

Dec. 19, 1967

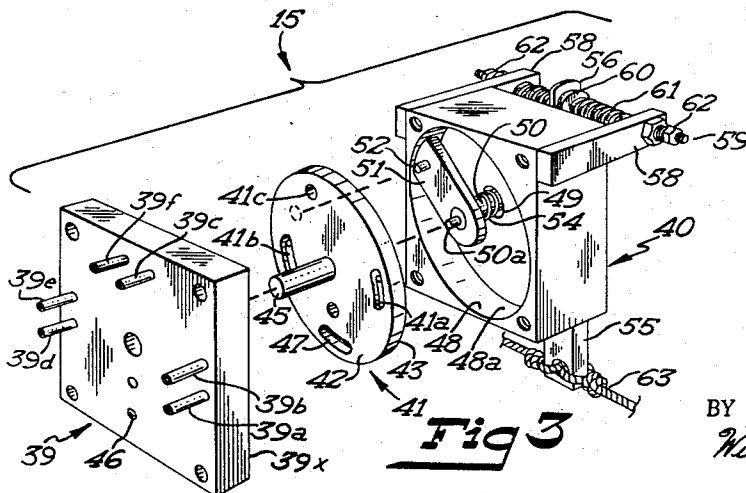
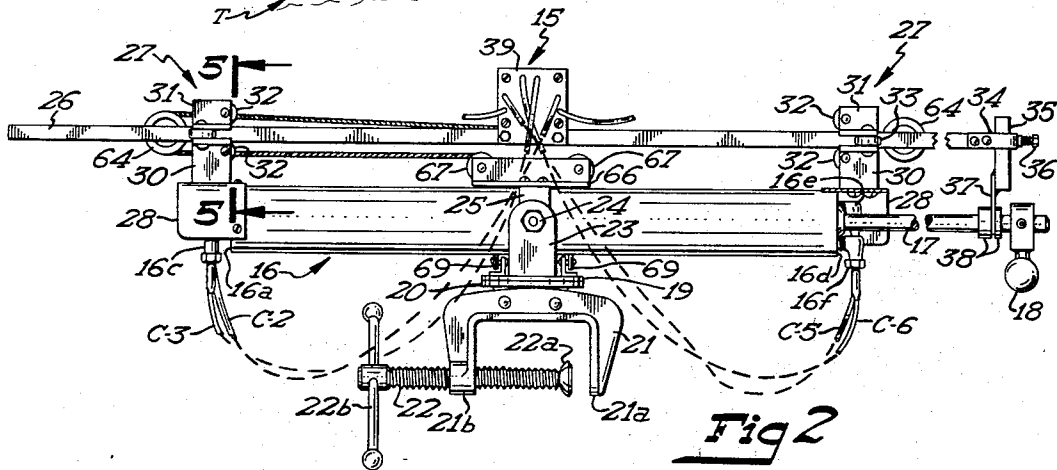
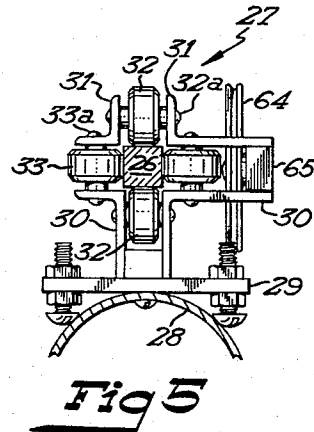
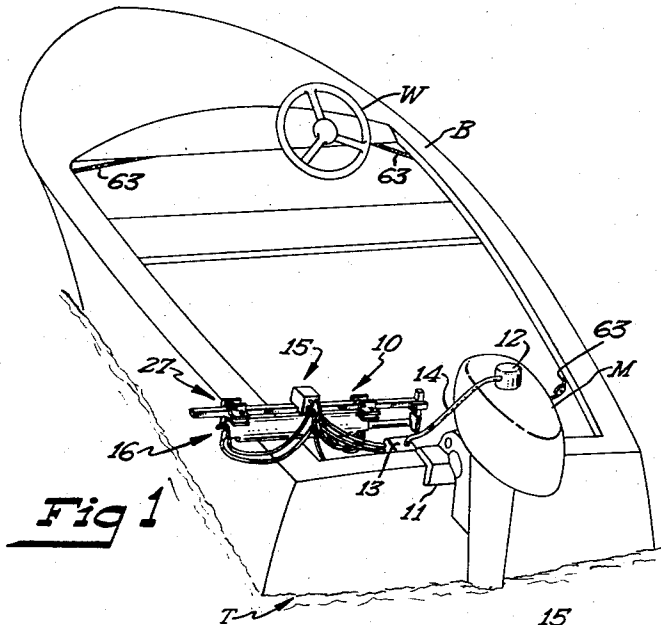
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3,358,564

