May 17, 1960 H. R. PATTY, JR 2,936,730

TILTABLE AND STEERABLE DUAL PROPELLER DRIVE FOR BOATS EQUIPPED WITH INBOARD MOTORS

Filed Aug. 9, 1957 3 Sheets-Sheet 1

Fig. 1.

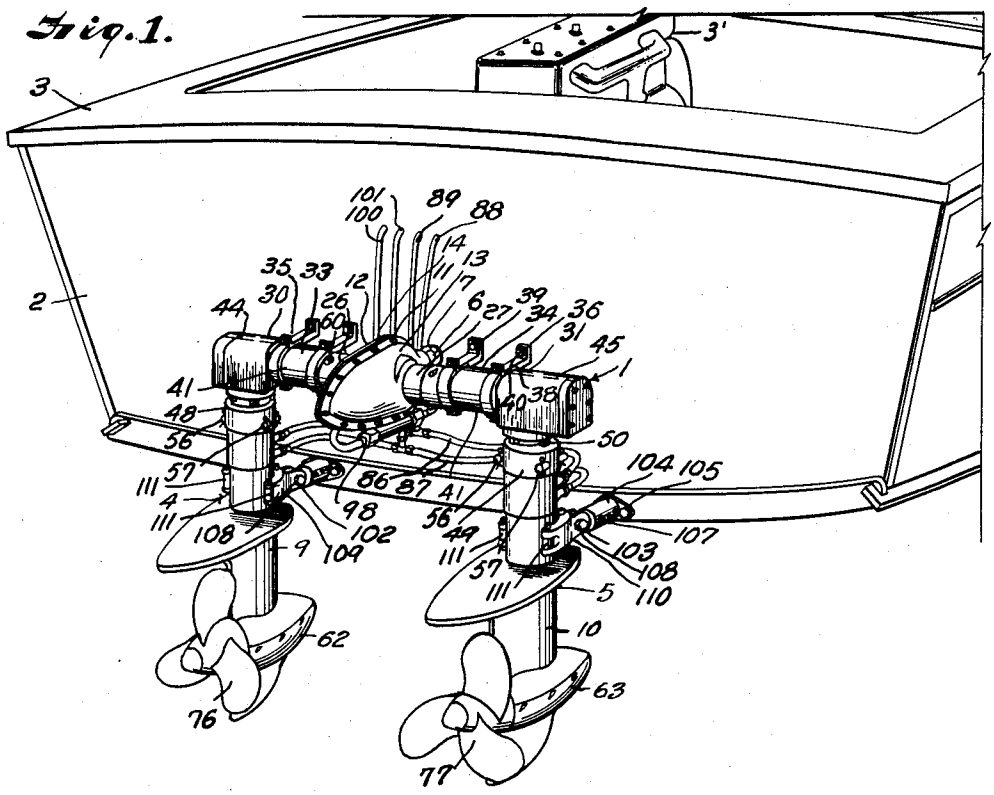
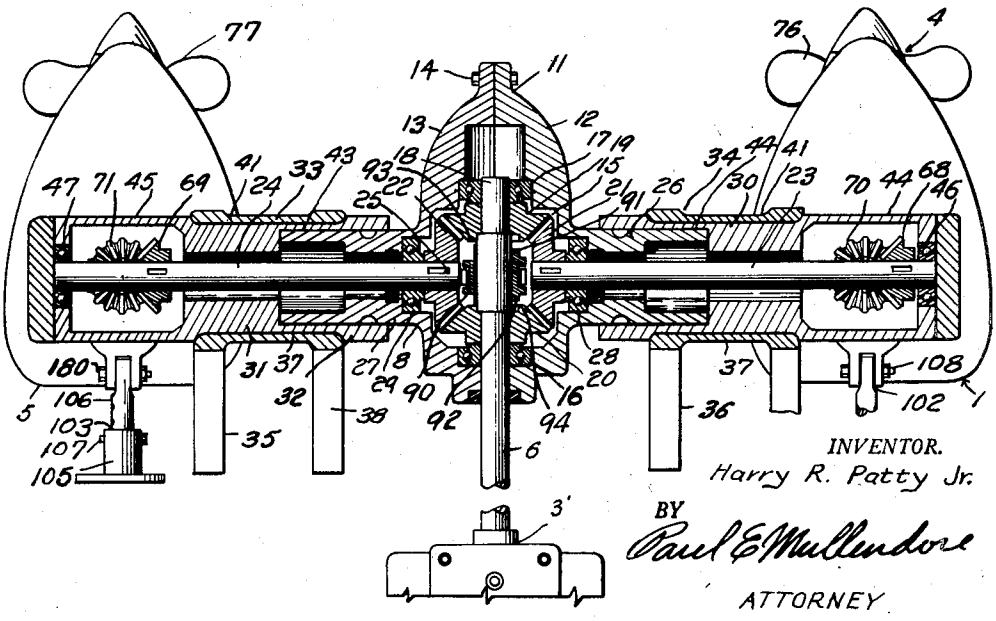


Fig. 2.



