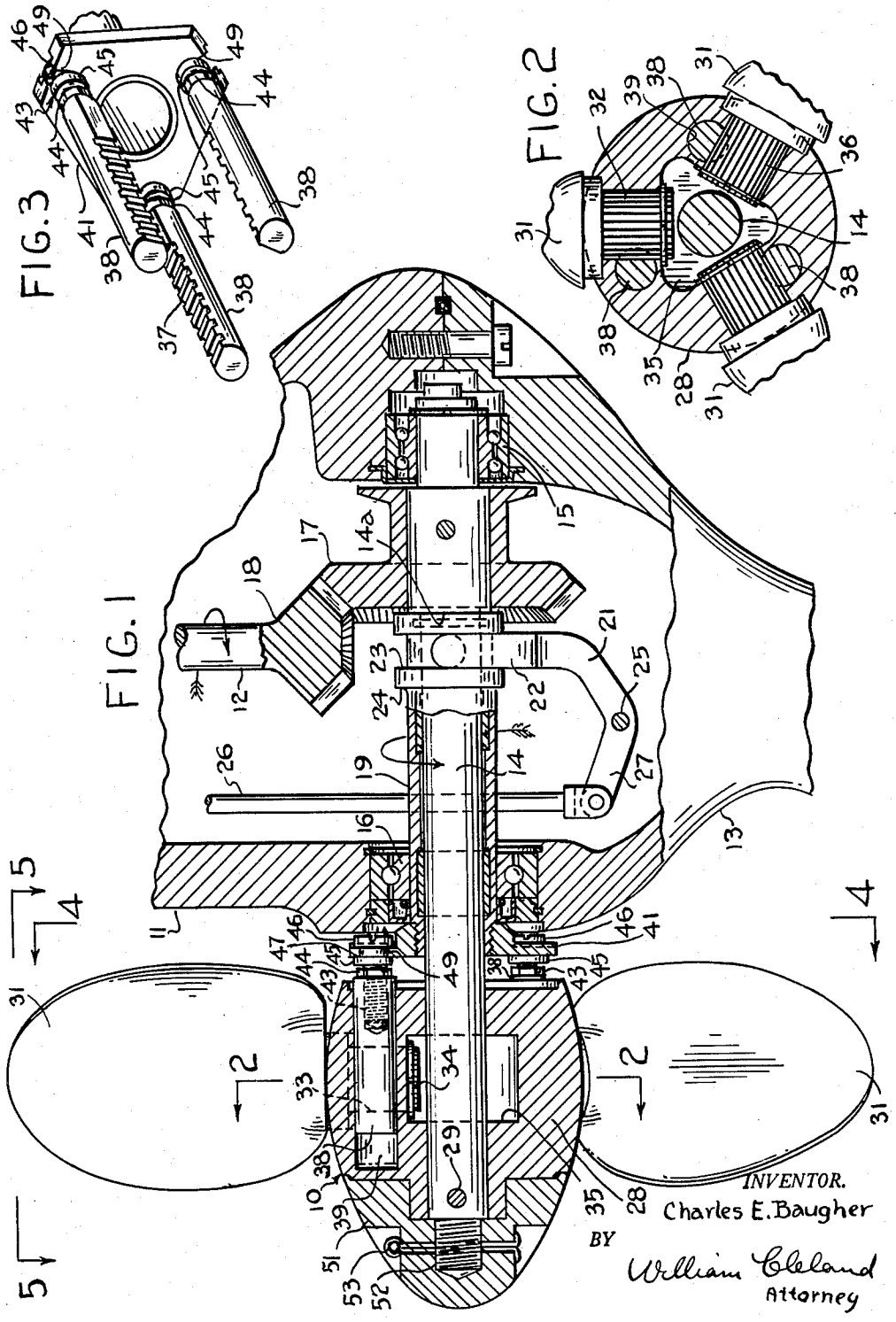
Sept. 19, 1961 C. E. BAUGHER 3,000,447

PROPELLER MECHANISM FOR MARINE VESSELS

Filed July 13, 1959 2 Sheets-Sheet 1



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FIG. 4

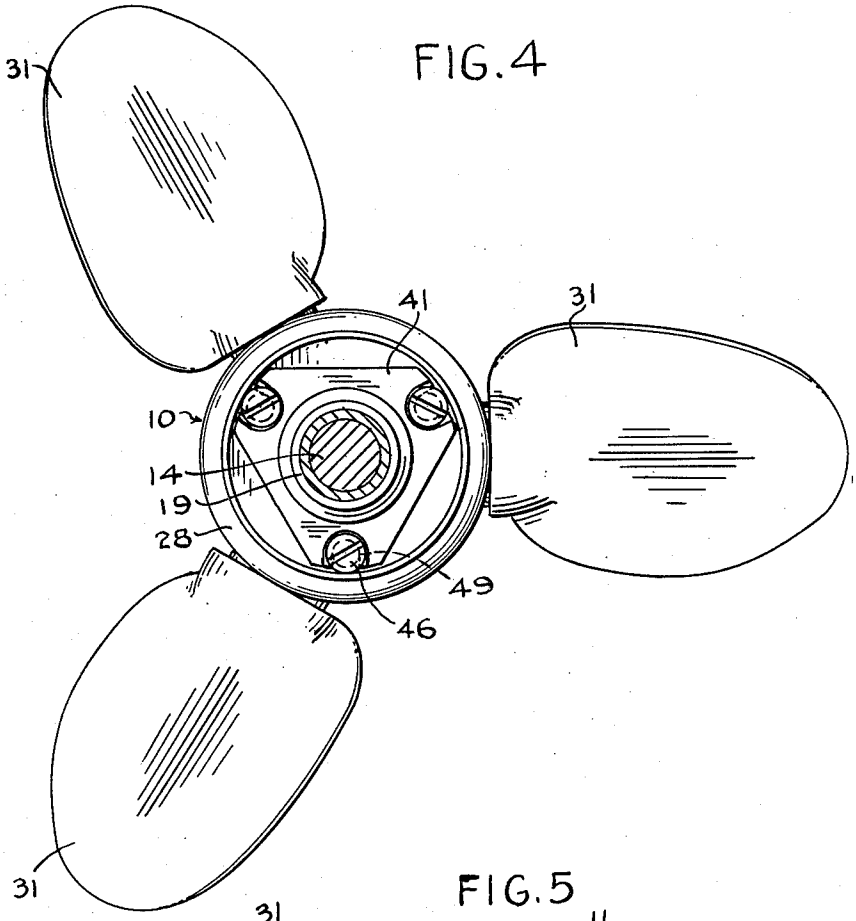
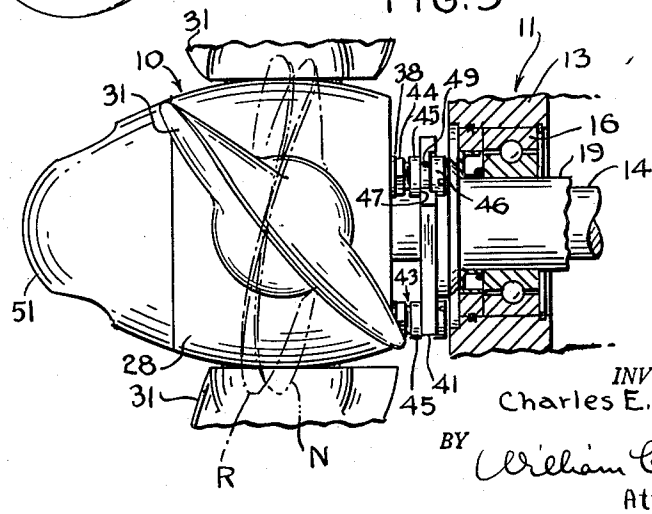


FIG. 5



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PROPELLER MECHANISM FOR MARINE VESSELS

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13 Claims. (Cl. 170—160.43)

This invention relates to a propeller mechanism for marine vessels, and in particular to a propeller unit for outboard motors.

Heretofore, outboard motors for small boats for example, have been provided with various devices for operating the boats in reverse as well as forward directions. These, however, have usually required use of complicated mechanisms, which either required operation of the driven shaft of the propeller in reverse directions, or required such extra housing space that they could not be incorporated in existing motors without creating unwanted complications.

One object of the present invention is to provide a reversible propeller mechanism of the character described which may be incorporated in many existing outboard motors without substantially changing the drives or speed controls thereof.

Another object of the invention is to provide a propeller mechanism of the character described wherein forward and reverse operations of the propeller are accomplished while the propeller shaft is driven in one given direction.

Another object of the invention is to provide an improved propeller unit in which the pitches of the propeller blades thereof may be accurately simultaneously adjusted, by remote control means, within a wide range of pitches, between forward and reverse driving pitches, and including an intermediate neutral or non-driving pitch.