FLUID PRESSURE SYSTEM FOR USE IN CONTROLLING
STEERING OF OUTBOARD MOTORS AND THE LIKE

Filed March 2, 1964

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

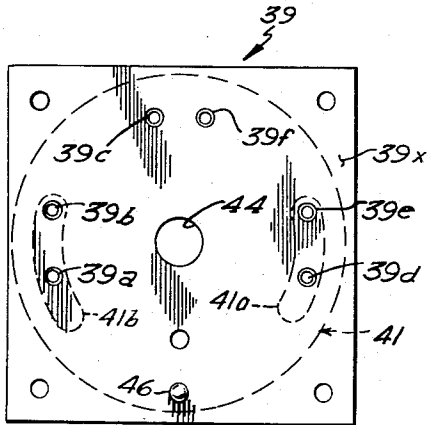


Fig 8

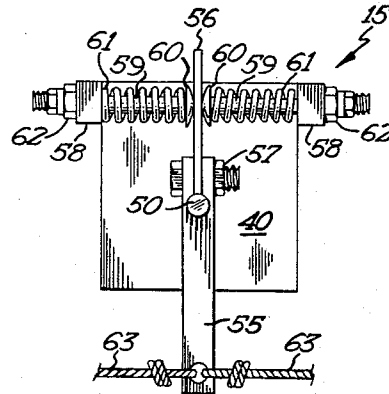


Fig 4

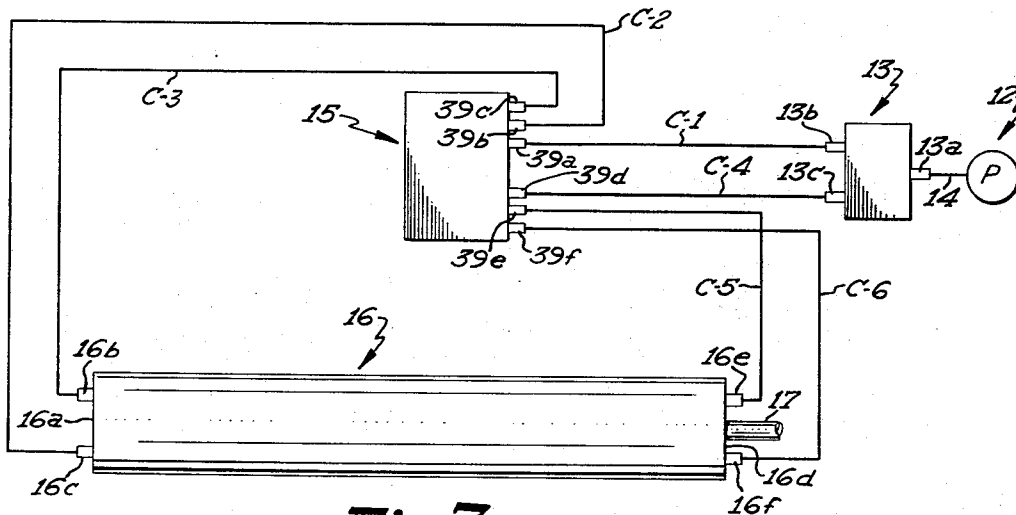


Fig 7

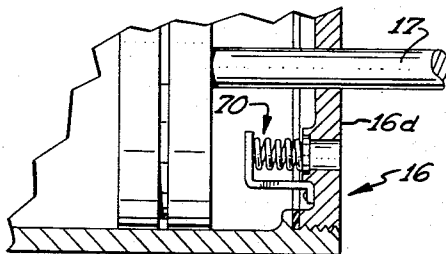


Fig 6

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3,358,564

FLUID PRESSURE SYSTEM FOR USE IN CONTROLLING STEERING OF OUTBOARD MOTORS AND THE LIKE

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Filed Mar. 2, 1964, Ser. No. 348,686
7 Claims. (Cl. 91—375)

This invention relates to a fluid pressure control system for selectively power shifting an outboard motor to thereby control steering of a boat upon which the motor is mounted.

An object of this invention is to provide a fluid pressure system for variably power shifting an outboard motor to control steering of the boat upon which the motor is mounted, and in which the fluid pressure system is operable in response to movement of a control mechanism, such as the steering wheel of the boat, through human touch, whereby the steering operation may be performed with minimum effort regardless generally of the size of the outboard motor.

A more specific object of this invention is to provide a fluid pressure system including a piston and cylinder unit connected to the steering cables of the boat and operable in response to movement of the steering wheel of the boat to variably power shift an outboard motor mounted on the boat to thereby facilitate steering of the boat, and also obviating cable rigging problems normally attendant in most conventional mechanical steering systems for boats having outboard motors.

A further object of this invention is to provide a novel fluid pressure system of the class above described including a variously adjustable feeler type sensing means which is operable to impart to the operator an increasing sense of resistance as the steering wheel is turned in a given direction, thereby permitting controlled steering of the boat to which the motor is attached.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings wherein like character references refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a rear perspective view of a small boat incorporating the fluid actuated control system applied for controlling steering of the outboard motor thereof;

FIG. 2 is a rear elevational view of the piston and cylinder unit including the carriage member and valve mechanism;

FIG. 3 is an exploded perspective view of the valve mechanism on an enlarged scale;

FIG. 4 is a front elevational view of the valve actuating element and the feeler type sensing means;

FIG. 5 is a cross sectional view on an enlarged scale taken approximately along line 5—5 of FIG. 2 and looking in the direction of the arrows;

FIG. 6 as a fragmentary sectional view on an enlarged scale of one end of the cylinder illustrating details of construction thereof;

FIG. 7 is a diagrammatic illustration, illustrating generally the flow diagram of the fluid pressure system; and

FIG. 8 is a front elevational view on an enlarged scale of the stationary valve head with certain concealed parts illustrated by dotted line configuration.

Referring now to the drawings and more specifically to FIG. 1 it will be seen that one embodiment of the fluid pressure system, designated generally by the reference numeral 10, is thereshown. It will be seen that this fluid pressure system 10 is applied for controlled power steering to a conventional outboard motor M which, as seen,

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is mounted on the stern plate of a small boat designated generally by the reference character B. The motor M is provided with the conventional mounting structure which includes a clamp which clampingly engages the transom or stern plate T of the boat. The motor M is also provided with the usual forwardly extending steering tongue S which in most outboards has a swignable rubber grip handle attached thereto. This handle may be removed if desired in the attachment of my system.

