Oct. 31, 1961 N. HANSSON ET AL 3,006,311

BOAT STEERING MEANS INCLUDING A SWINGABLE AND TILTABLE OUTBOARD UNIT

Filed June 15, 1960 3 Sheets-Sheet 1

Fig. 1.

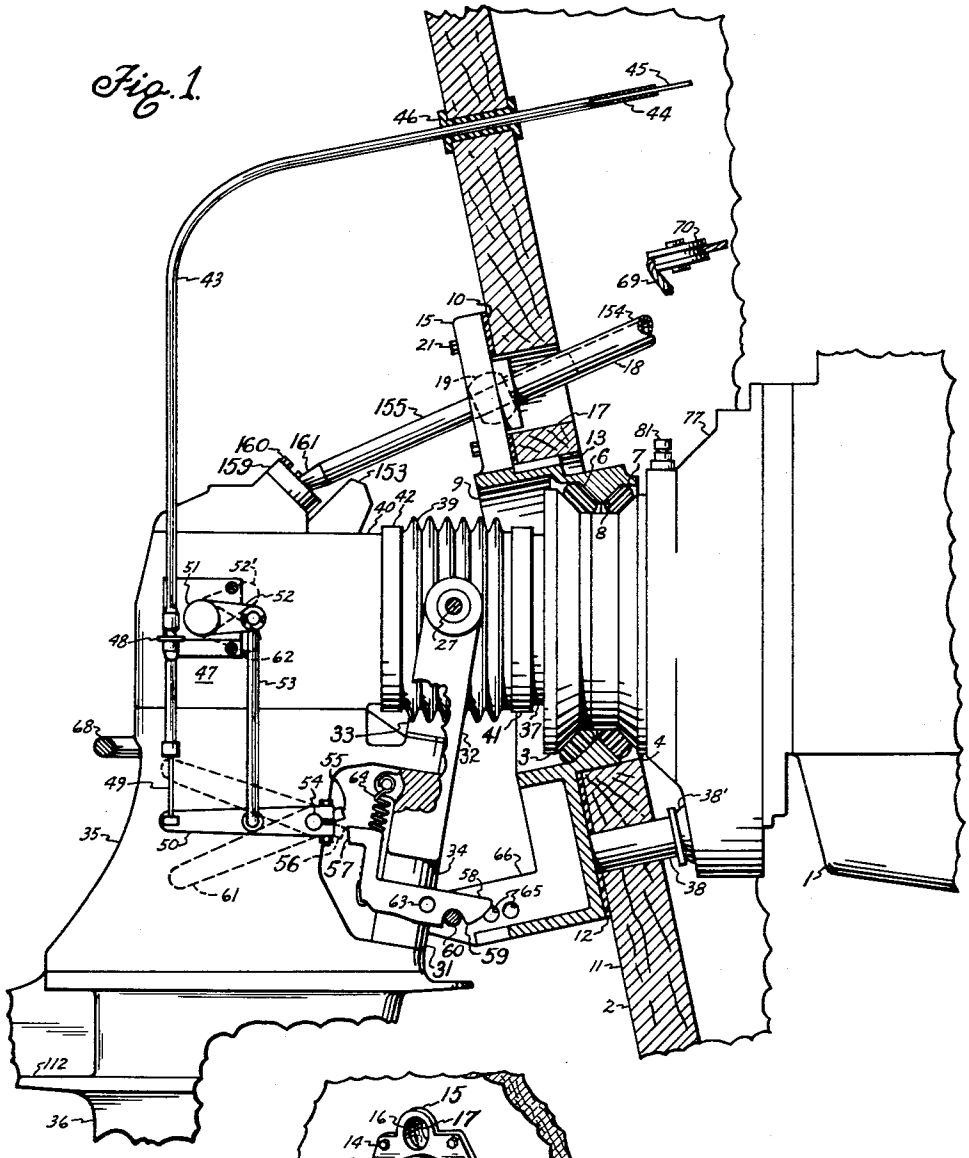
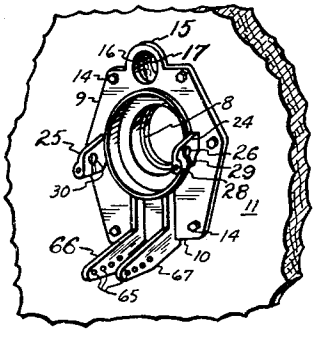


Fig. 2.



INVENTORS
NILS HANSSON & JAMES R. WYNNE
BY
George H. Baldwin
ATTORNEY

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Fig. 3.

