

April 15, 1958

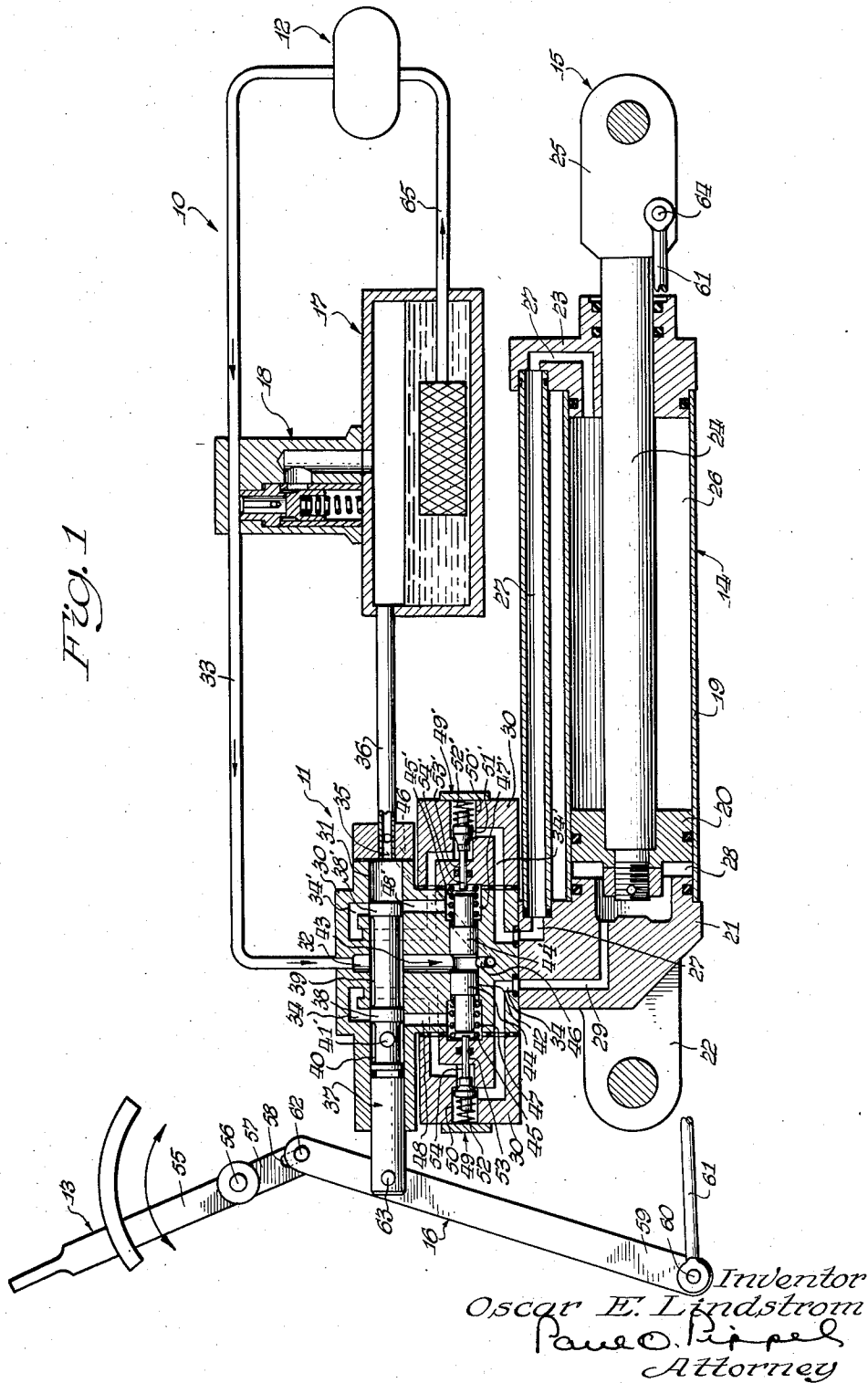
O. E. LINDSTROM

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TELEMETER TYPE HYDRAULIC POWER TRANSMITTING SYSTEM

