

Nov. 20, 1962

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PROPULSION OF OUTBOARD ENGINE DRIVEN
BOATS OR OTHER MARINE CRAFT
Filed March 23, 1960

3,064,616

Fig. 1.

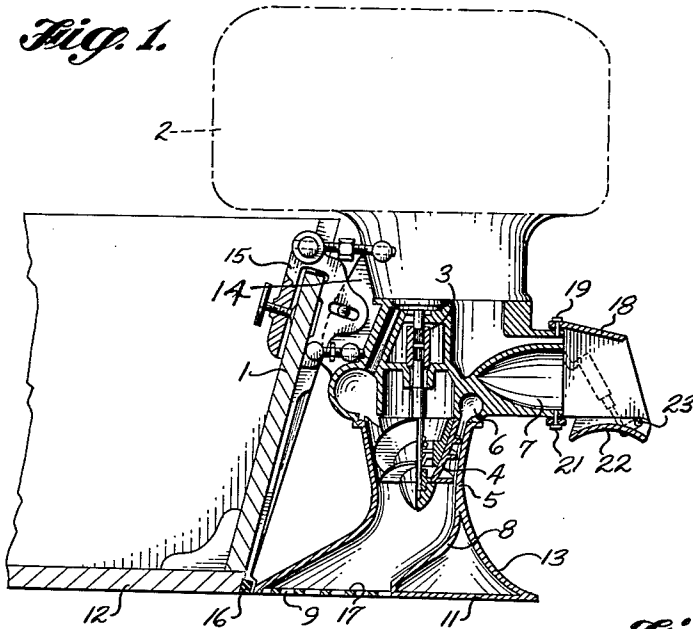


Fig. 2.

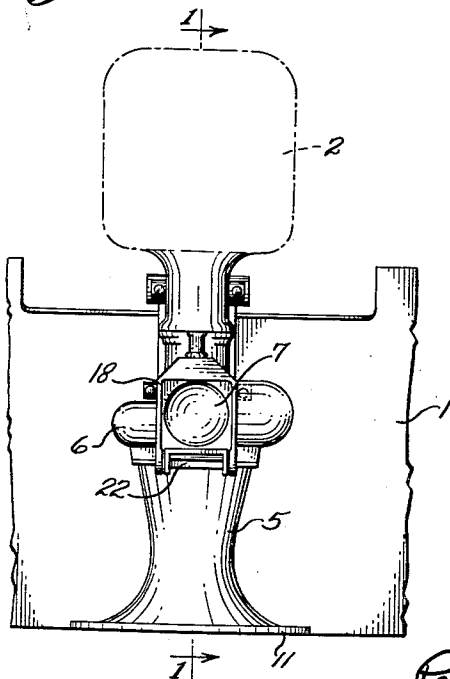
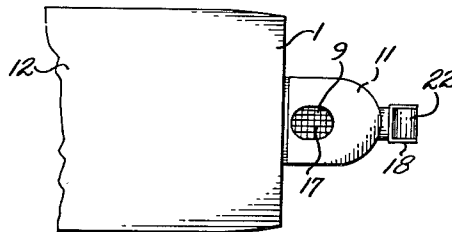


Fig. 3.



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1

3,064,616

PROPULSION OF OUTBOARD ENGINE DRIVEN BOATS OR OTHER MARINE CRAFT

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Filed Mar. 23, 1960, Ser. No. 17,138

Claims priority, application Great Britain Mar. 26, 1959
7 Claims. (Cl. 115—12)

This invention relates to the propulsion of boats or other marine craft hereinafter referred to for convenience as boats. The invention is concerned with propulsion apparatus of the kind formed as an outboard unit suitable for mounting at the stern of the boat and including an engine driving a pump located in a duct to draw water from the duct entry which is arranged at just below the water surface on which the boat floats, and to expel water from the duct as a jet having a horizontal velocity component the reaction of which provides the force to propel the boat. The jet nozzle may be located either above or below the water surface. Such propulsion apparatus is hereinafter referred to as propulsion apparatus of the kind referred to.