It is pointed out that the motor M is swingably supported by the mounting structure 11 for swinging movement about a substantially vertical axis during the steering operation. The motor M is also vertically swingable about a substantially transverse horizontal axis to permit elevation of the motor when the latter is not being used or in the event the motor strikes a submerged object or the like. The details of construction of this mounting structure are thought to be unnecessary for the instant application since the mounting structure is of conventional form and does permit horizontal swinging movement of the motor during the steering operation.

The fluid pressure control system 10 also includes a fluid pump mechanism 12 which, as shown, is diagrammatically illustrated. This pump mechanism 12 is of the diaphragm type and is identical in construction to that disclosed in my co-pending application, Ser. No. 124,095, filed July 14, 1961. Since the details of construction of this fluid pump mechanism are specifically set forth in my co-pending application, it is felt that a detailed description thereof is also unnecessary for the instant application. It is pointed out, however, that the pump mechanism includes a rectangular yoke which is slidably mounted for reciprocation between sets of opposed rollers and which is driven by a cam disc rotatably affixed to the upper end of the main crank shaft of the outboard motor. The cam disc which engages the cam track of the yoke retracts the yoke during the power stroke while movement of the yoke in the other direction is caused by the reciprocating part of the air pump. Reciprocation of the actuating yoke may be adjustably limited by suitable wing nut bolt means as described in my co-pending application and it is pointed out that the yoke may be disconnected from driving engagement with the cam carried by the main shaft of the outboard motor so that the air pump is rendered inoperable.

The air pump 12 is provided with a discharge fitting which is connected by a flexible conduit 14 to the intake fitting 13a of a manifold air chamber block structure 13. This manifold air chamber block structure which is hollow is also provided with a pair of discharge fittings 13b and 13c which are connected respectively by suitable flexible conduits that extend to and are connected to a control valve mechanism designated generally by the reference numeral 15.

This control valve mechanism 15 is interposed in controlling relation with respect to an actuator cylinder or unit 16 of an actuator cylinder and piston unit which controls steering of the outboard motor M. The actuator cylinder 16 is provided with an actuator piston which is reciprocable therein having smooth sealed engagement therewith and this piston carries an actuator rod or unit 17 which projects through suitable packing glands mounted on the inner or right end of the actuating cylinder as viewed in FIGS. 1 and 2. The actuator rod is provided with a suitable ball and socket connection 18 at the extremity thereof, which in turn is connected to the steering tongue S of the outboard motor in a well known manner.

The actuator cylinder and piston unit is mounted for limiting oscillation on a substantially vertical axis by a small turntable 19 which rotates on a pin (not shown)

that is affixed to a mounting disc 20 which in turn is rigidly secured to the upper edge of a C-clamp 21. The C-clamp 21 has clamping jaws 21a and 21b with the jaw 21b having threaded connection with the clamping bolt 22 carrying at its inner end a swivel clamp disc 22a and turned by means of a handle 22b. The turntable 19 carries a pair of widely spaced upstanding ears 23 which are each pivotally connected by one of a pair of pivot pins 24, the pivot pins 24 being swivelly connected to a pivot sleeve 25 affixed in clamping relation to the cylinder 16 adjacent the median portion thereof. It will be seen that the pivotal axis defined by the pivot pins 24 (only one of which is shown) lies in the same plane as the longitudinal axis of the cylinder 16. With this arrangement the clamp 21 is adapted to secure the cylinder 16 for swivel movement on a transverse horizontal axis and also for limited oscillation on a substantially vertical axis, through the intermediary of the turntable 19 and its related parts and the intermediary of the pivot pins 24 (only one of which is shown) and the pivot sleeve 25.

The control valve mechanism 15 is rigidly mounted on an elongate, generally bar-shaped carriage member 26 for movement therewith. It will be seen that the valve mechanism 15 is secured at approximately the mid-portion of the carriage member 26, the latter being positioned above the cylinder 16 and in close proximity thereto. The carriage member 26 is interconnected with the piston rod 17 for movement therewith longitudinally of the cylinder 16.

To this end it will be seen that a pair of roller support mechanisms 27 are provided, each being mounted adjacent one end of the cylinder 16. Each of the roller support mechanisms 27 includes an arcuate attachment element 28 which is secured to one end of the cylinder 16 and which projects axially therefrom, as best seen in FIG. 2. A substantially flat attachment plate 29 is secured to each arcuate attachment element 28 by suitable bolt means or the like and a pair of upstanding L-shaped roller brackets 30 are affixed to the attachment plate 29 for each roller support mechanism 27 and project upwardly therefrom. Another pair of L-shaped roller brackets 31 are provided for each roller support mechanism 27 and the transverse legs of the roller brackets 31 are disposed in vertically spaced, substantially parallel relation with the transverse or horizontal edge of the roller brackets 30. Similarly, the vertical legs of the roller brackets 31 are spaced-apart from each other in substantially parallel relation while the vertical legs of the roller brackets 30 are also spaced-apart and disposed in substantially parallel relation with respect to each other.