Filed March 21, 1956

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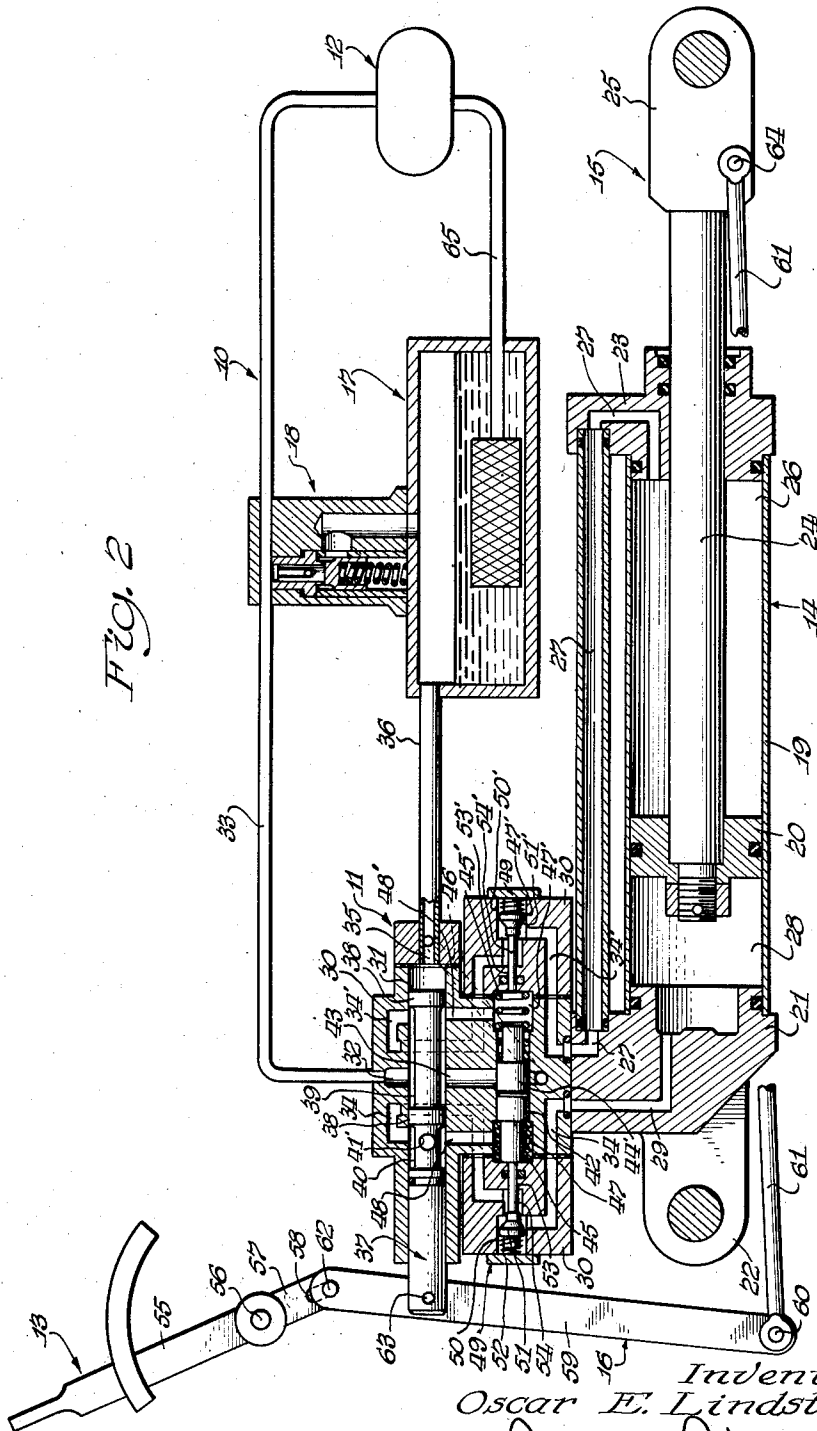
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