March 7, 1961 R. E. LADEWIG 2,973,738

HINGED MARINE DRIVE UNIT

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FIG. 1

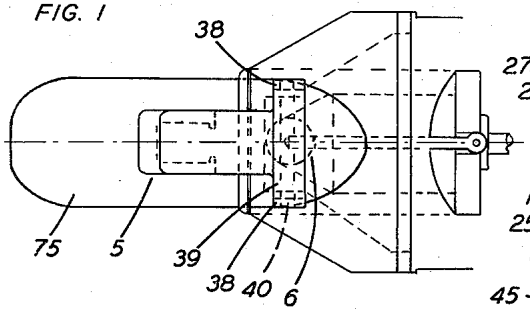

FIG. 2

FIG. 5

FIG. 4

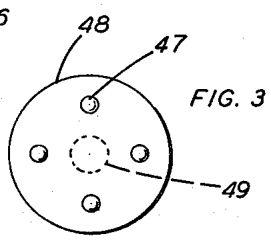

FIG. 3

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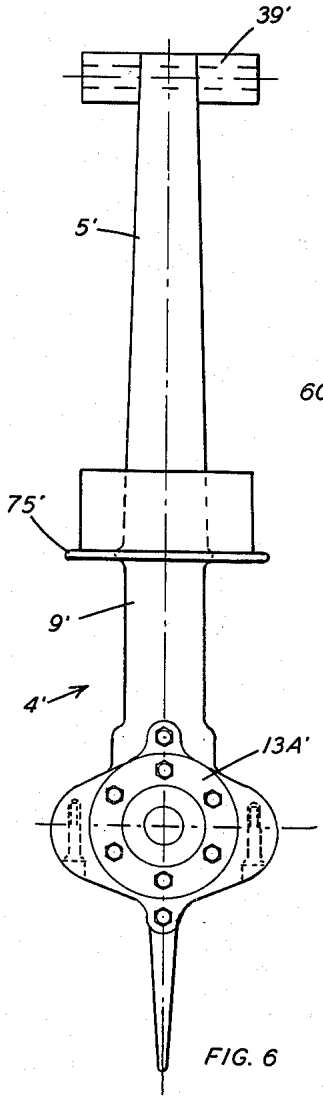

FIG. 6

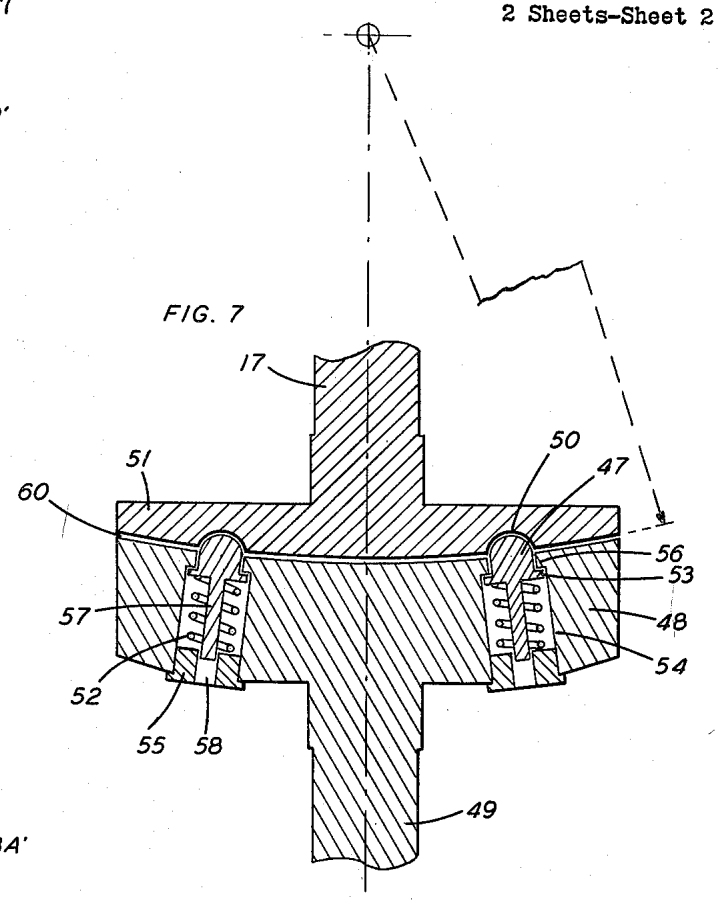

FIG. 7

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HINGED MARINE DRIVE UNIT

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2 Claims. (Cl. 115—41)

This invention relates generally to marine drive units and more specifically to a unit of this type which is employed on craft which may be used in relatively shallow water and which craft is known as an inboard motorboat.

Another object is to provide an improved marine drive unit which includes a power transmission arrangement from an upper gear box section to a lower propeller fin section which permits instant disengagement of the propeller fin section when the latter contacts an underwater obstruction and which permits automatic reengagement after the obstruction has passed.

A further object is to provide an improved marine drive unit which includes a completely gear driven transmission arrangement to drive an underwater propeller unit which arrangement will disengage at one set of gears upon a predetermined force on said propeller unit and which arrangement will permit automatic remeshing of said gears upon the removal of said force.