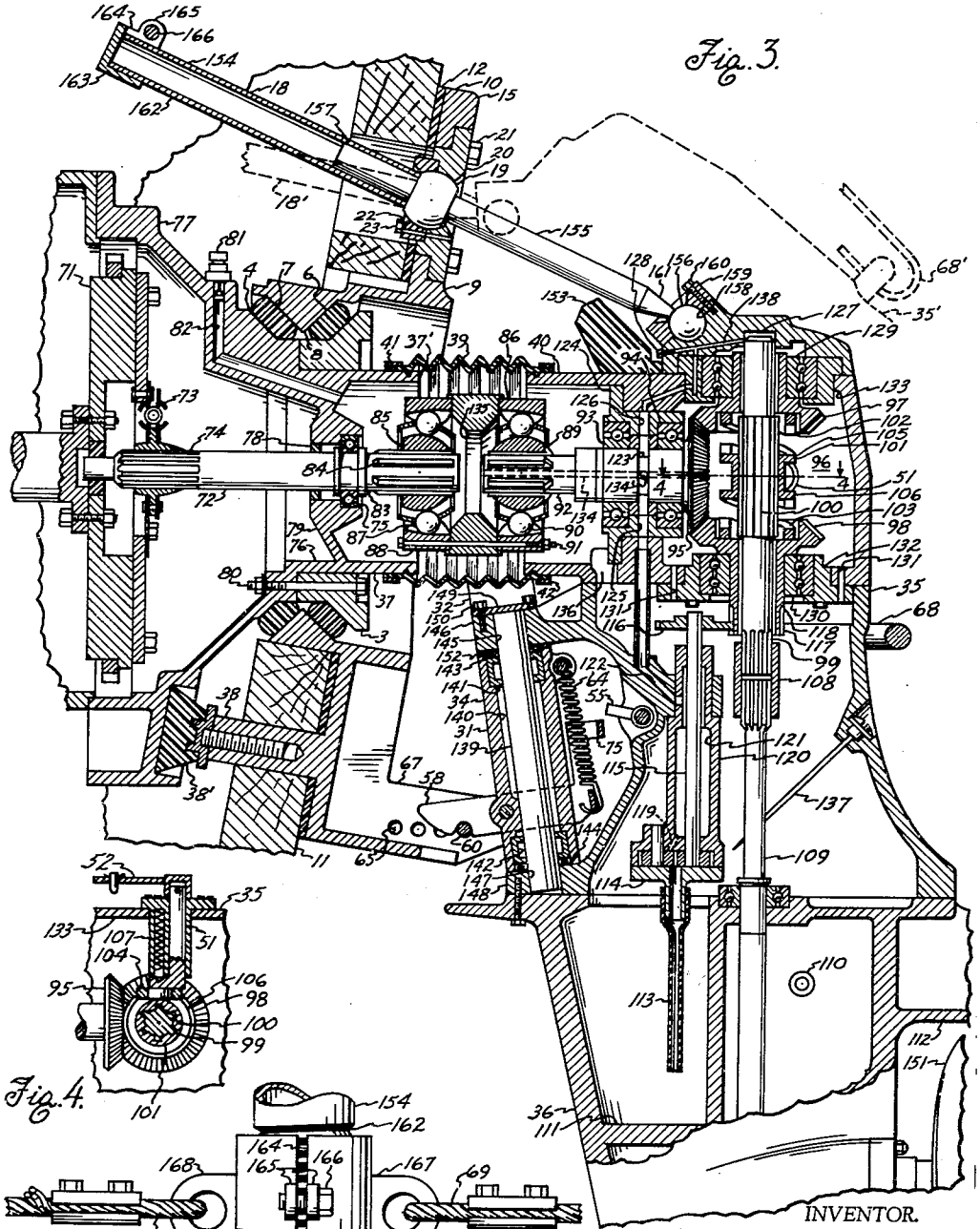


Fig. 4.

Fig. 5.

INVENTOR.
NILS HANSSON & JAMES R. WYNNE
BY
George H. Baldwin
ATTORNEY

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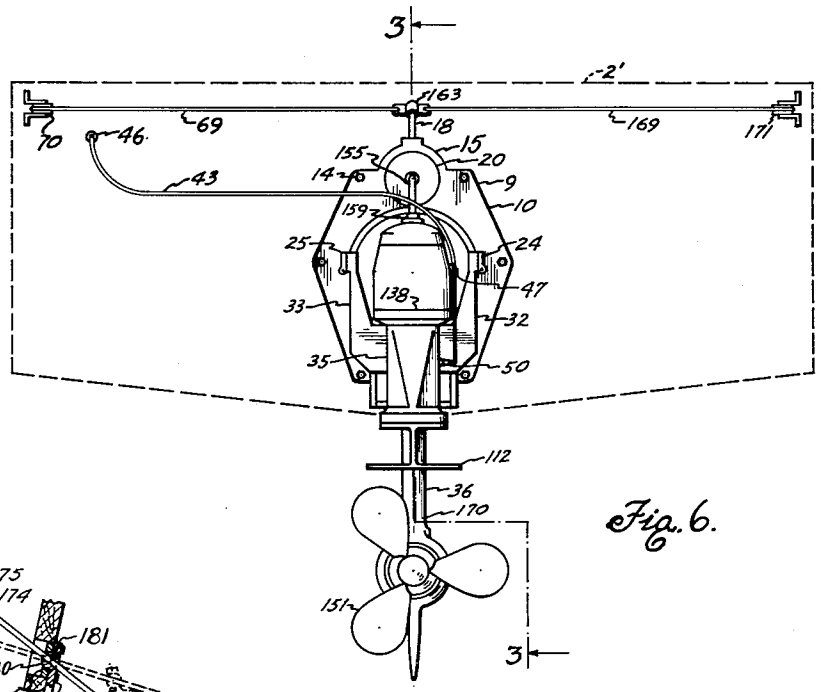


Fig. 6.

