

[54] **PROPULSION DEVICE FOR BOATS**

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[58] Field of Search..... 115/0.5, 12, 34, 115/35, 39; 114/61, 66.5

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[57]

ABSTRACT

A propulsion device for boats wherein a boxlike housing is mounted on the transom of a boat; the bottom of the boxlike housing defines an inclined cavity having an inverted U-shaped cross section and a progressively increasing depth toward the rear end; there is disposed a propeller in said inverted U-shaped section to increase propulsion efficiency; and a footboard is detachably fitted on the upper portion of the boxlike housing.

4 Claims, 3 Drawing Figures

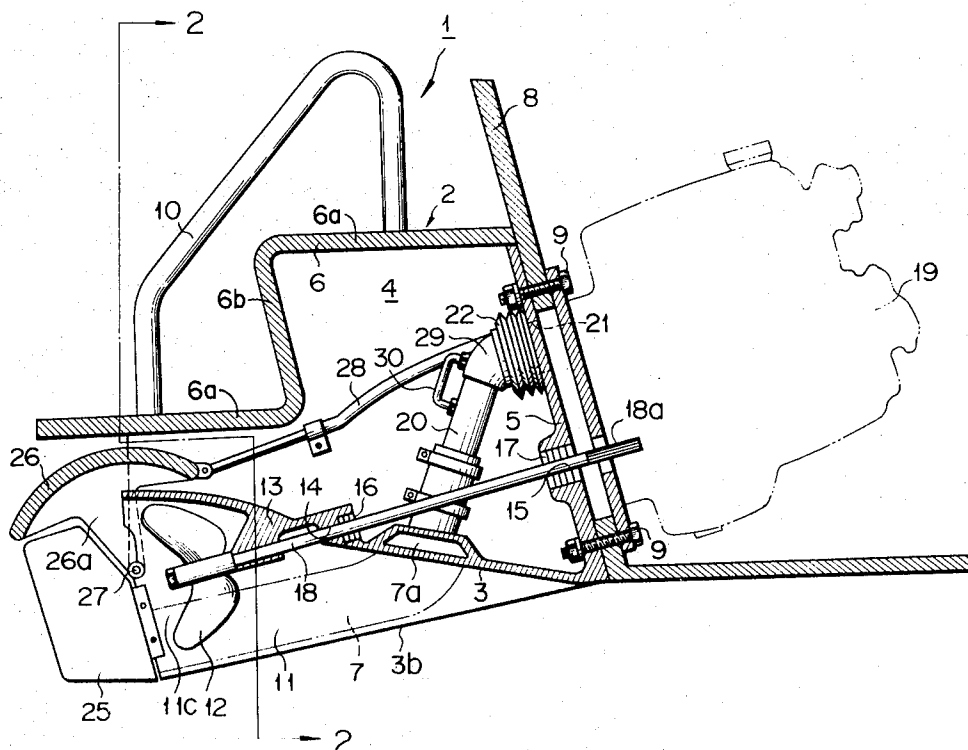
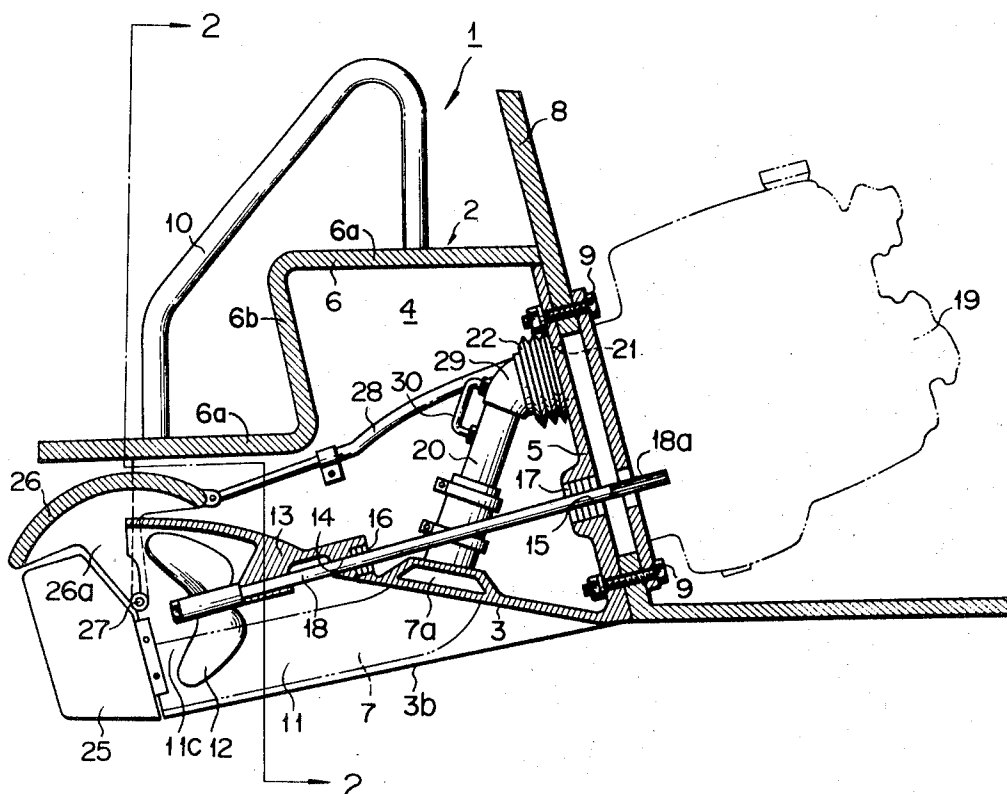