A still further object is to provide a marine drive unit having an upper gear section and a separable lower propeller fin section which is so constructed as to permit the latter section to pivot away from and become disengaged from the gear section when desired, and yet to permit steering to be accomplished through the propeller fin section both before and after disengagement.

And yet another object is to provide a normal drive unit which is made in two separable sections having a quick disconnect unit between and not enclosed by either section to permit instant service should the need arise.

An additional object is to provide a marine drive unit of the type described which employs a positive quadrant arm for steering the entire propeller unit thus eliminating the need for a geared steering unit.

And another object is to provide a marine drive unit having a unique single piece combination steering and tilt yoke.

A further object is to provide a marine drive unit comprising an upper gear housing and pivoted thereto a lower propeller housing, each housing including a common power drive arrangement extending therethrough and in which unit the entire connection between the housing is at the common pivot pin and through a separate device in the common drive arrangement.

Another object is to provide a marine drive unit of the type described which has a power drive arrangement including meshing spur gears on two parallel drive shafts to permit instant disengagement of said power drive and which unit includes guiding means in the immediate vicinity of the gears to provide instant and accurate re-engagement of said spur gears.

Another object is to provide a marine drive unit of this type wherein the propeller section may tilt up to avoid an obstruction and may drop back into engagement, all while the engine and gear box section gears continue to rotate.

These and other objects will be apparent from an examination of the following drawing and specification in which:

Figure 1 is a front elevational view of the marine drive unit of this invention shown in outline form.

Figure 2 is a side elevational view of the device taken in cross section along the lines 2—2 of Figure 1.

Figure 3 is a fragmentary cross sectional view of a modified arrangement of the separable unit of this invention.

Referring now more particularly to the characters of reference on the drawing, it will be observed that the complete marine drive unit, indicated generally at 2, includes an upper gear box section 3, a lower propeller fin section 4, a tilt arm 5 integral with section 4 and connected to section 3 through a single piece tilt and steering yoke 6, and a separable quick disconnect unit 7 which is common to both sections 3 and 4 but is external to either section's housing 8 and 9 respectively.

The upper gear box section 3 is attached to the stern of a boat (not shown) by means of a transom bracket 10 which is integral with housing 8 as a functional unit but is made separately and attached by capscrews 11 for convenience of fabrication. A horizontally positioned bearing cage 12 including a retainer cap 13 and a vertically positioned bearing cage 14 with retainer cap 15 are also installed in housing 8 to rotatably support power drive shaft 16 and upper transmission shaft 17 and their meshing right angle bevel gears 18 and 19 respectively. Gears 18 and 19 are held in place and adjusted for wear by means of threaded nuts 20 which tighten their respective gears and shafts against a pair of spaced and opposed tapered roller bearings 21 and 22 which latter bearings are engaged by a shoulder 23 of shafts 16 and 17 and which former bearings (21) are directly engaged by gears 18 and 19. Appropriate fluid seals 24 are installed where required to prevent oil leakage around shafts 16, 17, and O rings 25 are installed at all mating surfaces for the same purpose. Steering and tilt yoke 6 is rotatably inserted in an opening 26 at the top of housing 8 and is retained therein by a lower cap plate 27 which overlaps the adjoining walls of housing 8 and which is held in place relative to yoke 6 by a capscrew 28. The top part of yoke 6 includes a projecting lip 29 which also overlaps the walls of housing 8 so that the lip 29, cap plate 27, and O rings 25 which are positioned between yoke 6 and housing 8, all combine to provide a rotatable, leak proof connection for this junctional yoke 6.

A steering quadrant arm 35 is threaded or otherwise attached at 36 to yoke 6 from the direction of the boat and passing through an elongated opening 37 in housing 8 so that lateral movement may be imparted to arm 35 from an occupant or mechanism in the boat. The upper end of yoke 6 includes a pair of upstanding ears 38 which are connected to ear 39 of tilt arm 5 by means of a pivot pin 40. As small guide block 45 is attached to the side of arm 5 which is adjacent the gear section 3 and this block 45 in cooperation with a quadrant ring 46 acts as both a guide for the relative movement of the arm 5 and fin section 4 when these units are turning in unison about gear sections 3 and also as a stop to prevent overswing of fin section 4 when the latter drops back to its initial vertical position as shown in Figure 2.

At this position, buttons 47 of the lower concave head 48 of transmission shaft 49 are in circumferential alignment with recesses 50 of upper convex head 51 of shaft 17. When shaft 17 rotates only a fraction of a revolution, buttons 47, under the urging of springs 52 acting on button shoulder 53, will seek out and engage the aligned recesses 50 and thus provide a drive connection between shafts 17 and 49. Springs 52 and button 47 are both held in place in counterbore 54 by cap 55 which threads into the lower end of counterbore 54 and slightly