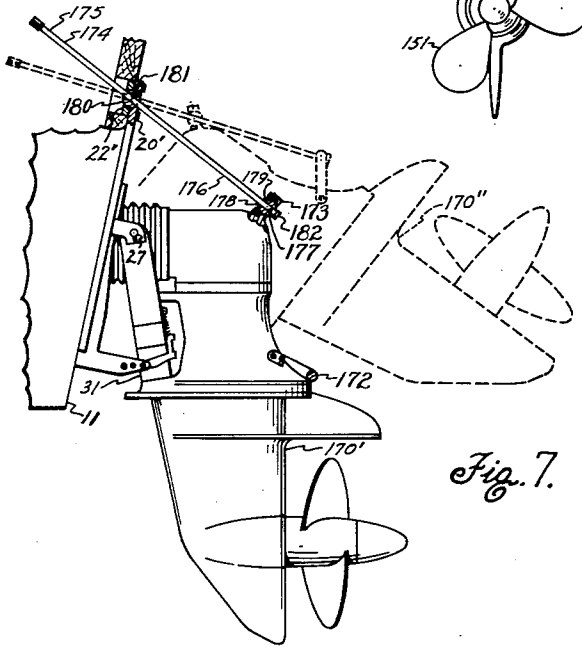


Fig. 7.

INVENTORS
NILS HANSSON & JAMES R. WYNNE
BY
George H. Baldwin
ATTORNEY

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BOAT STEERING MEANS INCLUDING A SWINGABLE AND TILTABLE OUTBOARD UNIT

Nils Hansson, Goteborg, Sweden, and James R. Wynne, Miami, Fla.; said Hansson assignor to AB Penta, Goteborg, Sweden

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11 Claims. (Cl. 115—35)

This invention pertains to steering means for a swingable and tiltable outboard water reaction unit, and particularly to steering means comprising a reaction unit which includes a driven propeller.

This invention has particular applicability to a boat propulsion system which comprises an inboard engine connected through the stern transom to an outboard unit carrying a propeller at its lower end and mounted to the transom by pivot means permitting the outboard unit to swing about an upright steering axis and to tilt about a generally transverse horizontal axis. The outboard unit, in a typical installation, is located entirely below the level of the top of the transom.

A general object of the invention is to provide improved means for controlling swinging movement of an outboard mounted water reaction steering element.

Specific objects of the invention are to provide sturdy, simple, accurate, compact and convenient means for controlling swinging movement of an outboard unit mounted outwardly of the transom on an upright pivot for steering and a horizontal pivot for tilting, and to provide such means compatible with existing steering systems.

A further specific object of the invention is to provide in a rigid tiller for attachment to a swingable and tiltable outboard unit located below the level of the transom top, means to accommodate tilting of the unit and an arrangement in which the tiller is readily accessible within the boat and in which openings in the transom, through which water might be taken aboard, are suitably closed.

The novel features which are believed to be characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a starboard elevation of an outboard steering and propulsion unit, mounted on a boat transom, partially broken away and in section, in combination with a steering mechanism in accord with this invention;

FIG. 2 is a perspective view of a transom mounting bracket shown attached to a fragment of the boat transom;

FIG. 3 is a sectional view taken from the port side, substantially along line 3—3 of FIG. 6;

FIG. 4 is a detail view of a portion of the forward-reverse shift mechanism of the outboard unit taken along line 4—4 of FIG. 4;

FIG. 5 is a top view on an enlarged scale of the inboard end portion of the tiller showing steering cables attached thereto;

FIG. 6 is a rear elevation on reduced scale of the outboard unit, mounting bracket, tiller and steering cable system, the boat transom being represented in phantom; and

FIG. 7 is a side elevation substantially on the scale of FIG. 6 showing a steering assembly according to a modified embodiment of the invention.

As shown in FIG. 1, the engine 1, which may be a four cycle inboard engine, is disposed in the boat and fixedly mounted to the transom 2 by means of separable flange members 3 and 4 which are drawn together by bolts,

such as bolt 80 (FIG. 3), on rubber sealing and shock damping rings 6 and 7, and with these rings interposed, on annular ring portion 8 of bracket 9. Bracket 9 includes a flat plate portion 10 engaged against the rear face 11 of the transom, with a sealing gasket 12 preferably interposed, and as best seen in FIGS. 1 and 2, the bracket plate portion surrounds an opening 13 which extends through the transom. Bolts 14 connect the bracket to the transom.

Bracket 9 includes an upper portion 15 having an opening 16 therethrough which aligns with a second transom opening 17, and these two aligned openings 16, 17 accommodate a telescoping tiller 18 universally mounted at the transom by means of a ball 19 engaged in a socket formed of socket element 20, shown in FIG. 3, bolted by bolts, such as bolt 21, to the bracket, and socket element 22 bolted by bolts including bolt 23 to element 20. Ball 19 is freely universally movable in its socket but fits the socket elements 20 and 22 sufficiently closely to provide a substantially watertight fit.

Bracket 9, as further shown in FIGS. 1 and 2, also includes a pair of rearwardly extending ear portions 24, 25 each having a transverse bore, such as bore 26, in which a respective pivot pin, such as pin 27, is engaged. Bore 26 is arranged to be closable sufficiently to clamp the pivot pin therein, set screw 28 and slot 29 being provided for this purpose. Ear portion 25 with its bore 30 is similarly arranged.

Support member 31, shown in FIG. 1, is in the form of a yoke comprising two upward arms 32 and 33 pivoted on the horizontal axis pivots of bracket 9 established by pin 27 and by corresponding pin, not shown, engaged in bore 30. The arms of the yoke are preferably disposed between and inwardly adjacent the respective ear portions 24 and 25 of the bracket. The yoke member 31 further includes a generally upright portion 34 extending downwardly from the arms establishing an upright pivot axis on which outboard housing 35 swings for steering. The outboard housing and support member 31 pivot or tilt about the horizontal pivot pin 27 in a direction to swing the lower end portion 36 of the housing rearwardly and upwardly when the lower end portion meets an obstruction during forward movement of the boat, or when the housing is manually tilted.