INVENTOR.
Harry R. Patty Jr.

BY
Paul E. Mullendore

ATTORNEY

May 17, 1960 H. R. PATTY, JR 2,936,730

TILTABLE AND STEERABLE DUAL PROPELLER DRIVE FOR BOATS EQUIPPED WITH INBOARD MOTORS

Filed Aug. 9, 1957 3 Sheets-Sheet 2

Fig. 3.

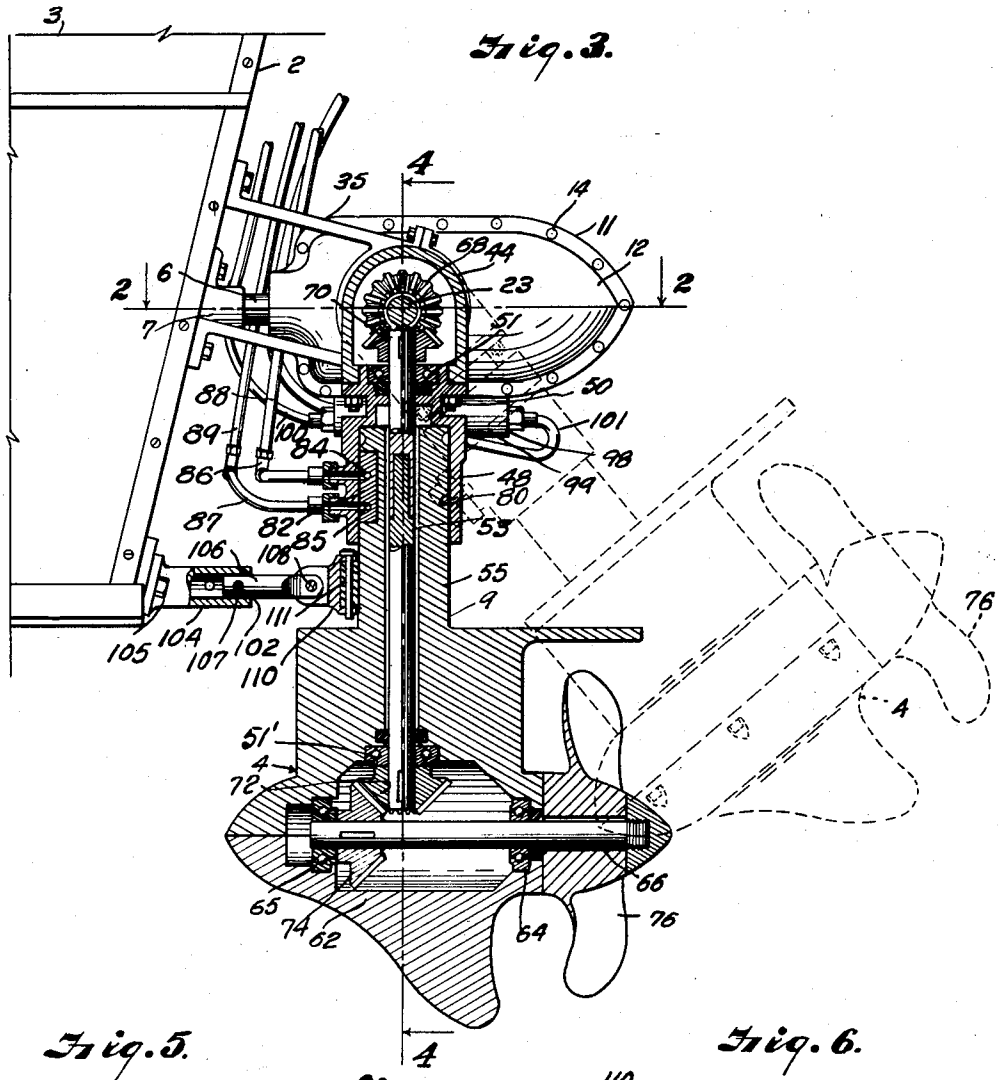


Fig. 5.

