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Langlois

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[54] **DETACHABLE PROPELLER BLADE**

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[52] **U.S. Cl.** **416/207,** 416/245

[51] **Int. Cl.** **B63h 1/20**

[58] **Field of Search** ..... 416/205, 207, 93 M, 245 A

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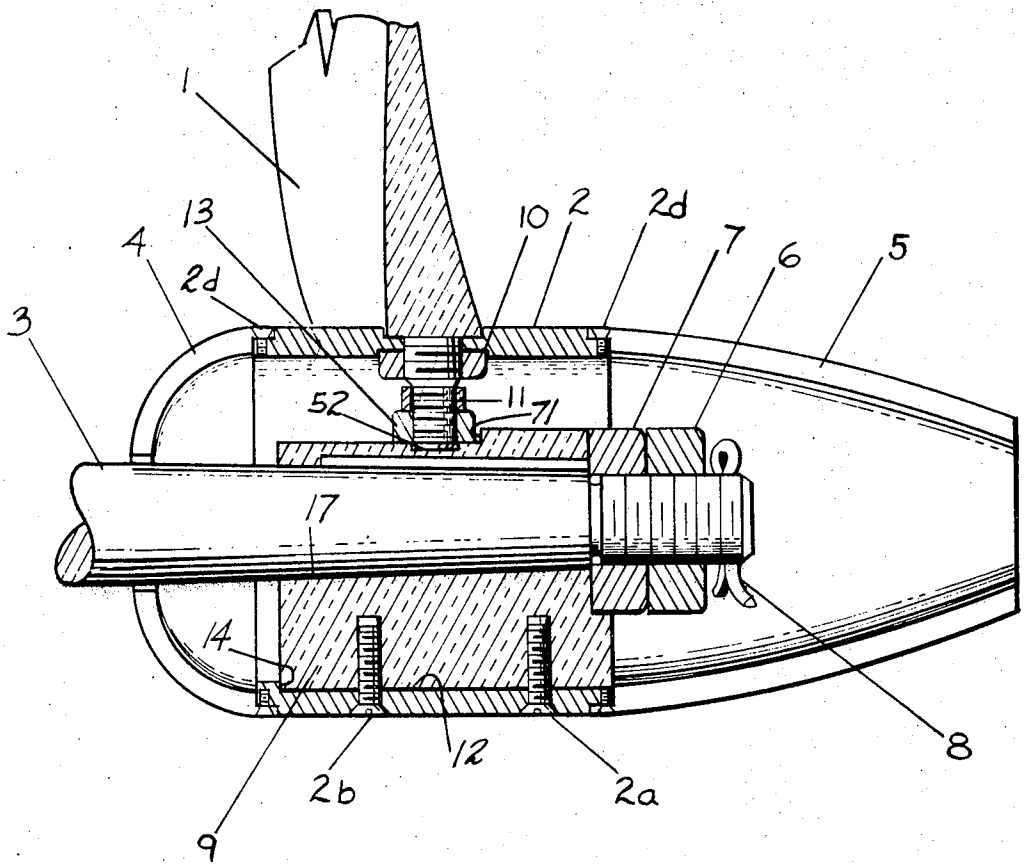
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[57] **ABSTRACT**

A propulsion unit for a watercraft having an annular casing to be axially positioned about the end zone of the drive shaft of the watercraft, the casing being connected to an inner hub to be secured to the drive shaft with spacer portions radially extending from the hub and connecting it to the casing; the casing and hub have means for connecting the blade to the hub, the blades each having a shank portion seated in the hub periphery and extending through a hole, the casing, with the shank of each blade being locked to the hub and casing in a predetermined pitch attitude, the lock being releasible to change the pitch of the blade or to replace it with a different type or configuration thereof.