Referring again to FIG. 5 it will be seen that a pair of vertically oriented, vertically spaced-apart rollers 32 are journaled for rotation between the respective vertical legs of the roller brackets 30 and 31 by suitable axle pins 32a. A pair of horizontally oriented rollers 33, which are laterally spaced-apart, are journaled for rotation between the respective horizontal legs of the brackets 30 and 31. It will be noted that since the carriage member 26 is of substantially rectangular cross sectional configuration, the pairs of rollers 32 and 33 engage opposite sides of the carriage member adjacent opposite ends thereof and support the carriage member for longitudinal rectilinear movement.

Referring now to FIG. 2 it will be seen that that end of the carriage member 26 which is positioned adjacent the exteriorly disposed end of the piston rod 17 is provided with a U-shaped attachment bracket 34 which is secured thereto by suitable bolt means and which has the bight portion thereof spaced from the adjacent terminal end of the carriage member. An elongate post 35 extends through the space defined by the U-shaped bracket 35 and the end of the carriage member 26 and this post is clamped against the end of the carriage member 26 by means of a set screw 36 which threadedly engages an opening formed in the bight portion of the U-shaped bracket 34. With this

arrangement, the post 35 may be set in various vertical positions relative to the carriage member 26.

A piston rod engaging element 37 is rigidly affixed to the lower end portion of the post 35 and projects downwardly therefrom. This piston rod engaging element has an arcuate recess formed in the lower edge thereof for receiving the piston rod 17 therein. A pair of axially spaced-apart positioning collars 38 are affixed to the piston rod 17 adjacent the end thereof and these positioning collars are disposed on opposite sides of the piston rod engaging element 37 and cooperate therewith to cause the carriage member 26 to be moved with the piston rod 17 during retraction and extension of the latter. It is also pointed out that the post 35 may be moved vertically to shift the piston rod engaging element 37 out of cooperative engagement with the piston rod 17 and the positioning collars 38 so that the piston rod may be moved independently of the carriage member 26.

Referring again to FIGS. 3, 7 and 8, it will be seen that the valve mechanism 15 includes a stationary head 39 having a plurality of passages therein for fluid communication with the piston and cylinder unit and the manifold air chamber block structure 13. This stationary head 39 is secured to a closure cap or bonnet 40 by suitable bolt means which are received within apertures in the corners of the respective stationary head and the closure cap. In the embodiment shown, the stationary head 39 has a cross sectional area substantially identical in size and shape to the cross sectional area defined by the closure cap 40.

The stationary valve head 39, as best seen in FIG. 8, has a planar face 39x against which is seated an oscillatory valving disc or rotor 41. A series of ports, hereinafter to be described, communicate through the face 39x and which are arranged in a predetermined pattern thereon, each communicating with an extension of the overall passage which in turn passes through the body portion of the head 39, terminating in a fitting or nipple for connection with its appropriate conduit. Reference is made to FIGS. 3, 7 and 8 which disclose the passages in the stationary head 39 and their relationship with the associated nipples and conduits.

It will be seen that a conduit C-1 connects the discharge passage or nipple 13b of the manifold air block structure 13 with an air supply inlet 39a of the valve head 39. A second flexible conduit C-2 connects the air intake passage 16b at the left end 16a of the actuator cylinder 16 with the air discharge passage 39b disposed, as shown in FIG. 7, in close relationship to the air inlet port 39a.

A third flexible conduit C-3 connects the outlet or decompression port 16c at the left of the cylinder 16 with the outlet or decompression passage 39c of the valve head 39. A fourth flexible conduit C-4 connects the air passage port or nipple 13c of the manifold air chamber block structure 13 with the air supply passage 39d in the valve head 39. Another flexible conduit C-5 connects the air supply passage 16e at the right end 16d of the cylinder 16 with the air discharge passage 39e disposed closely adjacent the air inlet passage 39d on the valve head 39. A sixth conduit C-6 connects the air outlet or decompression passage 16f at the right end of the cylinder 16 with a decompression passage 39f of the valve head 39. It will therefore be seen that the arrangement of the piston and cylinder unit with respect to the valve head 39 is quite similar to the flow arrangement illustrated in my co-pending application, Ser. No. 124,095.

The planar face 39x of the stationary valve head 39 is normally oriented vertically if the system is supported from the side gunnels of a boat, although it will be appreciated that this valve control mechanism need not have this specific orientation. However, for the purpose of clarity, the face 39x will be described as being oriented vertically and will be referred to as facing forwardly. Similarly the oscillatory valving disc or rotor 41 has opposed faces 42 and 43, as best seen in FIG. 3, face 42 for the purpose of clarity being designated the rear face while

face 43 will hereafter be referred to as the front face. The faces 42 and 43 are substantially planar, the rear face 42 contacting the face 39x of the stationary valve head 39.

The stationary valve head 39 has a centrally located axially extending socket 44 therein while the oscillatory valving disc or rotor 41 has a small stub shaft 45 projecting axially from the rear face 42 thereof and which seats within the socket 44. It will therefore be seen that the oscillatory valving disc 41 is mounted with respect to the stationary valve head 39 for revolving movement relative thereto.

Referring again to FIG. 3, it will be seen that the rear face 42 of the valving disc 41 has two shallow arcuate communication grooves 41a and 41b, these grooves not extending axially through the disc. The groove 41a is of a length to span and interconnect the ports or passages 39a and 39b in the stationary valve head 39 even when the disc is turned through a partial revolution in one direction, from a normally neutral position. To this end, it is pointed out that the oscillatory valving disc 41 is normally urged to the neutral position and that the groove 41a is of a length to intercommunicate the ports 39a and 39b when in the neutral position. Similarly, the groove 41b is of a length to intercommunicate the ports 39d and 39e when the valving disc 41 is in the neutral position. Thus it will be seen that the fluid will be supplied to both sides of the piston and the cylinder 16 when the valving disc is in the neutral position.