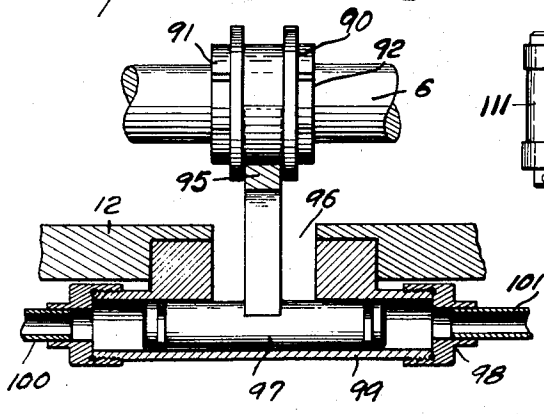
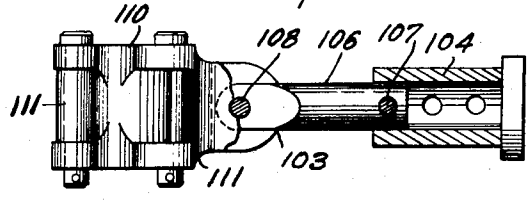


Fig. 6.



INVENTOR.
Harry R. Patty Jr.
BY
Paul E Mullendore
ATTORNEY

May 17, 1960 H. R. PATTY, JR 2,936,730

TILTABLE AND STEERABLE DUAL PROPELLER DRIVE FOR BOATS EQUIPPED WITH INBOARD MOTORS

Filed Aug. 9, 1957 3 Sheets-Sheet 3

Fig. 4.

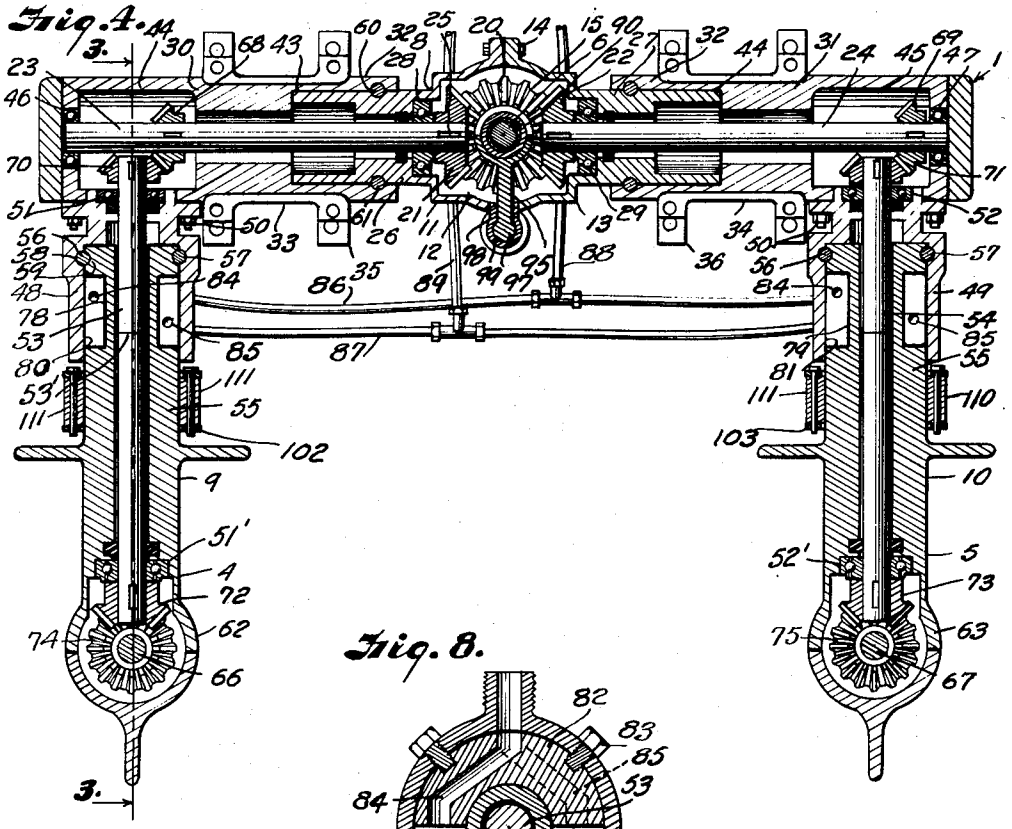


Fig. 8.

Fig. 7.

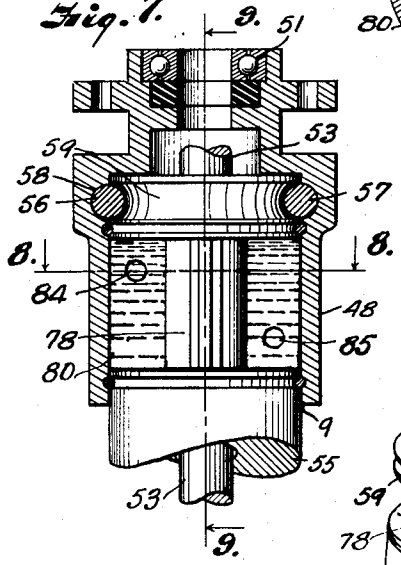


Fig. 9.