4 Claims, 6 Drawing Figures



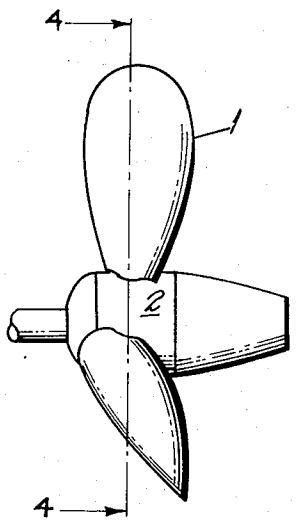


FIG. 1

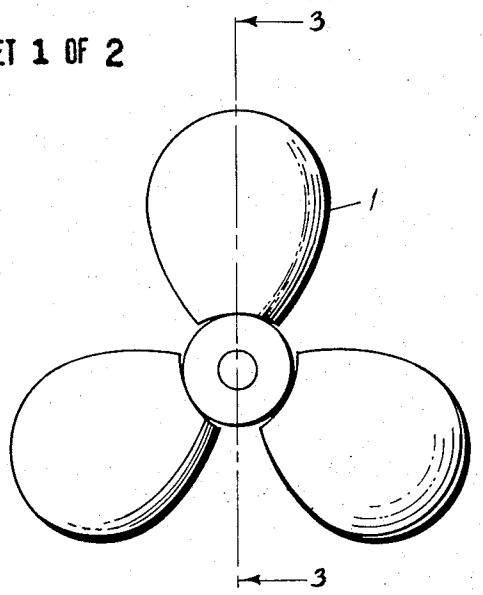


FIG. 2

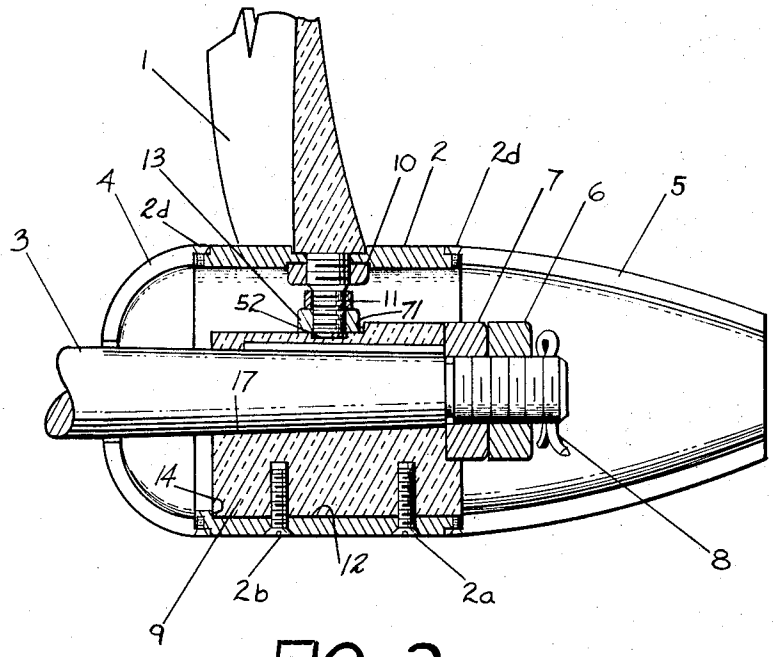


FIG. 3

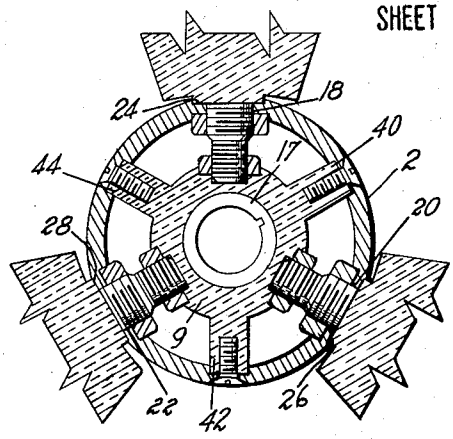


FIG. 4

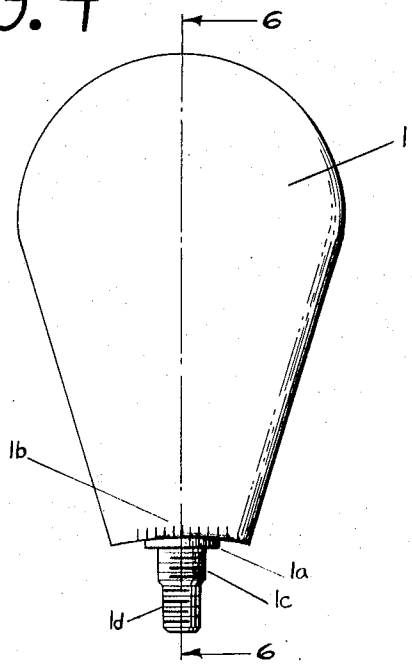


FIG. 5

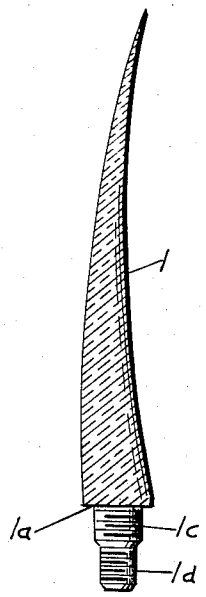


FIG. 6

DETACHABLE PROPELLER BLADE

FIELD OF THE INVENTION

This invention relates to propulsion units for watercraft, and more particularly, to a propulsion unit for a watercraft which is characterized by propeller blades which are adjustable and replaceable.