Metal sleeve 37 extends rearwardly from a connection with plate portion 10, the connection being established through flange members 3, 4, rings 6, 7 and annular ring portion 8. The sleeve 37 is thus sealed to and supported by the transom through the plate portion 10 and has an open rearward or outer end portion 37'. Rubber rings 6, 7 serve as shock absorbers to reduce transmission of vibration from flange members 3, 4 to the transom. In the present embodiment, engine 1 is supportedly connected through flange members 3, 4 to plate portion 10 and thus to the transom. Further support for the engine is afforded by a post or heavy rod 38 integral with plate portion 10 extending inwardly from the plate portion through the transom and provided at its inner end with a shock absorbing rubber knob 38' against which the engine engages generally below the mounting 3, 4, 8.

Flexible corrugated rubber tubular boot 39 is engaged on the rearward end 37' of sleeve 37 and on forwardly extending sleeve 40 which is integral with housing 35. Removable clamp rings 41 and 42 may be provided to secure the boot on the respective sleeves.

A flexible cable 43 comprising a tube 44 and wire core 45 is sealed through the transom by a rubber grommet 46 and terminates aft at a control lever assembly 47 on the housing 35. The tube 44 is fixed to housing 35 by a bracket 48, which core 45 terminates in a rod 49 attached to freely pivotally supported lever 50.

A shaft 51 projects from the housing 35 and carries a lever 52 which is linked, by link 53, to lever 50. A shift mechanism in the housing is operated by shaft 51. Upon pulling core 45 forwardly, lever 50 swings upwardly on its pivot 54 swinging tab 55 into its engageable position (shown in broken lines at 56) with respect to arm 57 of catch 58, thereby retaining notch 59 engaged on a pin 60. Upward swinging of lever 50 upon retraction of rod 49 causes lever 52 to swing upwardly into the position represented by broken lines at 52' thereby to cause shifting of internal gears into reverse. Sliding of core 45 in a direction to eject core rod 49 from the tube swings levers 50 and 52 into their full line positions corresponding to neutral, or into their forward positions shown in broken lines at 61 and 62. In neutral and forward positions, tab 55 is displaced from arm 57, whereby the catch 58 may rotate about its mounting pivot 63 against the tension of spring 64 and free itself from pin 60. Pin 60 is mounted in one or another of openings 65, permitting adjustment of the relative angles between the transom and the axis of portion 34 of the yoke. Openings 65 are arranged in rearwardly extending arm portions 66 and 67 of the mounting bracket 9. Tilting of the outboard unit on pivot 27 may occur upon meeting an obstruction with sufficient force to cause arm 58 to ride up over pin 60. It will be noted that notch 59 is so shaped as to provide a cam action to raise catch 58 when the housing is urged away from the transom. The housing may be manually tilted by releasing catch 58 with the fingers and grasping handle 68 which is attached to the housing. Upon tilting, cable 43 bends and tiller 18 telescopes as hereinafter described. Steering is accomplished by means including steering cables, such as cable 69, engaged on suitable directing blocks, such as block 70, to a desired position for a steering wheel or the like (not shown).

Further details of the construction are seen in FIG. 3. Engine flywheel 71 is connected drivingly to a shaft 72 by means of torsion damper 73 and the splines 74 of the shaft. Bearing 75 supports the shaft at the rearward end 76 of the engine flywheel housing 77, a suitable oil seal 78 being provided adjacent the bearing. Sleeve 37 conveniently constitutes an integral portion of housing 77, while annular flange portion 79 extends inwardly of the sleeve to support the bearing 75 and, with seal 78, to close the forward or inner end of the sleeve. Connection of the sleeve to the bracket 9 is by means of annular flanges 3, 4 which are seen to be bolted together by means of bolts including bolt 80. An oil filler plug 81 and passageway 82 are conveniently provided in housing 77 opening into sleeve 37 rearwardly or outwardly of flange 79.

The rearward end portion 83 of driving shaft 72, which is driven by the engine 1, is provided with elongated splines 84 which slideably engage in element 85 of a double universal joint assembly 86. Joint element 85 may slide along shaft 72 while being continuously in driven engagement on the splines. In the specific double universal joint assembly 86 as shown, element 85 is arranged to drive, through ball coupling 87, a hollow shaft 88 which, in turn, is arranged to drive an output element 89 of the double joint assembly through a second coupling 90. The shaft 88 is seen to be arranged outwardly around other elements of the joint, the elements 85 and 89 being rockable within the shaft 88 while continuously coupled thereto for rotation therewith. Shaft 88, accordingly, serves as a coupling shaft between the two universal joints embodied in the assembly 86, the individual joints being made up, respectively, of element 85 universally coupled to shaft 88 through coupling 87 and of element 89 universally coupled to shaft 88 through coupling 90. Bolts, such as bolt 91, provide for assembly and disassembly of the double joint assembly.