The present invention comprises a propulsion apparatus of the kind referred to, per se, and in combination with a boat equipped with the same, in which propulsion apparatus a plate, sheet or other member is arranged to provide a substantially rigid lower surface in contact with the water on which the boat floats and extending rearwardly from the stern of the boat, the duct entry being accommodated by an aperture within this surface. The sheet, plate or other member may be an extension of or carried by the keel of the boat, or alternatively it may be carried by the propulsion apparatus of the kind referred to. The width of the sheet, plate or other member may be the same as the width of the stern of the boat or it may be of such smaller width as to provide a substantial area of surface around the duct entry. Preferably the lower surface of the plate, sheet or other member is arranged to be substantially continuous with the under surface of the keel of the boat. The duct entry may extend from a position closely adjacent to the end of the keel of the boat in a rearward and upward direction to facilitate entry of water into the duct when the boat is moving forwardly.

One example of the invention will be described with reference to the accompanying drawings, in which:

FIGURE 1 is a vertical cross-sectional through the propulsion apparatus in position on the stern of a boat;

FIGURE 2 is an end elevation of propulsion apparatus as shown in FIGURE 1; and

FIGURE 3 is a plan view of the underside of the boat and propulsion apparatus.

In the drawings the stern 1 of the boat carries the outboard unit. The outboard unit is driven by a small internal combustion engine 2 from which a drive shaft 3 extends vertically downwards. The drive shaft is connected to drive an impeller 4 mounted within a pump casing 5. The impeller is of the kind giving combined axial and centrifugal flow and the output from the impeller 4 is collected within a volute 6 formed within the casing from which water is delivered to a jet pipe 7 which is horizontally directed in the rearward direction. The entry into the casing 5 is formed by a comparatively large diameter tubular member 8 which extends downwardly from the impeller 4 and at its lower end forms the entry 9 for water into the pump. The tube 8, pump casing 5, volute 6 and the jet nozzle 7 together form the duct through which water is propelled by the impeller 4. At its lower end the tube 8 is integrally formed with a flat

2

plate 11 which in plan view is of D-shape, the flat side of the D being adjacent to the stern of the boat at the keel, all as is shown in FIGURE 3. The entry 9 is formed as an aperture within the plate 11, located closely adjacent to the end of the keel 12 of the boat whereby the entry tube 8 may extend rearwardly and upwardly from the entry 9 towards the impeller 4. In this way forward motion of the boat can be made to assist in the entry of water into the duct. A fairing 13 is formed around the entry tube 8 and supports the D-shaped plate 11 around its periphery on to the pump casing. The engine 2, volute 6, jet nozzle 7, pump casing 5, entry tube 8, fairing 13 and plate 11, in the form shown, are all rigidly secured together to form the outboard unit which is detachably secured on the stern of the boat by means of mounting brackets 14 and 15 such that the unit while in use cannot move vertically relatively to the boat. The D-shaped plate 11, when the outboard unit is mounted in position, is in effect a continuation of the keel 12 and a rubber sealing strip 16 may be provided between plate 11 and the keel 12 to ensure that there is a continuous smooth surface between the keel and the plate.

During operation as the boat is moving forwardly water enters the entry 9 and is pumped by the impeller 4 through volute 6 to the jet tube 7 from which it emerges as a horizontal jet the reaction of which propels the boat forwardly. A grill 17 may be provided over the entry 9 to prevent the entry of large pieces of solid matter into the pump. Small pieces of solid matter which pass the grill are not sufficiently large in size to cause any damage within the pump.

A deflector unit 18 is mounted on the jet nozzle 7 by means of a pair of pivot pins 19 and 21 so as to be angularly movable about a substantially vertical axis relative to the jet nozzle 7, whereby the issuing jet may be directed rearwardly or to port or starboard to produce a forward impulse, or one having an opposite lateral component. Controls, not shown, extend from the deflecting unit 18 into the boat whereby the deflector unit may be angularly adjusted for steering purposes by a steering control within the boat. A thrust reversing member 22 pivotally carried within the deflector unit 18 normally occupies the position shown in FIGURE 1, but during reversal it may be moved upwardly about its pivot 23 to close the rearward end of the deflector unit 18 and to open a downwardly and forwardly directed opening from deflector unit 18. The water issuing from the downwardly and forwardly directed opening is arranged to effect rearward propulsion of the boat, and during such rearward propulsion as, indeed, during forward propulsion, movement of the deflector 18 on pins 19 and 21 will steer the boat as desired.

