April 2, 1957 S. E. SCHROEDER 2,787,235

BOAT CONTROL MEANS

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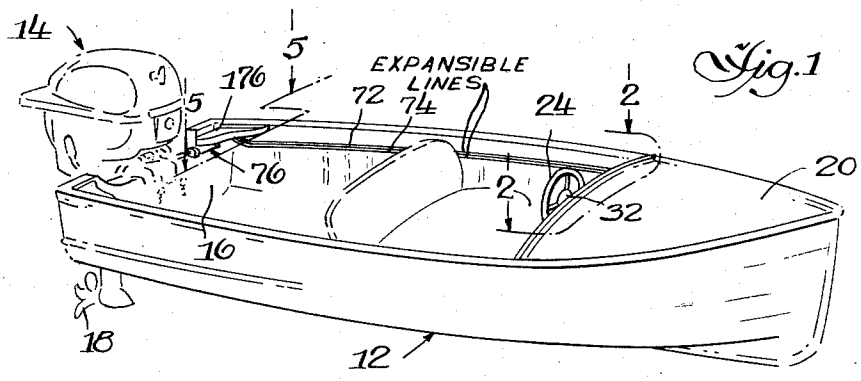


Fig. 1

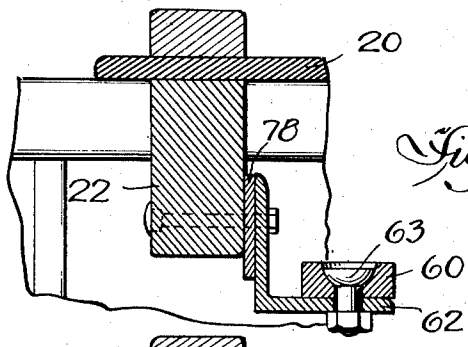


Fig. 4

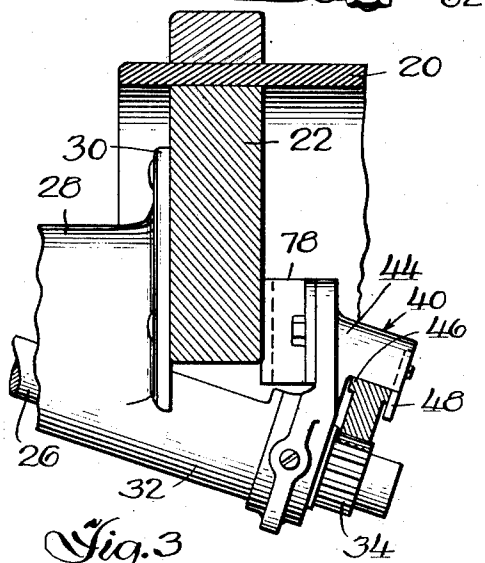


Fig. 3