Output element 89 is splinedly connected to driven shaft 92 which extends rearwardly from the universal joint assembly into the housing 35, being supported therein by a pair of ball bearings 93 and 94 and terminating rearwardly in a bevel gear 95 comprising a part of transmission 96. Bevel gears 97 and 98 are arranged freely rotatably on vertical shaft 99 and both gears 97 and 98 are in constant mesh with gear 95, gear 97 above gear 95 being used for driving in reverse, while gear 98 being for forward drive. Shaft 99 between bevel gears 97 and 98 carries splines 100 therealong, and a dog clutch element 101 is engaged on the splines movably therealong from a neutral position, shown in FIG. 3, to an upper position in driven contact with dog elements 102 integral with gear 97 or to a lower position in driven contact with dog elements 103 integral with gear 98. Shifting of the dog clutch for forward, reverse and neutral drive is accomplished by lever 52 and shaft 51 previously described in connection with FIG. 1 and shown in further detail in FIG. 4. Lever 52 is seen to be attached to shaft 51, the shaft extending into housing 35 and carrying inside the housing a roller cam 104 which engages with the movable dog clutch element flanges 105 and 106. With swinging of lever 52 and cam 104, the one or the other of gears 97, 98 through its dogs engages and rotates the dog element 101 and with it the splined shaft 99. A spring loaded detent mechanism 107 is preferably associated with the shift means, including lever 52 and cam 104, yieldably to retain the dog clutch element in neutral, forward or reverse positions until intentionally forced into another position by means of cable 43.

Referring again to FIG. 3, shaft 99 is connected through a separable spline coupling 108 to shaft member 109 and forms therewith a continuous upright shaft connection between the transmission 96 and suitable bevel gears (not shown) disposed in the lower end 36 of the housing forwardly of the propeller 151 and arranged to rotate the propeller in accord with rotation of the shaft 99, 109. The provision of splined coupling 108 facilitates assembly and disassembly of the outboard unit, the lower housing portion 36 in which shaft member 109 is mounted being preferably a removable part of the housing as shown in the drawings. A grease fitting 110 is provided for greasing the propeller drive gears.

It will be seen in FIG. 3 that a sump chamber 111 is formed in the lower end portion 36 of the housing extending below cavitation plate 112 and, accordingly, below normal water level. Lubricating oil is contained in sump chamber 111 and is cooled therein by water contacting the housing. A conduit 113 extends downwardly into the chamber for sucking cool oil therefrom under the influence of gear pump 114, which is driven through a shaft 115 having a gear 116 at its upper end meshed with gear teeth 117 of an extended sleeve portion 118 of bevel gear 98. Since gear 98 is constantly in mesh with gear 95, the oil pump is constantly driven whenever flywheel 71 is rotating.

Oil sucked from sump 111 is pumped through passageway 119 (shown in broken lines) in pump body 120 into a small chamber 121 thereof and thence through passageway 122 into space 123 between bearings 93 and 94. Bearings 93 and 94 are mounted in a flanged insert sleeve 124 which is provided with openings at 125 and 126, of which opening 125 communicates with passageway 122, to admit oil into space 123. Opening 126 communicates between space 123 and a passageway 138 which leads to a point 127 above the upper end of shaft 99. The passageway 138 is drilled into the housing and, as shown, may take a tortuous path as dictated by the arrangement of the housing. A plug 128 is provided at one part of the passageway to seal off the passageway where it is necessary to drill in from a point outside of the housing.

From the point 127, the oil flows down through bearing 129, by means of which gear 97 is mounted in the housing, into the transmission to lubricate the gears, dog clutch and bearings thereof, including the bearing 130 which mounts gear 98 and bearing 94 for shaft 92. From

the transmission, a portion of the oil returns to the sump through openings 131 provided in the lower wall 132 of the transmission housing chamber 133.

Shaft 92 connecting the universal joint output element 89 to the transmission is provided with a bore shown in broken lines at 134 which opens through the ends of the shaft into the interior of the transmission chamber 133 at one end and into the interior 135 of the double universal joint at the other. A lateral opening 134' enters the shaft 92 at space 123 and intersects bore 134, whereby oil is supplied from space 123 into the bore and thence into the universal joint interior 135 and into the transmission housing. The oil supplied into the universal joint interior passes outwardly through the couplings or individual universal joint portions 87 and 90 of the assembly 86, provides lubrication for the joints and for shaft bearings 75 and 93, and then returns for cooling to the sump 111 through an opening 136. Bellows or boot 39 retains the oil after it has flowed out of the joint assembly and, of course, protects the joint from water, being sealed to the sleeve portion 37 of the mounting bracket and to the forwardly extending sleeve portion 40 of the outboard housing. The oil which passes from opening 134' through bore 134 into the transmission chamber 133 adds to that entering through bearing 129 to provide more complete lubrication of the transmission, and this oil, too, returns to the sump 111 through openings 131.

A dip stick 137 enters the housing 35 to measure the oil level in the sump. Oil is conveniently added to the sump when required to bring up the level through passageway 82, plug 81 being removable for this purpose.

Handle 68 is externally attached to the housing for use in tilting the housing, such as into the broken line position 35', and for carrying the housing when detached from the boat and motor. To detach the housing, it is only necessary to detach one or the other end of boot 39, to remove the horizontal yoke supporting pins, such as pin 27 previously described, and then to slip universal joint element 85 from shaft 83. Cable 43 and tiller 18 should be disconnected from the housing when it is to be removed from the boat.

The upright pivot mount for yoke 31 is shown in internal detail in FIG. 3. Pivot pin 139 extends through bore 140 of the upright portion 34 of yoke 31, being journalled therein in bearing inserts 141 and 142 sealed between grease seals 143 and 144. Pin 139 extends outwardly of the yoke portion 34 and enters bore 145 of boss 146 above portion 34 and socket 147 of boss 148 below the portion 34. Bosses 146 and 148 comprise forwardly extended portions of housing 35. A removable cap 149 is bolted by bolt 150 to boss 146 to retain the pin in position in bore 145 and socket 147, though permitting its removal when desired upon removal of the cap 149.