A communication port or aperture 41c extends through the valving disc 41 and this aperture serves to selectively intercommunicate either of the decompression passages 39c or 39f formed in the stationary valve head through the valving disc where thereafter such fluid escapes to the exterior. When the valving disc 41 is in the neutral position the aperture 41c will be positioned between the decompression ports 39c and 39f so that no decompression can take place with respect to the cylinder 16. However, when the valving disc 41 is revolved in either direction, the communication or discharge aperture 41c will intercommunicate one of the decompression passages 39c or 39f whereby one side of the cylinder will have the air thereof exhausted therefrom.

To limit oscillation of the valving disc or rotor 41, a pin 46 is secured to the stationary valve head 39 and projects forwardly from the face 39x thereof and through an arcuate slot 47 which is formed in the valve disc 41. The ends of the slot cooperate with the pin 46 to limit oscillation of the valving disc in both directions.

The closure cap or bonnet 40 has a cylindrically shaped chamber 48 formed therein which accommodates the oscillatory disc 41 therein. It will also be seen that this closure cap 40 has a centrally located, generally cylindrically shaped bore or opening 49 therein through which projects an actuator shaft 50. The rear end of the shaft 50 is reduced to define a positioning pin 50a which projects into a forwardly facing axial opening in the stub shaft 45. This actuator shaft 50 is revolvable relative to the bonnet 40 and has an arm 51 affixed thereto and projecting outwardly therefrom. It will be seen that the arm 51 is of a length to revolve in the chamber 48 and has a pin 52 therein which projects into the small aperture 53 in the front face 43 of the oscillatory disc 41. Thus it will be seen that when the shaft 50 is revolved, this revolving movement will be transmitted through the arm 51 and pin 52 to thereby produce revolving movement of the disc 41.

The forward portion of the opening 49, although not shown in the drawing, is reduced to define a shoulder against which a coil spring 54 engages, the other end of the coil spring 54 bearing against the arm 51 to normally urge the latter rearwardly. It will therefore be seen that the shaft 50 and the arm 51 will be normally urged rearwardly by the coaction of the spring 54 with respect to the bonnet 40 and the arm 51.

An actuator mechanism is provided for controlling

revolving movement of the oscillatory disc 41 and this comprises an elongate actuator lever or arm 55 which is affixed to the forward end of the shaft 50 to control movement of the latter. It is pointed out that the forward end of the shaft 50 projects exteriorly forwardly of the bonnet 40.

It will be seen that the actuator lever 55 is normally oriented vertically when the valving disc 41 is in the neutral position and that the upper end of this actuator lever is apertured to receive the forward end of the shaft 50 and that this opening in the lever arm communicates with a vertically extending slot in the upper end of the lever. The slot in the upper end of the actuator lever 55 accommodates the lower end of a substantially flat elongate feeler type sensing arm or element 56 which projects upwardly from the lever 55. A bolt assembly 57 clamps the actuating lever 55 to the shaft 50 and clamps the feeler arm 56 to the actuating lever whereby upon swinging movement of the actuating lever, the shaft 50 will be revolved and the arm 56 will also be swung.

Means are provided for engaging and resisting movement of the sensing arm 56 and to thereby resist movement of the lever 55 during swinging movement of the latter. This means includes a pair of brackets 58 which are secured to opposite sides of the bonnet 40 adjacent the upper portion thereof. These brackets project forwardly from the bonnet and each has an aperture in the forward end thereof for accommodating elongate plungers 59 therethrough.

The plungers 59 have enlarged arcuate heads 60 and suitable coil springs 61 are positioned around the plungers, each having one end thereof bearing against the enlarged plunger head of the associated plunger and having the other end thereof bearing against the inner surface of the associated bracket 58. It will be seen that the outermost end of each plunger 59 is threaded and has a retaining element 62 threadedly engaging the same to limit inward axial movement of the plunger.

With this arrangement, it will be seen that the plungers are normally urged by the coil spring 61 towards the sensing arm 56 so that the respective plunger heads thereof engage the sensing arm. It will also be noted that swinging movement of the lever is resisted by the spring urged plungers in either direction and that this resistance progressively increases as the actuator lever is swung further in a given direction. It is pointed out that the plungers 59 are preferably threaded to permit adjustment thereof relative to the springs 61.

The means for actuating the lever arm 55 includes elongate flexible actuator cables 63 each of which has one end secured to the lower end of the actuating lever 55 and each having the other end thereof secured and wound upon a deep grooved threaded drum (not shown) which is controlled by the control wheel W. The drum to which the control wheel W is secured is of a diameter substantially larger than the conventionally used spools associated with conventional cable steering mechanisms now used on most outboard motors. Suitable guide elements are provided in the form of pulleys so that the actuator lever will be swung in a predetermined direction in response to turning of the control wheel W in a given direction. This guide means includes a pair of pulleys 64, which, as best seen in FIGS. 2 and 5, are each secured to one of a pair of pulley support bars 65. The support bars 65 are secured between the horizontal legs of the roller support brackets 30 and 31. It will be seen that the pulleys 64 are therefore positioned above and adjacent the ends of the cylinder 16 and are disposed to permit a relatively large amount of movement of the carriage member 25 and the control valve mechanism 15 carried thereby.

