June 22, 1954 A. M. ROSSMAN 2,681,632

OUTBOARD MOTOR WITH ADJUSTABLE PITCH PROPELLER

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FIG. 1

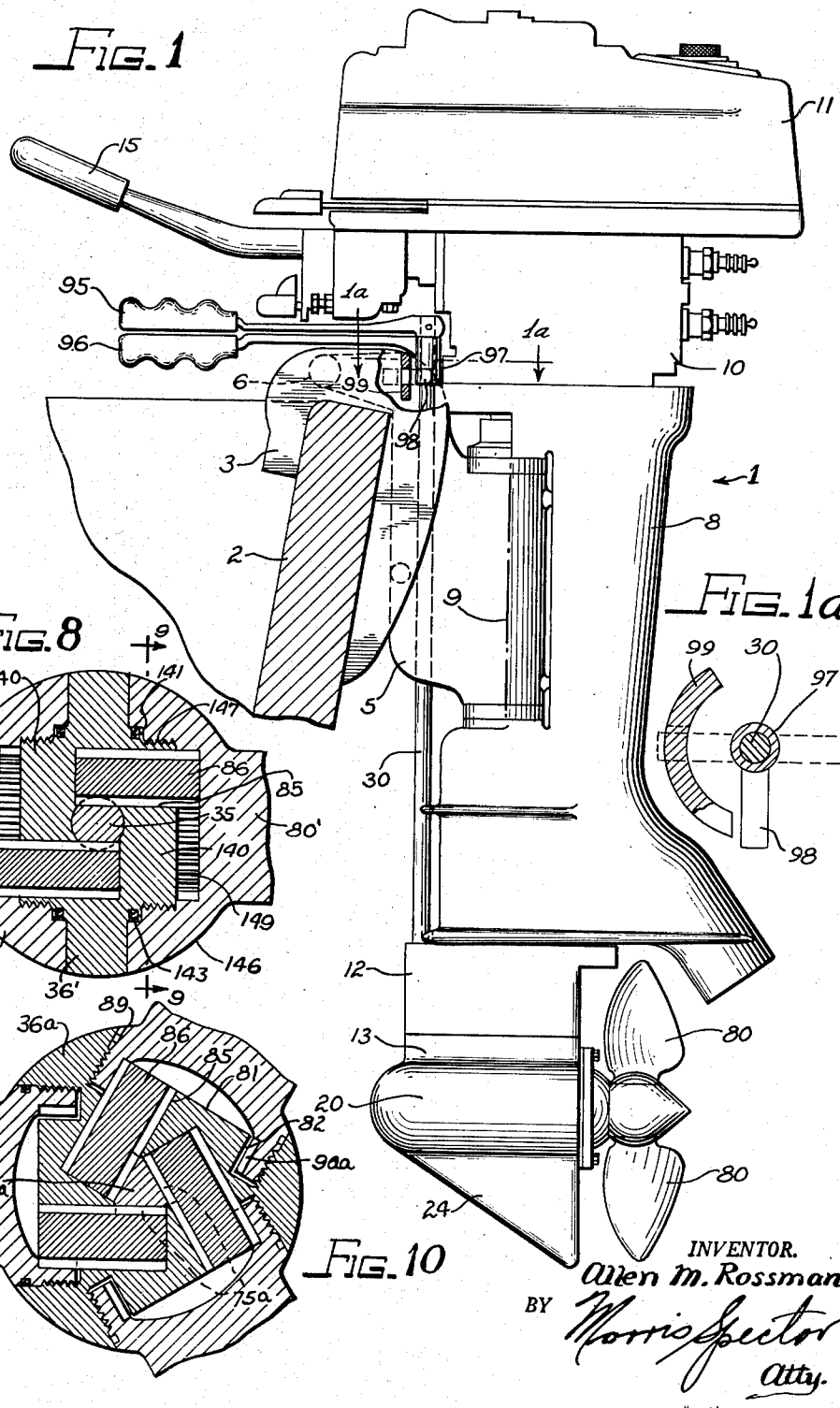


FIG. 1a

FIG. 8