A thrust bearing insert in the form of annular disc 152 is provided surrounding pin 139 and interposed between the yoke portion 34 and boss 146. The weight of the housing is carried by the yoke portion 34 which, through bearing insert 152, supports boss 146. The housing is thus free to swing about the axis of pin 139 for steering.

Steering is accomplished through the medium of tiller 18 which, as seen in FIG. 3, is telescopic to permit tilting of the housing into the broken line position 35'. Rubber tilt bumper 153 is mounted on the top of the housing in position to provide cushioning contact with the bracket 9 upon tilting of the housing.

The tiller comprises specifically an elongated tubular arm member 154 of metal such as stainless steel or plated brass extending forwardly of the transom inwardly of the boat and a rod member 155 of similar material extending rearwardly of the transom and terminating rearwardly in an integral ball 156 by means of which it is attached to the housing. With the tiller extended, as it is when the housing is in normal operating position, a forward end portion 157 of the telescoping rod 155 is engaged in the tubular member 154 whereby the members 154 and 155 are retained in alignment. Ball 156 is caged and freely rotatable in a socket 158 formed between an annular socket member 159 and the housing. Bolts such as bolt 160 retain member 159 in position on the housing. Rod 155 has a reduced diameter neck portion 161 at and immediately forward of its ball portion 156 proportioned to give appropriate freedom of universal swinging motion of the rod 155 on ball 156. Such swinging occurs, for example, when the housing is tilted between its upright full line position and its tilted broken line position 35'. Upon tilting into position 35', rod 155 telescopes into tube 154 and the tiller swings on the center of ball 19 into the broken line position 18' as ball 19 rotates in its socket.

Pin 139 is seen in the drawings to establish an upright pivot axis about which the unit swings for steering, but the axis is inclined slightly forwardly of the vertical to facilitate steering movement of the unit by means of the tiller. The pin is typically inclined forwardly, toward its upper end, at an angle of 8° or 10° from the vertical.

As a convenience in retaining the unit in tilted position, such as while trailering or during periods at anchor afloat, a hook indicated at 68' extending rearwardly from the transom may be engaged with handle 68.

The forward end 162 of the tiller is provided with a cable attachment cap member 163 threaded onto tube 154. Cap member 163 may be applied as a substantially airtight closure for the tube, while rod 155, which may be either solid or hollow, may have a close sliding fit in the tube, whereby air may be compressed in tube 154 ahead of rod 155 as the housing tilts toward position 35' providing a cushioning or shock absorbing effect of increasing force as ball 156 approached the transom.

As best shown in FIG. 5, the cap member 163 is preferably formed with a side slot 164 and includes a pair of ears 165 and bolt 166 by means of which the cap may be clamped tightly on the tube 154. Ring tabs 167 and 168 integral with the cap member extend from opposite sides thereof, and suitable steering cable means 69 and 169 are suitably secured to the respective rings. The cables are arranged to swing the tiller end 162 back and forth in an arc extending laterally of the boat and, of course, on ball 19 as a center or fulcrum. With the housing in normal upright position, such swinging of the tiller swings ball 156 back and forth. Since ball 156 is displaced in a direction longitudinally along the tiller from the axis of pin 139, such lateral swinging of ball 156 causes the housing to swing about the axis of pin 139. It is advantageous that the pivot ball 19 for the tiller be disposed in alignment with the axis of pin 139, since under this condition there is no telescoping movement of rod 155 with respect to tube 154 during steering.

In performing the steering function for the boat, it will be apparent, particularly with reference to FIG. 6, that the housing 35, and particularly the lower portion 36 thereof, constitutes a reaction member 170 of generally streamlined aspect which, through reaction of water thereagainst, is effective to steer the boat of which the transom is indicated in phantom at 2', corresponding to transom 2 of FIGS. 1–3.

The propeller when operative will be understood to be a water reaction element by means of which steering may be accomplished by changing the direction in which the propeller drives against the water. A water reaction element for steering may comprise, accordingly, a streamlined element such as portion 136 of the unit acting as a rudder, or a driven propeller, or, as is shown in the embodiments herein described, a combination of both embodied in one integral outboard unit. The means for swinging the tiller, including cables 69 and 169 connected to the forward end cable attachment cap 163 of the tiller, are shown extending laterally of the boat and engaged on respective blocks 70 and 171. The cables will extend forwardly from blocks 70 and 171 in a typical

installation for operation by a steering wheel (not shown) arranged in a convenient forward position in the boat.

It will be seen, accordingly, that the steering is accomplished by means of the reaction element **170**, mounted on upright pivot axis **139** outwardly of transom **2**, the transom having a first ball socket **20**, **22** at opening **17**, with the socket opening inwardly and opening outwardly of the boat hull, ball member **19** being caged in the first ball socket and having a bore therethrough which, in the construction shown, extends into the tubular tiller arm portion **154**. Arm portion **154** extending inwardly of the hull is integral with ball member **19**. Elongated tiller rod member **155** has one end portion **157** fittingly and slideably engaged in the bore of ball member **19** and at a portion spaced therealong from portion **157**, rod member **155** carries ball **156**. Ball **156** is caged in socket **158** which is formed on reaction element **170** offset from pivot axis **139**. The inwardly extending tiller arm portion **154** comprises means which may be manually grasped or operated by cables **69** and **169** to swing ball member **19** and rod member **155** together, on ball member **19** as a pivot, ball member **19** rotating within the confines of caging members **20**, **22**.