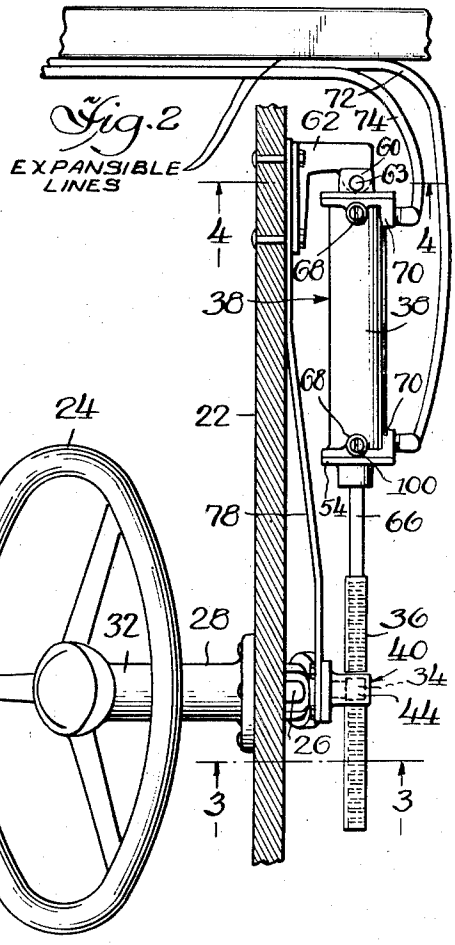


Fig. 2

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BOAT CONTROL MEANS

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Fig. 5

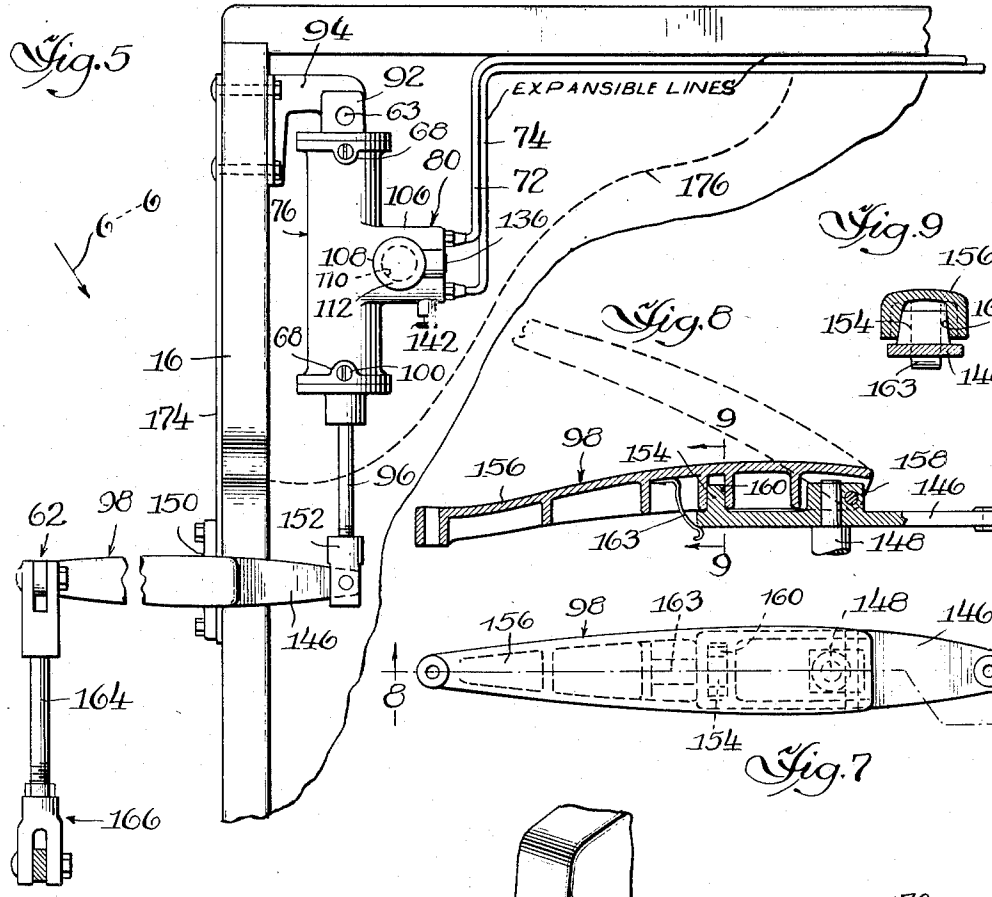
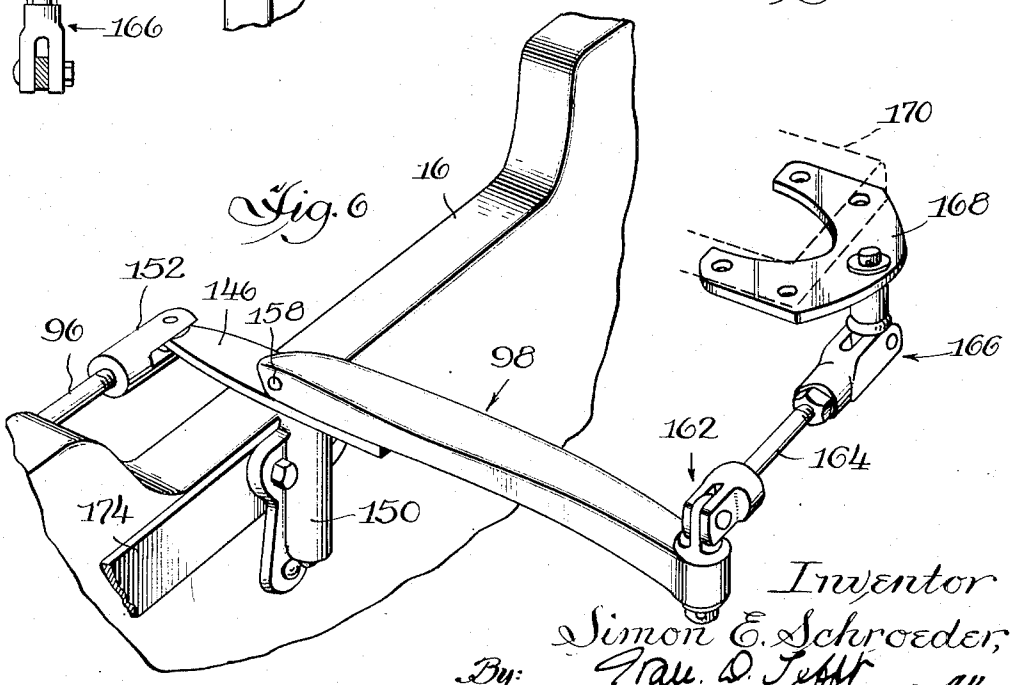