FIG. 1



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FIG. 2

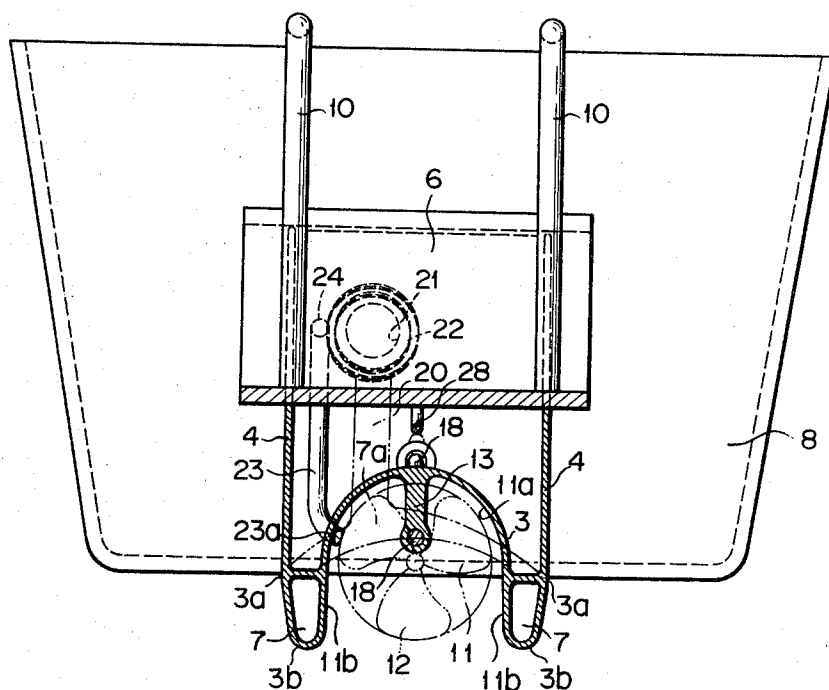
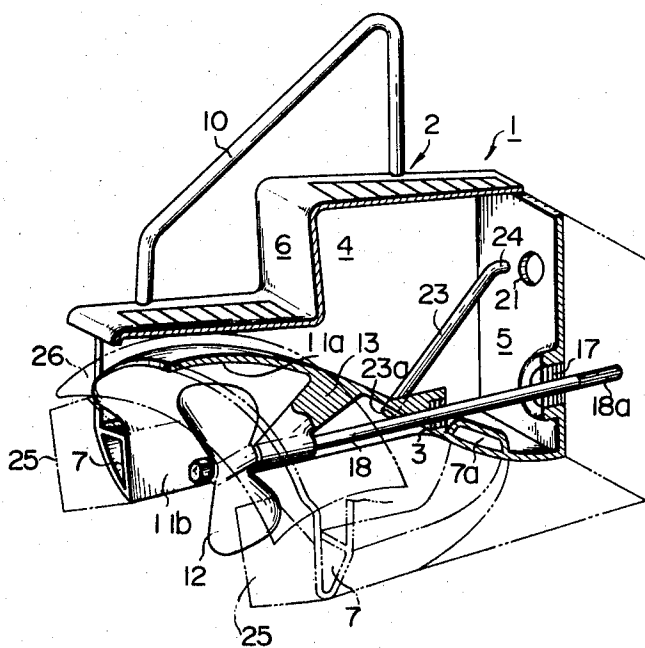