In the embodiment of FIGS. 1–6, with the unit in normal operating position as seen in FIGS. 1, 2 and 6, the engine flywheel and shaft **72**, the universal joints **87** and **90** and the coupling shaft **88**, and shaft **92** are all aligned and rotate about a common horizontal, or approximately horizontal, axis. The tilt axis established by pin **27** preferably intersects the axis of the aligned shafts and joint members, or passes close thereto, and passes between the universal joints **87** and **90**. The steering axis of pin **139** also passes between the universal joints and preferably intersects the tiller pivot ball **19** at about its center of curvature.

The steering system shown in FIG. 7 permits tilting of water reaction unit or element **170'**, which may be identical to element **170** previously described except in the provision of a hingedly connected U-shaped handle **172** and of a projecting universal pivot ball socket assembly **173**. Unit **170'** is pivotally mounted by means including yoke **31** and horizontal axis pivot pin **27** to the boat stern transom **11** as previously described.

The system of FIG. 7 comprises a tiller rod **174** having a forward end portion **175** within the boat hull accessible for manual swinging or for connection to steering cables. The rearward end portion **176** of the rod extending aft from the transom passes above the horizontal tilt axis **27** and above the element **170'** and passes through the bore **177** of universally pivotally mounted ball **178** in a sliding fit. Assembly **173** extends upwardly from element **170'** and provides a socket **179** for the ball **178**.

A ball **180** is fixed to rod **174** between its end portions. Set screw **181** is preferably provided to permit original adjustment of the proper ball position for the specific installation, but, once properly positioned, the ball remains fixed in position on the rod. Socket elements **20'** and **22'** are provided to universally pivotally mount ball **180** in the transom, corresponding to socket elements **20**, **22** of the first embodiment.

In the embodiment of FIG. 7, element **170'** may tilt from its full line normal operative position into an upwardly tilted position shown in broken lines at **170''** while ball **178** slides forwardly along rod **174**. When so tilted, the orientation of the element with respect to the rod **174** is changed from the orientation assumed when the element is in operative position. Means in the form of swingable handle **172** are provided for releasably retaining the element and rod in the orientation corresponding to the tilted position of the element. The handle **172** is mounted rearwardly on the element **170'** and the handle, as the element is tilted, comes into a position in which it may be slipped up over the rearward end portion **176** of the rod. A small end knob **182** is formed on or suitably affixed to the rod **174** over which the handle is swung, the knob serving as a stop or shoulder to retain the handle engaged on the rod until the element is raised manually slightly above the position **170''** to intentionally unhook the handle from rod **174** and to return the element into operative position.

It will be understood that in other respects the modified embodiment of FIG. 7 is in accord with the preferred embodiment of FIGS. 1–6.

While only certain preferred embodiments of this invention have been shown and described by way of illustration, many modifications will occur to those skilled in the art and it is, therefore, desired that it be understood that it is intended in the appended claims to cover all such modifications as fall within the true spirit and scope of this invention.

What is claimed as new and what it is desired to secure by Letters Patent of the United States is:

1. In an assembly for steering a boat hull, a water reaction element, means mounting said element outwardly of said hull on an upright pivot axis, a ball member having a bore extending therethrough, an elongated tiller rod member having one end portion fittingly and slidably engaged in said bore and having a ball formed thereon at a fixed portion thereof spaced therealong from said one end portion thereof, said hull having an opening therethrough, means on said hull at said opening forming a first ball socket opening inwardly and opening outwardly of said hull, and means forming a second ball socket attached to said reaction element offset from said upright pivot axis, the ball of one of said members being caged in said first ball socket, said one member having an integral tiller arm portion extending inwardly of said hull from said first socket and said inwardly extending tiller arm portion comprising means for swinging said members on said ball in said first socket, the ball of the other of said members being caged in said second ball socket.

2. In a boat having a hull with an opening therethrough, a water reaction steering unit, pivot means mounting said unit outwardly of said hull on an upright steering axis pivot, a tiller assembly comprising two universal pivot elements and elongated arm means, said elements being spaced along and being interconnected by said arm means, said assembly including a slideable connection between said elements providing freedom of movement for said elements toward and away from each other in a direction longitudinally of said arm means, means connecting one of said elements to said unit offset from said upright steering axis, means connecting the other said element to said hull aligned with said opening, said arm means extending through said opening and comprising an inner end portion within said boat adapted and arranged to be swung to and fro to swing said unit on said steering axis.

3. In an assembly for steering a boat hull, a water reaction element, means mounting said element outwardly of said hull on an upright pivot axis, an elongated hollow tiller tube member, a ball formed on and extending outwardly around said tube member, an elongated tiller rod member having one end portion telescopingly engaged in said tube and having a ball formed thereon at a portion thereof spaced therealong from said one end portion thereof, said hull having an opening therethrough, means on said hull at said opening forming a first ball socket opening inwardly and opening outwardly of said hull, and means forming a second ball socket attached to said reaction element offset from said upright pivot axis, the ball of one of said members being caged in said first ball socket, said one member having an integral tiller arm portion extending inwardly of said hull from said first socket and said inwardly extending tiller arm portion comprising means for swinging said members on said ball in said first socket, the ball of the other of said members being caged in said second ball socket.