FIG. 10

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FIG. 2

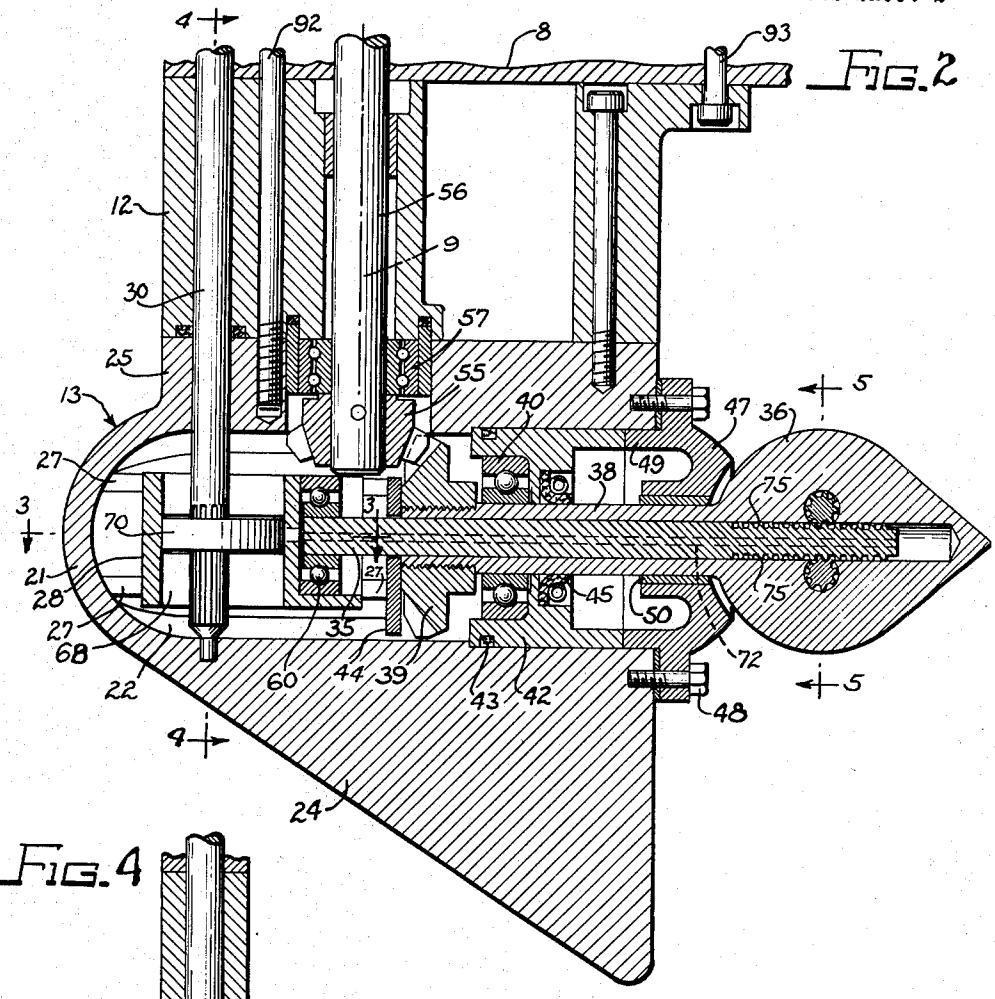


FIG. 4

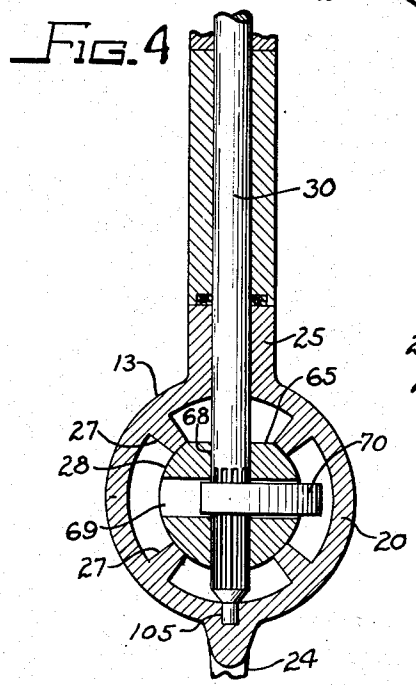
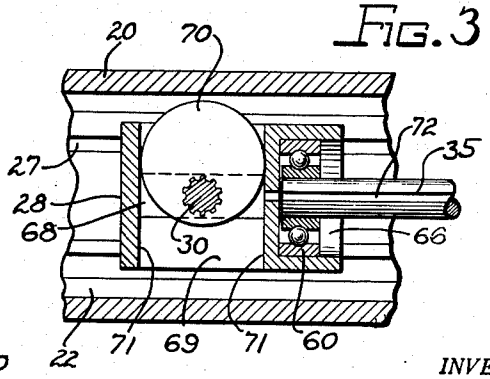