Fig. 9

Fig. 8

Fig. 7

Fig. 6

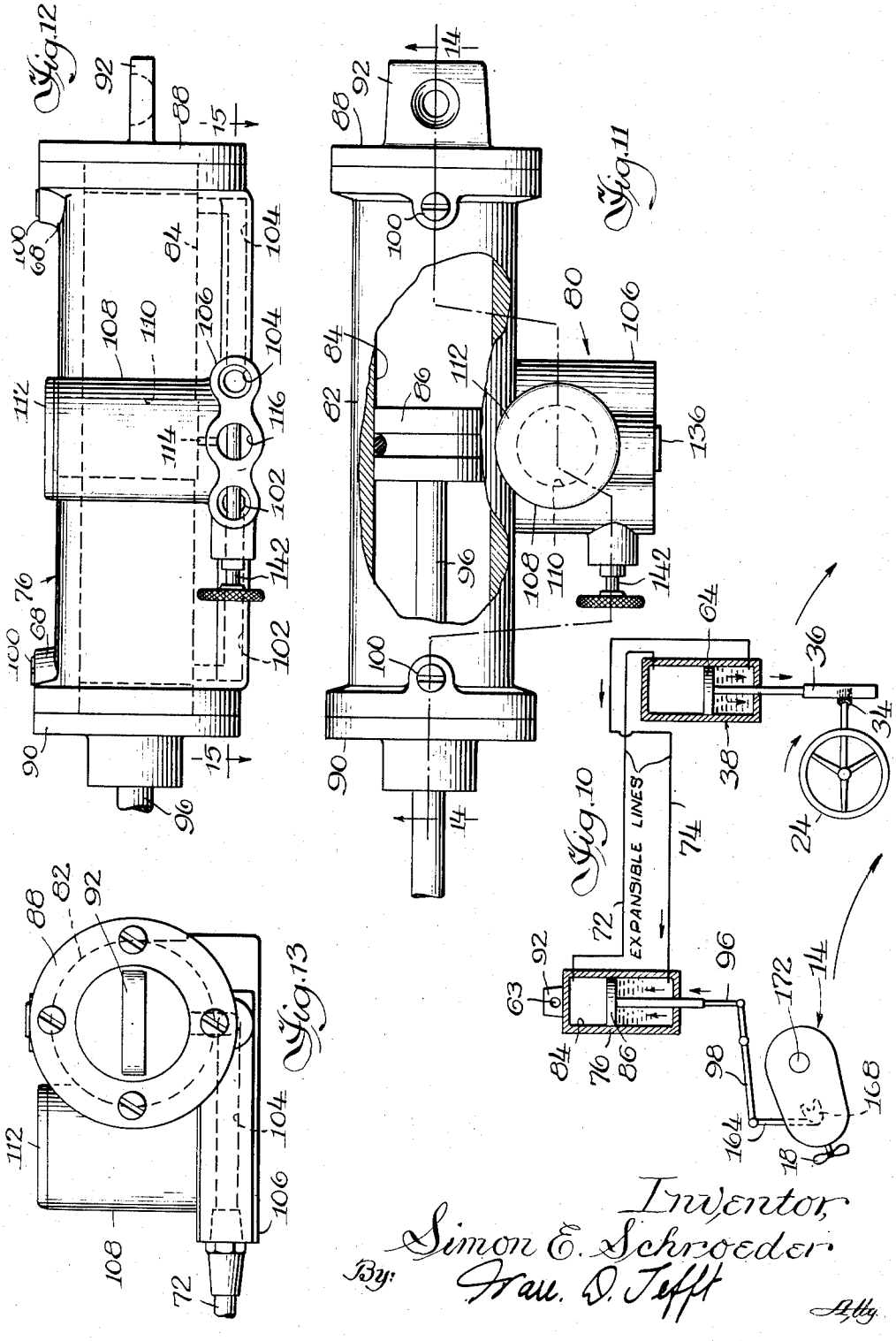


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BOAT CONTROL MEANS

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BOAT CONTROL MEANS

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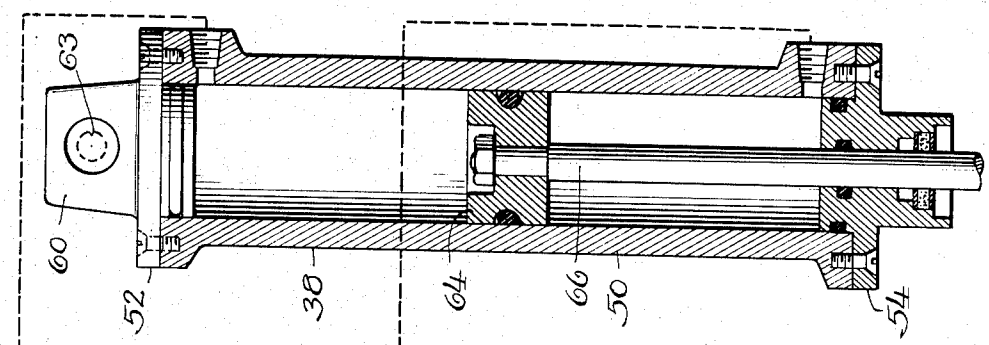