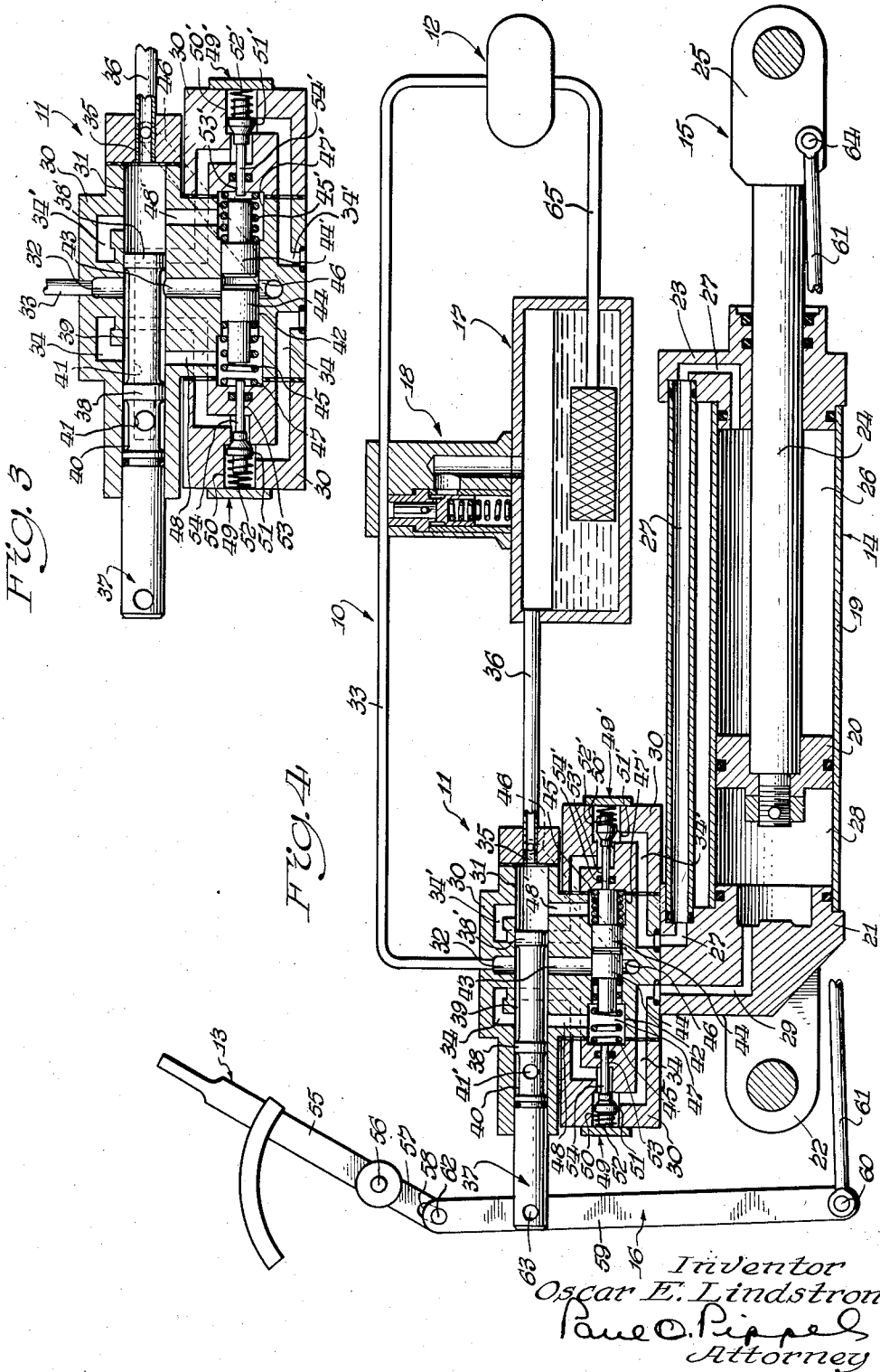
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TELEMETER TYPE HYDRAULIC POWER TRANSMITTING SYSTEM