BACKGROUND OF THE INVENTION

In the past it has been known to provide propeller blades for inboard and outboard propeller devices or propulsion units of the type used on watercraft. It is also known to provide blades which are adjustable in the sense that the pitch of the blades can be varied. It has further been known to provide a structure such that the blades of a unit can be replaced. The present invention relates to that art generally and constitutes an improvement in that new structure is provided for more readily adjusting or replacing propeller blades.

In the past prior art propellers which have adjustable blades have not been of such a structure that would adapt them for attachment to the many various sizes of drive shafts of engines on the market. The present invention is so adapted. It provides an outer casing which carries the blades of the propulsion unit and an inner hub in which the blades are seated and which hub is designed to mate with a particular type of drive shaft but which hub can be replaced by another inner hub sized to mate with a different type of drive shaft. The present invention provides to connect the hub, which is appropriate for the drive shaft to which it is to be mounted, and the outer casing together with the blades and which permits the pitch of the blades to be adjusted or replaced with a different design of blade of a different blade area or shape, to suit the particular use to be made of the craft by the operator.

It is, accordingly, an object of this invention to provide an improved propulsion unit which is provided with replaceable and adjustable blades and includes an inner hub and an outer casing about the hub and means to secure the blades in a predetermined fixed attitude in use, yet adjustable readily by manipulation of nuts included in the structure, which is described more fully hereinafter.

In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with reference to the accompanying drawings in which:

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of a propulsion unit constructed in accordance with this invention;

FIG. 2 is a rear elevation view of the propulsion unit seen in FIG. 1;

FIG. 3 is a view in cross section taken on the plane indicated by the line 3—3 of FIG. 2 and looking in the direction of the arrow;

FIG. 4 is a view in cross section taken from the plane indicated by the line 4—4 of FIG. 1 and looking in the direction of the arrow;

FIG. 5 is a view of a conventional propeller blade; and

FIG. 6 is a view in cross section taken along the plane indicated by the line 6—6 of FIG. 5 and looking in the direction of the arrow.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, after the desired propeller is calculated with respect to diameter pitch and blade area, a center hub **9** is chosen that will accommodate the desired propeller diameter. An outside casing **2** is provided which mates with the desired center hub in the manner described hereinafter. The inner hub has a through bore **17**, see FIG. **4**, to fit the end zone **3** of the shaft to which the propeller is to be mounted, see FIG. **3**. The outside casing **2** is machined with three slots, such as that designated by the numeral **12** in FIG. **4** which extend longitudinally from the outer end almost the length of the casing, stopping short about one-fourth of an inch or so before the inner end of the cylinder, defining a shoulder **14**, see FIG. **3**. These longitudinally extending slots act to position the center hub **9** in the outside casing and to absorb forward thrust and sideways torque. Any suitable connecting means may be employed to connect the propeller to the shaft such as a keyway, spline, etc. Reverse thrust is absorbed by the machine screws **2a** and **2b** and the blade roots **1***a*, **1** *c*, and **1***d*, see FIG. **5**. The outside casing **2** is machined with three main radial holes **18**, **20** and **22** which are set 120° apart, in the case of a three bladed propeller. These holes have a rimmed shoulder **24**, **26** and **28** for the blade bottom **1a** to seat upon and the holes are each of such diameter as to allow the threaded blade end **1***c*, **1***d*, to pass through. An area inside the casing is also machined flat to receive a right-hand threaded stainless steel jamb nut **10**. To secure the center hub **9** and outside casing **2** together, flat head stainless steel machine screws, such as **2***a* and **2***b*, are placed through the outside casing to and into the center hub **9**, such screws being threadably advanced into each protruding spacer portion of the center hub, the spacer portions being designated by the numerals **40**, **42** and **44**. These machine screws **2***a* and **2***b* are installed in pairs at each center hub spacer portion and each pair is located 120° apart. The machined holes for the blades **1** and the holes for the stainless steel machine screws **2***a* and **2***b* are separated by 60° in the embodiment shown of a three bladed propeller. Propellers with more or less blades than three would have a center hub **9** and outside casing **2** shaped and machined respectively to suit the number of blades utilized.