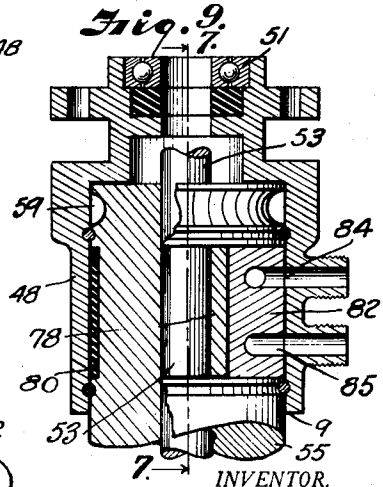
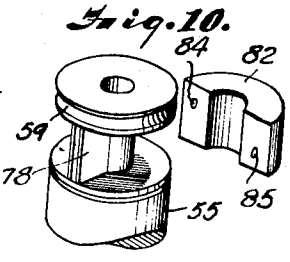


Fig. 10.



INVENTOR.
Harry R. Patty Jr.
BY
Paul E. Mullendore
ATTORNEY

United States Patent Office 2,936,730 Patented May 17, 1960

2,936,730

TILTABLE AND STEERABLE DUAL PROPELLER DRIVE FOR BOATS EQUIPPED WITH INBOARD MOTORS

Harry R. Patty, Jr., Sapulpa, Okla., assignor of one-half to Lee C. McClure, Sapulpa, Okla.

Application August 9, 1957, Serial No. 677,263

5 Claims. (Cl. 115—37)

This invention relates to a drive for boats, particularly of the motor boat class and equipped with inboard motors.

It is well known that inboard motors are most satisfactory when considered from the power factor. For example, inboard motors are more dependable, simpler in design, are easily accessible for repairs, and easier to protect from the water, corrosion, and other elements. Also, inboard motors are less likely to be damaged in case of accidents. However, the transmission of the power, from an inboard motor, to the propellers is a constant source of trouble brought about by water leakage through the packings, loss of power because of too tight packing, misalignment, and many other factors. Also, complicated rudder systems are required for steering, particularly for low speeds. Consequently, many boat enthusiasts are sacrificing the advantages of inboard motors to gain the simplicity, ease of maneuverability and elimination of transmission troubles offered by outboard motors.

It is, therefore, the principal object of the present invention to provide a drive for boats that are equipped with inboard motors which has all the advantages of outboard power, while also attaining the advantages afforded by an inboard motor.

Other objects of the invention are to provide a simple, trouble free drive that functions in the manner of the drive effected by outboard motors, to provide a drive equipped with multiple propeller units, to provide a drive which is protected from damage by floating obstructions, to provide a connection of the propellers which allows the propellers to kick out of the water, either separately or together, when struck by floating objects, or to be raised manually when beaching a boat.

Further objects of the invention are to provide a multiple propeller drive wherein the propeller units are adapted to turn on vertical axes to steer the boat without use of a rudder; to provide control of the drive to the respective propellers whereby the boat may be steered equally well in both directions; to provide a drive of this character wherein the thrusts of the propellers or engine torque is balanced by driving the propellers in opposite directions to enable the use of a simple steering control and which may be actuated by any conventional hydraulic steering control; to provide a common drive for the plurality of independent propeller units adapted to be held in alignment solely by the steering system linkage; and to provide an inboard motor drive equipped with means for changing the propeller angle in relation to the bottom of the boat to compensate for different weight loads.

Another object is to provide the drive with forward, reverse, and neutral, preferably selected by a hydraulic control.

It is a further object of the invention to provide a propeller drive wherein the mountng brackets, drive shafts and controls are above the water line.

In accomplishing these and other objects of the invention as hereinafter pointed out, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the stern of a boat equipped with a propeller drive assembly embodying the features of the present invention.

Fig. 2 is a horizontal section through the propeller drive assembly on the line 2—2 of Fig. 3, particularly illustrating connection of the power shaft with the right and left lateral or transverse shafts for driving the right and left propeller units.

Fig. 3 is a side elevational view of the stern portion of a boat and propeller drive assembly, with one of the propeller units being shown in vertical section, the section being taken on a line 3—3 of Fig. 4.

Fig. 4 is a transverse vertical section taken on the line 4—4 of Fig. 3.

Fig. 5 is a fragmentary view showing the clutch collar and the hydraulic mechanism for effecting forward, reverse and neutral positions thereof.

