ABSTRACT

An exhaust-through hub is provided with mounting brackets for holding a plurality of propeller blade segments each having a blade and a mounting base. The segments are held in the hub by a releasable retainer which can be secured and removed for replacement of the propeller blades without the use of threaded couplings.

3 Claims, 5 Drawing Figures
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REMOVABLE PROPELLER BLADE ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to improvements in marine propellers and particularly to exhaust-through propellers.

2. Description of the Prior Art

Hitherto through-the-propeller exhaust systems have employed a unitary propeller having a plurality of blades integrally formed on a hub. The hub is secured to the propeller shaft by a lock nut threaded on to the shaft. In the event of damage to one of the blades, the entire propeller has to be replaced. Replacement is generally performed when the vessel is removed from the water since corrosion, particularly in salt water, makes removal of the lock nut used to secure the propeller to the propeller shaft, a difficult task and requires a wrench capable of transferring a high torque.

One solution to the difficulty presented by replacing a propeller where damage has occurred to only one blade is to make the blades individually removable from the hub of the propeller. Typical examples of various techniques for this purpose are shown in U.S. Pat. Nos. 3,073,395 and 1,010,929. In general, however, the patented techniques have been directed to propellers of the type not requiring the exhaust of the engine to pass through the propeller. As a result, simple techniques have been employed in these prior art devices for the removal of propeller blades. Equivalent removable blades for exhaust-through propellers, however, have not been available. In addition the prior art removable propeller blades even for the simple non-exhaust-through propeller systems have required threaded couplings to secure the blades to the hub. Due to the ever present problem of corrosion, it has been found that in no practical way could these threaded couplings ever be removed while the vessel remained in the water and in all cases required use of wrenches or other special tools to remove the blades.

Another difficulty with through-the-propeller exhaust systems is that the gaseous exhaust products, unless properly dispersed, can create gaseous pockets around the propeller resulting in cavitation and loss of power. The conventional technique for dispersing the gaseous exhaust products is to direct the products outwardly from the propeller blade by the use of a diverging guide plate at the aft end of the propeller hub. While this technique has proved generally satisfactory, it does not in all cases completely eliminate cavitation problems.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a propeller having easily removable individual blades.

It is another object of this invention to provide a propeller through which passes the products of exhaust from the engine and which is provided with individually removable blades.

It is another object of this invention to provide a propeller having individually removable blades on a hub and in which the blades are held on the hub without the use of threaded couplings.

Basically the invention accomplishes these objects by providing a propeller hub having an outer hub assembly through which products of exhaust can pass from forward to aft of the hub, means provided on the outer hub assembly for mounting a plurality of blade segments each having a blade and a mounting base, and retaining means to hold the blade segments on the outer hub assembly without the use of threaded couplings. The mounting feature is equally applicable to solid hubs in which no exhaust products are present. In the preferred embodiment means are provided for dispersing the exhaust products to prevent cavitation of the propeller blade. In modified forms of the invention, alternative means are provided for dispersing the exhaust products to prevent cavitation.

The advantages of this invention are readily apparent. No tools are needed to change propeller blades. Each blade is attached to the hub throughout the entire root thereby obtaining maximum strength. Each blade segment occupies a full one-third of the hub for greater strength in the hub connection.

DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an exploded isometric of a propeller embodying the principles of the invention.

FIG. 2 is a longitudinal section of the propeller unit shown in FIG. 1.

FIG. 3 is an end elevation looking from aft of the propeller unit shown in FIG. 2.

FIG. 4 is a modified exhaust dispersion member.

FIG. 5 is another modified exhaust dispersion member.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The propeller unit of this invention comprises a hub 10 having an inner hub assembly 12. The inner hub assembly includes a conventional metal and rubber shock resisting sleeve having conventional splines suitable to be fitted over the splines 14 of the propeller shaft 15 of a marine propulsion system. The marine propulsion system can be an outboard motor, or any other marine drive system having exhaust products discharged through the propeller. The hub is further provided with an outer hub assembly 16 that is joined to the inner hub assembly by three spaced webs 18. The outer hub assembly is provided with a mounting bracket 20 for releasably holding a plurality of propeller blade segments 22. Retainer means 24 locks the propeller blade segments into a mounting bracket and includes a retainer ring 26 and a locking band 28. As is well known the hub is held on the propeller shaft by a conventional nut and lock washer 30.

The mounting bracket 20 includes a forward flange 32 and an aft flange 34. Each propeller blade segment 22 includes a blade 36 and a mounting base 38. The blade can be of any suitable size and pitch configuration so that by the simple expedient of replacing one or more of the blade segments damaged blade segments can be replaced. In addition all of the blade segments may be replaced with blades having a different size or pitch to vary the torque output of the propeller.

