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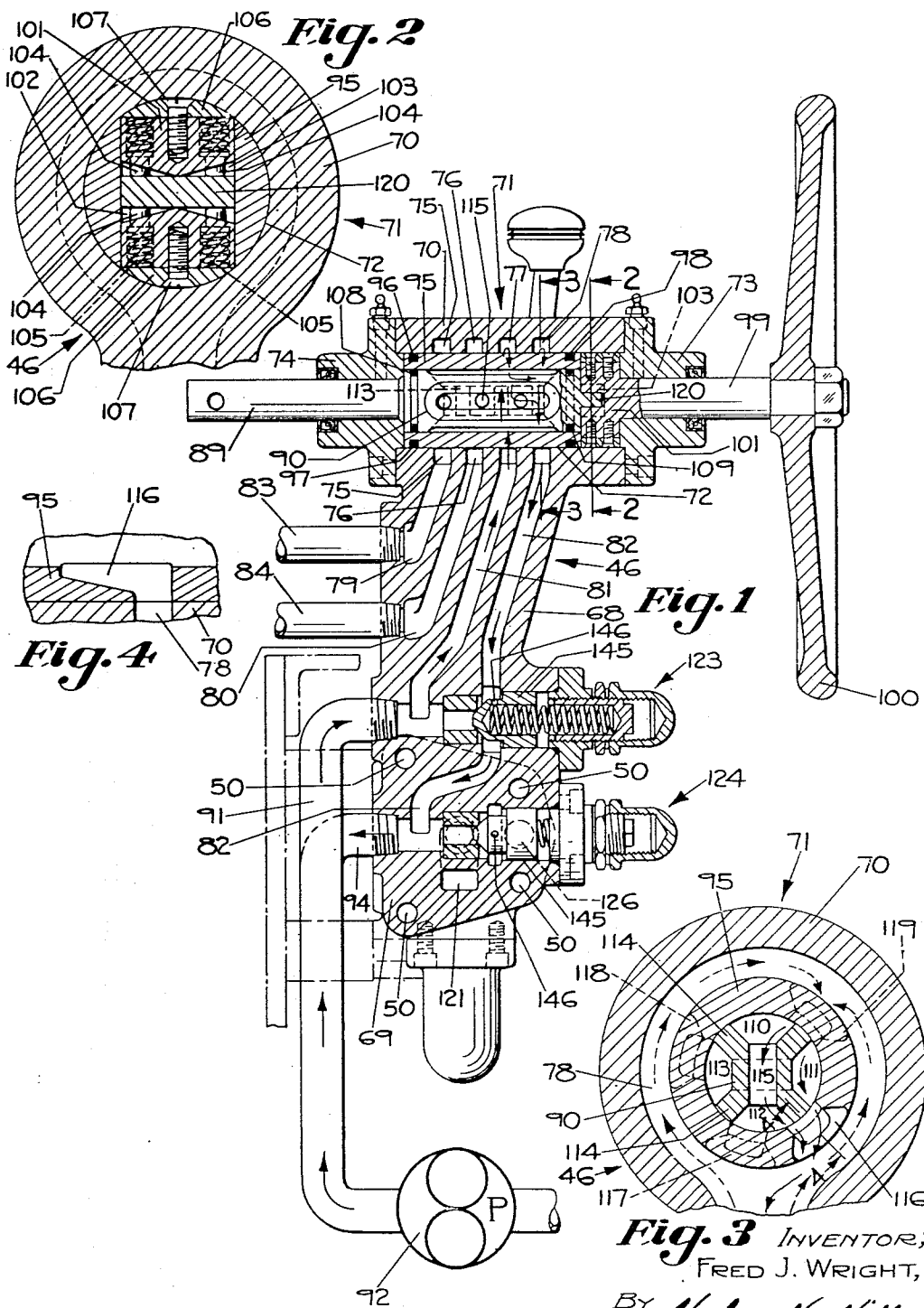
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HYDRAULIC VALVE AND POST

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2 SHEETS—SHEET 1



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ATT'Y.

2,607,558

2 SHEETS—SHEET 2



ATTY.

Fig. 7

UNITED STATES PATENT OFFICE

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HYDRAULIC VALVE AND POST

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Original application November 27, 1944, Serial No.
565,356, now Patent No. 2,464,110, dated March
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1946, Serial No. 665,530

3 Claims. (Cl. 251-105)

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This invention relates to a hydraulic valve and post particularly designed for controlling various operations of a vehicle, such as a road grader.