A bracket 66 is secured to the upper surface of the cylinder 16 adjacent the median portion thereof and this bracket has a pair of pulleys 67 journaled for rotation thereon adjacent opposite ends thereof. It will be noted

that the pulleys 67 are positioned slightly below the pulleys 64 and inwardly thereof. A pair of generally L-shaped laterally spaced-apart pulley support brackets 68 are secured in upstanding relation on the turntable 19 and each has a pulley 69 journaled thereon, these pulleys 69 being vertically oriented and having their respective axes extending transversely of the boat upon which the system is mounted. It will also be noted that the pulleys 69 have their axes of rotation disposed at an angle of approximately ninety degrees with respect to the axes of rotation of the pulleys 64 and 67. It will further be noted that the pulleys 69 are positioned below and substantially inwardly of the pulleys 67.

The cables are then trained about other guide pulleys located along both sides of the boat and the respective forward ends of the cables are attached to the deep grooved threaded drum to which the control wheel W is connected. It will therefore be seen that when the wheel W is turned to the right, as viewed in FIG. 1, to cause the boat B to be steered to the right, the cable 63 located at the right of FIG. 4 will be tensioned for swinging the lower end of the actuating lever 55 to the right, as viewed in FIG. 4. Conversely, by revolving the wheel W to the left, the lever 55, as viewed in FIG. 4, will have its lowermost end pulled in a direction to the left thereby causing extension of the piston rod and shifting movement of the forward portion of the motor to the right. The rear end portion of the motor M will be swung to the left and the boat will then be steered to the left.

In operation, the control wheel W and the cable drum associated therewith will be so disposed that the motor M will be positioned in substantially longitudinal alignment with the longitudinal axis of the boat so that the boat will theoretically be driven in a straight line. When so disposed, the actuator lever 55 will be disposed substantially vertically or in the neutral position and when the motor M is in operation, the air pump will be supplying air to the system. The air under pressure will be supplied to the cylinder 16 on opposite sides of the piston therein in the manner of my co-pending application, Ser. No. 339,524, filed Jan. 22, 1964, now Patent No. 3,180,096.

When the valve mechanism 15 is in the neutral position, the discharge aperture 41c will be disposed between the decompression passages 39c and 39f in the valve head 39 so that air cannot be discharged from opposite sides of the cylinder 16. The communication groove 41a will intercommunicate the passages 39a and 39b and the communication groove 41b will intercommunicate ports 39d and 39e whereby air will be supplied on both sides of the piston. If it is desirable to steer the boat to the right, the control wheel W is revolved to the right or in a clockwise direction with respect to an operator facing forwardly and one of the steering cables 63 will be tensioned to cause the lower end of the actuator lever 55 to be swung to the right, as viewed in FIG. 4. Movement of the actuator lever 55 in this direction causes revolving movement of the shaft 50 which in turn causes swinging movement of the arm 51 and the pin 52. Thus the valving disc 41 will be shifted so that the communication groove 41a will move out of communication with respect to the port 39b. The communication groove 41b will, however, be retained in communicating relation with respect to the ports 39d and 39e so that air will be supplied through conduit C-4 from the manifold air chamber block structure 13 to the valve control mechanism 15 and through conduit C-5 to the cylinder 16. The piston therein will be moved to retract the piston rod 17 thus causing the forward portion of the motor M to be moved towards the adjacent end of the cylinder 16. The rear end portion of the motor M pivots in the opposite direction and the boat will be steered to the right. It will be seen that during this operation, resistance to turning will be transmitted to the cables 63 from the feeler type sensing arm 56 by its coaction with the spring urged plungers. This arrangement allows the operator to perform the steering

operation without over-steering or erratic motions since the shifting of the actuator lever 55 may be very easily accomplished by just a slight movement of the wheel W.

During shifting movement of the valving disc 41 in a direction to retract the piston rod 17, the decompression port 39c in the valve head 39 will be communicated with the aperture 41c of the valving disc 41 so that air is discharged from one side of the cylinder 16 into the valve chamber 48 of the bonnet 40 and thereafter escapes to the exterior through an exhaust port 48a formed in the bonnet 40 and which intercommunicates the chamber 48 with the exterior. It will be seen that during retraction of the piston rod 17, the carriage member 26 and the valve control mechanism 15 carried thereby will also be moved in the same direction of movement as the piston rod. When this occurs, the cable which is not being tensioned by the winding action of the drum to which the control wheel W is connected, will be tightened because of the shifting movement of the valve mechanism 15 so that no slack occurs in the cable. This completely obviates the rigging problems associated with conventional cable steering mechanisms for outboard motors. The two cables 63 will therefore be maintained in substantially tensioned condition regardless of the position of the motor M relative to the boat B.

If the boat is to be steered in the opposite direction or to the left from a straight line or neutral position, the steering wheel will be turned to the left or in a counter-clockwise direction with respect to an operator facing forwardly. This causes swinging movement of the actuator lever 55 so that the bottom portion thereof is shifted to the left as viewed in FIG. 4. This movement causes the communication groove 41b to be moved out of communication with respect to the port 39e of the valve head 39. The communication groove 41a of the valving disc intercommunicate the ports 39a and 39b of the stationary valve head so that air under pressure from the pump 12 will be supplied through the manifold air chamber block structure 13 to the control valve mechanism 15 and to the left side of the cylinder 16, as viewed in FIG. 2, to thereby cause extension of the piston rod 17. The aperture 41c will be moved into registering or communicating relation with the decompression passage or port 39f of valve head 39 so that air is discharged from the opposite side of the piston in the cylinder 16. The discharge port 39c in the stationary valve head will be simultaneously closed and the piston rod 17 will be extended to move the forward portion of the motor M away from the adjacent end of the cylinder 16 and to swing the rear end of the motor to the left. The boat B will then be steered or caused to turn to the left with respect to an operator facing forwardly. Again it is pointed out that since the shifting of the motor M merely necessitates the movement of the lever 55, the cooperative action of the spring urged plungers and feeler type sensing arm provide the operator with a feel of resistance to prevent over-steering or erratic operation of the boat. The plungers also tend to urge the actuator lever to the neutral position when no tension is exerted by either of the cables 63 with respect to the actuator lever.