Fig. 6 is a side elevational view of one of the propeller angle adjustment brackets, with parts being shown in section to better illustrate the construction.

Fig. 7 is a fragmentary section through one of the hydraulically actuated steering mechanisms, the section being taken on the line 7—7 of Fig. 9.

Fig. 8 is a horizontal section on the line 8—8 of Fig. 7.

Fig. 9 is a vertical section at right angles to the section shown in Fig. 7, the section being taken on the line 9—9 of Fig. 7.

Fig. 10 is a fragmentary perspective view of the steering vane and the parts that form one of the steering vane chambers.

Referring more in detail to the drawings:

1 designates a propeller driving assembly embodying the features of the present invention and showing the mounting thereof on the transom 2 of a motorboat 3. The boat 3 is equipped with an inboard power unit, such as a motor which may be an internal combustion engine designated 3', Figs. 1 and 2 for supplying power to the right and left propeller units 4 and 5 of the assembly through a power shaft 6 that extends through the transom 2 of the boat above the water line, as best shown in Figs. 1 and 3. Since the power shaft 6 is located above the water line, it may extend with comparative freedom through a plain collar 7, which, if desired, may be provided with a low pressure packing.

The propeller drive assembly includes a transverse housing 8 carrying at the ends thereof depending tubular housings 9 and 10 of the right and left propeller units 4 and 5, as best shown in Fig. 1. The transverse housing includes a central or stationary section 11 composed of complementary casing parts 12 and 13 that are secured together by bolts 14 to form an enclosure or gear case for a cluster of gears 15. The casing parts are provided on the inside in the fore and aft direction thereof with antifriction bearings 16 and 17 for journaling therein the end 18 of the power shaft 6. The gear cluster includes driving gears 19 and 20 that are freely rotatable on the power shaft 6 at the inner sides of the antifriction bearings 16 and 17. The gears are of the bevel type and are supported in driving engagement with driven gears 21 and 22, which are keyed to the innermost ends of lateral shafts 23 and 24 by means of keys or the equivalent 25. The casing parts 12 and 13 have coaxial tubular extensions 26 and 27 which carry antifriction bearings 28 and 29 for journaling the inner ends of the lateral shafts 23 and 24.

The transverse housing also includes right and left sections 30 and 31, having ends 32 coaxially containing the extensions 26 and 27. The sections 30 and 31 are journaled within bearing collars 33 and 34 of brackets

35 and 36 by which the entire assembly is attached to and supported by the transom 2 of the boat. The bearing collars 33 and 34 preferably comprise a seat 37 having legs 38 that terminate in feet 39 which are attached to the transom of the boat by suitable fastening devices such as bolts 40. The ends 32 of the housing sections 30 and 31 are retained in the seats 37 of the brackets by caps 41 that are bolted to the brackets. The portions of the ends 32 are journaled in the brackets and are preferably of reduced diameter to prevent sidewise movement of the assembly. To assure axial alignment of the housing parts, the ends 32 have counterbores 42 and 43 for receiving therein the outer ends of the lateral extensions 26 and 27 of the central casing parts, as best shown in Fig. 2.

The outer ends of the housing sections 30 and 31 have gear cases 44 and 45 which carry antifriction bearings 46 and 47 for journaling the outer ends of the lateral shafts 23 and 24. The housing sections 30 and 31 also include depending socket portions 48 and 49, which may constitute separate parts that are connected to the gear cases by fastening devices such as bolts 50. The parts 48 and 49 carry antifriction bearings 51 and 52 for mounting the upper ends of vertical shafts 53 and 54. The depending housings 9 and 10 also include tubular leg portions 55 that are rotatably anchored in the sockets 48 and 49 by pairs of pins 56 and 57 that extend through the holes 58 in the walls of the sockets and have portions engaging in grooves 59 arranged substantially tangentially of the leg portions 55. The lateral extensions 26 and 27 of the central housing section are similarly connected with the end sections by pairs of key pins 60 and 61. In this way the propeller units 4 and 5 are free to swing independently of each other rearwardly and upwardly about the axis of the lateral shafts, and to turn or oscillate within the sockets 48 and 49 without the housing members pulling apart. The shafts 53 and 54 are preferably in two parts to facilitate assembly, as indicated at 53'. The lower ends of the shafts 53 and 54 are mounted in bearings 51' and 52' that are carried in the lower ends of the legs.

The lower ends of the legs 55 carry gear cases 62 and 63 and which contain at the respective forward and rear ends thereof antifriction bearings 64 and 65 for journaling propeller shafts 66 and 67, respectively.