An object of the invention is to provide an improved apparatus of the above mentioned type.

Another object of the invention is to provide a combination valve and steering post which preferably has feed and discharge passages which lead to and from a valve, preferably a rotary valve, in the top thereof, and which in a more specific aspect of the invention also is provided with one or more high pressure relief bypass valves in its base and in a still more specific aspect of the invention also includes a drain passageway formed in the post for draining leakage hydraulic fluid from a valve in the top of the post to a drain or tank passageway.

Still another object of the invention is to provide an improved hydraulic apparatus in the form of an upstanding post which houses a steering valve in the top and a relief valve or valves in the bottom.

Another object of the invention is to provide an improved rotary valve having a shell formed to obtain the desirable area of hydraulic passageway, though bridged by a core.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a sectional elevational view through the center of the steering post and valve of my invention. This figure also includes a portion of the associated hydraulic circuit;

Fig. 2 is a transverse sectional view taken on the line 2-2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a transverse sectional view taken on the line 3-3 of Fig. 1, looking in the direction of the arrows;

Fig. 4 is an enlarged sectional view taken on the line 4-4 of Fig. 3, looking in the direction of the arrows, and with the spider or core omitted;

Fig. 5 is a view, similar to Fig. 1, of a modified form of post and steering valve;

Fig. 6 is a sectional view taken on the line 6-6 of Fig. 5; and

Fig. 7 is an enlarged side view of the shell of the steering valve of Figs. 5 and 6, with parts broken away and shown in section.

This application is a division of my application Serial No. 565,356, entitled Hydraulic System and Apparatus, filed November 27, 1944, now Patent No. 2,464,110 issued March 8, 1949.

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The hydraulic apparatus herein disclosed may be used in a variety of different places or with a variety of different vehicles. One vehicle where it is particularly adapted to be used is a road grader, such as that disclosed in more detail in the patent to Franklin E. Arndt, No. 2,340,169, dated January 25, 1944, for a Road Grader.

Attention is directed particularly to Fig. 1 of the drawings and to the structure of the steering post designated 46, and its associated valves. Said post 46 includes a main body, casting or casing 68 which is in the form of an elongated upwardly extending member having a base portion 69 at its bottom which has a pair of flat parallel side surfaces preferably having the same distance apart as the flat parallel side surfaces of a standard style valve. As clearly illustrated in Fig. 1 of the drawings, this base portion 69 includes the bores 50 through which tie bolts extend.

The steering post 46 is adapted to be banked into or flanked at opposite sides by individual control valves, which as shown and described in my parent application, Serial No. 565,356, above identified, are spool or slide type valves connected in series. It is pointed out that in the complete valve assembly including the steering post 46 and the flanking valves there is a rotary follow-up type steering valve positioned in the top of post 46. This valve is fully described hereinafter, and it also is connected in series with all of the individual valves. In practice the steering valve is the first valve of all of the valves to receive hydraulic fluid under pressure from a hydraulic pump, the hydraulic fluid either after passing through the steering valve or by-passing it being conducted through a return feed pipe or conduit to supply the spool or slide valves into which the post 46 is banked.

The upper end of the post casting 68 is provided with an integral generally cylindrical portion 70 which forms a head and constitutes the main body or casing of a rotary steering valve 71. The head 70 is provided along its longitudinal axis with a cylindrical bore 72 which is closed at its front by removable end cap 73 and at its rear by removable end cap 74. The axis of bore 72 and the valve therein is transverse to the axis of the post body 46.

Communicating with the cylindrical bore 72, or, in other words, formed on the interior surface of the head 70 are four longitudinally spaced peripheral passageways or grooves 75, 76, 77 and 78. The passageways or grooves 75, 76, 77 and 78 communicate with generally axially or longi-

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tudinally upwardly extending passageways 79, 80, 81 and 82, respectively, which are formed in the intermediate section of the post 46 or, in other words, between the base 69 and the head 70 thereof.

The rear face of the casting 68 is provided with threaded openings to receive hydraulic conduits, there being a conduit leading to each of the passageways 79, 80, 81 and 82. Conduits 83 and 84 are cylinder or motor conduits and they are connected with passageways 79 and 80, respectively. These two conduits 83 and 84 extend forwardly along the main frame of the road grader or other vehicle and deliver hydraulic fluid to and from a double acting hydraulic piston steering motor.