Still another object of the invention is to provide a propeller unit of the character described, including effective means for individually adjusting the accuracy of the pitch range of each propeller blade, with or without removal of the propeller unit from the motor housing.

Another object of the invention is to provide an improved propeller unit wherein the propeller blades are self-locked in the adjusted pitch settings thereof and not subject to being disturbed by water pressure against the blades, whereby the usual hand control for varying the speed of operation of the unit does not require a locking device.

Another object of the invention is to provide a propeller unit of the character described by which the engine speed may be at full throttle to the driven propeller shaft, while the propeller blades are maintained in a neutral, non-propelling pitch, but adapted to be changed to a full forward driving pitch without necessarily lowering the driven speed of the shaft.

Other objects of the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

FIGURE 1 is a vertical cross-section longitudinally through a propeller mechanism, partly broken away, embodying the features of the invention in association with related parts of an outboard motor.

FIGURE 2 is a fragmentary vertical cross-section, taken substantially on the line 2—2 of FIGURE 1, and illustrating the propeller hub with pitch-changing means therein.

FIGURE 3 is a perspective view, partly broken away, of a reciprocable part of said pitch-changing means, removed from the propeller hub.

FIGURE 4 is a vertical cross-section taken substantially on the line 4—4 of FIGURE 1, but with the hub in a different position of rotation thereof.

FIGURE 5 is a top plan view of the propeller mechanism, in part, substantially as viewed on the line 5—5 of FIGURE 1, and illustrating representative variations in the pitches of the propeller blades in full and chain-dotted lines.

Referring to the drawings generally, and to FIGURES 1 to 3 in particular, the numeral 10 designates a propeller unit for an outboard motor 11, having a power-operated vertical driving shaft 12 suitably mounted in a relatively fixed motor housing 13. A driven shaft 14 is horizontally supported between fluid-sealed bearings 15 and 16 in the housing, and is driven by a bevel gear 17, suitably keyed on the shaft 14 and constantly meshing with a bevel gear 18 affixed on the lower end of vertical shaft 12. The shaft 14 is supported by the outer bearing 16 through an elongated sleeve 19, which is longitudinally slidably received with respect to said driven shaft and said bearing 16. The sleeve, however, is adapted to rotate with shaft 14 in a manner to be described later. Sleeve 19 may be axially reciprocated on shaft 14 by means of a pivoted arm 21, having a yoke 22 engaging in an annular groove 23 in a collar 24 integral with the inner end of the sleeve. Arm 21 is pivoted on a fixed pivot 25, to reciprocate the sleeve, by means of a rod 26, pivotally connected to an extension 27 of arm 21, the upper end of the control rod 26 being operably connected in known manner to a suitable hand control device (not shown) either on the top of motor housing 11 or on some remote part of a boat on which the motor is mounted.

Propeller unit 10 may include a solid hub 28 affixed on a free outer end of the driven shaft 14, as by means of a shear pin 29. Mounted on the hub, to extend radially of the axis of rotation of shaft 14, may be a plurality of adjustable-pitch propeller blades 31, 31 (three being shown).

For adjusting the pitches of the respective blades 31, the same may have reduced inwardly extending stem portions 32, 32 rotatably retained in radial bores 33, 33 in the hub, by means of split rings 34 on inner ends of the stems protruding into a central chamber 35 in the hub. At least portions of the stems are provided with peripherally spaced gear teeth 36 which mesh with longitudinally spaced teeth 37 on rack elements 38, 38 slidably or reciprocably received in bores 39, 39 extending axially of shaft 14, from the inner end of the hub. These rack elements may be extensibly or axially adjustably secured on a plate or member 41 threaded or otherwise secured on an outer end portion of sleeve 19, between the housing 13 and the inner end of the hub. The arrangement is such that upon reciprocating the sleeve 19, through operation of rod 26 and arm 21 as described, the plate 41 will reciprocate the rack elements 38, and through meshing engagement with toothed stem portions 32 thereby to rotate the blades 31 in unison. Sleeve 19, while being rotatably mounted on shaft 14, will rotate with the same through the keying effect of the elements 38 between the plate 41 and hub 28. Should shear pin 29 break, the shaft 14 will rotate with respect to sleeve 19, as well as hub 28.