The lateral shafts have fixed thereon bevel gears 68 and 69 which mesh with bevel gears 70 and 71 on the upper ends of the vertical shafts 53 and 54, the gears 68 and 69 being arranged at the respective ends of the lateral shafts 23 and 24 whereby the vertical shaft 53 is driven in one direction and the other vertical shaft 54 is driven in the opposite direction, to equalize torque on the power shaft 6.

The lower ends of the vertical shafts 53 and 54 have fixed thereto bevel gears 72 and 73 which mesh with bevel gears 74 and 75 on the propeller shafts 66 and 67. The rear ends of the propeller shafts 66 and 67 project from the cases 62 and 63 and carry propellers 76 and 77 having blades set to exert thrusts in the same direction even though they turn in opposite directions. In this way any tendency for one propeller unit to deviate is counteracted by the other and a simple easy acting steering mechanism may be used to hold the propeller units in the same course.

The steering connection might be a direct mechanical linkage, but to simplify the controls and to provide for power steering, the connection is of hydraulic character. The propeller units carry piston elements or vanes 78 and 79, respectively, that are adapted to oscillate within substantially semicylindrical chambers 80 and 81 that are provided by annular recesses in the vertical shaft housings.

When the propeller units 4 and 5 are in a straightaway direction, the vanes 78 and 79 extend rearwardly within the piston chambers and the forward portions of the

recesses are filled in by arcuate blocks 82 that are retained in fixed relation within the socket parts 48 and 49 by fastening devices such as cap screws 83 (Fig. 8). The blocks 82 are provided with ports 84 and 85 opening into the piston chambers 80 and 81 on the respective sides of the vanes 78 and 79 for passing a hydraulic fluid into and out of the respective chambers, as later described.

The ports 84 and 85 of one propeller unit are connected with corresponding ports of the other propeller unit by ducts 86 and 87 which are connected with fluid supply and return lines 88 and 89 that extend through the transom of the boat and are connected with a source of pressure fluid by any conventional steering control valve (not shown), whereby fluid may be admitted under pressure into one and the other of the supply lines and exhausted from the other supply line to act on the respective sides of the vane for steering the propeller units, as later described.

In order to selectively connect the driving gears 19 and 20 to the power shaft 6, the power shaft 6 carries a clutch collar 90 that is slidably keyed to the power shaft at a point intermediate the gears 19 and 20, and the ends of the clutch collar have lugs 91 and 92 that are adapted to engage corresponding lugs 93 and 94 on the facing sides of the drive gears, so that when the lugs at one side of the collar engage the lugs of the facing gear, that gear is connected in driving relation with the power shaft to effect rotation of both the lateral shafts in one direction, and when the lugs at the opposite side of the collar are engaged with the lugs of the gear at that side, that gear is rendered effective to rotate the lateral shafts in a reverse direction, thereby providing for forward and reverse rotation of the propellers.

The clutch collar 90 may be actuated by a shipper 95 that operates through a slot 96 in the central housing parts and is connected with a piston 97 of a hydraulic actuator mechanism 98. The piston 97 is slidable in a cylinder 99 that is suitably attached to the under side of the central housing parts, and the ends thereof are connected by ducts 100 and 101 that lead through the transom of the boat and are connected with a hydraulic control valve (not shown) for selectively admitting hydraulic fluid to one end and the other of the cylinder and exhausting it from the opposite end of the cylinder to manipulate the clutch and for locking the piston in an intermediate position to hold the clutch collar in neutral.

In order that the propeller units may be pivoted to support the propeller shafts at the proper angle relative to variable loading of the boat, each propeller unit is braced from the boat by brace arms 102 and 103. Each brace arm includes a fixed tubular part 104 that is attached to the lower portion of the transom of the boat by fastening devices 105. The tubular parts slidably contain the other parts 106 and which parts are adjustably connected by a pin 107 that extends through one of a series of openings in the tubular part 104 and through an opening in the part 106.

Pivotally mounted by means of a pin 108 on the rear ends of the parts 109 are yokes 110, which yokes 110 are open at the front to accommodate therein the depending shaft housings of the propeller units. To reduce friction, the yokes are provided at spaced points with rollers 111. The open sides of the yokes allow the propeller units to swing therefrom, as shown in dotted lines, Fig. 3, for clearing the propeller units, as when beaching the boat or in case a floating object should strike one or the other of the propeller units, as later described.

The propeller unit constructed and assembled as described is mounted on the transom 2 of the motorboat, so that the propeller heads are in proper submergence with the power shaft 6 extending through the collar 7 and into the boat, where it is connected with the inboard motor or with a speed control unit that is driven by the inboard motor.