4. In an assembly for steering a boat hull, a water

reaction element, means mounting said element outwardly of said hull on an upright pivot axis, a ball member having a bore extending therethrough, an elongated tiller rod element having a ball at one end thereof, said hull having an opening therethrough, means on said hull at said opening forming a first ball socket opening inwardly and opening outwardly of said hull, means forming a second ball socket attached to said reaction element offset from said upright pivot axis, said rod element ball being caged in said second ball socket, said ball member being caged in said first ball socket, said rod element extending from its said ball slideably and fittingly through said bore and opening and terminating inwardly of said hull, and means engaging a portion of said rod element within said hull for imparting swinging movement thereto about the center of said ball member.

5. In an assembly for steering a boat hull, a water reaction element, a support member, means comprising a pivot pin disposed with its axis extending generally laterally of the center line of the boat supporting said member rearwardly of the stern transom of said hull for pivoting on said axis, means supporting said element on said member comprising a pivot pin disposed with its axis extending generally laterally of said center line, one of said axes being upright and the other substantially horizontal whereby said element may swing from side to side on said one axis and tilt on said other axis, a tiller rod, means universally pivotally attaching one end of said rod to said element offset from said upright axis, a tiller tube, said transom having an opening therein, a watertight universal pivot assembly mounting said tube for universal pivoting to said transom at said opening and sealing said tube externally to said transom around said opening, said tube extending inwardly of said hull from said transom and having an open rearward end receiving the other end of said rod telescopingly thereinto.

6. In an assembly for steering a boat hull, a water reaction element, a support member, means supporting said member rearwardly of the stern transom of said hull comprising a pivot pin disposed with its axis extending generally laterally of the center line of the boat supporting said member for pivoting on said axis, means supporting said element on said member comprising a pivot pin disposed with its axis extending generally laterally of said center line, one of said axes being upright and the other substantially horizontal whereby said element may swing from side to side on said one axis and tilt on said other axis, a tiller rod extending through said transom having a forward end portion within said hull and having a rearward end portion extending rearwardly from said transom above said horizontal axis and above said element and terminating rearwardly of said upright axis, a water tight universal pivot assembly mounting said rod between its said end portions to said transom, a coupling element universally pivotally attached to and disposed above said reaction element, said rearward end portion of said rod being slideably connected to said coupling element whereby upon tilting of said reaction element said coupling element slides along said rod and the orientation of the rod with respect to the reaction element is changed, and releasable means engaged between said rod and reaction element for maintaining said rod and reaction element in predetermined relative orientation.

7. In an assembly for steering a boat, a reaction member pivotal about an upright axis to the rear of said hull, an extensible tiller comprising a rod and a tube having adjacent ends in assembled overlapping and telescoping engagement and having remote ends, first universal pivot means located intermediate said remote ends and mounting said tiller with respect to said hull, and second universal pivot means connecting a portion of said tiller aft of said first pivot to a point on said reaction member offset from said upright axis.

8. An assembly as in claim 7 further characterized by the reaction member being swingable about a tilt axis which is normal to said upright axis and which lies in an imaginary plane passing through said upright axis.

9. In a boat having a stern transom, a steering assembly comprising a water reaction steering member, a support assembly including a generally horizontal pivot element, a generally upright pivot element, and means swingably supported on one of said elements and supporting the other said element, said elements and said means being disposed rearwardly of said transom, said assembly further comprising means supportingly connecting said one element to said transom, means mounting said water reaction member on said other pivot element, said water reaction steering member being swingable on said generally upright pivot and being adapted and arranged to steer the boat by water reaction in accord with its position on said generally upright pivot, said member being tiltable on said generally horizontal pivot, said transom having an opening therethrough, an elongated rigid member having a rearward end, means pivotally connecting said end to a point of said member offset from the axis of said generally upright pivot, a ball having a bore, a socket for said ball mounted on said transom and freely universally mounting said ball alignedly with said opening, said elongated rigid member extending from its said rearward end generally forwardly and through said bore in a sliding fit, and means inwardly of said transom for swinging said rigid member to and fro on said universally mounted ball.

10. A propulsion and steering system for a boat hull comprising an inboard engine, an outboard unit comprising a water reaction propeller at a lower end thereof, said unit having an upper end, means swingably and tiltably mounting said unit on predetermined adjacent upright and horizontal axes aft of the boat stern with its said upper end below the top of the stern, flexible drive means connecting said engine through said stern to and through said unit to said propeller, a rod pivotally connected to said unit offset from said upright axis extending forwardly from said unit and terminating forwardly in a forward end portion, a tiller arm element having a forward end disposed within said boat and having a hollow rearward end portion opening through the boat stern receiving said forward end portion of said rod telescopingly therein, and means swingably mounting said tiller arm rearwardly of its said forward end to the stern of the boat and watertightly sealing about said arm to said stern.

11. In an assembly for steering a boat hull, a water reaction element, means mounting said element outwardly of said hull on an upright pivot axis, an elongated tiller rod element extending generally fore and aft and having a ball fixed thereon between the forward and rearward ends thereof, said hull having an opening therethrough, means on said hull at said opening forming a first ball socket opening inwardly and opening outwardly of said hull, said tiller rod element ball being caged in said first ball socket and said tiller rod element having a first portion extending inwardly of said hull from its said ball and having a second portion extending from its said ball outwardly of said hull, means forming a second ball socket attached to said reaction element offset from said upright pivot axis, a ball member having a bore therethrough caged in said second ball socket, said second portion of said tiller rod element extending slidably and fittingly through said bore of said ball member.

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