FIG. 3



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FIG. 5

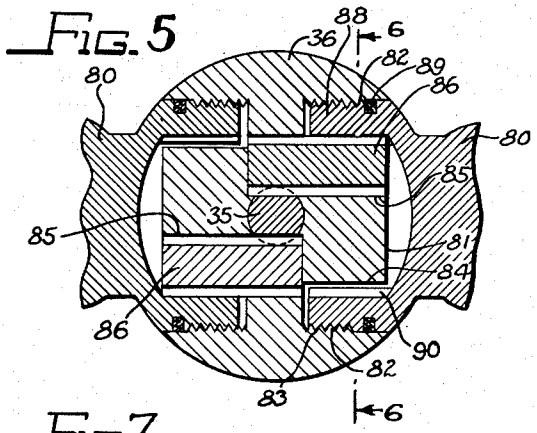


FIG. 6

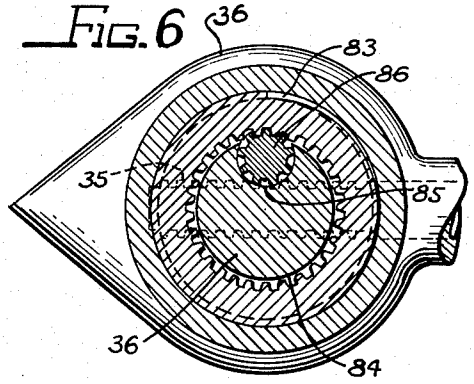


FIG. 7

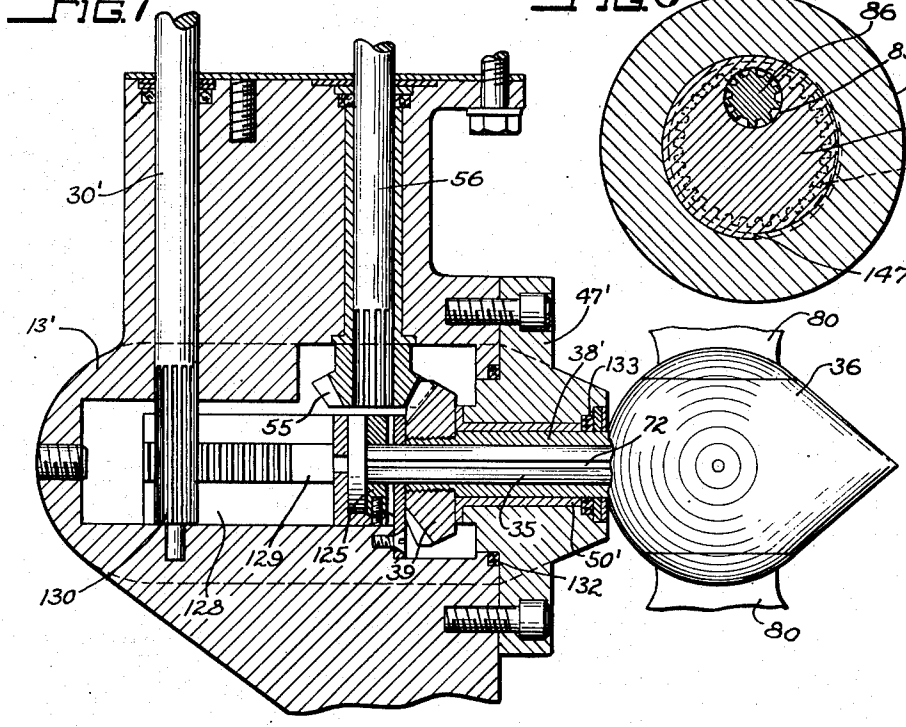
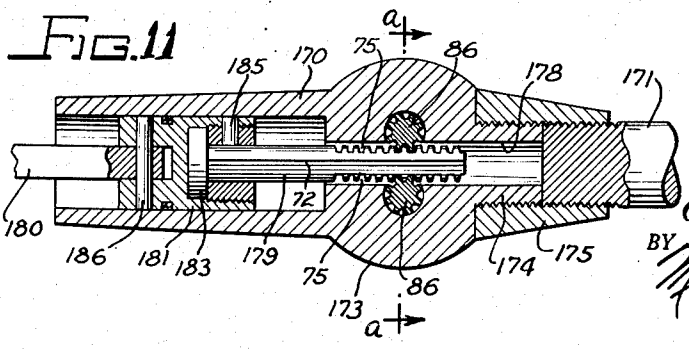


FIG. 9

FIG. 11



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UNITED STATES PATENT OFFICE

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OUTBOARD MOTOR WITH ADJUSTABLE PITCH PROPELLER

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Application June 20, 1949, Serial No. 100,235

10 Claims. (Cl. 115—17)

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This invention relates to adjustable pitch propellers and, more particularly, to such propellers as may be adjusted an amount sufficient to effect a complete reversal of the direction of drive by the propeller. In its more specific aspects the present invention is concerned with propellers for boats, wherein the speed is varied by changing the propeller pitch. The invention is particularly applicable to propellers driven by outboard motors.

It is one of the objects of the present invention to provide an improved means for mounting an adjustable pitch propeller in a hub. In the preferred embodiment of the present invention the propeller blade is adjustable about an axis that extends radially of the axis about which the blade rotates when in operation. Each blade is adjusted angularly by means of an internal gear that is part of the propeller blade, and a pinion, one end of which is in mesh with the internal gear and the opposite end of which is in mesh with a rack that extends axially of the propeller hub. The pinion that connects the rack with the propeller blade is offset from a radial position in the hub. This offset facilitates the location of the propeller blades with their axes of adjustment extending radially, with a resulting improvement in the efficiency of the propeller blades.

It is a further object of the present invention to provide improved means for holding the pitch adjusting pinion in the propeller hub. In accordance with the principles of the present invention the pinion is located in a cylindrical bore in the hub, which bore is of a diameter only sufficiently greater than the diameter of the pinion to allow a minimum of clearance between them. The cylindrical wall of the bore acts as a bearing for the pinion thus eliminating the need of a central bearing for the pinion.

It is a further object of the present invention to provide an outboard motor with an improved gearing mechanism for transmitting the propeller pitch adjusting motion. In an outboard motor of the type with which the present invention is primarily concerned there is provided a vertical drive shaft which terminates in an underwater unit that includes a gear housing from which extends the propeller shaft that is driven by the vertical drive shaft. The gear housing also contains the gearing for adjusting the pitch of the propeller. It is one of the objects of the present invention to provide a suitable gear housing for such purposes, which gear housing is simple in construction and economical of manufacture and which lends itself particularly for use as part of the underwater unit of an outboard motor for boats.