compresses spring 52 against the bottom of button 47 and thus forces the button shoulder 53 against the shoulder 56 of counterbore 54. Buttons 47 each include an integral projecting guide rod 57 which aligns with a center hole 58 of the cap 55 to prevent the button from becoming cocked at any position of its vertical travel. Rod 57 is of a sufficient length that when the button 47 is fully extended and shoulder 53 is in engagement with counterbore shoulder 56 a small length of rod 57 is contained in and guided by the center hole 58. When a sufficiently large force or resistance is encountered by the lower fin section 4 when the latter is travelling through the water, a moment arm is applied through fin section 4 and its attached arm 5 and about hinge pin 40 to raise section 4 in a clockwise direction and during this action a sufficient lateral force is applied at head 48 of disconnect unit 7 to cause the buttons 47 to be depressed by the rear surface edges of recesses 50 as the head 48 swings along the cooperating arcs 60 of heads 48 and 51, and the propeller 65 swings upward along a larger radius but concentric arc 66 which is shown in phantom in Figure 2. It will be observed that when a sufficient resistance is encountered by fin section 4, such as would be occasioned if the boat carrying marine drive unit 2 were travelling in water that was too shallow for the size of unit 2, that section 4 would automatically break the connection (7) between transmission shafts 17 and 49 even though power drive shaft 16 and shaft 17 continued to rotate. It will be further noted that no damage will be occasioned to any of the operating parts involved either at this break-away or at the subsequent re-engagement of quick disconnect unit 7. Not only may the boat engine (not shown) continue to operate and drive shafts 16 and 17 all during the break-away and re-engagement period, but steering through arm 35, yoke 6, arm 5 and fin section 4 may also be carried on during this period.

Fin section 4 contains a horizontally positioned bearing cage 70 which includes opposed tapered roller bearings 71 which rotatably support a short horizontal output shaft 72 having a propeller assembly 65 at its outer end and being keyed to a bevel gear 73 at its inner end. The construction details of gears 73 and its mating gear 74 and their corresponding shafts and associated parts correspond to the similar parts called out heretofore relative to gear box section 3, and where referred to will carry an "A" suffix in this specification. The uppermost end of housing 9 terminates in an elongated flat platform 75 to which arm 5 is attached by capscrew 76. A bearing retainer and seal plate 15A is attached to housing 9 by capscrews 77A about shaft 49, and a similar plate 13A is attached to housing 9 about output shaft 72.

In the second embodiment of this invention as shown in Figure 4, corresponding parts will be identified by the prime numbers of the parts in Figure 2. The output shaft 16' extends through its bearing cage 12' and includes a bevel gear 18' which meshes with and drives bevel gear 19' of upper transmission shaft 17'. Gear 19' and shaft 17' are rotatably supported near their upper end by a thrust bearing 80 and at its lower end by a bushing 81. A modified spur gear 82 is located on shaft 17' at a point intermediate these bearing points, and this gear meshes with a second modified spur gear 83 at the upper end of lower transmission shaft 49' which is parallel to and spaced from shaft 17' by a distance equal to the pitch diameter of gears 82, 83 if they are of equal size, or equal to the sum of their respective pitch radii if they are of a different size. The use of gears having a different number of teeth will be desirable if further speed reduction is desired prior to the final output to propeller 65'. In Figure 5 it will be seen that the teeth 84 of gears 82, 83 are rounded near their crown to a greater degree than conventional spur gears for the purpose of permitting quick and positive engagement and the elimination of any dead spots for the return meshing of the gears. Lower housing 9' includes an open channel 85 into which bearing boss 86 may be guided during engagement of gears 82, 83 to insure alignment. A single spring loaded button 47A is provided in the bottom of channel 85 to be engaged by a recess 50A in the bottom of boss 86: this device prevents unintentional disengagement of gears 82 and 83 due to underwater currents, or due to their own torque of transmission. This latter device may not be necessary where the weight of the lower section 4 combined with the thrust of propeller 65 is sufficient to counterbalance the gear torque and water resistance.

The invention is not limited to the exemplary construction herein shown and described, but may be made in various ways within the scope of the appended claims.

What is claimed is:

1. A marine drive unit comprising: an upper gear box section having a housing for attachment to a boat, a lower propeller-fin section having a housing extending below the water line of said boat, and a quick disconnect unit interposed between said named sections and external to each housing, said quick disconnect unit being comprised of a rotating element journaled in said upper gear box section, a rotating element journaled in said propeller-fin section, and disengageable projections thercbetween, a transmission arrangement extending from within said gear box section to within said propeller-fin section and including said disconnect unit, and a combination means to pivot said lower housing from said upper housing above the water line and simultaneously steer said lower housing relative to said upper housing.

2. A quick disconnect unit for a marine drive transmission arrangement, comprising: a transmission shaft having an enlarged head at one end, a second transmission shaft in axial alignment with said transmission shaft, a driven head at the end of said second shaft adjacent and in close proximity to said enlarged head, one of said heads including circumferentially spaced recesses, the other of said heads including circumferentially spaced buttons, said buttons being spring loaded and spaced the same as said recesses whereby said buttons will forceably engage said recesses when they become aligned therewith and cause transmission power between said shafts; means to move one of said shafts laterally with respect to the other shaft with sufficient force to depress said buttons against the wall of said recesses and cause said shaft to move out of axial alignment with said other shaft and break the transmission of power between said buttons and said recesses.

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