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3 Claims. (Cl. 121—40)

This invention relates to a control mechanism for an hydraulic motor. More in particular this invention relates to a new and novel control valve which is adapted for a telemeter type control of an hydraulic power transmitting system.

Heretofore in hydraulic control systems of this type a separate and costly servo-motor has been employed to return the control means to a neutral position when the main hydraulic motor has reached a predetermined position corresponding to the position of the control lever as set by the operator. The movement of the servo-motor was determined by the metering of fluid therethrough. Furthermore when such control means was in a neutral position excessive fluid pressure would be required in the by-passing of fluid to the pump reservoir. In addition these systems do not provide for hydraulically locking the motor from movement when the control means is in a neutral position or upon failure of the source of fluid flow.

It is therefore an object of this invention to provide a compact control valve mechanism adapted to a telemeter type hydraulic power transmitting circuit.

A further object of this invention is to provide a telemeter type control valve mechanism having a unique by-pass valve which is actuated for closing or opening by fluid pressure.

A still further object of this invention is to provide a telemeter type control valve mechanism having an hydraulic locking means for preventing movement of the motor under a load when the control valve mechanism is in a neutral position.

Still another object of this invention is to provide a telemeter type control valve mechanism according to the preceding object wherein the hydraulic locking means is releasable by the direct action of the by-pass valve mechanism.

These and other desirable objects and advantages of the invention will become apparent from the following description of a preferred embodiment, the appended claims and the drawings wherein:

Figure 1 is a side elevation, partly in section, illustrating the invention where the control valve is in a neutral position.

Figure 2 is a side elevation, partly in section, similar to Figure 1 except that the control valve is illustrated in an operating position whereby the hydraulic motor is moving in one direction.

Figure 3 is an enlarged side elevation, in section, of the control valve illustrating an intermediate stage of the valve mechanism which occurs at the moment when the control valve is moved from a neutral position to an operating position.

Figure 4 is a side elevation, partly in section, similar to Figure 2 except that the control valve is illustrated in an operating position whereby the hydraulic motor is moving in the other direction.

With reference to the drawings the numeral 10 general-

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ly indicates an hydraulic power transmitting system. The system 10 includes a control valve generally indicated at 11, a source of fluid flow which may be a pump generally indicated at 12, a control lever indicated at 13, an hydraulic motor 14 having a movable work member 15, link means generally indicated at 16 which interconnects the control lever 13 with the work member 15 and control valve 11, a fluid return reservoir 17 and a safety valve 18 all connected together as generally shown in Figures 1, 2 and 4.

The hydraulic motor 14 selected for illustration in this embodiment of the invention is an ordinary two-way hydraulic ram. The ram 14 is comprised of the usual casing 19, piston 20, rear head member 21 having an integrally connected mounting lug 22, a front head member 23 and a connecting rod 24 rigidly connected at one end to the piston 20 and having lug member 25 at the other end thereof adapted for connection to a work load (not shown). Thus it may be seen that the assembly of the piston 20 with the rod 24 and lug 25 constitute the movable work member 15 of the motor 14. The motor 14 is provided with the usual front cylinder chamber 26 and associated tube 27 for conducting fluid to and from the chamber 26. Likewise the motor 14 is provided with the usual rear cylinder chamber 28 and associated tube 29 for conducting fluid to and from the chamber 28. Thus by introducing fluid pressure into one of the tubes 27 or 29 while exhausting the other tube 29 or 27 causes the work member 15 to be urged in the corresponding direction.