Fig. 15

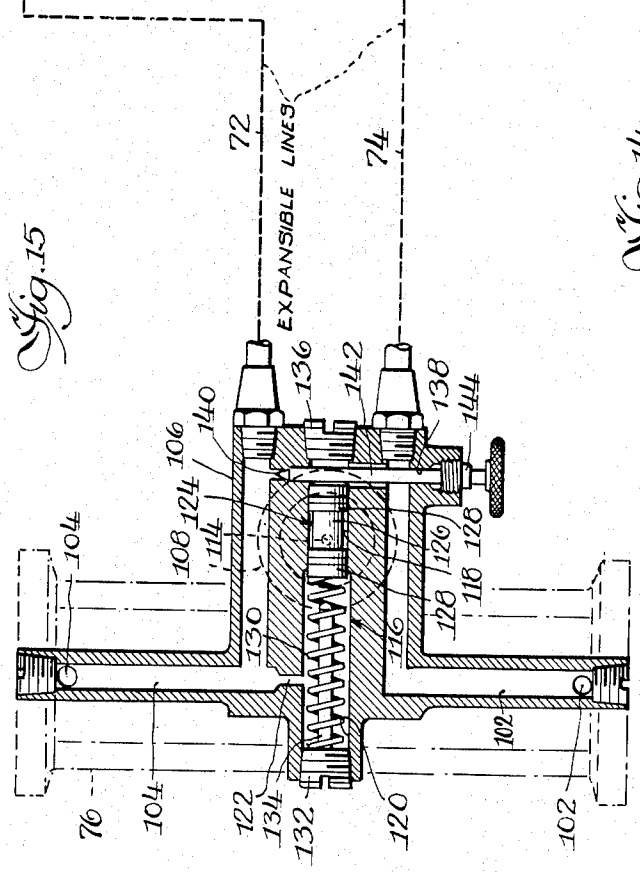
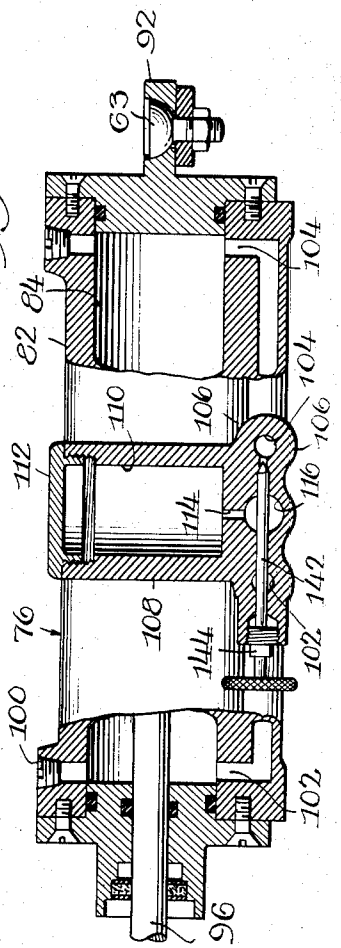


Fig. 14



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2,787,235

BOAT CONTROL MEANS

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Application December 22, 1952, Serial No. 327,335

4 Claims. (Cl. 114—150)

The present invention relates to boat control means and more particularly to hydraulic means for steering a boat.

The device of the present invention is adaptable to outboard motor boats. The boat control means of the present invention effects movements of boat steering means such as the outboard motor itself. The outboard motor is maneuvered or moved for providing the desired steering action, and the control means of the present invention is utilized for effecting such movements of the outboard motor.

An object of the invention is to provide novel hydraulic boat control means of the foregoing character.

Another object is to provide hydraulic boat control means of novel character having a portion adapted to be positioned for actuation by a steering wheel and a portion adapted to be positioned for connection to the steering means of the boat at a position remote from the first portion.

Another object is to provide hydraulic boat control means including a fluid system having an operating supply of fluid in which means is provided for automatically replenishing fluid in the system as may be necessary to maintain the operating supply at the desired volume.

A further object is to provide hydraulic boat control means having a fluid system with flexible fluid lines, whereby effective yieldability is provided in the system.

Still another object is to provide hydraulic boat control means including a driving cylinder and a driven cylinder having pistons operating therein, forming portions effectively on opposite sides of the pistons, and means for replenishing fluid in one side of the system and thereby maintaining the system filled.

Another object is to provide hydraulic boat control means of the foregoing character in which means is provided for periodically, and as desired, balancing the system and equalizing the volume of fluid on opposite sides of the system.

A further object is to provide boat control means of the above mentioned character, having a system containing a supply of operating fluid, and a reservoir for replenishing fluid in the system, and novel valve means effective for enabling automatic replenishment of fluid in the system from the reservoir in response to normal steering movements of the control means.

Another object is to provide novel hydraulic control means for steering a boat including a driving cylinder and driven cylinder with interconnecting flexible fluid lines, and means for mounting the cylinders in predetermined positions relative to the instrumentalities respectively operating and operated by the cylinders.

Another object is to provide novel mounting means for an outboard motor on a boat enabling the motor to be tilted upwardly out of operating position.

A still further object is to provide boat control means including a motor mounted for tilting movement between a lower operating position and an upper non-operating

position, and for oscillation about a vertical axis in its lower position, and an arm mounted on the boat and connected with the motor for effecting oscillation of the motor, in which the arm includes novel construction enabling tilting movement of the motor while remaining connected thereto.

Other objects and advantages of the invention will appear from the following detailed description taken in conjunction with the accompanying drawings, in which—

Figure 1 is a perspective view of a boat to which the control means of the present invention is applied, and showing a portion of the control means;

Fig. 2 is an enlarged view looking downwardly substantially on the line 2—2 of Fig. 1, illustrating a portion of the control means and showing a portion of the boat in section;

Fig. 3 is an enlarged view taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a plan view of a portion of the rear corner of the boat, taken on line 5—5 of Fig. 1, showing a portion of the control means;

Fig. 6 is a perspective view of a rear portion of the boat and mounting and control means for the motor as viewed diagonally in Fig. 5 as indicated by the arrow 6—6;

Fig. 7 is an enlarged plan view of the actuating arm shown in Figs. 5 and 6;

Fig. 8 is a longitudinal sectional view taken on line 8—8 of Fig. 7;

Fig. 9 is a cross sectional view taken on line 9—9 of Fig. 8;

Fig. 10 is a semi-diagrammatic illustration of the control means showing its relation to the steering wheel and outboard motor of the boat;

Fig. 11 is a plan view, partially broken away, showing the driven cylinder of the control means;

Fig. 12 is a side elevational view of the driven cylinder;

Fig. 13 is a view from the right end of Fig. 12;

Fig. 14 is a sectional view taken on staggered line 14—14 of Fig. 11; and

Fig. 15 shows diagrammatically the relation between the two cylinders, showing the driving cylinder in longitudinal section and the driven cylinder in sectional view as taken on line 15—15 of Fig. 12.