The propeller blades **1** are of cast material or welded pieces with specially threaded end portions **1***a*, **1***d* and **1***c*. Each blade has a machined portion **1***a*, **1***d* and **1***c* at the root end that fits into and through the outside casing **2**. The threaded terminal end **1***d* fits down and into the center hub **9** in the recessed hole **52**, see FIG. **3**, the hole being machined into the hub to receive the threaded blade end. The threaded root of the blade it is seen is characterized by two different diameters. The terminal end, previously described, and an adjacent threaded portion **1c** which is somewhat wider. The wider portion is provided with a right-hand thread and the narrower terminal portion is provided with a left-hand thread. The opposite threads serve to prevent the blade from turning once it has been installed. Stainless steel jam nuts **10** and **13** are used on the threaded portions **1***c* and **1***d* respectively to lock the blade in position; and a ring formed from a strip of lead **11**, see FIG. **3**, is wrapped around the exposed threaded area be-

tween the nuts **10** and **13** to serve as a spacer and to insure that there is no movement.

The outside casing **2** is machined on its inner surface to give a recessed flat area for tightening the jam nut **10** against it. On the outside surface of the outside casing **2** a flat recessed area is machined around each hole where the blade end **1***a*, **1***d* and **1***c* passes through in assembly, the same forming a seat for the blades bearing surface **1***a* intermediate the blade portion and the threaded portions of the root of the blade. The center hub **9** has a flat area machined from the jam nut seat to the inner end of the hub which allows the hub to be slipped into the outer casing with the blade installed, defining a shoulder **71**, see FIG. **3**.

Pitch is set by matching the casted pitch marks **1**b on the blade to the center point bench mark machined on the center area of each blade installation hole. Fiber glass fairing pieces **4** and **5** are fitted over each end of the outer casing to streamline flow over the propeller connecting means described.

ASSEMBLY OF THE PREFERRED EMBODIMENT

The blades are placed into the outer casing and arranged to the desired pitch by using the appropriate marks **1***b*. The large right-hand threaded jam nuts **10** are secured tightly to the wider threaded end of each blade **1***c*. The left-hand jam nut **13** is placed on **1**d and threadably advanced so that the blade end **1**d protrudes below it. The center hub **9** is then slid into place and secured by means of the machine screws **2***a* and **2***b*. The left-hand jam nuts **13** are then tightened down against the center hub **9**. Thereafter, the fairing portions **4** and **5** are secured into place by use of stainless steel flat-head machine screws **2***d*. The propeller is placed on the shaft and secured with nuts **6** and **7** and the carter pin **8**.

It is thus seen that the system is designed primarily to meet the needs of modern boating and is primarily adapted for use on outboard motors, inboard direct or V drive installations and inboard outdrive units. Anywhere a propeller of normal design is used, this propeller as described above may be installed.

What is claimed is:

1. A propeller to be connected to the end zone of a drive shaft comprising:

an annular, axially symmetrical casing to be axially arranged in spaced relation about the drive shaft end zone, said casing having a plurality of circumferentially equi-spaced holes therethrough, the center lines of said holes being coplanar in a transverse plane located in the mid-zone between the ends of said casing, each hole having an inwardly and an outwardly facing seat thereabout defined in the surface of the casing;

a plurality of propeller blades, each having a proximal end with a stepped threaded shank, the shank of each blade extending through one of the holes of the casing, said stepped shanks being of a common length and each having a first threaded length of reduced diameter and a second threaded length of greater diameter, said second threaded length being intermediate the first threaded length and the adjacent end of the blade, said second threaded length being of an axial length greater than the radial thickness of the casing, one of the threaded lengths of said stepped shank being characterized by a right-hand thread and the other of said threaded lengths being characterized by a left-hand thread;

an inner hub on the end zone of the shaft and within the casing, said hub having an inner and an outer axially facing end, and a plurality of radially extending spacer portions;

means to connect the spacer portions to the casing;

means to connect the hub to the shaft; and

a plurality of spaced radial recesses in the surface of the hub, each characterized by a radial center line in said plane and one of said holes being between each spacer;

each of said recesses defining a hole to receive the inner end of one of the blades and having a flat radially facing surface which opens toward the inner end of the hub;

a first nut on the larger diameter portion of the shank of each blade tightened to secure the blade to the casing and securing the blade in a predetermined pitch attitude with respect to the casing;

and locking means for the blade comprising a second nut on the reduced diameter length of the shank and in tight engagement with the surface of the flat of the recess of the hub.

2. The device as set forth in claim **1**, wherein, a rigid annular spacer ring member is lodged between the nuts to prevent axial displacement of the nuts on the shank.

3. The device as set forth in claim **1**, wherein, an annular generally cone-shaped fairing cap with an axially extending through hole to loosely pass the end zone of the shaft and means to connect the base of the cone to the casing.

4. The device as set forth in claim **1**, wherein, a fairing cone is provided and means are provided to connect the fairing cone to the outer end of the casing when arranged about the end zone of a drive shaft.

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