Furthermore, the movement of the steering motor is fed back in appropriate gearing to a stub shaft 89, which extends through the rear end cap 74 and is formed as an integral part of a spider or core 90 of the valve 71, the structure of which core or spider is described in full detail hereinafter.

Connected with the previously mentioned passageway 81 in the casting 68 is a feed or pressure conduit 91 leading from a pump 92 which derives hydraulic fluid from a tank. The previously described passageway 82 is connected with a return conduit 94 which in practice is a feed conduit for supplying hydraulic fluid pumped by pump 92 to the banked individual spool or slide valves hereinbefore referred to which flank the steering post 46 and are connected in series.

Returning to a consideration of the structure which makes up the rotary steering valve 71, rotatably mounted within the cylindrical bore 72 and having a close fit therewith is a rotatable cylinder, sleeve, or shell 95 which extends longitudinally beyond the end grooves 75 and 78 and abuts the end caps 73 and 74. Adjacent its rear or left-hand end the cylinder 95 is provided with a groove 96 which receives an O-ring 97 providing a seal between this portion of the sleeve 95 and the interior cylindrical surface of the head 70. A cylinder groove and O-ring seal 98 is provided near the right-hand or front portion of the sleeve or shell 95.

Extending through the cap 73 is a steering wheel shaft 99 having a steering wheel 100 rigidly attached to the right-hand end thereof and within easy reach of the operator. At its inner end and within the housing provided by the head 70 and the caps 73 and 74, the shaft 99 is provided with a head 101 which extends into a diametrical groove 102 (see Fig. 2) which is formed in the right-hand end of the sleeve or cylinder 95. As a consequence of this construction, a turning of the wheel 100 will turn the shell or sleeve 95 therewith. The head 101 is provided with a transverse winged groove 103 into which project abutments 104 which are urged outwardly toward said groove 103 by springs 105. The abutments 104 are provided with heads which fit in the bottoms of bores which receive the springs 105 and thus limit their outward movement into the groove 103. Removable caps 106 are provided on the head 101 and are removably connected thereto by screws 107.

The previously mentioned spider or core 90 extends into and is mounted for rotation with respect to the cylinder or sleeve 95, it being provided at its opposite ends with generally cylindrical end portions having O-ring seals 108 and 109, respectively.

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Intermediate its cylindrical ends which are provided with the seals 108 and 109, the spider or core 90 is formed with four longitudinal grooves or troughs 110, 111, 112 and 113 (see Fig. 3). These grooves 110 to 113, inclusive, form four radially extending webs 114 which are preferably 90° apart, as clearly illustrated in Fig. 3 of the drawings. The troughs or grooves 110 to 113, extend along the spider 90 so as to overlap a distance equal to that between the passageways or grooves 75 to 78, inclusive, in the head 70.

The central portion of the spider 90 is provided with a plurality of radial cross bores 115 which are effective to interconnect the grooves or troughs 110 and 112 in one instance, and the grooves 111 and 112 in the other instance. This provides for a completely balanced arrangement of the valve 71.

The shell or cylinder 95 is provided with four radial ports 116, 117, 118 and 119 (see Figs. 3 and 4). There is one of these ports for each of the grooves 75 to 78, inclusive, and these ports 116 to 119, inclusive, are distributed axially along the shell 95 so that one of them is in alignment and communication with each of said passageways 75 to 78 and is individual thereto. For example, port 116, as illustrated in Fig. 4 of the drawings, communicates with and is individual to circumferential passageway or groove 78. These are the return passageway and port of the valve by which hydraulic fluid is conveyed from it to the system. Port 119 is individual to and communicates with circumferential passageway 77. These are the pressure or feed passageway and port. Port 117 is individual to and communicates with circumferential passageway 76. These are one of the cylinder or motor passageways and ports. Port 118 communicates with and is individual to circumferential passageway 75 which are the other motor or cylinder passageway and port.

Referring particularly to Fig. 3 of the drawings, it will be noted that the angular relation of the center lines of the various ports 116 to 119 is important. If horizontal and vertical lines are drawn, intersecting at the center of the core 90, the center lines of the various ports 116 to 119, inclusive, will be as follows: Center line of port 116 will be forty-five degrees from both vertical and horizontal lines; center line of port 117 will be fifteen degrees from the vertical line. The center line of port 118 will be fifteen degrees from the horizontal line, and the center line of port 119 will be forty-five degrees from both the horizontal and vertical lines.