In the event that my system becomes inoperative because of loss of fluid pressure, it will be appreciated that this system can be operated entirely manually by operation of the control wheel W. Thus by turning the wheel to the right, the cables may be tensioned to swing the lower end portion of the actuator lever 55 to the right, as viewed in FIG. 4, and this force will be transmitted to the carriage member 26 to physically or forcibly retract the piston rod 17 and to thereby cause shifting movement of the motor.

In order to facilitate movement of the piston rod 17, each end portion of the cylinder 16 is provided with an intake port and a spring urged intake valve disc for normally closing the port. Each of these intake valves 70 will be spring urged to the closed position to close the associated port but will open when the pressure with-

in the cylinder in the adjacent volumetric space becomes less than atmospheric. Therefore when the piston is moved away from one of the intake valves 70 during mechanical operation, the valve will be moved to the open position thus allowing air from the exterior to be introduced into the volumetric space to obviate pulling air through the control mechanism 15 during manual operation.

It will be seen from the foregoing description that I have provided a novel fluid pressure system for power steering an outboard motor mounted on a boat and in which fluid pressure is provided to opposite sides of the piston and cylinder unit when the control valve mechanism thereof is in the neutral position. This arrangement allows the system to operate even if the system has a leak therein.

It will also be seen from the preceding paragraphs that my novel fluid pressure system necessitates only the movement of the small actuator lever valve arm through manipulation of the control wheel during the steering operation so that the power steering operation may be very easily carried out.

It will also be noted that my novel system causes the steering cables to be maintained in taut condition regardless of the position of the motor and thereby obviates any rigging problems normally attendant with conventional mechanical steering apparatus. It will also be seen that through the use of intake valves, the outboard motor can be moved manually through manipulation of the control wheel with a minimum of effort and these intake valves also serve to provide safety means in the event that there is a malfunctioning in the system due to a failure of pressure to one side or the other of the cylinder and piston unit.

Thus it will be seen from the foregoing description that I have provided a novel and unique fluid pressure system which permits power steering of outboard motors in response to revolving movement of the conventional control wheel and which operation may be carried out in a more efficient manner than any heretofore known comparable system or device.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. A fluid actuated control system for selectively power shifting an outboard motor mounted on a boat and in which the motor is shifted during the steering operation in response to movement of a control device such as a steering wheel, said system comprising
 - a source of gaseous medium such as air under pressure,
 - a fluid-responsive actuator including a cylinder unit and a piston mounted therein, a piston rod unit extending through one end of said cylinder unit and having sealed relation with said cylinder unit, one of said units being interconnected with said outboard motor for shifting the same,
 - opposite end portions of said cylinder having intake passages therein for transmitting fluid pressure to opposite sides of said piston, said cylinder also having decompression passages at opposite end portions thereof,
 - a carriage member connected to one of said cylinder piston rod units for movement therewith,
 - a valve mechanism interconnected with one of said cylinder and piston rod units and being movable therewith, said valve mechanism having a plurality of interconnectible fluid passages therein and having a shiftable valving element shiftable in opposite directions for simultaneously interconnecting certain of said fluid passages and disconnecting certain of said fluid passages relative to the intake of the fluid passages in said cylinder unit,
 - and a control mechanism including a control actuating member mounted for shifting movement in

opposite directions from neutral position and being interconnected with said shiftable valving element to cause shifting thereof, means for interconnecting said control element with the steering wheel of the boat whereby movement to said control member in one direction in response to movement of the steering wheel cause corresponding shifting movement of the valving element to thereby interconnect fluid pressure to cause relative shifting movement between said piston rod and cylinder units in one direction while shifting of said control element in the opposite direction in response to movement of the steering wheel will interconnect fluid pressure to the cylinder unit to cause relative shifting movement between said piston rod and cylinder units in the opposite direction.

2. A fluid actuated control system for selectively power shifting an outboard motor mounted on a boat and in which the motor is shifted during the steering operation in response to movement of a control device such as a steering wheel, said system comprising

- a source of gaseous medium such as air under pressure,
- a fluid-responsive actuator including a cylinder and a piston mounted therein, a piston rod extending through one end of said cylinder and having sealed relation with said cylinder, said piston rod having actuating connection with said outboard motor for shifting the same,

- opposite end portions of said cylinder having intake passages therein for transmitting fluid pressure to opposite sides of said piston, said cylinder also having decompression passages at opposite end portions thereof,

- a carriage member connected to said piston rod for movement therewith,

- a valve mechanism mounted on said carriage member and being movable therewith, said valve mechanism having a plurality of interconnectible fluid passages therein and having a shiftable valving element shiftable in opposite directions for simultaneously interconnecting certain of said fluid passages and disconnecting certain of said fluid passages relative to the intake of the fluid passages in said cylinder,

- a control mechanism including a control actuating member mounted for shifting movement in opposite directions from a neutral position and being interconnected with said shiftable valving element to cause shifting thereof,

- and a pair of elongate cable elements each having one end thereof connected with said actuating member and each having the other end thereof connectible with the steering wheel device of the boat whereby movement of said control member in one direction in response to movement of the steering wheel causes corresponding shifting movement of the valving element to thereby interconnect fluid pressure to power shift said piston rod in one direction while shifting said control element in the opposite direction in response to movement of the steering wheel will interconnect fluid pressure to the cylinder to power shift said piston rod in the opposite direction.