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Outboard motors are generally mounted in such a manner as to permit swinging of the entire unit to bring the underwater portion of the unit out of the path of any obstruction that may be encountered by the bottom of the unit. When such a unit is operated to reverse the direction of movement of the boat there is a tendency for the underwater unit to swing upwardly or in a direction outwardly of the water. To prevent such occurrence during rearward movement of the boat there is provided means for locking the motor unit against upwardly swinging of the underwater part. In dealing with a unit wherein change in the direction of operation of the boat is effected by changing the pitch of the propeller blades it has been proposed to provide a lock for locking the unit against swiveling, which lock is brought into action as the pitch adjusting handle is actuated to change from forward to reverse motion. There is a serious objection to utilizing a single handle for performing the pitch adjustment function and also the function of locking the unit against tilting. When a boat that is driven by an outboard motor is operating at a high speed and it is desired to reverse the propeller blade by adjusting the pitch thereof, it is found that as the pitch of the propeller is being changed a condition sometimes is reached when the momentum of the boat is carrying it in a forward direction faster than the corresponding propeller speed even before the pitch adjusting handle has reached its reverse drive position and before the unit has been locked against tilting. During that interval of time there is a tendency for the whole motor unit to swing about its pivot due to the reaction of the water against the forward moving propeller unit. When this occurs then the continued manual movement of the pitch control lever to bring the propeller blades into reverse driving position may not be effective to lock the unit. It is an object of the present invention to provide means for overcoming the above difficulty. This, in the preferred embodiment of the invention, is effected by providing two separate handles, one for adjusting the pitch and the other for locking the unit against tilting. The two handles are so arranged that in the normal operation of the unit both may be gripped simultaneously in one hand and moved together. However, when desired the lock-actuating handle may be actuated independently of the pitch adjusting handle. When

changing from a forward to a reverse direction of operation of the boat it is desirable first to operate the locking handle to lock the unit against swinging and then to operate the pitch adjusting handle to its reverse direction position.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is an elevational view of an outboard motor embodying the present invention;

Figure 1*a* is a fragmentary sectional view taken along the line 1*a*—1*a* of Figure 1;

Figure 2 is an enlarged longitudinal sectional view of the gear housing which is the bottom of the underwater portion of the motor of Figure 1;

Figure 3 is a sectional view taken along the line 3—3 of Figure 2;

Figure 4 is a sectional view taken along the line 4—4 of Figure 2;

Figure 5 is a sectional view taken along the line 5—5 of Figure 2;

Figure 6 is a sectional view taken along the line 6—6 of Figure 5;

Figure 7 is a view corresponding to Figure 2 and illustrating another embodiment of the present invention;

Figures 8 and 10 are sections corresponding to Figure 5 and showing alternate ways of mounting the propeller blades in the hub;

Figure 9 is a section taken along the line 9—9 of Figure 8; and

Figure 11 is a longitudinal sectional view showing this invention as applied to an inboard motor.

Reference may now be had more particularly to the drawings wherein like reference numerals designate like parts throughout.

In Figure 1 there is shown, at 1, an outboard motor embodying the present invention, said motor being shown as mounted on a boat in a conventional manner. The stern of the boat is indicated fragmentarily at 2, and at 3 is indicated a bracket for mounting an outboard motor, that bracket being clamped to the stern in the usual manner. A motor supporting arm 5 is pivoted to the bracket 3 to swing about a horizontal pivot 6. A casing 8 is supported on the arm 5, being pivoted to swing about an axis 9. The casing 8 constitutes at its upper end a support for an internal combustion engine 10 and gasoline tank 11, and at its lower end a support for an underwater unit comprising a spacer 12 and a gear case 13. The casing 8 is mounted on the arm 5 in a conventional manner, and the engine 10 and gas tank 11 are secured on the casing in the usual manner. The entire unit that is mounted on the arm 5 may be swung about the axis 9 by means of a handle 15 for steering the boat, as is conventional. The casing 8 also constitutes an underwater exhaust for the engine 10, as is usual in the art. The usual drive shaft from the engine extends through the casing 8 to the gear housing 13 for transmitting power to drive the propeller, as will be more fully described as this specification proceeds.

Reference may now be had more particularly to Figure 2 which shows a vertical cross section through the gear housing 13. The gear housing 13 comprises a casting having a horizontal cylindrical portion 20 that is closed at one end by a curved wall 21 which is an integral part of the casting. There is thus formed a cylindrical space 22 that is open at one end to receive the propeller hub and the gearing, bearings, etc., for the propeller. At its lower end the cylindrical portion 20 has a central fin 24 that acts as a rudder and also serves to protect the propeller from articles in the path of the propeller. At its upper end the cylindrical portion 20 has a lengthwise extending rib 25 for securing the gear housing to the rest of the motor unit.