The right-hand end of the spider 90 is provided with a projection 120, the top and bottom surfaces of which are parallel, said projection extending into the winged groove 103 formed in the head 101 of shaft 99.

As clearly illustrated in Fig. 2 of the drawings, the abutments 104 when in their normal positions as illustrated, just contact the top and bottom surfaces of the projection 120 on opposite sides of the center or axis of rotation of said projection 120 which, of course, is the axis of the spider 90. The wing shape of the groove 103 provides for limited relative rotary movement between the spider 90 and the shell 95 before said projection 120 comes into a solid driving abutment with the walls of said groove 103.

The centering means formed by the springs 105 and abutments 104 have a double function and their effectiveness may be adjusted by adjusting the strength of the springs 105. The

first function of these springs is to provide a certain amount of "feel" in the wheel 100 so that when wheel 100 is turned by the operator, there will be a tendency for the rotation of shaft 99 to be transferred mechanically and directly to the shaft 89 through the head 101 and the spider 90 through these spring means 104, 105. However, under most normal conditions the springs 105 will be too weak to transfer any appreciable direct driving movement, though, if desired, they may be made strong enough to provide an appreciable direct mechanical driving connection.

The second function of the spring centering means 104, 105 is to provide a biasing means which will tend to adjust the spider or core 90 to its neutral position with respect to the shell or cylinder 95 and this is particularly desirable to prevent undesirable oscillation of the steering rod in case there is an appreciable lost motion between the mechanical connection to the piston of the hydraulic steering motor and the stub shaft 89 which will develop particularly in the universal joints leading to said shaft 89 and the reduction gearing.

Attention is directed also to Fig. 4 of the drawings and to a feature of construction of the ports 116 to 119, which are of similar design, port 116 being illustrated in said Fig. 4. In order to maintain the relative angular movement between the shell 95 and the spider 90 at a desired amount and consistent with that provided by the projection 120 and the winged slot 103, it is necessary that the ports 116 to 119 extend over a limited portion of the circumference of the interior surface of shell 95.

As illustrated in Fig. 3 the port 116 is bridged by a web of the spider 90. This, of course, appreciably reduces its effective area or, in other words, the area through which hydraulic fluid can flow, as illustrated in said Fig. 3 by the arrows, when the valve is in its neutral position which is the relative position of the parts as illustrated in said Fig. 3.

In order not to increase unduly the velocity of the fluid when it passes along the sides of said web which bridges the inside of port 116, it is necessary to increase the axial length of the port 116 on the inside surface, as is clearly illustrated in Fig. 4 of the drawings. The outside surface or area of the port 116 can not be increased undesirably in an axial direction because if this were done it would overlap two of the circumferential grooves, such as grooves 77 and 78, or it would undesirably reduce the sealing area between the two adjacent grooves, such as grooves 77 and 78. This outside dimension of the port 116, however, can be circumferentially extended as compared with the circumferential extent of its inside surface and this has been done, as clearly illustrated in said Fig. 3, while maintaining its axial dimension or width substantially equal to that of associated groove 78.

In view of this construction, the effective area of the port 116 is substantially the same on both its outer and inner surfaces when the inner surface is bridged by the above mentioned web. The structures of the ports 117, 118 and 119 are the same as that of port 116.

The operation of the steering mechanism is as follows. Hydraulic fluid is delivered from the pump 92 through the feed conduit 91 and then flows through passageway 81, as indicated by the arrows, and around the circumferential passageway 77 in head 70. It then flows through port

119 in the shell 95 and on opposite sides of a bridging web of spider or core 90 into the grooves or troughs 110, 111. Since trough 110 is connected with trough 112, and trough 111 is connected with trough 113, it is obvious that the hydraulic fluid would be flowing in all four of the troughs 110 to 113, inclusive, throughout their full lengths. As a consequence, the oil flowing in troughs 111 and 112 will flow through the port 116 on opposite sides of the web of spider 90 which bridges the interior opening thereof, flowing into the circumferential passageway 78 in head 70, as clearly illustrated in Figs. 1 and 3 of the drawings. As previously stated, this is the normal or neutral position of the valve 71 and no steering operation is effected.