3. The fluid actuated control system as defined in claim 2 and a plurality of guide elements about which said cables are trained whereby when one of said cables is tensioned in response to movement of the steering wheel, the other of said cables will be tensioned by the relative movement of said carriage member, valve and control mechanisms with respect to said guide elements so that both of the cables are maintained in taut condition regardless of the position of the motor being shifted.

4. The fluid actuated control system as defined in claim 2 and resilient means engaging said actuating member and being operative to progressively resist movement of said actuating member in either direction from the neutral position.

5. A fluid actuated control system for selectively power shifting an outboard motor mounted on a boat and in which the boat is shifted during the steering operation in response to movement of a control device such as a steering wheel, said system comprising

a source of gaseous medium such as air under pressure, a fluid-responsive actuator including a cylinder and a piston mounted therein, a piston rod extending through one end of said cylinder and having sealed relation with said cylinder, said piston rod having actuating connection with said outboard motor for shifting the same,

opposite end portions of said cylinder having intake passages therein for transmitting fluid pressure to opposite sides of said piston, said cylinder also having decompression passages at opposite end portions thereof,

an elongate carriage member connected to said piston rod for longitudinal movement therewith,

guide means engaging said carriage member and guiding movement thereof,

a valve mechanism fixedly mounted on said carriage member and being bodily movable therewith, said valve mechanism having a plurality of interconnectible fluid passages therein and having a shiftable valving element shiftable in opposite directions for simultaneously interconnecting certain of said fluid passages and disconnecting certain of said fluid passages relative to the intake of the fluid passages in said cylinder,

and a control mechanism including an actuating member mounted for shifting movement in opposite directions from a neutral position and being interconnected with said valving element to cause shifting thereof,

and means for interconnecting said actuating member with the steering wheel of the boat whereby movement of said actuating member in one direction in response to movement of the steering wheel causes corresponding shifting movement of the valving element to thereby interconnect fluid pressure to power shift said piston rod in one direction while shifting of said actuating member in the opposite direction in response to movement of the steering wheel will interconnect fluid pressure to the cylinder to power shift said piston rod in the opposite direction.

6. The fluid actuated control system as defined in claim 5 wherein said valve element of said valve mechanism simultaneously interconnects the source of fluid under pressure to opposite sides of the piston within said cylinder when the control member and valve element are in the neutral position whereby pressure on opposite sides of the piston will be substantially equal.

7. A fluid actuated control system for selectively power shifting an outboard motor mounted on a boat and in which the boat is shifted during the steering operation in response to movement of a control device such as a steering wheel, said system comprising

a source of gaseous medium such as air under pressure, a fluid-responsive actuator including a cylinder and a piston mounted therein, a piston rod extending through one end of said cylinder and having sealed relation with said cylinder, said piston rod having actuating connection with said outboard motor for shifting the same,

opposite end portions of said cylinder having intake passages therein for transmitting fluid pressure to opposite sides of said piston, said cylinder also having decompression passages at opposite end portions thereof,

an elongate carriage member detachably connected to said piston rod for movement therewith,

a valve mechanism mounted on said carriage member and being movable therewith, said valve mechanism comprising a head having passage means in communication with said source of fluid under pressure and having fluid discharge passages, one for communication with one end of said actuator cylinder and another for communication with the opposite end of said actuator cylinder, and also having a pair of decompression passages, one for communication with one end portion of said cylinder and another for communication with the opposite end portion of said cylinder,

said valve mechanism also including an oscillatory disc having a shaft affixed thereto and projecting exteriorly from said valve mechanism and being revolvable relative thereto, said shaft and oscillatory disc being revolvable selectively in opposite directions from a normal neutral position,

said oscillatory disc having communication passages for simultaneously interconnecting and communicating said source of fluid with one of said fluid discharge passages while shutting off communication between the other fluid discharge passage and also simultaneously connecting and communicating said decompression passage with the opposite end of said actuator cylinder while closing off communication with said decompression passage to the first mentioned end of said cylinder when said disc is revolved in a given direction,

said oscillatory disc when in said neutral position having the communication passages thereof simultaneous interconnecting and communicating the source of fluid with both of said fluid discharge passages in said stationary head while simultaneously closing off communication of both of said decompression passages therein whereby air under pressure is supplied to opposite sides of the piston in said cylinder, a control lever connected to said shaft and being mounted for swinging movement in opposite directions from a neutral position, corresponding to the neutral position of said oscillatory disc, to thereby produce revolving movement of said disc,

and means for interconnecting said lever with the steering wheel of the boat whereby movement of said control member in one direction in response to movement of the steering wheel causes corresponding shifting movement of the valving element to thereby interconnect fluid pressure to power shift said piston rod in one direction while shifting of said control element in the opposite direction in response to movement of the steering wheel will interconnect fluid pressure to the cylinder to power shift said piston rod in the opposite direction.

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