FIG. 3



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PROPULSION DEVICE FOR BOATS

BACKGROUND OF THE INVENTION

This invention relates to a propulsion device for boats and more particularly to propulsion device for boats capable of improving workability of inner surface, propulsion efficiency, maintenance and inspection by exposing a space below the propeller to the external water.

A prior art propulsion device for boats is the type where the propeller was received in a cylindrical duct disposed at the stern. However, said conventional device had the drawbacks that while there was maintained a high pumping efficiency, the so-called duct loss increased due to the presence of great frictions between jetted water and the inner walls of the duct, failing effectively to convert the driving power of an engine to a propulsion force. In such a prior art propulsion device, it is necessary to cast the casing by using a core, to smooth the inner surface of the duct, to dispose the periphery of the propeller blades at a prescribed equal clearance from the inner surface of the duct, and to finish the associated components with elaborate smoothness and high precision to increase the propeller efficiency, thus consuming a great deal of time and work in manufacture. Furthermore, when a propeller is entwined with seaweeds, fishing nets, and other floatages in water, or when marine growths, such as barnacles, are grown up on the inner surface of the duct, propeller or guide vanes, they are difficult to remove.

SUMMARY OF THE INVENTION

The present invention provides a propulsion device for boats wherein a boxlike housing is mounted on a transom of a boat; the bottom of the boxlike housing defines an inclined cavity having an inverted U-shaped cross section and a progressively increasing depth toward the rear end; the bottom wall of the rear end portion of the bottom defines a semicircular cross section and receive a propeller coaxially disposed with said semicircular section; the drive shaft of the propeller is passed through the housing to be connected to an in-board engine disposed at the front of said housing; exhaust gas from the engine is expelled into the water through an exhaust conduit in the housing; both sides of the rear end portion of the housing bottom are provided with a pair of rudders which are designed to move in the same direction; and a footboard is detachably fitted on the upper portion of the boxlike housing.

An object of the invention is to provide a propulsion device for boats capable of easy mount, removal and replacement in whole.

Another object of the invention is to provide a propulsion device for boats which is capable of very easy manufacture, assembly, maintenance, inspection, and repair, due to simple construction of a cavity having an inverted U-shaped cross section.

A still further object of this invention is to provide a propulsion device for boats little subject to duct loss and permitting high propulsion efficiency.

Still another object of the invention is to provide a propulsion device capable of conducting exhaust engine gas through an exhaust line into the water to elevate a silencing effect without requiring any additional part.

Further object of the invention is to provide a propulsion device for boats which does not require any space in the boat.