The hydraulic fluid in the troughs 110 to 113, inclusive, is free to flow through the conduits 83 and 84 by way of circumferential passageways 75 and 76 and connecting passageways 79 and 80, but this is appreciably without effect on the hydraulic steering motor or if it does have any effect thereon due to the unbalanced nature of said hydraulic jack, this will cause an automatic correcting movement of the spider 90.

The oil or hydraulic fluid flowing downwardly through passageway 82 continues through said passageway into the base 69 of post 68, thence to conduit 94 and through all of the spool or slide valves lying to one side of the post 46. Since these spool or slide valves are connected in series the hydraulic fluid supplied through conduit 94 to them flows toward the base portion 69 of post 46 and through a by-pass passageway 121 in the base 69 of post 68 which acts as a connecting passageway between the valves on opposite sides of the post assembly 46. Under normal conditions, there is a no-load circuit through all of the control valves from the pump 92 to the tank. Conduit 121 forms a part of this no-load hydraulic circuit. However, it will be seen that when any one of the spool or slide valves which is supplied with hydraulic fluid passing through conduit 121 in the base 69 of post 46 is actuated the conduit 94, the passageway through the preceding individual spool or slide valves, and the conduit 121, which in effect form a single passageway, will be subjected to pressure of hydraulic fluid pumped by pump 92.

If the steering wheel 100 is turned in a clockwise direction, the angular movement thereof will produce equal angular movement of the shell 95 by virtue of the head 101 fitting snugly in the groove 102 formed in the right-hand end of said cylinder 95. This clockwise rotation of the shell 95 will cause it to rotate with respect to the spider 90 which will be held against movement by the mechanical linkage including the steering rod which, under the conditions just described, is connected to the piston end of the steering motor which, at the moment, is stationary. The relative movement between shell 95 and spider 90 just described will connect pressure port 119 to interconnected troughs 111 and 113 and will connect discharge port 116 to interconnected troughs 110 and 112. The hydraulic fluid in passageway 81 will thereupon flow through circumferential passageway 77, port 119, groove or trough 111 and the radial bores 115 in spider 90 to trough or groove 113; thence by port 118 through circumferential passageway 75 and post passageway 79 to conduit 83 which leads to the hydraulic motor. Thus, hydraulic fluid will be delivered to operate the double acting hydraulic piston motor or cylinder.

The return path for the hydraulic fluid from the hydraulic cylinder or motor will be by way of conduit 84, post passageway 80, circumferential passageway 76, port 117, groove or trough 112, port 116, and circumferential passageway 78 to the post passageway 82 which delivers it to conduit 94 and thence to tank through the group of banked valves in series as above mentioned.

The steering movement of the front wheels of the vehicle in response to operation of the operating motor will be reflected in angular movement of the steering rod 89 which is connected to the spider 90 as above described, so as to produce a follow-up type of system so that whenever the wheels have been adjusted a variable amount as determined by the variable movement of the wheel 100, the relative position of the cylinder 95 and the spider 90 will be restored to that illustrated in Fig. 3, or, in other words, to their normal position.

Thus in effect the operation of the steering valve 71 simulates ordinary mechanical steering except that hydraulic power is provided to do the actual work. As previously mentioned, in case of failure of the hydraulic system, it is only necessary to disconnect the piston head of the operating motor, so as not to be working against it, and a direct mechanical drive is provided from the wheel 100.

In view of the fact that the hydraulic circuit is a series circuit, it is obvious that the hydraulic fluid flowing in conduit 94, regardless of whether the steering valve is in its neutral position or is in a position to deliver hydraulic fluid to the steering motor, may be employed to operate any one or more of the double acting or reversible hydraulic motors controlled by the individual valves. That is, with this system, any number of control valves, including the rotary control valve, from one to the maximum number, may be operated simultaneously.

The steering valve 71 is operable upon counter-clockwise rotation of the wheel 100 in a manner which is comparable to that above described so that power steering may be effected by turning the wheel in either direction.