The control means of the present invention, for the purpose of exemplifying its principal features, is shown as applied to an outboard motor boat. A boat of this type is steered by means of oscillating the motor about a vertical axis, which positions the motor angularly with respect to the longitudinal axis of the boat. However, in a motor boat in which the motor is built in, a rudder proper is supplied for steering the boat. In either case, control means of the present invention is applicable, and although it is here shown as applied to an outboard motor, its applicability to a rudder will be readily observed.

In Fig. 1 the boat 12 is provided with an outboard motor 14 mounted on the transom 16 of the boat, in a manner that is well known, for movement into and out of operating position shown in Fig. 1, in which the impeller 18 extends down into the water and is rotated on a horizontal axis. When the impeller axis extends directly longitudinally of the boat, the boat progresses forwardly without turning, but when the axis is directed angularly with respect to the direction noted, the boat is steered to one side or the other according to the direction in which the impeller is directed.

The movement into and out of the position shown in Fig. 1 is a tilting movement, in which the motor proper or upper portion is tilted forwardly about a horizontal transverse axis, and the lower end containing the im-

peller is swung rearwardly and upwardly out of the water. The control means of the present invention includes a novel construction facilitating such tilting movement of the motor without requiring disconnection from the motor.

The boat may also include a steering wheel at the forward end at a convenient steering station. In such cases it is of course necessary to provide for connection of the control means with the steering wheel and with the rudder, or outboard motor as in the present case. The steering wheel and motor are disposed at relatively remote positions, necessitating the adaptation of the control means so as to effectively transmit the steering movements from the steering wheel to the motor. The boat may have a fore compartment covered by a deck 20 and a conventional dashboard 22 on which the steering wheel 24 is mounted. In the present instance the steering wheel 24 includes a shaft 26 journalled in a suitable mounting 28 having a flange portion 30 for securement to the dashboard and a housing 32 receiving the steering wheel shaft. The inner or fore end of the shaft 26 is provided with a pinion for meshing with a rack 36 formed on the outer end of the piston in the cylinder 38, the latter to be referred to later. The rack 36 is maintained in meshing engagement with the pinion 34 by means of an extension 40 of the mounting 28, which includes an upper portion 44 having a lower surface 46 engaging the rack and a plate 48 removably secured to the extension. Removal of the plate facilitates removal of the rack from meshing engagement with the pinion. Upon rotation of the steering wheel and its shaft, the pinion 34 in a well known manner actuates the rack and feeds it laterally to the right or left, depending upon the direction of rotation for producing the guiding movements in the control means, as will be described in detail later.

The hydraulic control means includes a ram or driving cylinder, and a second ram or a driven cylinder, and fluid lines interconnecting the cylinders. Upon actuation of the piston in the driving cylinder, the fluid flows through the lines for actuating the piston in the driven cylinder in accordance with the direction of movement of the piston in the driving cylinder.

In the present instance the cylinder 38 constitutes the driving cylinder and is mounted on the dashboard 22 at a position adjacent the steering wheel. The ram or cylinder 38, as shown in section in Fig. 15, may be conventional, and briefly includes a cylinder housing 50 closed at its ends by members 52 and 54 having appropriate sealing means. The member 52 includes a lug or ear 60 which may be integral for pivotal mounting on a mounting bracket 62 secured to the dashboard 22. A pin or bolt 63 (Fig. 4) is inserted in the hole through the ear 60 and hole in the bracket 62 for enabling swinging movements of the cylinder about a vertical axis. The ram or cylinder 38 also includes a piston 64 appropriately sealed, and having a piston rod 66 extending through the end member 54 and provided with the rack 36 referred to above. The end member 54 also has suitable sealing means for engagement with the piston rod.

The cylinder 38 may be provided with filling openings 68 normally closed by screw plugs. The cylinder also is provided with tapped openings 70 for receiving the fluid lines 72 and 74 respectively for interconnecting the cylinder 38 with the driven cylinder 76 which is located at the aft end of the boat and connected with the outboard motor.

In order that the driving cylinder 38 may be positioned relative to the steering wheel 24 conveniently and without the necessity for calculation in the act of installing the control means, locating means is provided for automatically positioning the cylinder relative to the steering wheel. Such locating means takes the form of an elongated member 78 which is predetermined in length and provided with holes for receiving the bolts which support the mounting bracket 62, and holes for receiving bolts threaded into tapped holes in the extension 40. Connection of the member 78 with the bracket 62 and extension 40 assures the user that the cylinder is accurately positioned relative to the steering wheel so that when the piston element 64 is centered in the cylinder, the rack 36 will be centered with respect to the steering wheel as is, of course, preferred and as provided for in the dimensioning of the relative parts.

The fluid lines 72 and 74 are extended along the side of the boat in any convenient location to the stern for connection with the driven ram or cylinder 76. In Fig. 2 the arrangement is shown diagrammatically wherein an opening is indicated between the dashboard and the side of the boat. The lines are then extended below and near the gunwales.