Each mounting base 38 is provided with forward and aft projections 40 and 44. The forward projection 40 seats against the forward flange 32 and within a recess 46 provided in the forward flange 32. The aft extension 44 seats against the aft flange 34. A longitudinal flange 50 is provided with a longitudinal recess 52 that hooks over a longitudinal edge 54 of the mounting base. To insert a blade segment the mounting base is fitted into the recess 46 and the longitudinal recess 52 and
pressed against the forward and aft flanges 32 and 34. An abutment surface 56 on the outer side of the flange 50 prevents the mounting bases from sliding circumferentially out of the longitudinal recess 32.

The mounting bases 38 are held in the mounting brackets 20 by the retainer ring 26 which has a circumferential projection 58 that slips forwardly over the aft projections 44 of the mounting bases. The mounting bases are provided with equidistantly spaced holes 60. Holes 59 and 61, respectively, are provided in the aft flange 34 and the retaining ring 26 and are alignable with the holes 60. Finally, the locking band 28 is provided with pins 62 held in slots 63 that are alignable, when the band is compressed, to fit through the holes 59, 60 and 61, when the band is allowed to expand. The band is preferably made of spring steel or other suitable resilient material and is split so that the band can be compressed to insert the pins and then expands when released to force the pins to remain in the holes 59, 60 and 61, thus holding the retainer ring 26 and the blade segments 22 tightly assembled in the mounting bracket 20. The pins fit loosely in the slots 63 so that the circumferential movement of the slots as the band expands radially will allow the pins to remain in alignment with the holes 59, 60 and 61.

Other forms of retaining rings may be provided. The important feature of this retaining concept is that ring or the locking band or the like should be removed or installed by simply compressing one of the members without any tools or at most with the use of a rock to break the pins free of corrosion. No threaded connection is used which may become corroded and difficult if not impossible to remove while the vessel is afloat.

The retainer ring 26 in the preferred embodiment is provided with finned or cupped openings 66 that create a vortex as the hub is rotated for dispersing the gaseous exhaust products to prevent cavitation.

An alternative form of exhaust dispersion retainer ring 67 is shown in FIG. 4 and is provided with an annular flange 68 which blocks the exhaust products from moving forwardly against the propeller. The ring in FIG. 4 is also provided with holes 60 as in the preferred embodiment.

Another form of exhaust dispersion retainer ring 77 is shown in FIG. 5. In this more simplified form the ring has an inner outwardly diverging surface 72 terminating at a recess 78, and a straight outer wall. The embodiments of the invention in which a particular product or privilege is claimed are defined as follows:

1. A removable propeller blade assembly comprising a hub adapted to be secured to the output shaft of a boat drive unit, a plurality of removable propeller blade segments each having a blade and a mounting base, receiving means on said hub for supporting the mounting bases, non-threaded means for securing said bases to and releasing the bases from said receiving means, said hub comprising an outer hub assembly, an inner hub assembly and spaced web means securing said outer hub assembly to said inner hub assembly for allowing passage of exhaust gases through said outer hub assembly, said locking means including ring means for encircling said mounting bases and holding them against said receiving means, said locking means including an expandable band having a plurality of appendages, said receiving means, mounting bases and ring means having alignable holes for receiving said appendages whereby the expanded band and ring means interlock the propeller blade segments to the hub.

2. A removable propeller blade assembly comprising a hub adapted to be secured on the output shaft of a boat drive unit, a plurality of removable propeller blade segments each having a blade and a mounting base, receiving means on said hub for supporting the mounting bases, non-threaded means for locking said bases to and releasing the bases from said receiving means, said hub comprising an outer hub assembly, an inner hub assembly and spaced web means securing said outer hub assembly to said inner hub assembly for allowing passage of exhaust gases through said outer hub assembly, said locking and releasing means including ring means for encircling said mounting bases and holding them against said receiving means, said receiving means, said locking means including forward and aft supporting members for supporting inner end surfaces of said mounting bases against radially inward movement, said forward member having a forward recess for receiving the forward end of said mounting bases, and spaced longitudinal flanges each having a recess for receiving a lateral edge of said mounting bases whereby said mounting bases are nested in said forward and longitudinal flanges recesses and against said forward and aft supporting members to firmly support said propeller blade segments on said outer hub assembly, said locking and releasing means including an expandable band having a plurality of spaced appendages, said receiving means, mounting bases and ring means having alignable holes for receiving said appendages whereby the expanded band and ring means interlock the propeller blade segments to the hub.

3. The propeller blade assembly of claim 1, said non-threaded means for locking said bases to and releasing the bases from said receiving means including means for locking and releasing the bases without employing wrenches or the like so that the blade segments can be replaced with ease while the boat is in the water.