On the interior of the cylindrical portion 20, at one end thereof, there are formed four inwardly projecting, lengthwise extending tracks 27 that constitute a support for a cam follower 28 which will be described more fully as this specification proceeds. It is sufficient here to state that the cam follower is movable longitudinally in the cylindrical portion 20 when actuated to do so by a cam that is splined on an axially rotatable pitch adjusting rod 30. The cam follower 28 is non-rotatable and is provided for reciprocating a pitch adjusting shaft 35 that is longitudinally slidable in but rotates with a propeller hub 36. The propeller hub includes a streamlined blade-receiving portion from which a hollow shaft 38 extends into the gear housing. The shaft 38 has a bevel gear 39 at the end thereof within the housing and is journalled in a thrust ball bearing 40 the outer race of which is pressed into a mounting ring 42 that is slip fitted into the housing and suitably gasketed at its outer periphery by a ring gasket 43 to effect a watertight seal. A plate 44 assists the thrust bearing 40 in preventing longitudinal movement of the shaft 38 and the gear 39 in the assembled unit. The plate 44 bears against the ends of the tracks 27 and may be held against rotation in any desired manner. A water sealing spring pressed packing 45 is provided for effecting a watertight seal between the shaft 38 and the inner periphery of the ring 42. The ring 42 is maintained in place in the gear housing by a closure plate 47 that is suitably bolted to the gear housing as by two bolts 48. To that effect the closure plate 47 has a ring portion 49 that engages the end of the ring 42. The plate 47 also has a bushing 50 that constitutes a bearing for the shaft 38. The shaft 38 is rotated by a bevel gear 55 that is in mesh with the gear 39. The bevel gear 55 is keyed to a drive shaft 56 that is suitably journalled in ball bearings 57 in the rib 25 of the gear housing 13. At its upper end the drive shaft 56 is driven by the internal combustion engine 10.

As previously stated, the pitch adjusting shaft 35 rotates with the shaft 38 but is longitudinally movable therein. A ball type thrust bearing 60 secures the shaft 35 to the non-rotatable cam follower 28 in such a manner that movement of the cam follower to the right or to the left results in a corresponding movement of the pitch adjusting shaft 35.

The cam follower 28 consists of a solid cylindrical block of metal that is slabbed off at the top, as indicated at 65 (Fig. 4), and that has a bearing-receiving bore 66 formed at one end thereof. The outer race of the ball bearing 60 is secured within the bore 66 and the inner race is secured to the pitch adjusting shaft 35, so that movement of the cam follower produces corresponding movement of the pitch adjusting shaft. In addition, the cam follower 28 has a vertical slot 68 formed therein which extends through the full height of the follower, that slot being of sufficient width to permit the pitch adjusting rod 30 to pass therethrough, and of a length in a horizontal direction sufficient to permit the follower the requisite freedom of mo-

tion without the follower stopping against the pitch adjusting rod 30. The cam follower 28 also has a horizontal slot 69 therethrough within which is located a cam 70 that is keyed to the pitch adjusting rod 30. The cam 70 may consist of a circular disk that is mounted on the pitch adjusting rod 30 eccentrically. The cam turns in the slot 69 and acts upon the walls 71—71 of the cam follower to move the cam follower lengthwise on the tracks 27—27.

The pitch adjusting shaft 35 has one or more longitudinally extending oil grooves 72 in the periphery thereof to permit the exchange flow of oil between the hub 36 and the interior of the gear housing as the shaft 35 is moved. At the end of the pitch adjusting shaft 35 opposite the thrust bearing 60 the shaft has two gear racks 75—75.

The portion of the hub 36 in which the propeller blades are mounted is streamlined. In the construction herein shown the hub is constructed to receive two propeller blades, indicated at 80—80. For mounting each propeller blade the hub 36 is slabbed off to provide a flat surface 81, and is machined to provide a deep annular groove 82. The outer wall of the groove 82 is screw threaded, as indicated at 83. The inner wall is comparatively smooth, as indicated at 84. A cylindrical bore 85 is formed in the hub 36 extending from the flat surface 81 to a depth appreciably greater than the depth of the annular groove 82. The bore 85 is eccentric of the groove 82. An elongated pinion 86 fits into the bore 85. The pinion is rotatable within the bore 85, with the extremities of the teeth sliding against the wall surface 85 of the bore, which surface therefore acts as a journal for the pinion 86 within the bore. The pinion 86 is in mesh with the gear teeth of the rack 75.

Each propeller blade 80 has a shank 88 in the form of a ring that is externally threaded to engage the threads 83 in the propeller hub. A ring gasket 89 is provided for sealing against the entrance of water into the hub at the joint between the propeller shaft and the hub. The shank 88 has an internal ring gear 90 formed therein, the teeth of which are in mesh with the pinion 86 and clear the smooth wall 84 of the deep groove 82. Thus, longitudinal movement of the pitch adjusting shaft 35 turns the pinions 86 each of which pinions turns the corresponding propeller blade 80.

The gear case 13 is secured to the casing 8 in any desired manner, as by bolts 92—93.

The pitch adjusting rod 30 extends upwardly from the gear housing 13, through the spacer 12, and terminates at its upper end in two handles 95—96. The handle 95 is keyed to the pitch adjusting rod 30 and is rotatable through an angle of approximately 180° to effect the corresponding turning of the pitch adjusting rod 30. The handle 96 has a collar 97 as a part thereof, which collar is freely rotatable on the pitch adjusting rod 30. The collar 97 has a locking lug 98 integral therewith and extending radially therefrom. As the handle 96 is turned, the lug 98 comes into a position where it enters a slot in an arcuate flange 99 that extends downwardly from the top of the mounting bracket 3 and is integral therewith. When the lug 98 is outside of the slot the entire motor unit is free to turn about the pivot 6 as a center. This turning is necessary to permit the underwater unit to swing clear of any obstructions that may be engaged by the rudder fin 24. When the handle 96 is turned to bring the lug 98 into the slot in the flange 99 the lug prevents swinging of the unit 1 about the pivot 6. This is necessary when the motor is driving the boat in reverse or when the boat is coasting and moving at a speed greater than the speed at which it would be driven by the corresponding rotation.