When the brackets **35** are secured to the transom, the propeller units **4** and **5** hang freely from the horizontal axis and may be moved in the brackets to a position as shown in dotted lines, Fig. 3, in case, when cruising, a submerged object should strike one or the other of the units. The propeller units, however, are supported against the thrust of the propellers by the brace arms **102** and **103**, so that the yokes **110** thereof embrace the leg portions **55** of the propeller units. The effective lengths of the brackets are adjusted by inserting the pins **107** in the proper holes of the tubular parts **104** of the brace arms to support the propeller shafts **66** and **67** at a predetermined angle relatively to the bottom of the boat.

The ducts **88** and **89** are connected with the standard hydraulic steering control valve within the boat, and the ducts **100** and **101** are connected with a control valve whereby the clutch collar may be moved from neutral position to engage one or the other of the driving gears **19** and **20**, as when the boat is to be moved in a forward direction or in a reverse direction.

As above stated, the leg portions of the propeller units are swivelly retained within the sockets **48** and **49**, so that they may turn therein and in the yokes of the brace arms **102** and **103**.

When pressure fluid is admitted through the ports **84** and exhausted from the ports **85**, the propeller units are caused to turn in a anticlockwise direction, and when the flow of pressure fluid is reversed, the pressure acts on the opposite side of the vanes **78** to turn the propeller units in the opposite direction. Thus, the boat is capable of being steered entirely by the propeller units. This is made possible by the counter rotation of the propellers which equalizes the motor torque, that is, any tendency for one propeller to deviate from its intended direction is counteracted by the other unit.

The propeller units are brought into gear in forward and reverse direction by admitting pressure fluid to one or the other ends of the cylinder **99**, which brings the clutch collar **90** into engagement with the clutch faces of one or the other of the gears, depending upon the direction that the boat is to be moved.

When it is desired to dock the boat, the propeller units may be raised through the dotted line position shown in Fig. 3 so as to bring them in an out of way position above the bottom of the boat. Should one or both of the propeller units be contacted by a submerged object, the leg portions of the units are merely kicked out of the supporting yokes until the object has been passed, after which the weight of the units returns them to seating engagement within the yokes of the brace arms. The thrust of the propellers in moving the boat through the water acts automatically to retain the units in the yokes of the supporting arms on forward movement of the boat. While the rear of the yokes are open to permit the units to kick up under engagement by a submerged object, under normal operating conditions the weight of the units will hold them in proper position in the yokes upon backing of the boat, however, if desired, the gear cases **44** and **45** may be latched to the bracket collars **33** and **34** by suitable slide bolts (not shown) that may be actuated to lock the parts together before placing the units in reverse.

From the foregoing it is obvious that I have provided a simple propeller drive for boats equipped with inboard motors that has the maneuverability and advantages of outboard motors without the disadvantages of present intallations where the propeller shafts must extend through packed bearings in the bottom of the boat.

What I claim and desire to secure by Letters Patent is:

1. A dual propeller drive for a motor boat having an inboard motor and a transom at the stern of the boat for mounting the propeller drive, said propeller drive including laterally spaced propeller units, means for independently mounting the propeller units on the transom of the boat for independent swinging movement rearwardly and upwardly about a common transverse axis, said propeller units having joints on which the propeller units are oscillatable about vertical axes, hydraulically actuated steering means interconnecting the propeller units to steer the boat, a common drive connection between the propeller units and the inboard motor, said driving connection including gears rotatable on the transverse axis meshing with gears on the vertical axes of the propeller units with the gears in the vertical axes being adapted to roll upon the gears in the transverse axis when one of the propeller units swings rearwardly and upwardly on the transverse axis to maintain said driving connections, and said hydraulic steering means including flexible tubular ducts to maintain the steering connections intact during movement of said one propeller unit for propelling and steering of the boat by the other propeller unit.

2. A dual propeller drive for a motor boat having an inboard motor and a transom at the stern of the boat for mounting the propeller drive, said propeller drive including laterally spaced propeller units, means for independently mounting the propeller units on the transom of the boat for independent swinging movement rearwardly and upwardly about a common transverse axis, brackets adapted for attachment to the stern of the boat and having yoke portions seating the propeller units in vertical position in opposite to thrust of the impellers of said units and said yokes having open fronts for releasing a propeller unit to swing about the transverse axis in case the propeller unit should be engaged by an underwater obstruction, said propeller units having joints on which the propeller units are oscillatable about vertical axes, hydraulically actuated steering means interconnecting the propeller units to steer the boat, a common drive connection between the propeller units and the inboard motor, said driving connection including gears rotatable on the transverse axis meshing with gears in the vertical axes of the propeller units with the gears in the vertical axes being adapted to roll upon the gears in the transverse axis to maintain the driving connection when one of the propeller units swings rearwardly and upwardly on the transverse axis to maintain said driving connections, and said hydraulic steering means including flexible tubular ducts to maintain the steering connections intact during movement of said one propeller unit for steering of the boat by the other propeller unit.