In the base 69 of the casting 68, I provide a pair of high pressure relief by-pass valves 123 and 124 which are of duplicate construction, but which provide different functions. The by-pass valve 123 by-passes the rotary valve 71 and it is preferably set to open at a pressure differential which is lower than that at which by-pass valve 124 opens. The function of the by-pass valve 124 is to control a passageway or chamber providing a by-pass to tank through a conduit 126 a portion of which is formed in the base 69 of post 46 and extends between the opposite flat parallel side surfaces of the bottom of the steering post 46 whenever a high pressure condition exists anywhere in the system, except on the input side of the double acting steering motor, but this by-passing of the fluid only discharges the fluid to tank after it has passed through the rotary valve 71 or through its individual relief valve 123.

The relief valve 123 provides a high pressure by-pass for the valve 71 since it controls a passageway or chamber interconnecting feed passageway 81 and discharge passageway 82 and obviously upon the appearance of a predetermined high pressure in conduit 91 or passageway 81 as compared with the pressure in passageway 82, this high pressure relief valve will open, providing a by-pass around valve 71, thus directing the fluid from conduit 91 through the passageways

in by-pass valve 123 to the lower portion of passageway 82 and into the feed pipe or conduit 94.

The structures of the high pressure valves 123 and 124 are of essentially standard design and thus need no detailed explanation. It may be pointed out, however, that a hollow spring-pressed valve closing piston 145 of each is provided with a port 146 so that hydraulic fluid in the passageway 82 will be present on both sides of the piston 145 and hydraulic fluid flowing through passageway 126 in valve 124 will also be on both sides of its piston 145. This is of particular importance in connection with relief valve 123 because it insures that whatever the pressure in passageway 82, by-pass valve 123 will only open in response to a higher predetermined pressure in passageway 81 determined by the adjustment of spring of valve 123. For example, if valve 123 is adjusted to open at 200 pounds per square inch and valve 124 at 500 pounds per square inch, and should the double acting motor controlled by one of the slide valves reach the end of its stroke and thus cause the 500 pounds pressure to appear in conduit 82 and thereby cause valve 124 to open, valve 123 would only open when the pressure in passageway 81 reached 700 pounds. Because of this fact there is always hydraulic pressure available to control the steering of the vehicle even though the pressure relief valve 124 is open for any reason. This is an important feature of the hydraulic system of my invention. The pressures at which the valves 123 and 124 open may be varied by adjusting their compression springs.

It is to be particularly noted that, regardless of whether the hydraulic fluid flowing through conduit 91 is by-passed by the by-pass valve 123 or flows through the valve 71 and the motor 85, it is always delivered to the lower portion of passageway 82 and to conduit 94. If, however, high pressure relief valve 124 is actuated, the hydraulic fluid will be by-passed thereby through tank passageway 126 which extends through aligned individual passageways in each of the individual castings or bodies of the banked valves.

In Figs. 5, 6 and 7 of the drawings, I have disclosed a modified form of steering post assembly 246 which may be substituted for steering post assembly 46. It is to be understood that unless a contrary fact is indicated, the steering post assembly 246 follows the structure of steering post assembly 46. One difference therein is in the structure of the head or cylindrical portion 270. Said head portion 270 is provided at its top with a drain passageway 130 which extends from the front to the rear thereof and opens into the cylindrical bore 72 at both ends.

The post 246 includes a main body casting or casing 268 which in addition to the four passageways 79, 80, 81 and 82, is provided with a drain passageway 131 which receives leakage fluid collected from a rotary steering valve 271 and delivers it to the drain passageway 126. The rotary steering valve 271 differs from the steering valve 71 in a number of particulars. In the first place, the O-ring seals 97, 98, 103 and 109 have been eliminated and the leakage of the valve parts is drained off by the passageways 130 and 131. Furthermore, in place of shell, sleeve or cylinder 95, I employ a different shell, sleeve or cylinder 295 which is provided with a pair of diametrically opposed ports, as viewed from its interior surface, associated with each of the cylindrical passageways or grooves 75, 76, 77 and 78. Diametrically opposed ports 219 communicate with pas-

sageway 78; diametrically opposed ports 216 communicate with passageway 77; diametrically opposed ports 217 communicate with passageway 76; and diametrically opposed ports 218 communicate with passageway 75.

It is to be noted by reference particularly to Fig. 6 of the drawings, that the ports 217 and 218 do not extend radially through the shell 295, but extend parallel with the ports 219. This is to provide for forming of the sand cores to make the shell 295 so that the core patterns can be separated without destroying the dry sand cores. Functionally, the operation would be the same if all of the ports 216 to 219, inclusive, extended radially through the shell 295.