The stroke of reciprocation of sleeve 19 may be limited in extreme opposite positions, or full forward and full reverse positions, by engagement of the plate 41 with portions of the hub 28 and engagement of the opposite end of sleeve 19 a shoulder 14*a* on shaft 14, respectively. Adjustment of the stroke preferably is such that in the extreme forward or full driving pitches of the blades they will have the concave sides facing rearwardly and the general planes thereof will be approximately at an angle of forty-five degrees to a plane at right angles to the axis of shaft 14, substantially as best shown in full lines in FIGURE 5, and in the opposite extreme or full reverse driving pitches, the blades will face forwardly (convex sides rearwardly), with the general planes of the same

approximately at an angle of ten degrees to said right-angled plane, substantially as shown in chain-dotted lines at R in FIGURE 5. In these two extreme forward and reverse positions of the blades the shaft **14**, while the hub is rotated at a selected speed in one direction only (clockwise as indicated by an arrow in FIGURE 1), the blades will be effective to propel a boat (not shown) at full forward and full reverse speeds. By reciprocating the plate **41** and sleeve **19** the effective pitches of the blades may be varied to reduce forward speed pitch to zero, in the neutral position of the blades shown in chain-dotted lines at N in FIGURE 5, and in which the planes of the blades are substantially in said plane at right angles to the axis of shaft **14**. The reverse speeds may be similarly varied between full reverse and zero, but the range of reverse speeds need not be great for obvious reasons.

The effective surface area of the rearward convex side of each blade is equally divided on opposite sides of the radial center line of the blade. The water pressure on the blade therefore, will be the same on both sides of said center line and there will be no tendency for the blade to be turned by water pressure. For this reason the hand control means (not shown) will require no locking device to hold the rod **26** and associated parts in selected positions of adjustment of the pitches of the blades **31**.

Provision may be made for adjusting the accuracy of the individual propeller settings. To this end, each rack element **38** may have a stud **43** threaded in the forward end thereof and locked in threaded axial adjustment by a lock nut **44** threaded on the stud and tightened against the forward end of the element. For mounting the element on plate **41**, the stud **43** may have an integral collar **45** spaced rearwardly of a slotted head **46**, defining an annular groove **47** and a reduced neck **48**, said neck being rotatably retained in one of a plurality of open ended slots **49** extending radially of the edge portion of the plate, by the collar and the slotted head. This arrangement is such that, after releasing nut **44**, the stud **43** may be turned with respect to its relatively non-rotatable element **38**, as by use of a special angled screw-driver blade, and while the hub is secured on shaft **14**, thereby to extend or retract the element **38** with reference to plate **41** and turn the respective blade **31** to attain desired pitch range. When this has been accomplished the lock nut **44** may again be tightened to retain the selected pitch adjustment. It is possible, however, to preset the blade pitch ranges when the propeller unit **10** is assembled and/or mounted on the plate **41** and sleeve **19**.

A streamlined cap or nut **51** may be received on a threaded extension **52** of shaft **14**, and locked in place by a cotter pin **53**. This cap also serves as a safety device to retain the propeller unit on shaft **14** should the shear pin **29** be accidentally sheared off.

It will be self-evident by reference to FIGURE 1 that the propeller unit **10** and the pitch-changing plate **41** may be removed from shaft **14** without disturbing the aforementioned propeller pitch adjustments. For this purpose cotter pin **53** first may be removed to permit removal of cap **51** from threaded end **52** of shaft **14**. Now, upon removal of the safety pin **29**, the hub **28** may be turned with respect to shaft **14**, and thereby, through rack elements **38** to unscrew plate **14** from the threaded outer end of sleeve **19**. This easy operation is very convenient for repairing individual parts of the propeller unit and/or other portions of the mechanism. Conversely, the propeller unit may be remounted on shaft **19** without disturbing said propeller-pitch adjustments. Upon the safety pin **29** being accidentally sheared, the cap **51** will retain the hub on the shaft while the shaft freely rotates, independently of the hub and sleeve **19**.

In use of the improved propeller unit **10** on an outboard motor **11** attached to a boat (not shown), the lever **26** may be operated to shift sleeve **19** to an intermediate position of the latter, in which the propeller blades **31** will be in neutral positions (see intermediate chain-dotted line position in FIGURE 5). With this condition maintained, the engine (not shown), driving the shaft **14** in clockwise direction (see arrow in FIGURE 1) may be operated to relatively high power of the same without substantial effect of moving the boat in the water. When desired steady speed of the shaft **14** is obtained, the rod **26** may again be operated, through the control unit (not shown) to move the elements **38** in either direction, and through the toothed connection with the stem portions **32** to set the blades for any desired speed of movement of the boat within the above-mentioned range, including those requiring forward and reverse pitches of the blades.

