ABSTRACT

A propeller and drive assembly for boats in particular as an auxiliary power source for sail boats including a drive assembly which is extendible through the hull below the water line of the sail boat into operating position then retractable to a position within the hull. The assembly includes a trunk preferably cylindrical in shape extending from the hull upward and closed by a plate member secured to the bottom of the drive assembly. A plurality of upstanding shafts align the drive assembly for substantially vertical movement. One of said shafts is operably connected to a power source for driving the propeller when the assembly is extended.

5 Claims, 8 Drawing Figures
RETRACTABLE THRU-HULL DRIVE SYSTEM FOR BOATS

BACKGROUND OF THE INVENTION

Heretofore the provision of auxiliary power for sail boats has been accomplished in one of the following manners:

a. An inboard power unit driving a shaft through a gland with a propeller and strut assembly.

b. An outboard motor which is secured to the stern of the boat and removed when not in use.

c. A through hull mounting of a modified outboard motor.

In each of these cases, auxiliary power with reasonable efficiency is achieved. The inboard unit is designed particularly for sailboat propulsion and is satisfactory with the reservation that such units are quite expensive and must be mounted forward, usually in the most wanted cockpit or cabin space. The external drive assembly including the shaft, gland, strut and propeller provide unwanted drag while sailing. Low drag folding propellers of the type disclosed in U.S. Pat. No. 3,190,254 to R.H. Meibauer have been used to minimize drag with a degree of success.

Outboard motors are designed particularly for driving planing type hull vessels and consequently operate at higher speeds and are not particularly efficient in driving displacement hulls such as most sailboats. Outboard motors do not provide any drag during sailing operation since they are withdrawn from the water by tipping on their mounting bracket or removal from the stern and stowage. The mounting and removal of motor on the stern is an awkward procedure and one left to strong individuals. Consequently, the use of an outboard motor on sail boats has been an unhappy compromise. It is significantly less expensive than inboard units and minimizes the interference with cabin space and explosion danger of inboard power units.

Outboard motor units have been modified to make them more adaptable to sail boats. In my U.S. Pat. No. 3,628,492 issued Dec. 21, 1971, I disclose a lower motor unit for sailboat outboard motors. This unit accepts a larger propeller and provides a speed reduction to make the unit more efficient in propelling displacement hulls.

U.S. Pat. No. 3,190,254 discloses a through hull drive unit for mounting outboard motor power units inside of a hull and the motor drive unit on the exterior gaining the simplicity and low cost of an outboard motor unit. The perennial drag of the fixed drive unit is present.

BRIEF STATEMENT OF THE INVENTION

I have invented a fully retractable drive unit for mounting on the hull of a sail or other boat which reduces the drag of the drive unit to zero when not in use and although retractable preserves the water tight integrity of the boat. The unit includes mounts for a motor and power unit or it may be remotely located. The drive unit retracts into a trunk secured to the hull. It carries an end closure for the trunk when retracted and which acts as a flow confining member to increase the efficiency when the unit is driving the boat. Novel locking and drive arrangements are disclosed.

BRIEF DESCRIPTION OF THE DRAWING

These features may be more clearly understood from the following detailed description and by reference to the drawing in which:

FIG. 1 is a side view of a sail boat incorporating this invention with the drive unit retracted;

FIG. 2 is a side view of the same sail boat with the drive unit extended;

FIG. 3 is a vertical sectional view along the keel line of the sail boat of FIG. 2 showing the retractable power unit in accordance with this invention;

FIG. 4 is a fragmentary view of the underside of a boat employing this invention with the unit retracted;

FIG. 5 is a fragmentary vertical sectional view of the apparatus in accordance with this invention taken along line 5—5 of FIG. 2;

FIG. 6 is a fragmentary horizontal section taken along lines 6—6 of FIG. 3;

FIG. 7 is a fragmentary horizontal section taken along lines 7—7 of FIG. 3;

FIG. 8 is a detail of one of the support members of this invention.

DETAILED DESCRIPTION OF THE INVENTION

Now referring to FIGS. 1 and 2 in which a portion of the hull of a boat, for example a sail boat, is shown incorporating this invention.