The source of fluid flow 12 may be an ordinary constant delivery type pump. The reservoir 17 is of the usual type associated with the inlet side of the pump 12. Of course if the fluid selected is air the reservoir 17 may be omitted as the atmosphere then becomes the system's reservoir. The safety valve 18 is of the well known type which bleeds fluid from the delivery side of the pump 12 when the system is subjected to a fluid pressure exceeding a predetermined maximum limit thereby preventing damage to any of the components in the system.

The control valve 11 which forms the main feature of this invention is comprised, among other things, of a housing 30 which housing may, for manufacturing reasons, consist of a plurality of parts or sections assembled together rigidly by any well known means such as bolts and the like. The upper portion of the housing 30 is provided with a first bore 31 extending longitudinally through the rear wall of the housing 30. An inlet port 32 is disposed in the upper portion of the housing 30 and in fluid communication with the bore 31 and pipe 33 leading to the outlet of the pump 12. A first service port 34 is disposed rearwardly of the inlet port 32 in the housing 30 which port communicates for fluid flow the bore 31 with the tube 29 of the motor 14. A second service port 34' is disposed forwardly of the inlet port 32 in the housing 30 which port communicates for fluid flow the bore 31 with the tube 27 of the motor 14.

On the forward end of the bore 31 in the housing 30 is a discharge port 35 connecting the bore 31 with the reservoir 17 through a pipe 36.

The bore 31 is provided with a main valve plunger generally indicated at 37. The plunger 37 is slidably fitted into the bore 31 for axial movement therein and extends through the rearward opening of the bore 31 in the housing 30 so that the rearward portion of the plunger 37 protrudes externally of the housing 30 as shown in each of the drawings. The plunger 37 is provided with a first land 38 which is positioned in registerable relation with the opening of the first service port 34 into the bore 31. Forwardly of the first land 38 on the plunger 37 is a second land 38' which is spaced from the first land 38

such that when the first land 38 is in registry with the first service port 34 the second land 38' will also be in registry with the second service port 34'. Between the first and second lands 38 and 38' on the plunger 37 is a large circumferential groove 39 which groove is continuously in registration with the inlet port 32 throughout the range of axial movement of the plunger 37. Rearwardly of, and adjacent to, the first land 38 on the plunger 37 is a small circumferential groove 40 which groove is registrable with the first service port 34. A fluid passage between the small circumferential groove 40 and the forward end portion of the bore 31 leading into the discharge port 35 is provided by an axially disposed recess 41 in the plunger 37 extending from the forward end of the plunger 37 and connected with the groove 40 by a transverse hole 41' as best shown in Figure 3. Thus the small circumferential groove 40 is in continuous fluid communication with the discharge port 35.

The control valve 11 is also provided with a second bore 42 disposed in the housing 30. Centrally located and communicating for fluid flow the bore 42 with the inlet port 32 is a by-pass conduit 43. For manufacturing convenience the by-pass conduit 43 may communicate with the inlet port 32 by opening into the bore 31 in alignment with port 32 as shown in each of the drawings. Since the large circumferential groove 39 is always in registration with the inlet port 32 and the by-pass conduit 43 fluid communication between the conduit 43 and the inlet port 32 is continuously established.

Into the second bore 42 is slidably fitted a pair of movable elements 44 and 44' in opposed relation. The inner faces of the elements 44 and 44' may be beveled to facilitate the separation of the two elements from each other which will be hereinafter explained. On the outer ends of each of the elements 44 and 44' are captive springs 45 and 45', respectively, adapted to urge the elements 44 and 44' inwardly or toward each other.

Opening into the bore 42 positioned in alignment with the by-pass conduit 43 is a discharge conduit 46 which communicates for fluid flow the bore 42 with the discharge port 35 as shown partly in dotted lines on Figure 3.