To the end of facilitating placing the fluid lines 72 and 74 in proper location, the lines are preferably flexible so that they may be conveniently shaped to accommodate them to any kind of irregular formation, in leading them to a remote location as from the driving cylinder at the dashboard to the driven cylinder at the stern, i. e., they can be "snaked" around various shapes. For this purpose, copper tubing is found to be quite effective. When the lines are of relatively great length, tubing of relatively large diameter is utilized. It is also contemplated that the invention includes expansibility in the lines as well as flexibility. Copper tubing is normally non-expensible, but the lines may be made of material possessing a certain degree of elasticity enabling expansion thereof under the influence of pressures developed in the hydraulic system, but contractible again to normal size upon release of the pressure. The particular material of which the lines are made for providing the desired expansibility is not essential. A number of kinds of lines are found on the market, and any suitable hose or tubing may be utilized so long as it possesses a limited degree of resilience and the necessary strength. The provision of expansible lines overcomes the disadvantage of having the lines burst upon expansion of the fluid due to atmospheric temperature variations. Non-expansible lines (such as copper tubing) sometimes burst under these conditions. Expansible lines, however, expand with the fluid and prevent bursting.

The control means includes a reservoir for additional fluid for replenishing the system, and novel valve means for automatically effecting the replenishing action in the normal steering operation. The valve means mentioned is indicated at 80 and is preferably contained in a housing structure integral with the housing of the ram or cylinder 76. The cylinder 76 includes a housing 82 (Fig. 11) defining a working cylinder 84 in which a piston element 86 is operatively disposed. The cylinder 84 is closed by end members 88 and 90, the one end member 88 having an ear 92 for mounting the cylinder on a bracket 94 in a manner similar to the mounting of the driving cylinder 38. The ear 92 and bracket 94 are provided with apertures for reception of a pin 63 mounting the cylinder for limited swinging movement about a vertical axis. The piston 86 has a piston rod 96 extending outwardly through the end member 90, the latter having suitable sealing means engaging the piston rod and the wall of the working cylinder 84. The outer end of the piston rod 96 is connected with an arm 98 as will be referred to in detail later. Filling openings 100 may be provided as desired in the cylinder, which are normally closed by screw threaded plugs. The driven cylinder 76 is shorter, or at least of less volume, than the driving cylinder 38, effecting full movement of the piston 86 in response to less than full movement of the piston 64.

The housing 82 is provided with bores or fluid passages 102 and 104, preferably in the lower portion, opening respectively into the working cylinder 84 on opposite sides of the piston. The passages lead longitudinally through the housing toward the center and then laterally through a housing portion 106 where they open to the

exterior and receive fittings on the fluid lines **72** and **74**. It is through these passages, namely **102** and **104**, that the fluid lines have communication with the interior of the ram **76**.

The housing portion **106** through which the passages **102** and **104** pass includes the reservoir mentioned for replenishing the hydraulic system and to eliminate differential in amount of fluid in opposite sides of the system. The housing also includes the valve means mentioned for automatically effecting the replenishing action, as well as manually operable valve means for balancing the system and equalizing the pressure and amount of fluid on opposite sides of the system.

The housing portion **106** includes an upstanding portion **108** defining a reservoir **110** preferably enclosed by a cap **112**. The reservoir communicates through a lower passage **114** with a central connecting passage **116** disposed between the side passages **102** and **104** and preferably parallel therewith. As shown in Fig. 15, the central connecting passage **116** is formed of two portions, namely, a reduced diameter portion **118** with which the passage **114** directly communicates, and a second and enlarged portion **120**. Leading from the passage **104** is a bore **122** communicating with the connecting passage **116** in the enlarged portion **120** thereof.

The connecting passage **116** contains valve means for controlling the flow of fluid therethrough and more particularly for enabling replenishment of the fluid in the system as is found necessary in the operation of the device. The valve means includes a double ended piston **124** having a central reduced diameter portion **126** and end piston elements **128** having sliding and sealing engagement with the portion **118** of the passage for blocking the flow of oil therepast. A compression spring **130** is compressed between the piston **124** and a cap or plug **132** screw threaded in the outer end of the passage **116**, the spring constantly urging the piston toward the opposite end of the passage and toward the normal position thereof which is shown in Fig. 15. The cap **132** is preferably provided with a pin **134** extending through the spring and engageable by the piston for limiting the movement of the latter in that direction, as will be explained later. The opposite end of the connecting passage **116** is closed by a cap or plug **136** and inwardly thereof is a transverse passage **138** interconnecting the side passages **102** and **104** and also communicating with the central connecting passage **116**. The passage **138** is provided with a valve seat **140** for engagement by the tapered end of a valve pin **142** operably mounted in the passage by means of a fitting **144** screw threaded in the enlarged outer end of the passage. The passage **138** contains portions of greater dimension, at least in one direction, than the pin **142**, so as to enable passage of fluid through the passage around the pin. For example, it is desired that constant communication be established between the bore **102** and the connecting passage **116**. Also, when the valve pin **142** is retracted from the valve seat, it is desired that fluid be enabled to flow through the passage **138** in the proper direction between the bores or passages **102** and **104**. Normally the valve pin **142** remains in closed position and is opened only when it is desired to establish a balance of pressure and volume of fluid in opposite sides of the fluid system. In all cases, however, the communication between the passage **102** and central passage **116** provides for imposition of the pressure in the bore **102** (and therefore in the line **74**) on the adjacent end of the piston **124** for moving the latter out of its normal position of Fig. 15 for enabling flow of fluid from the reservoir into the system. The valve pin **142** serves as a convenient stop means for limiting movement of the piston **124** out of the normal position of Fig. 15 in that direction. The reservoir **110** being vertical, as it is, enables oil for replenishing the fluid system to flow under the action of gravity into the system. The operation of the valve means will be described later in conjunction with the description of the steering movements effected through the connection of the ram **76** with the motor which will now be described.