Still further object of the invention is to provide a propulsion device for boats functioning as a footboard which helps boat operators and passengers on and off the boats.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal sectional view of a propulsion device embodying the present invention;

FIG. 2 is a sectional view of the propulsion device taken along line 2 — 2 of FIG. 1; and

FIG. 3 is a perspective view of the longitudinally broken away propulsion device of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

There will now be described this invention with reference to the appended drawings. Throughout the figures, numeral 1 denotes a propulsion device for boats embodying the present invention. The propulsion device includes a boxlike housing 2 consisting of a bottom 3, side walls 4 and a front wall 5 assembled substantially in an integral body. The housing is preferably formed of light and corrosion-resistant metals such as corrosion resisting aluminum alloy and is usually mounted on the stern of a boat.

The bottom 3 defines an inclined cavity 11 on the underside thereof having an inverted U-shaped cross section and a progressively increasing depth toward the rear end. The lower portions of right and left extension walls 11b of the bottom 3 which define the aforesaid cavity 11 are bent outward to be connected to the side walls 4 of the housing 2. The lower portions of the side walls 4, the lower portions of the extension walls 11b and partition walls 3a define exhaust conduits 7. The conduits 7 extending along the bottom 3 open at the lower rear ends of the extension walls 11b and are connected to communicate with each other at their front end portion 7a.

The conduit 7 may be mounted at one of the side walls 4. The front wall 5 of the housing 2 is attached by means of bolts 9 to the outside of a transom 8 of a boat in such a manner that the front end portion of the housing bottom 3 is aligned with the boat bottom and that an imaginary plane including the lower edges 3b of the bottom 3 is inclined with respect to a horizontal plane with an angle of incidence toward the front end of the bottom 3.

A horizontal footboard 6 detachably fitted on the upper portions of the side walls 4 of the housing 2 is preferably made of reinforced plastics and helps boat operators and passengers on and off the boat at the rear end and can be easily lifted off its place. The horizontal footboard 6 may be constructed of a plate member. It may also have two horizontally parallel plates 6a connected by an upright web 6b in different planes so as to constitute a stepped member as a whole. A pair of handrails 10 are mounted on both sides of the footboard 6 to assist boat operators and passengers in getting on and off the boat.

The rear end portion 11c of the bottom cavity 11 is defined by the bottom wall 11a formed in a semicircular cross section and both extension walls 11b extended

vertically downward from the lower ends of said bottom wall 11a.

A propeller 12 is received in said rear end portion 11c of the bottom cavity 11.

A propeller shaft 18 rotatably penetrates a boss 13 hanging from the upper wall 11a at the front part of said rear end portion 11c of the bottom cavity 11 and holes 14 and 15 perforated near the center of the bottom wall 11a of the bottom cavity as well as of the front wall 5 through the corresponding water seals 16 and 17. The front end portion 18a of the shaft 18 is formed into a male spline, and the rear end portion to which the propeller 12 is fixed substantially intersects the locus of the center of the semicircular cross section. An inboard engine 19 for driving the propeller shaft 18 is mounted on the inside of the transom 8. To simplify assembly, both the inboard engine 19 and the propulsion device 1 may be jointly clamped to the transom 8 by means of bolts 9, as shown in FIG. 1. The upper end of an exhaust tube 20 contained in the housing 2 is connected through an exhaust passage formed in a water jacket 29 with the exhaust manifold (not shown) of the engine 19. The lower end of said exhaust tube 20 is open to the connecting section 7a of the conduits 7. The exhaust water jacket 29 projects through a hole 21 formed in the front wall 5, and bellows 22 are disposed between the water jacket 29 and the front wall to prevent water from being taken into the boat.

In the housing 2 is provided a coolant line 23 (FIGS. 2,3), the upper end of which is connected through a hole 24 perforated in the front wall 5 to an intake port (not shown) of cooling water for the engine 19, and the lower end of which is exposed to the external water through an aperture 23a formed in the bottom wall 11a of the bottom 3.