The handles 95 and 96 are arranged so that they can both be gripped in one hand simultaneously and both turned together. Turning of the handle 95 effects pitch adjustment. When the handle 95 is in any position such that the pitch of the propeller tends to drive the boat forward, the corresponding position of the handle 96 is such that the lug 98 is free of its locking slot. When the handle 95 is in a position such that the propeller tends to drive the boat backwards the corresponding position of the handle 96 is such that the lug 98 is in locking engagement in its slot so that the motor unit 1 is locked against swinging about the pivot 6 in a direction counter-clockwise as seen in Figure 1.

While the boat is being manipulated, either during forward movement of the boat or backing movement of the boat, or in changing from backing to forward movement, the two handles 95 and 96 are operated together. When it is desired to change quickly from forward movement to rearward movement it is desirable that the locking handle 96 be operated in advance of the handle 95 to lock the motor unit against tilting before the pitch of the propeller has been changed to "reverse drive." This is due to the fact that at times, as the propeller pitch is being changed from forward to reverse movement, the reaction of the water on the propeller due to the momentum of the boat may tend to swing the unit about the pivot 6 in a direction counter-clockwise as seen in Figure 1. This action may take place even before the propeller has been adjusted to the reverse driving position. To avoid that action the handle 96 may be operated in advance of the handle 95 to lock the unit against swinging about the pivot 6.

The thrust of the water on the propeller blades may create a force tending to turn the blades within the hub. This turning action is transmitted through the pinions 86 to the rack 75 so that there is an axial thrust on the rotating shaft 35. This thrust is transmitted through the thrust bearing 60 to the cam follower, which in turn transmits it to the cam 70. As an aid in resisting this thrust the bottom of the pitch adjusting rod 30 is journalled in a groove 105 at the bottom of the gear casing. The thrust of the cam follower 28 against the cam 70 is a thrust between two members that are stationary with respect to one another most of the time, since the rotating thrust is taken by the thrust bearing 60. The movement between the cam 70 and the cam follower 28 takes place only when the cam 70 is turned to adjust the pitch of the propeller.

In order to remove the gearing, etc., from within the housing 20 it is merely necessary to slide the rod 30 upwardly out of the cam 70 and above the follower 68, then, upon unbolting the bolts 48 the entire mechanism within the space 22 may be easily withdrawn through the open end of the housing.

The entire gear housing 13 may be filled with a lubricating grease or oil, which grease or oil extends also into the hub 36 and fills the spaces between the pinions 86 and the bore 85. The pitch adjusting shaft 35 has a pair of longi-

tudinal grooves in the periphery thereof to permit the flow of oil from one end of the shaft to the other end thereof as the shaft 35 is moved further into or out of the propeller hub.

Reference may now be had more particularly to Figure 7 wherein there is shown a modification of the embodiment of the invention previously described. Insofar as the structure of Figure 7 is the same as Figure 6, identical reference numerals have been used. One of the differences between the structure of Figure 7 and that of the embodiment previously described lies in the fact that instead of the ball bearing type of thrust bearing 60 at the end of the pitch adjusting shaft 35 there is here substituted an "Oilite" metal bearing 125 between the rotatable pitch adjusting shaft 35 and the reciprocating but non-rotatable carriage structure 128 that corresponds to the cam follower 28. The "Oilite" bearing consists of very small metal particles pressed tightly together and sintered to form a porous mass, which mass is then impregnated with oil. The carrier 128, here as in the embodiment previously described, slides lengthwise in the gear housing 13'. This sliding movement is obtained by means of a rack 129 formed in the carriage, the rack having gear teeth in mesh with teeth 130 on the pitch adjusting rod 30'. The bevel gear 39 on the propeller shaft 38' is driven by the bevel gear 55 on the end of the engine driven shaft 56 as in the embodiment previously described, and thus drives the propeller shaft. In this instance the shaft 38' that corresponds to the shaft 38 of Figure 2 is journalled in a bearing 50' that is located in a ring 47' that is bolted to and constitutes a closure for the gear housing. A ring gasket 132 provides a water-tight seal between the closure plate 47' and the opening of the gear housing. A suitable water sealing gasket 133 seals against leakage of water into the gear housing around the periphery of the rotatable propeller shaft.