The outer end of the piston rod **96** is pivotally connected to the inner end of the actuating arm **98**, the latter being pivoted intermediate its ends on the transom of the boat, while its outer end is connected to the outboard motor so that upon oscillation of the arm the motor is oscillated on its vertical axis for bringing about the steering movements of the boat. Upon reciprocation of the piston in the ram or cylinder **76** in response to the reciprocation of the piston **64** in the ram or cylinder **38**, the arm **98** is oscillated and accordingly the outboard motor is oscillated. The arm **98** includes a novel construction for accommodating the tilting movement of the outboard motor out of its operating position of Fig. 1. Such movement of the motor is enabled without necessitating disconnection of any of the parts for that purpose. More particularly, the arm includes a pair of articulated sections, one of which remains stationary (with respect to the tilting movement) and is connected to the piston rod **96** and the other of which moves with the motor in the tilting movements thereof. The specific and preferred construction of the actuating arm **98** includes a first section **146** having a journal pin **148** mounted for rocking movement in a socket **150** mounted on the transom of the boat. At the inner end of the section **146** is an aperture for reception of a pin in a yoke **152** on the piston rod **96** for pivotal connection thereto. At the other and outer end of the section is an upwardly extending projection **154** which may be slightly wedge-shaped in one direction as shown in Fig. 9.

The arm **98** also includes a second section **156** pivotally mounted at **158** on the section **146**, on a horizontal transverse axis, the location of the pivot axis preferably being adjacent the pin **158**. The section **156** is provided with a downwardly opening socket **160** for reception of the projection **154** for aiding in locking the two sections together for producing the oscillating movements desired. The arm section **156** is thus enabled to swing upwardly about the pivot of the pin **158** on an axis transverse to the longitudinal direction of the arm. When the arm section **156** is lowered and the projection **154** is disposed in the socket, the longitudinally spaced points of connection between the two arm sections afford solidity of connection therebetween. However, the arm sections are permitted relative swinging movement for enabling tilting movement of the motor without in any way disconnecting the chain of connection between the driven cylinder **76** and the motor. The outer end of the arm is connected through a suitable universal joint **162** of conventional form to a link **164** which in turn is connected at its other end to a second universal joint **166** mounted on a bracket **168**.

Fig. 6 indicates diagrammatically an element **170** of the motor **114**, the latter being supported in the main by suitable supporting means of known construction and not shown in detail herein. Suffice it to say that as shown in Fig. 10, the motor **14** is mounted for oscillation about a vertical axis **172** and the bracket **168** is offset from that axis, whereby oscillating movements of the arm **98** produce corresponding oscillating movements of the motor, as will be evident from the relation of the parts as shown in Fig. 10.

In order that the cylinder **76** and arm **98** may be conveniently located in proper spaced relation in installing them in the boat, an elongated element **174** is provided for predetermining the spacing between the bracket **94** and socket **150**. The spacing element **174** is provided with holes at one end for receiving bolts for supporting the bracket **94** and at the other end for receiving the bolts which support the socket **150**, and thereby position the cylinder and arm **98** in the desired predetermined relation. If desired, the piston rod **96** and link **164** may be provided with threaded connections in their fittings to en-

able adjustment between the parts. A convenient location for the driven cylinder 76 is at the aft end and below a corner knee 176 where it is protected and to a great extent concealed.

In the operation of steering the boat, assume that it is desired to bear right, whereupon the steering wheel will be turned to the right as indicated in Fig. 10. Rotation of the pinion on the steering shaft moves the rack 36 in corresponding direction (to the right) forcing the piston in that direction through the cylinder 38 (as indicated by the arrow, Fig. 10). As diagrammatically illustrated in Fig. 10, fluid is indicated only on one side of the system for the sake of convenience in referring to the action in the steering movements.

The fluid in the cylinder 38 is forced through the line 74 into the cylinder 76 on the side of the piston for forcing the piston rod inwardly so as to oscillate the actuating arm 98 in counterclockwise direction. The latter movement produces a similar oscillating movement of the motor, namely, in counter-clockwise direction so that the impeller 18 is disposed angularly toward the left, urging the stern toward the left and hence the stem to the right. A similar but opposite operation takes place in a turn to the left.

It will be understood that the lines 72 and 74 have undisturbed communication through the passages 104 and 102 into the cylinder 76. The valve means in the latter cylinder does not hinder in any way the flow of fluid as mentioned.