The water which has cooled the engine 19 is exhausted from the exhaust water jacket 29 into the exhaust tube 20 through a water pipe 30.

A pair of rudders 25 are disposed on the extreme ends of both extension walls 11b of the rear portions 11c of the bottom cavity 11 so as to be jointly moved in a substantially equal rightward or leftward direction.

A deflector 26 (FIGS. 1, 3) having an arcuate longitudinal section is rotatably supported on the rear portion 11c of the bottom cavity by shafts 27 inserted into the lower ends of a pair of downward projecting arm members 26a fitted to the lengthwise sides of said deflector 26. The front end portion of the deflector 26 is coupled to a Bowden cable 28. When actuated by the Bowden cable, the deflector 26 is rotated about the shafts 27 to vary the direction of streams of water jetted by the propeller 12.

With the propulsion device of this invention, the passageway of jetted water is open at the bottom, resulting in advantages of easy casting or molding of the housing and smooth finishing of the inner surface of the cavity, but in disadvantages of a less propulsion force than in the conventional type using a duct. Since, however, advantages in duct loss outweigh disadvantages in propulsion force, there can be eventually obtained a higher propulsion efficiency.

There will now be described the operation of the propulsion device of this invention.

When the deflector 26 is in the position shown in FIG. 1, the jet flow remains unobstructed, enabling the boat to advance by reaction.

When the deflector 26 is rotated counterclockwise as viewed from FIG. 1 by the action of the Bowden cable 28, the jet flow will strike against the inner surface of the deflector 26, thereby changing the direction of jetted streams of water to permit the stop or retreat of the boat.

The exhaust gas from the engine 19 is drawn out from the exhaust manifold into the water through the exhaust tube 20, and conduits 7 in turn, thus prominently reducing noises.

The water taken in from the aperture 23a formed in the upper wall 11a of the bottom cavity 11 is supplied to the engine 19 through the coolant line 23 and, after cooling the engine 19, is expelled from the exhaust water jacket 29 thereof into the exhaust tube 20 through the water pipe 30. After further cooling the exhaust gas, the water is drawn outside of the boat together with the exhaust gas through the conduits 7.

The stepped member 6 of the housing 2 can be easily removed by lifting the handrails 10, which facilitates the mount, removal, inspection and repair of the propulsion device 1.

What is claimed is:

1. A propulsion device for boats comprising:

- a. a housing having a front wall through which said housing is mounted upon the outside of a transom of a boat, right and left side walls fixed to said bottom wall, a bottom fixed to said front and side walls and having a bottom wall formed semi-circular in cross-section at the rear end portion of said bottom, and right and left extension walls extending substantially vertically from the bottom so as to connect said bottom with the lower ends of the corresponding side walls, said bottom and extension walls defining a cavity having an inverted U-shaped cross-section and a progressively increasing depth toward the rear end thereof;
- b. a propeller shaft penetrating said bottom and said front wall and having the rear end portion thereof disposed substantially on the center of the semi-circular rear portion of said bottom wall;
- c. a propeller fixed to said rear end portion of said propeller shaft so as to be disposed in the rear end portion of said cavity;
- d. said side walls and corresponding extension walls each having a partition wall to define a pair of exhaust conduits; and
- e. an exhaust tube disposed in said housing and having one end connected with the exhaust manifold of an engine of the boat for driving said propeller shaft and the other end connected with said exhaust conduits.

2. The propulsion device according to claim 1 wherein there is further provided a footboard detachably mounted on the upper portion of said housing so as to be accessible to the exhaust tube for inspection and repair thereof when said footboard is detached from the upper portion of said housing.

3. The propulsion device according to claim 2 wherein said footboard comprises two horizontal parallel plates and an upright web by which said plates are connected with each other.

4. The propulsion device according to claim 1 wherein there is further provided a coolant line having one end opened to the external water through said bottom and the other end connected with the coolant intake port of the engine so as to supply cooling water thereto.

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