As seen in FIG. 1, along the center line of the hull and ahead of the rudder 11 is a mounting ring 12 and a closure and water ducting plate 13. The latter ring 12 and plate 13 serve to conceal and protect an auxiliary power unit 14 of FIG. 3. The auxiliary power unit 14 may be seen in FIG. 3 and its lower drive unit 15 appears in FIG. 2, but is virtually entirely concealed in FIG. 1. The only elements of the auxiliary power unit 14 visible in FIG. 1 are the throttle 16 and retraction control 20 located topside or in the cockpit of the boat in a convenient location. Retraction control 20 is shown in the drawing FIG. 1 in its aft position and the power and drive portions of the auxiliary power unit 14 are entirely within the hull 10. When in this position, the auxiliary power unit 14 produces absolutely no additional drag for the boat, a factor of major significance in racing.

As seen in FIG. 2, the retraction control 20 is in its forward position and the drive unit 15 of the auxiliary power unit 14 extends below the hull 10 in position to provide efficient propulsion of the boat. The drive unit 15 comprises a housing 22, propeller 23 and the closure plate 13, all better seen in FIGS. 3 and 5.

In FIG. 2 the throttle is shown in a half forward position and as described below, the auxiliary power unit 14 will then be operational and provide propulsion force for the boat. Movement of the throttle 16 to an aft position reverses the direction of rotation of propeller 23 to back the vessel down. Such single lever control throttles are well known in the marine motor field and the unilever control of the Morse Controls Co. of Akron, Ohio has proved eminently satisfactory for this purpose. The retraction control 20 employs a similar control handle which through a flexible cable is operatively coupled to the drive unit 15 to extend and retract the drive unit 15. Additionally, I have found that the control 20 and its flexible cable (seen in FIG. 3) with a suitable mechanical lock on the control handle such as a bungee cord engaging the handle and the boat constitutes an efficient position lock for the drive unit 15. This provides the drive lock at the control 20
position and removes it totally from the portions of the power unit 14 exposed to the water.

Now referring to FIG. 3, the power unit 14 may be seen in partial section with drive unit 15 in its extended position. It includes in addition to its drive unit 15, a motor 24 and a trunk or wall assembly 25. The latter is secured to the hull 10 by the mounting ring 12 and fasteners such as recessed machine bolts, two of which appear in FIG. 2. The mounting ring 12 is preferably recessed into a mating annular step in the hull 10 at the edge of the hull opening through which the power unit 14 extends. When the mounting ring 12 is recessed as shown, the skin line of the hull is virtually continuous, and minimum disturbance of its hydrodynamic characteristics occurs.

The trunk or well 25 in its preferred form is a cylindrical metal tube in the order of 12 to 20 inches in diameter and 16 to 30 inches in height depending upon the size of the hull and power source used. The trunk dimensions are more particularly determined by (a) the propeller assembly diameter and (b) the depth of draw of the vessel. The trunk preferably extends above the water line to avoid the necessity of sealing its upper end.

The trunk 25 is secured as by welding to the mounting ring 12 and by reason of its shape constitutes a structural hollow column of substantial strength. Trunk 25 is thus capable of supporting the motor or power head 24 of the auxiliary power unit 14 when desired. Such mounting of the motor may be seen in FIG. 3. A typical motor 24 for 23 to 30 foot sail boats is the 9.5 horse power power head of the type produced by Outboard Marine Corp. of Wakegan, Ill. for use in outboard motors. In this case the motor unit 24 is shown in simplified form and typically will include a generator 32 mounted thereon and belt driven by the fly wheel 33 of the motor 24. The generator 32 provides charging current for a starting battery unshown and additionally allows the unit of this invention to act as a motor generator set to provide electrical power for the boat when under way, under power and additionally with the drive unit retracted and the boat under sail or moored.

The motor 24 includes a drive pulley 34 on its fly wheel 33. Power is transmitted from the motor 24 via pulley 34, a belt 36 to a dogged clutch pulley 40 riding on the main drive shaft 41 of the drive unit 15. The shaft 41 extends parallel to the axis of trunk 25 and is coupled through angle drive bevel gears in the unit 15 and unshown in the drawing to the propeller 23. The shaft 41 is journaled in bearing and seal assembly 42 in the top plate 43 of trunk 25 and in the drive unit 15.

The shaft 41 extends and retracts with the drive unit 15 and carries at its upper end the dog assembly portion of clutch pulley 40 so that the pulley 40 and shaft 41 are operatively connected when shaft 41 is fully extended downward and disengaged when the shaft (and drive unit 15) are retracted one half inch or more. Thus the motor 24 may be started and run while disconnected from the drive unit and engaged by operation of the retraction control 20 (of FIGS. 1 and 2).