As an example, it has often been difficult in the past to operate an outboard motor at uniformly high speed sufficient to tow water skiers to upright positions on the water. With the present structure, however, the motor may be operated to turn shaft **14** at maximum speed or otherwise desirably high speed while the propeller blades are held adjusted in neutral position, in which condition the boat will be stationary. As soon as desired steady high power is achieved, however, the operator may suddenly operate the control rod **26** to adjust the propeller blades to the full forward pitches thereof, in which case the boat will simultaneously move forward at requisite high speed and quickly move the water skier into upright position with a minimum chance of being upset.

With use of the improved propeller unit the propeller blades may be continuously smoothly operated through the entire range of forward and reverse speed pitches thereof, backward and forward, all while the driven shaft **14** and hub **28** thereon are turned in a single direction, at a given or selected r.p.m. The propeller unit, moreover, may be incorporated on existing outboard motors after relatively minor changes in the mounting means thereof, for example, to replace standard propellers of the fixed blade type.

Modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. A propeller drive unit for a driven shaft of a marine power unit including control element rotatably and axially shiftably mounted on the shaft, comprising a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub to the driven shaft to rotate therewith in given direction about the axis of the shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades each mounted on said hub to be rotatable about an axis radially of the longitudinal axis, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially inwardly of one end of the same and communicating with said stem portions, and pitch-adjusting means including a member at said end of the hub having peripherally spaced elements extending therefrom and reciprocable in said passages with reciprocable movement of said member with respect to the hub, said elements and stem portions having interengaging means operable by reciprocation of said member to rotate said blades, said member having means thereon for releasably affixing the same to the control element on the shaft, said hub and pitch-adjusting means being mountable on the shaft as a unit by releasably affixing said hub and member to said driven shaft and said control element, respectively, and said control element being prevented from rotation on the shaft through rigid connection of the pitch-adjusting means between the control element and the hub, whereby accidental release of said releasable means with respect to the shaft will allow the shaft to rotate independently of said control element as well as said adjusting means and said hub while the hub is retained in the shaft by said retaining means.

2. A propeller drive unit for a driven shaft of a marine power unit including control element rotatably and axially shiftably mounted on the shaft, comprising a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub to the driven shaft to rotate therewith in given direction about the axis of the shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades each mounted on said hub to be rotatable about an axis radially of the longitudinal axis, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially inwardly of one end of the same and communicating with said stem portions, and pitch-adjusting means including a member at said end of the hub having peripherally spaced elements extending therefrom and reciprocable in said passages with reciprocable movement of said member with respect to the hub, said elements and stem portions having interengaging means operable by reciprocation of said member to rotate said blades, said member having means thereon for releasably affixing the same to the control element on the shaft, said hub and pitch-adjusting means being mountable on the shaft as a unit by releasably affixing said hub and member to said driven shaft and said control element, respectively, and said control element being prevented from rotation on the shaft through rigid connection of the pitch-adjusting means between the control element and the hub, whereby accidental release of said releasable means with respect to the shaft will allow the shaft to rotate independently of said control element as well as said adjusting means and said hub while the hub is retained in the shaft by said retaining means, means being provided to limit the reciprocation stroke of said member for rotating said blades within an included range of pitch positions thereof in which the general plane of each blade passes from a forward driving pitch position, through a neutral non-driving pitch position in which said general plane is substantially at right angles to said longitudinal axis, to a reverse driving pitch position, whereby said hub is required to be rotated only in one direction for all said included range of pitch positions.