The spider or core 290 also differs from the spider or core 90 not only in the elimination of the O-ring seals, but also in the elimination of the equalizing cross bores 115. These are not necessary to produce a balanced condition in the valve because of the presence of the diametrically opposed ports 216 to 219, inclusive.

It is also to be noted by reference particularly to Fig. 7 of the drawings that I no longer employ the particular form of port comparable to port 116, as illustrated in Fig. 4 of the drawings. It is to be distinctly understood, however, that the ports 216 to 219, inclusive, may follow the design of said port 116 of Fig. 4.

It is also to be noted that I have eliminated the centering spring means 104, 105 and the shaft 99 is provided with a substantially solid head 201 provided with a winged shaped groove 203. If desired, the spring means 104 and 105 disclosed in detail in Figs. 1 and 2 of the drawings, may be employed with the valve 271. In other words, shaft 99, head 101, and associated spring means 104-107 of Figs. 1 and 2 may be employed instead of that illustrated in Fig. 5 of the drawings.

Furthermore, in case these spring means are eliminated, or, in other words, in case the structure shown in Fig. 5 is employed, it may be desirable to add a certain amount of friction to rotation of the shaft 99 and one easy way to accomplish this is to provide an O-ring seal on the shell 295 comparable to the O-ring seal 97 or 98.

To provide free drainage of the oil which is received in the upper drain passageway 130, the head 201 is provided with a circumferential notch, recess or groove 132 which provides a circumferential passageway interconnecting the top passageway 130 and the drain passageway 131.

Except for the action of the spring means 104-107 previously described, the action of the rotary steering valve 271 is essentially the same as that of the rotary steering valve 71. This valve 271 also provides a direct mechanical drive in case of emergency, since the core or spider 290 is provided with a projection 220 which projects into the previously mentioned winged groove 203.

Except for the differences above mentioned, the post assembly 246 is essentially the same as the post assembly 46 and either may be substituted in the hydraulic system, for the other.

From the foregoing description of my improved steering post, its associated valve mechanisms and the operation thereof, it will be readily apparent to those skilled in the art that I have provided a new combination and arrangement of elements in such apparatus and particularly that I have provided a steering post that is adapted to be included in or flanked by other valves adapted to control the operation of ap-

paratus other than steering apparatus and that because of the post features of my improved combination, the steering wheel of the steering valve which is located in the top of the steering post is positioned above the other valves thereby permitting the grouping of all of the control valves and the steering valve in one unit with the steering valve and the steering wheel thereof positioned so that an operator of the apparatus of which the valves form a part may have ready access to the control valves as a group without interference from the steering wheel.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a device of the class described, a post forming a housing having an elongated upstanding body portion having an attaching base at its bottom for mounting said post and a valve casing at its top which includes a valve operably mounted therein, hydraulic feed and return passageways running longitudinally in said body leading to and from said valve casing, said valve controlling the opening and closing of said passageways, a pressure relief valve passageway in the base of said housing for by-passing said valve by placing said feed and return passageways in communication with each other before the latter said passageways communicate with said valve housing, and a second pressure relief valve passageway in the base of said housing connecting the return passageway to drain.

2. A combination valve and steering post including an elongated upstanding housing having valve housing means adjacent its top receiving a rotary steering valve and a bottom portion adapted to be banked between other valves, said bottom portion including opposite parallel surfaces adapted to receive said other valves, means in said housing providing feed and return passageways extending longitudinally thereof and to said rotary valve, means providing motor passageways in said housing connecting with said rotary steering valve, means providing a continuous passageway extending through the bottom portion of said housing between said opposite surfaces, means forming a drain passageway extending between said opposite surfaces, a by-pass passageway in said housing interconnecting said feed and return passageways for by-passing said rotary steering valve, and a second by-pass passageway in said housing interconnecting said return passageway and said drain passageway for by-passing fluid from the former into the latter.

3. A combination valve and steering post including an elongated upstanding housing having valve housing means adjacent its top receiving a rotary steering valve and a bottom portion adapted to be banked between other valves, said bottom portion including opposite surfaces adapted to receive said other valves, means in said housing providing feed and return passageways extending longitudinally thereof and to said rotary valve, means providing motor passageways in said housing connecting with said rotary steering valve, means providing a continuous passageway extending through the bot-

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tom portion of said housing between said opposite surfaces, and means forming a drain passageway extending between said opposite surfaces.

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