Reference may now be had to Figure 8 which is a view corresponding to Figure 5 and shows a modified hub structure. In this instance the hub structure, indicated at 36', has integral therewith two opposite circular bosses 140 that are externally screw threaded, the threads terminating at an annular shoulder 141 that surrounds each boss, said shoulder having a peripheral groove therein for receiving a circular sealing gasket 143. Each boss 140 has a cylindrical bore 85 formed therein for receiving the pinion 86 that is in mesh with the teeth on the rack of the pitch adjusting shaft 35. The longitudinal axis of each bore 85 is parallel to the longitudinal axis of its boss and is located eccentrically thereof, as in the case of the corresponding bores of the structure of Figure 5. Each propeller blade, indicated at 39', terminates at a base 146 a portion of the outside of which is of the shape of a part of a sphere of the same radius as the radius of the spherical surface of the propeller hub 36'. The inside of the base has a bore therein that is internally threaded, as indicated at 147, to thread over the boss 140. At the end of the bore the base 146 has an internal gear 149 formed therein that is in mesh with the pinion 86. The base 146 has a counterbore that makes a sliding fit on the annular shoulder 141 of the hub 36' and makes a sealing fit with the gasket 143. It is believed that the operation of the pitch adjusting propeller, in the embodiment illustrated in Figures 8 and 9, will be apparent from the description previously given in connection with the first described embodiment of the invention.

The propeller of the present invention may include more than two propeller blades if desired. In Figure 10 there has been illustrated a manner of mounting three propeller blades on the hub of an outboard motor constructed in the manner illustrated in Figures 1 and 2. In this instance the propeller hub is indicated at 36*a* and the rack end of the pitch adjusting shaft is indicated at 35*a*. The pitch adjusting shaft 35*a* has three sets of racks, indicated at 75*a*, the racks being at 60° to one another. The propeller hub 36*a* in this instance has three hub-receiving slots or annular grooves 82 that are identical with the grooves 82 illustrated in Figures 5 and 6, the three grooves 82 in Figure 10 being centered on axes 120° apart. The three pinions 86 are mounted in bores 85, as in the embodiment illustrated in Figure 5, said bores being eccentric of the center of flat surfaces 81 in the propeller hub structure.

Reference may now be had to Figure 11 that shows the present propeller mounting means as mounted on a hub of a boat driven by an inboard motor. The inboard motor and the connections therefrom for driving the propeller hub may be of any preferred construction. It is sufficient here to state that the underwater driving part of the unit includes a hub structure 170 that is keyed to rotate with and be driven by an engine driven, axially rotatable drive shaft 171 that rotates the hub and with it the propeller blades that are mounted thereon. The hub structure includes a spherical portion 173 that has a cylindrical externally threaded shank 174 that is, in this instance, secured to the drive shaft by a threaded adaptor 175. A longitudinal cylindrical bore 178 is formed in the hub centrally thereof for receiving a pitch adjusting shaft 179 that rotates with the hub but is longitudinally slidable therein. The pitch adjusting shaft 179 is secured to a non-rotatable longitudinally movable shaft 180 by means of a thrust bearing structure 181. The thrust bearing structure is an "Oilite" bearing. The bearing consists of two parts screw threaded together and receiving between them a cylindrical disk head 183 that is centered on and secured to the shaft 179. The two "Oilite" parts are keyed together by a pin 185. The shaft 180 is secured to the bearing by a pin 186. As a result of this arrangement the bearing is non-rotatable in the hub but is slidable therein, and the pitch adjusting shaft 179 rotates in the bearing.

A section of the hub structure, taken along the line *a*—*a*, would appear exactly as Figure 5, or as Figures 8 or 10, if those embodiments were used.

Adjustment of the pitch of the propeller blades is obtained by producing relative longitudinal movement of the pitch adjusting shaft 179 with respect to the hub 170. This may be done in either of two ways. In one type of inboard motor the hub structure 170 is mounted so that it cannot move longitudinally as it is rotated. In this type of structure pitch adjustment is made by moving the shaft 180 further into or out of the hub. In another type of inboard motor the shaft 180 is held against longitudinal movement and the rotatable drive shaft with its connected hub structure is mounted for controlled longitudinal movement so that as the hub is moved to the right or to the left, as seen in Figure 11, there is a corresponding rotation of the pinions 86 on the gear racks 75.

In compliance with the requirements of the patent statutes I have here shown and described

a few preferred embodiments of my invention. It is, however, to be understood that the invention is not limited to the precise constructions here shown, the same being merely illustrative of the principles of the invention. What I consider new and desire to secure by Letters Patent is:

1. An outboard motor having an underwater unit comprising a gear housing, a propeller shaft rotatable in said housing and extending therefrom, a reciprocable pitch adjusting member extending lengthwise of the shaft and rotatable therewith, a slide member in the housing, means in the housing engaging and guiding the slide member for movement in a direction lengthwise of the propeller shaft, a thrust bearing for the pitch adjusting member, said bearing being mounted on the slide member, means for holding the slide member against rotation, said last means including a rotatable pitch adjusting rod extending at substantially right angles to the propeller shaft into the housing, and actuating means connecting the rod with the slide member for actuating the slide member for pitch adjustment of the propeller upon turning of the rod.