The operative connection between the retraction control 20 of FIGS. 1 and 2 and the drive unit 15 is via flexible cable 50 enclosed in sheath 51 which terminates at tube 49. The cable 50 extends into the trunk 25 and is secured to a transverse plate 52 rigidly connected to the drive unit 15 and slidably mounted on three upstanding guide rods or shafts 53, 54 and 55, two of which appear in FIG. 3 and better seen in FIG. 7.

A second transverse plate 56 is also secured to the drive unit 15. This plate 56 is preferably circular or more exactly, conforms to the shape of the trunk 25 and is located immediately above the propeller 23. Whenever the drive unit 15 is extended, the plate 56 substantially closes the trunk 25. The plate 56 operates with the outer closure plate 13 to virtually provide a duct for the propeller to increase its efficiency. It should be noted that the closing plate 13 parallels the hull line and thus produces minimum drag and serves to channel the laminar flow region of water along the hull directly into the propeller region denoted by arrows. Thus propulsion efficiency is enhanced. The plate 56 in addition to closing the trunk 25 during powered operation is effective as an anti cavitation plate.

This latter feature is of less significance than in the case of outboard motors since the through hull mounting in accordance with this invention places the drive unit well below the surface and the entire hull 10 and plate 56 prevent cavitation.

Plate 56 is best seen in FIG. 6 as engaging the three guide rods 53–55 and secured to the drive unit 15. The plate 56 has slight clearance with trunk 25 as the trunk is not intended to be water tight at its lower end. Similarly the bottom plate 13 is not sealed when closed as shown in FIG. 4 and allowing slight entrance and exit of water between the trunk 25 and exterior.

To minimize vibration and harmful misalignment of the drive unit 15 with respect to the shaft 41, the second plate 56 as shown in FIG. 8 includes tapered holes 60 mating with tapered end sections 61 of the rods 53–55, one of which appears in FIG. 8. As the retraction control 20 is moved full forward, the cable 50 of FIG. 3 advances the drive unit 15 and plate 56 this last one/half inch engaging the three tapered extensions of the rods 53–55 firmly wedging the unit in operating position. During that same travel, the clutch pulley 40 engages the dog 44 and shaft 41 and the auxiliary power unit is operational. Its minimum profile while operating is apparent from FIG. 5.

In the description above, the auxiliary power unit of this invention is described as installed with the water line approximately half way up the trunk 25. This arrangement is preferred since maintenance on both the motor 24 and the drive unit 15 may be performed easily without allowing the entrance of water into the boat.

The drive unit 15 may be removed with the boat in the water by merely removing belt 36 and the top cover 43.

In certain installations the trunk is entirely below the water line and the system operates equally well since the top plate 43 is sealed to the trunk 25 and the bearing 42 includes a seal as well.

The above-described embodiments of this invention are merely descriptive of its principles and are not to be considered limiting. The scope of this invention instead shall be determined from the scope of the following claims, including their equivalents.

What is claimed is:

1. A retractable drive unit for boats comprising:
a drive unit including a propeller, a housing, gear means for driving said propeller and a shaft extending generally upward from said housing when said drive unit is mounted for operation on a boat,
a hollow trunk,
means securing said trunk to the hull of a boat sur-
rounding an opening therein,
guide means secured to said trunk paralleling the
shaft of said drive unit, said guide means engaging
said drive unit,
means coupled to said drive unit to extend and re-
tract said drive unit out of and into said trunk,
means coupling said drive unit to a power unit which
is fixed relative to the boat,
said drive unit at its lower end carrying a closure for
the opening in said hull,
said guide means comprising a plurality of longitudi-
nally extending rods including an enlarged end en-
gaging said drive unit at its lowermost extent of
travel to securely position said drive unit in its op-
erating position;
said coupling means including a drive shaft opera-
tively connected to move with said drive unit and
to drivingly engage said power unit as said drive
unit reaches its lowermost extent of travel.

2. The combination in accordance with claim 1
wherein said trunk extends within the hull to above the
waterline of the boat.

3. The combination in accordance with claim 1
wherein said trunk includes a mounting plate secured
to the hull of said boat and including a generally isosce-
les triangular opening therethrough with one vertex ex-
tending in the direction of the bow of the boat and the
triangular opening generally aligned with the center
line of the boat.

4. The combination in accordance with claim 1
wherein said power unit is mounted outside of said
trunk and engages said coupling means above said
trunk.

5. The combination in accordance with claim 1
wherein the end regions of said longitudinally extend-
ing rods are tapered outward to larger diameters and
said drive unit includes tapered holes positioned to en-
gage the tapered end regions of said rods to secure said
drive unit in driving position.

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