3. A dual propeller drive for a motor boat having an inboard motor and a transom at the stern of the boat for mounting the propeller drive, said propeller drive including a transverse housing having a stationary central section providing a gear case and having oppositely directed tubular extensions, oscillatable sections having tubular portions in sleeved relation with the tubular extensions of the stationary central section and having independent connections with the extensions of the central section in the axial directions thereof, said oscillatable sections having depending tubular portions at outer ends thereof, tubular housings having upper ends oscillatably connected with said tubular depending portions, a propeller unit on the lower end of each tubular housing, steering means interconnecting the tubular housings for oscillating the propeller units to steer the boat, brackets for mounting on the transom of the boat and having rearwardly extending bearing portions journaling the tubular portions of the oscillatable sections therein for supporting the transverse housing and in which the oscillatable sections are movable in oscillatory directions independently of each other and upon the tubular extensions of the stationary central section, a drive shaft journaled in said gear case of the central section and adapted to extend through the transom to connect with the inboard motor, separately aligned shafts in the transverse housing and having inner ends journaled in the tubular extensions of the central section and outer ends journaled in the tubular portions of the oscillatable sections, gears in the

gear case and interconnecting the drive shaft with said aligned shafts, vertical shafts rotatable within the depending tubular housings and having lower ends connected with the propeller units, gears connecting outer ends of the aligned shafts with the upper ends of the vertical shafts, brace arms for attachment to the stern of the boat and having yoke portions seating the depending tubular housings in opposition to thrust of the propellers and said yokes having open fronts for releasing the tubular housings to swing the propeller units upwardly and rearwardly with the tubular portions of the oscillatable sections turning within the bearing portions of the brackets and upon the tubular extensions of the central section and about the axis of said aligned shafts in case a propeller unit should be engaged by an underwater obstruction and moved thereby out of its seat in the yoke portion of its corresponding brace arm while the other propeller unit retains its vertical position and with the driving and steering connections thereof intact to steer and propel the boat.

4. A dual propeller drive for a motor boat having an inboard motor and a transom at the stern of the boat for mounting the propeller drive, said propeller drive including a transverse housing having a stationary central section providing a gear case and having laterally directed oscillatable sections in connection with the central section and having depending socket portions at outer ends thereof, tubular housings having upper ends oscillatably anchored within said socket portions, a propeller unit on the lower end of each tubular housing, said upper ends of the tubular housings having annular recesses, means in said socket portions cooperating with the annular recesses to provide substantially semicircular chambers, vanes on the tubular housings and oscillatable in said chambers, duct means connecting the portions of the chambers on opposite sides of the vanes of one tubular housing with the corresponding portions of the other, means connected with the duct means for supplying and exhausting a pressure fluid from the portions of the chambers on opposite sides of the vanes for oscillating the propeller units to steer the boat, brackets for attachment to the transom

of the boat and having rearwardly extending bearing portions journaling the oscillatable sections of the transverse housing and in which the oscillatable sections are movable independently of each other, a drive shaft journaled in the gear case of the transverse housing and adapted to extend through the transom to connect with the inboard motor, shaft means journaled in the transverse housing, gears in the gear case interconnecting the drive shaft with the shaft means, vertical shafts rotatable within the depending tubular housings and having lower ends connected with the propeller units, gears connecting ends of the shaft means with the upper ends of the vertical shafts, brace arms for attachment to the stern of the boat and having yoke portions seating the depending tubular housings in opposition to thrust of the propellers and said yokes having open fronts for releasing the tubular housings to swing the propeller units upwardly and rearwardly about the axis of the shaft means in case a propeller unit should engage an underwater obstruction while the other propeller unit retains its vertical position with the driving and steering connections thereof intact to steer and propel the boat.

5. A dual propeller drive for a motor boat as described in claim 2 wherein the brackets comprise brace parts carrying the yokes, and tubular parts adjustably containing the brace parts therein and having means for attachment to the stern of the boat, one of said parts having a series of openings and the other an opening adapted to be registered with one of the series of openings and a pin extending through the registering openings.

References Cited in the file of this patent

UNITED STATES PATENTS

1,822,573	Fitzgerald	Sept. 8, 1931
1,943,288	Chandler et al.	Jan. 16, 1934
1,943,323	Johnson	Jan. 16, 1934
2,091,557	Montgomery	July 31, 1937
2,608,060	Smith	July 26, 1952

FOREIGN PATENTS

598,598	Great Britain	Feb. 23, 1948