2. An outboard motor having an underwater unit comprising a gear housing, means mounting the unit for turning about one axis for steering and about another axis at a substantial angle to the first axis for swinging the unit out of the way of obstruction, a propeller shaft rotatable in said housing and extending therefrom, a reciprocable pitch adjusting member extending lengthwise of the shaft and rotatable therewith, a slide member in the housing, means in the housing engaging and guiding the slide member for movement in a direction lengthwise of the propeller shaft, a thrust bearing for the pitch adjusting member, said bearing being mounted on the slide member, means for holding the slide member against rotation, said last means including a rotatable pitch adjusting rod extending at substantially right angles to the propeller shaft into the housing, actuating means connecting the rod with the slide member for actuating the slide member for pitch adjustment of the propeller upon turning of the rod, an actuating handle secured to the rod for actuating the same, and means for locking the motor unit against turning about said second axis and including a second handle independent of said first handle and rotatably mounted on the rod and movable independently of the first handle and adjacent the first handle in a position to enable both handles to be gripped by one hand for joint operation.

3. A propeller type drive unit for boats, said unit including an adjustable pitch propeller and having means for hingedly mounting the unit on a boat in a position for swinging the propeller out of the water, means for adjusting the pitch of the propeller from forward to reverse drive, said last means including an actuating handle, means for locking the unit against swinging of the propeller portion thereof out of the water, a second actuating handle, an actuating connection between the locking means and the second handle, said two handles being separately operable and being adjacent one another in position to enable both handles to be gripped by one hand for joint operation.

4. In an outboard motor, an underwater unit comprising a gear housing having a longitudinal bore, an adjustable pitch propeller assembly comprising a rotatable propeller shaft and a pitch adjusting shaft concentric of one another and longitudinally slidable with respect to one another, said assembly including longitudinally movable means for actuating the pitch adjusting shaft and means for holding the longitudinally movable means against rotation and including also bearing means connecting said longitudinally movable means with the pitch adjusting shaft, said assembly including also a driving gear secured to the propeller shaft and a mounting ring, means for securing the mounting ring to the outer one of the two shafts said last named means including a bearing for the outer shaft, said first named means and said driving gear being both on one side of said mounting ring, adjustable pitch propeller blades mounted on the propeller shaft on the opposite side of the mounting ring, gearing connecting the blades to the pitch adjusting shaft, and means for securing the assembly to the housing with the inserted parts of the assembly within the bore.

5. An outboard motor having an underwater unit comprising a gear housing, a propeller shaft rotatable in said housing and extending therefrom, a reciprocable pitch adjusting member extending lengthwise of the shaft and rotatable therewith, a slide member in the housing, means in the housing engaging and guiding the slide member for movement in a direction lengthwise of the propeller shaft, a thrust bearing for the pitch adjusting member, said bearing being mounted on the slide member, means for holding the slide member against rotation, said last means including a rotatable pitch adjusting rod extending at substantially right angles to the propeller shaft into the slide member, and actuating means within the slide member connecting the rod with the slide member for actuating the slide member for pitch adjustment of the propeller upon turning of the rod.

6. An outboard motor having an underwater unit comprising a gear housing, a propeller shaft rotatable in said housing and extending therefrom, an adjustable pitch propeller driven by said shaft, a pitch adjusting rod extending into the housing, an actuating handle, means connecting the handle with the rod for actuating the rod upon actuation of the handle, and means for locking the motor unit, a second handle movable independently of the first handle means mounting the second handle for movement over substantially the same path of movement as the first handle, said mounting means locating the second handle adjacent to the first handle in a position to enable both handles to be gripped by one hand for joint operation, and an actuating connection between the locking means and the second handle.

7. A propeller type drive unit for boats, said unit including an adjustable pitch propeller and having means for hingedly mounting the unit on a boat in a position for swinging the propeller out of the water, means for adjusting the pitch of the propeller from forward to reverse drive, a pivoted actuating handle, an actuating connection between said handle and said last named means for operating said last named means upon operation of the handle, means for locking the unit against swinging of the propeller portion thereof out of the water, said second means includnig a second pivoted actuating handle, said two handles being separately operable and being pivoted about the same axis and being adjacent one another in position to enable both handles to be gripped by one hand for joint operation.

8. A structure such as is defined in claim 3 wherein there is provided means including a

third actuating handle for turning the unit to steer the boat, said two first-mentioned actuating handles being between the third handle and the aforementioned means for mounting the unit on a boat.

9. An outboard motor having an under water unit comprising a gear housing, a propeller shaft rotatable in said housing and extending therefrom, a reciprocable pitch adjusting member extending lengthwise of the shaft and rotatable therewith, a non-rotatable slide member in the housing, means in the housing engaging and guiding the slide member for movement in a direction lengthwise of the propeller shaft, a thrust bearing for the pitch adjusting member, said bearing being mounted on the slide member, a pitch adjusting rod extending at substantially right angles to the propeller shaft into the housing, and actuating means connecting the rod with the slide member for actuating the slide member for pitch adjustment of the propeller upon movement of the rod.

10. An outboard motor having an under water unit comprising a gear housing, a propeller shaft rotatable in said housing and extending therefrom, a reciprocable pitch adjusting member extending lengthwise of the shaft and rotatable therewith, a non-rotatable slide member in the housing, means in the housing engaging and guiding the slide member for movement in a direction lengthwise of the propeller shaft, a thrust bearing for the pitch adjusting member, said bearing being mounted on the slide member, a pitch adjusting rod extendnig into the housing at substantially right angles to the propeller shaft, and actuating means within the slide member connecting the rod with the slide member for actuatnig the slide member for pitch adjustment of the propeller upon movement of the rod.

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