It will be seen from the drawings that rearward of the movable element 44 in the bore 42 is formed a first by-pass chamber 47. Opening into the first bore 31 and in fluid communication with the first by-pass chamber 47 is a first by-pass actuating port 48. Now referring to Figure 1 it will be noted that the actuating port 48 is slightly offset rearwardly from direct alignment with the first service port 34. Thus when the first land 38 of the plunger 37 is in complete registration with the first service port 34 the actuating port 48 is in fluid communication with the small circumferential groove 40 for a purpose to be described later. Again from the drawings it will be seen that forward of the movable element 44' in the bore 42 is formed a second by-pass chamber 47'. Opening into the bore 31 and in fluid communication with the second by-pass chamber 47' is a second by-pass actuating port 48'. Now again from Figure 1 it will be noted that the second actuating port 48' is slightly offset forwardly from direct alignment with the second service port 34'. Thus when the second land 38' of the plunger 37 is in complete registration with the second service port 34' the second actuating port 48' is in fluid communication with the forward end portion of the bore 31 and discharge port 35 for a purpose to be described later.

Interposed in the first service port 34 between the first bore 31 and the tube 29 in the housing 30 is disposed a first check valve generally indicated at 49. The check valve 49 may conveniently be formed by a recessed portion 50 in the housing 30 connected or interposed serially with the first service port 34. Into the recessed portion 50 is slidably fitted the well known valve closing element 51 adapted to seat against the housing 30 in the usual manner. A small captive spring 52 is disposed in the

recessed portion 50 and is adapted to urge the closing element 51 in seating relation with the housing 30. It will be noted from the drawings that the check valve 49 is disposed in series relation with the first service port 34 and is openable in response to fluid flow in one direction emanating from the bore 31. In the housing 30 in axial alignment with the recessed portion 50 is hole 53 which hole slidably supports a drive pin 54. The drive pin 54 may, but not necessarily, be made integral with the closing element 51 and extends forwardly into the first by-pass chamber 47.

Interposed in the second service port 34' between the first bore 31 and the tube 27 is disposed in the housing 30 a second check valve generally indicated at 49'. The check valve 49' may conveniently be formed by a recessed portion 50' in the housing 30 connected or interposed serially with the second service port 34'. Into the recessed portion 50' is slidably fitted the well known valve closing element 51' adapted to seat against the housing 30 in the usual manner. A small captive spring 52' is disposed in the recessed portion 50' and is adapted to urge the closing element 51' in seating relation with the housing 30. Again it will be noted from the drawings that the check valve 49' is disposed in series relation with the second service port 34' and is openable in response to fluid flow in one direction emanating from the bore 31. In the housing 30 in axial alignment with the recessed portion 50' is hole 53' which hole slidably supports a drive pin 54'. Again, as before, the drive pin 54' may, but not necessarily, be made integral with the closing element 51' and extends rearwardly into the second bypass chamber 47'.

The control lever 13 is comprised of a manually operable handle 55 pivotally mounted at 56. A portion 57 of the handle 55 extends below the pivot 56 and is provided with an elongated aperture 58. The link means 16 for interconnecting the control lever 13 with the valve plunger 37 and the movable work member 15 of the motor 14 may be comprised of a beam 59 pivotally connected at 60 to one end of a rod member 61. The upper end of the beam 59 is pivotally connected to the handle 55 at 62 through the elongated aperture 58. From this it can be seen that the elongated aperture provides the necessary take-up allowance during the arcuate travel of the pivot 62. The rearward end portion of the plunger 37 is pivotally connected at 63 to the beam 59 and the other end of the rod member 61 is pivotally connected at 64 to the movable work member 15 of the motor 14.