The steering control means includes means for replenishing fluid in the system in the event there should be any loss of fluid. Assume that a tight turn to the right is negotiated. The greater volumetric capacity of the cylinder 38 relative to the cylinder 76 enables the desired pressure to be developed and fluid displacement effected even though loss of fluid has taken place. If such loss of fluid has taken place, there will be a corresponding rarefaction in the line 72. The desired replenishment from the reservoir will then be effected. This is accomplished by the differential in pressure in the lines acting on the piston 124. The pressure developed in the passage 102 (i. e. line 74) is imposed on the adjacent end of the piston 124 and because of the rarefaction of pressure in the opposite side of the system which is propagated to the passage 116, the piston is moved out of its normal position against the spring 130 (to the left of Fig. 15) to a position wherein the adjacent end portion 128 is disposed in the enlarged portion 120 of the passage so that communication is established between the bore 114 and passage 120 around the reduced portion 126 of the piston. The opposite side of the system, namely, the line 72 and bore 104 is then filled with fluid from the reservoir. Upon entrance of the fluid into that side of the system, the differential in the two sides is reduced and the compression spring 130 then moves the piston back to its normal closed position of Fig. 15.

A similar action takes place in the case of expansible fluid lines. When fluid lines of flexible and expansible character are employed, the relatively great pressure in the line 74 (for example) causes it to expand and thereby creates a greater effective volumetric capacity in the system and a corresponding rarefaction in the line 72. When such occurs, fluid is admitted to the line 72 in the manner above referred to.

The fluid system is maintained full by replenishing fluid to one side thereof. In continued steering movements when the piston 64 in the driving cylinder is habitually forced in the direction referred to, namely for developing pressure in the line 74, there may be a tendency for the piston 64 to creep, that is, to migrate toward one end of the cylinder. Such creeping action is brought about by the high pressure developed ahead of the piston which produces a tendency for the fluid to seep past the piston, as it will be understood that the seal between the piston and cylinder wall is never perfect and upon incessant development of such pressure there would normally be a minor amount of such seepage of fluid. When the piston thus creeps away from its normally centered position, and two pistons may be relatively recentered in the cylinders by manually unseating the valve pin 142 to open the passage 138 for establishing communication between the bores 102 and 104. If desired, appropriate markings may be made on the respective piston rods to indicate such centered positions. When the centering operation has been completed the valve pin 142 is then seated and any reciprocating movement of the piston 64 results in corresponding reciprocating movement of the piston 36 in the manner above described.

The flexible and expansible nature of the fluid lines provides novel means for producing a limited degree of yieldability in the system, not found in most previously known hydraulic systems.

I claim:

1. A device of the character disclosed comprising a housing having a passage in and extending through each of opposite sides thereof, a passage interconnecting the side passages, reservoir means having an opening communicating with said connecting passage, said connecting passage having an enlarged portion spaced laterally from said opening, a valve closure element reciprocable in said connecting passage comprising a double-ended piston with a central reduced portion, said closure element having a normal closing position wherein the end portions of the piston are disposed on opposite sides of said reservoir opening and block communication between both of said lines with said reservoir, spring means biasing said closure element to said normal position, stop means restraining movement of said closure element out of said position in one direction, said closure element being movable out of said position in the other direction against the action of said spring means by increased pressure in said one line relative to the other line to a second position wherein the respective end portion of the closure element is disposed in said enlarged portion of the connecting passage and thereby establishes communication between said reservoir and said second line.

2. Hydraulic control means for a boat having a steering wheel at a driving station and a boat steering means at the stern remote from the driving station, comprising a driving cylinder at the driving station, a piston in the driving cylinder having an extension to the exterior operatively connected with the steering wheel, a driven cylinder at the stern, a piston in the driven cylinder having an extension to the exterior operatively connected with the boat steering means, fluid lines connecting respective opposite ends of the pistons, the driven cylinder including a housing with a reservoir therein and a port leading from the reservoir to a passage having an enlarged end portion which communicates at opposite ends to the respective lines, a valve piston in the passage with large end portions normally sealing the passage and a central reduced portion in register with the port, stop means limiting movement of the valve piston in one direction and spring means yieldingly resisting movement in the opposite direction, said valve piston being movable from its normal position against the action of the spring means in response to greater pressure in a first line than the other and second line, and the valve piston and enlarged passage portion being so relatively dimensioned and proportioned as to establish communication between said port around the central reduced portion of the piston and the said second line.

3. The combination of claim 2 in which manually operated valve means cross connect said lines for controllably establishing communication therebetween.

4. Hydraulic control means for a boat having a driving station remote from the stern, the boat having a steering wheel at the driving station and boat steering means at the stern, the control means comprising a driving cylinder mounted at the driving station, a piston in the cylinder

with a piston rod extending to the exterior adapted for connection to the steering wheel, a driven cylinder at the stern, a piston in the driven cylinder with a piston rod extending to the exterior adapted for connection to the boat steering means, resiliently expansible fluid lines connecting respectively opposite ends of the cylinders, and non-compressible fluid in the cylinders and fluid lines, said driven cylinder including a housing having a reservoir and passages having spaced parallel portions leading from the fluid lines to opposite ends of the driven cylinder respectively, a transverse passage interconnecting the said parallel passage portions, a manually actuatable valve extending longitudinally of and substantially through the transverse passage and closing communication between the other passages, a connecting passage connected at one end to a first of the fluid lines and at its other end to the transverse passage and thereby to the other fluid line, a valve piston in the connecting passage with large end portions normally sealing the passage and a central reduced portion, the housing also having a port leading from the reservoir to the connecting passage between the large end portions of the valve piston, the manually actuatable valve limiting movement of the valve piston in one direction, and a spring yieldingly resisting movement in the opposite direction, the valve piston being movable in response to increased pressure in the said

other fluid line against the resistance of the spring to a position establishing communication around its central reduced portion between the reservoir port and the said first fluid line.

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