3. A propeller drive unit for a driven shaft of a marine power unit including control element rotatably and axially shiftably mounted on the shaft, comprising a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub to the driven shaft to rotate therewith in given direction about the axis of the shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades each mounted on said hub to be rotatable about an axis radially of the longitudinal axis, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially inwardly of one end of the same and communicating with said stem portions, and pitch-adjusting means including a member at said end of the hub having peripherally spaced elements extending therefrom and reciprocable in said passages with reciprocable movement of said member with respect to the hub, said elements and stem portions having interengaging means operable by reciprocation of said member to rotate said blades, said member having means thereon for releasably affixing the same to the control element on the shaft, said hub and pitch-adjusting means being mountable on the shaft as a unit by releasably affixing said hub and member to said driven shaft and said control element, respectively, and said control element being prevented from rotation on the shaft through rigid connection of the pitch-adjusting means between the control element and the hub, whereby accidental release of said releasable means with respect to the shaft will allow the shaft to rotate independently of said control element as well as said adjusting means and said hub while the hub is retained in the shaft by said retaining means, means being provided to limit the reciprocation stroke of said member for rotating said blades within an included range of pitch positions thereof in which the general plane of each blade passes from a forward driving pitch position, through a neutral non-driving pitch position in which said general plane is substantially at right angles to said longitudinal axis, to a reverse driving pitch position, whereby said hub is required to be rotated only in one direction for all said included range of pitch positions, means being provided for adjusting said elements axially with respect to said member to adjust said included pitch range.

4. A propeller drive unit for a driven shaft of a marine power unit including control element rotatably and axially shiftably mounted on the shaft, comprising a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub to the driven shaft to rotate therewith in given direction about the axis of the shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades each mounted on said hub to be rotatable about an axis radially of the longitudinal axis, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially inwardly of one end of the same and communicating with said stem portions, and pitch-adjusting means including a member at said end of the hub having peripherally spaced elements extending therefrom and reciprocable in said passages with reciprocable movement of said member with respect to the hub, said elements and stem portions having interengaging means operable by reciprocation of said member to rotate said blades, said member having means thereon for releasably affixing the same to the control element of the shaft, said hub and pitch-adjusting means being mountable on the shaft as a unit by releasably affixing said hub and member to said driven shaft and said control element, respectively, and said control element being prevented from rotation on the shaft through rigid connection of the pitch-adjusting means between the control element and the hub, whereby accidental release of said releasable means with respect to the shaft will allow the shaft to rotate independently of said control element as well as said adjusting means and said hub while the hub is retained in the shaft by said retaining means, said retaining means being a cap releasably locked in threaded connection with the outer end of said shaft.

5. A propeller drive unit for a driven shaft of a marine power unit including control element rotatably and axially shiftably mounted on the shaft, comprising a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub to the driven shaft to rotate therewith in given direction about the axis of the shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades each mounted on said hub to be rotatable about an axis radially of the longitudinal axis, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially inwardly of one end of the same and communicating with said stem portions, and pitch-adjusting means including a member at said end of the hub having peripherally spaced elements extending therefrom and reciprocable in said passages with reciprocable movement of said member with respect to the hub, said elements and stem portions having interengaging means operable by reciprocation of said member to rotate said blades, said member having means thereon for releasably

affixing the same to the control element on the shaft, said hub and pitch-adjusting means being mountable on the shaft as a unit by releasably affixing said hub and member to said driven shaft and said control element, respectively, and said control element being prevented from rotation on the shaft through rigid connection of the pitch-adjusting means between the control element and the hub, whereby accidental release of said releasable means with respect to the shaft will allow the shaft to rotate independently of said control element as well as said adjusting means and said hub while the hub is retained in the shaft by said retaining means, means being provided to limit the reciprocation stroke of said member for rotating said blades within an included range of pitch positions thereof in which the general plane of each blade passes from a forward driving pitch position, through a neutral non-driving pitch position in which said general plane is substantially at right angles to said longitudinal axis, to a reverse driving pitch position, whereby said hub is required to be rotated only in one direction for all said included range of pitch positions, means being provided for adjusting said elements axially with respect to said member to adjust said included pitch range, said interengaging means being meshing teeth on the stem portions and the respective reciprocable elements.

