advantages of the invention will become more fully apparent as reference is had to the accompanying drawings and specification wherein:

Fig. 1 is a fragmentary sectional side elevational view of the heat exchanger structure and adjacent hull.

Fig. 2 is a fragmentary bottom plan view looking in the direction of arrows 2—2 of Fig. 1, and

Fig. 3 is a fragmentary sectional front elevational view looking in the direction of arrows 3—3 of Fig. 1.

Referring now to the drawings and particularly to Fig. 1, there is illustrated a portion of a marine hull 2 having disposed substantially midway thereof a rectangular box-like casing 4 having an open bottom. Casing 4 provides a recess 5 which is adapted to receive a heat exchanger structure 6. Heat exchanger 6 is formed of two transversely extending longitudinally spaced apart header portions 8 and 10 between which are disposed a plurality of laterally spaced flat tubes 12 of generally rectangular cross section. At their opposite ends, tubes 12 extend into laterally spaced apart openings formed in the respective headers and are secured therein, as by brazing, to effect fluid tight communication therewith. Substantially transversely midway thereof, each header 8 and 10 is provided with an upwardly directed flared opening 13 and 14, respectively. Flared portions 13 and 14 extend into circular apertures 16 and 18 of casing 4 to effect communication with fluid conduits 20 and 22 which, in turn, communicate respectively with the inlet and outlet of the coolant jacket of a marine engine, not shown. Conduits 20 and 22 are disposed in fluid tight

relationship to plates 24 and 26 which are secured, as by welding, to the upper surface of the top wall 28 of rectangular casing 4. To secure the heat exchanger 6 in position in the recess 5, each header 8 and 10 is provided with laterally spaced vertically extending tubular elements 30 and 32 which are adapted to receive bolts 34 and 36. Bolts 34 and 36 are disposed in and extend upwardly through tubular sleeves 30 and 32 to threadably engage threaded openings 38 and 40 formed at opposite ends of plates 24 and 26. Cap members 41 and 42, welded over openings 38 and 40, prevent leakage of water into the interior of hull 2. To assure a leak proof juncture between flanged openings 13 and 14 and conduits 20 and 22, there are provided circular resilient gaskets 44 and 46 which surround the flanged portions 13 and 14 and are compressed between the top walls of headers 8 and 10, respectively, and the upper wall of the casing 4 when bolts 34 and 36 are drawn up. It will, thus, be seen that access to the inside of the hull is not required in order to install or remove the heat exchanger 6, the entire operation being performed from the outside.

As will be apparent from Figs. 1 and 3, the lower surface of heat exchanger 6 is substantially flush with the adjacent hull line. This arrangement not only reduces drag but also affords substantial protection against damage from submerged and floating obstructions. However, in the event of contact with a submerged but immovable object, severe damage to the heat exchanger may occur. To prevent the possibility of rupturing or otherwise damaging the heat exchanger under such circumstances, in accordance with the present invention, there is provided a cover plate or grille 48 which is adapted to be disposed over the opening defined by the side walls of the casing 5. Cover plate 48 may be in the form of a casting, forging or a pressing of heavy gauge material capable of withstanding sharp impact or abrasion. As shown in Fig. 1, the opposite ends 50 and 52 of cover plate 48 are downwardly dished or curved in horizontal cross sections. Each curved portion 50 and 52 is provided with a plurality of longitudinally extending laterally spaced apart slots 54 and 56 which extend from their respective longitudinally outer edges to their respective midportions. By forming the cover in this manner, the forwardly facing extremity of curved portion 50 and the rearwardly facing extremity of curved portion 52 function as a scoop and discharge port respectively, thus assuring unrestricted flow of water into and out of the recess 5, while affording maximum protection against damage to the heat exchanger 6.

As seen in Fig. 1, there is mounted substantially midway of the plate 48 a transversely extending corrosion inhibiting zinc anode 58 which is threadably secured in position by machine screws 60. A small aperture 62 formed centrally in the wall of plate 48 permits insertion of a probe, not shown, to determine when the anode has become exhausted. To replace the anode 58, it is only necessary to remove the machine screws 64 which permits removal of the plate 48 to gain access to the inner surface thereof.

From the foregoing it will be seen that a novel and efficient heat exchanger construction has been provided. The structure is not only simple and inexpensive to fabricate but in addition provides a degree of protection not heretofore available without perceptible reduction in efficiency of heat transfer. It should also be particularly noted that both installation and periodic servicing requires access to the outer surface of the vessel only.

While but a single embodiment of the invention has been shown and described, it will be apparent that changes and modifications may be made therein without departing from the spirit of the invention.

We claim:

1. In a water craft, a hull, an opening formed in said hull, an outwardly facing casing recessed in said opening, spaced apart openings formed in said casing, fluid conduits secured in said openings, a heat exchanger, means forming openings in said exchanger adapted for alignment with said openings in said casing, resilient means disposed between said heat exchanger and said casing to provide fluid tight communication therebetween, and means for securing said exchanger in said casing, said last mentioned means comprising threaded members accessible from the exterior of said craft.

2. In a water craft, a hull, means forming a recess in said hull, fluid conduits opening into said recess, a heat exchanger, means for coupling said heat exchanger in communicating relation with said conduits, said last mentioned means being disposed entirely outboard from said craft, a protective grille secured over said recess to prevent damage to said exchanger, sacrificial corrosion inhibiting means secured on the inner surface of said grille, and means forming an aperture in said grille whereby exhaustion of said corrosion inhibiting means may be determined without removal of said grille.

3. In a water craft having a liquid cooling system, a hull, a heat exchanger secured in a recess in said hull, means disposed over said recess to provide a protective cover for said heat exchanger, said last mentioned means comprising a plate having transversely extending downwardly curved portions spaced longitudinally of said craft, and means forming transversely spaced longitudinally extending slots in said curved portions to permit circulation of water into and out of said recess, said slots extending from the longitudinally outer edges to substantially the middle of said curved portions.

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