Whilst the outboard unit has been shown rigidly attached to the stern of the boat with a deflector unit from the jet nozzle to effect steering it would be appreciated that the outboard unit may equally well be mounted on the stern by brackets for pivotal movement as a whole about a substantially vertical axis to effect steering. A pivotal coupling would then be provided within the entry tube 8 to allow movement of the outboard unit without moving the entry 9. Again alternatively the outboard unit may be arranged for permanent attachment to the stern of the boat and the plate 11 may then form part of the structure of the boat itself.

The advantage gained by the use of the invention lies in the fact that the plate 11 facilitates a smooth flow of water under the keel and around the entry 9 into the duct, thus ensuring that there is a smooth flow of non-aerated water into the entry. If the plate 11 were not provided water passing from under the keel of the boat would be turbulent and aerated at the entry 9, resulting in less efficient propulsion.

3

The plate 11 may be adjustable relatively to the keel of the boat to ensure that it occupies the most useful position, but in use is fixed against vertical movement, at least, relative to the keel 12. Normally, its position will be that where the plate adjoins the keel to form a smooth continuation thereof. The adjustment may enable the plate 11 to be moved up or down to an appropriate height and/or it may enable the plate to be moved angularly about a horizontal transverse axis. Such angular adjustment may be conveniently attained by arranging bracket 15 to be adjustable to and from the stern so that the outboard unit in effect pivots about the lower bracket 12 and thus adjusts the angular setting of the plate 11. The plate 11 may be of the full width of the keel 12, or it may be somewhat narrower, as it is shown in FIGURE 3.

I claim as my invention:

1. In combination with a boat the keel whereof at its stern is relatively flat, an outboard propulsion unit including means to mount the same at the stern of the boat against relative vertical movement, said propulsion unit including a member formed with a bottom contour similar to that of the boat's keel at the stern, and located by said mounting means with its bottom contour just below the surface of the water on which the boat floats, and constituting in general a continuation of the keel's contour, said member being formed with an aperture in its bottom contour of materially lesser area than the bottom contour per se, constituting an entry, said propulsion unit further including a duct leading from said entry to a rearwardly directed discharge nozzle, a pump in said duct, and an engine driving said pump to draw water into the entry and to eject it as a jet from the nozzle to propel the boat.

2. A boat as claimed in claim 1, wherein the said apertured member is fixedly secured to the duct and is held in abutting relation with the stern of the boat.

3. A boat as claimed in claim 1, wherein the rigid surface is less wide than the keel of the boat at the stern.

4. An outboard propulsion unit including means for its securement to the stern of a boat against relative vertical

4

movement, said propulsion unit comprising a duct, an entry for the duct located, when the propulsion unit is so secured, just below the surface on which the boat floats, a jet nozzle from the duct adapted to extend rearwardly from the boat, an engine, a pump located in the duct for driving by the engine to draw water from the duct and to expel it as a jet from the nozzle, and a member fixed to the duct providing a substantially rigid surface in contact with the water on which the boat floats and adapted to extend rearwardly from the stern of the boat, to form substantially a continuation of the boat's keel, the said surface having an aperture forming the duct entry.

5. The combination of a boat formed with a keel of a given transverse contour, and a propulsion unit including a plate of a transverse contour corresponding to that of the keel, and of a shape in plan to fit closely to the boat's stern, said plate having an aperture inset from at least the side and rear edges of the plate, means supporting said plate from the boat against relative vertical movement, as a rearward continuation of said keel, to avoid cavitation in and consequent aeration of the water passing beyond the keel to the plate, and means to induct water through the plate's aperture and to eject it with a horizontal component, for propulsion.

6. A boat as claimed in claim 5, including adjustment means to adjust the setting of the said member relatively to the keel of the boat.

7. A boat as claimed in claim 6, including a pair of vertically spaced brackets to secure the propulsion unit to the stern of the boat, the upper bracket being adjustable to vary the spacing of the upper part of the propulsion unit from the stern to cause angular movement of the propulsion unit and the said member.

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