6. A propeller drive unit for a driven shaft of a marine power unit including control element rotatably and axially shiftably mounted on the shaft, comprising a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub to the driven shaft to rotate therewith in given direction about the axis of the shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades each mounted on said hub to be rotatable about an axis radially of the longitudinal axis, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially inwardly of one end of the same and communicating with said stem portions, and pitch-adjusting means including a member at said end of the hub having peripherally spaced elements extending therefrom and reciprocable in said passages with reciprocable movement of said member with respect to the hub, said elements and stem portions having interengaging means operable by reciprocation of said member to rotate said blades, said member having means thereon for releasably affixing the same to the control element on the shaft, said hub and pitch-adjusting means being mountable on the shaft as a unit by releasably affixing said hub and member to said driven shaft and said control element, respectively, and said control element being prevented from rotation on the shaft through rigid connection of the pitch-adjusting means between the control element and the hub, whereby accidental release of said releasable means with respect to the shaft will allow the shaft to rotate independently of said control element as well as said adjusting means and said hub while the hub is retained in the shaft by said retaining means, means being provided to limit the reciprocation stroke of said member for rotating said blades within an included range of pitch positions thereof in which the general plane of each blade passes from a forward driving pitch position, through a neutral non-driving position in which said general plane is substantially at right angles to said longitudinal axis, to a reverse driving pitch position, whereby said hub is required to be rotated only in one direction for all said included range of pitch positions, means being provided for adjusting said elements axially with respect to said member to adjust said included pitch range, said interengaging means being meshing teeth on the stem portions and the respective reciprocable elements, each said blade having equal surface areas at opposite sides of the radial axis thereof, whereby the respective blades retain the adjusted pitches thereof unaffected by water pressure against said surfaces.

7. A propeller mechanism for a marine vessel, comprising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudinal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and blades and thereby to adjust the pitches of the respective said blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means.

8. A propeller mechanism for a marine vessel, comprising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudinal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and blades and thereby to adjust the pitches of the respective said blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means, said retaining means being a cap releasably locked in threaded connection with the outer end of said shaft.

9. A propeller mechanism for a marine vessel, comprising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing

said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudinal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and blades and thereby to adjust the pitches of the respective said blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means, means being provided to limit the reciprocation stroke of said sleeve for rotating said blades within an included range of pitch positions thereof in which the general plane of each blade passes from a forward driving pitch position, through a neutral non-driving pitch position in which said general plane is substantially at right angles to said longitudinal axis, to a reverse driving pitch position, whereby said hub is required to be rotated only in one direction for all said included range of pitch positions.

10. A propeller mechanism for a marine vessel, comprising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudinal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and blades and thereby to adjust the pitches of the respective said blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means, means being provided for adjusting said elements axially with respect to said member to adjust said included pitch range.

11. A propeller mechanism for a marine vessel, comprising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudnal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and blades and thereby to adjust the pitches of the respective said blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means, means being provided for adjusting the included pitch range of each blade in either direction with respect to neutral pitch positions thereof.

12. A propeller mechanism for a marine vessel, comprising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudinal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and blades and thereby to adjust the pitches of the respective said blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means, means being provided for adjusting the included pitch range of each blade in either direction with respect to neutral pitch positions thereof, each said blade having equal surface areas at opposite sides of the radial axis thereof, whereby the respective blades retain the adjusted pitches thereof unaffected by water pressure against said surfaces.

13. A propeller mechanism for a marine vessel, com-

prising a housing, a shaft rotatably mounted in said housing and adapted to be driven, a hub having a central opening therethrough for rotatable reception of the shaft therethrough, releasable means for non-rotatably affixing said hub on said shaft, retaining means releasably affixed on the outer end of said shaft for retaining the hub on the shaft independently of said releasable means, a plurality of propeller blades, each mounted on said hub to rotate about an axis radially of the longitudinal axis, a sleeve rotatably and longitudinally shiftably received on said shaft, means for shifting said sleeve longitudinally of said shaft, and means operable by shifting said sleeve for rotating said blades in unison to selected relatively fixed positions with respect to said hub to change the respective pitches thereof, said blades having radially extending stem portions rotatable therewith within the hub, said hub having peripherally spaced passages extending axially from the inner end of the same and communicating with said stem portions, and pitch-adjusting means including a member releasably affixed on the outer end of said sleeve and having spaced elements thereon shiftably received in said passages, said elements and corresponding stem portions having intermeshing means operable by shifting said elements with the sleeve to rotate the stem portions and

blades, said sleeve normally being prevented from rotation on said shaft through rigid connection of said pitch-adjusting means between said sleeve and said hub, whereby upon release of said releasable means said shaft is free to rotate independently of said rigidly connected sleeve and hub while the hub is retained on the shaft by said retaining means, said member having open-ended radial slots defining spaced guide portions, each said element having a screw part axially adjustably threaded in the ends thereof and the screw part being provided with an annular groove receiving said guide portions, whereby the screw part is rotatable, but axially non-shiftable with respect to the member, said screw parts being rotatable to adjust the elements axially with respect to said stem portions, and means being provided for locking said screw parts and stems against relative turning thereof in various positions of axial adjustment.

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