Operation

From the drawings it will readily be seen that the moving parts within the second bore 42 comprise a by-pass valve while the valve plunger 37 in the first bore 31 comprises the main valve portion of the control valve 11. Figure 1 illustrates the control valve 11 in a neutral position. Fluid enters the control valve 11 from pipe 33 into the inlet port 32 and thence into the large circumferential groove 39. The first and second lands 38 and 38' are in respective registration with the first and second service ports 34 and 34'. Thus no fluid flows into either of the tubes 27 or 29 to energize the motor 14. Fluid in the first by-pass chamber 47 may exhaust through the first by-pass actuating port 48 past the rear edge of the first land 38 into the small circumferential groove 40 thence through the hole 41' into the axially disposed recess 41 into the forward end portion of the bore 31 and out the discharge port 35 into the pipe 36 leading to the reservoir 17. Likewise fluid in the second by-pass chamber 47' may exhaust through the second by-pass actuating port 48' past the forward edge of the second land 38' into the forward end portion of the bore 31 and out the discharge port 35 into the pipe 36 leading to the reservoir 17. From this it can be seen that when the plunger 37 is in a neutral position there exists no fluid pressure differential between the first and second

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by-pass chambers 47 and 47'. Furthermore the exhausting of fluid from the chambers 47 and 47' is unrestricted.

While the control valve 11 is in a neutral position the fluid entering the inlet port 32 from the pump 12 flows into the by-pass conduit 43 and the pressure thereof acts on the bevelled surfaces on the inner faces of the movable elements 44 and 44' to move the element 44 rearwardly against the urging of the spring 52 and move forwardly the element 44' against the urging of spring 52'. Thus the elements 44 and 44' are separated by respective axial movement resulting in an opening communicating the by-pass conduit 43 with the discharge conduit 46. From this it can be seen that the fluid flow from the pump 12 entering the inlet port 32 flows into the by-pass conduit 43 and thence between the separated elements 44 and 44' into the discharge conduit 46 to the discharge port 35, thence into the pipe 36 to the reservoir 17 and back to the pump 12 through the pipe 65. Thus when the control valve 22 is in a neutral position the pump operates at a relatively low pressure, the fluid being by-passed back to the reservoir 17.

When the control valve 11 is in a neutral position both first and second check valves 49 and 49' are in closed position which prevents the exhaust of fluid in the cylinder chambers 26 and 28 and the associated tubes 27 and 29 of the motor 14 thus hydraulically locking the position of the motor 14. At this point it should be noted that the motor 14 will remain hydraulically locked in the event of failure of the pump 12 even though the plunger 37 is moved from the neutral position to an operating position. This safety feature will become more evident from the ensuing discussion.

Now suppose the operator moves the control lever 13 forwardly from that shown in Figure 1 to, for example, that position shown in Figure 4. Since the work member 15 is momentarily stationary the rod member 61 will also be stationary. Thus, the movement of the control lever 13 causes the beam 59 of the link means 16 to pivot about the point 60. As a consequence of the movement of the beam 59 the valve plunger 37 is caused to move rearwardly to a position illustrated in Figure 4. Immediately upon the movement of the valve plunger 37 from a neutral position shown in Figure 1 to an operating position shown in Figure 4 the by-pass valve and check valves 49 and 49' shift to the position shown in Figure 4. However, the intermediate stage during this shift is illustrated in Figure 3.

From Figure 3 it will be seen from the position of the plunger 37 that fluid flow from the pump 12 entering the inlet port 32 is now permitted to enter the first service port 34 and the first by-pass actuating port 48 because the first land 38 has moved rearwardly thus registering the large circumferential groove 39 with both ports 34 and 48. From this it is seen that a rise in fluid pressure occurs in the first by-pass chamber 47. At the same time the second by-pass chamber 47' may still exhaust fluid into the forward end portion of the bore 31 and out the discharge port 35 to the reservoir 17 through the pipe 36. Thus a pressure differential exists between the first and second by-pass chambers 47 and 47' which pressure differential acts on the rear end of the movable element 44 urging it in a forward direction. As the element 44 moves forwardly the flow of fluid through the by-pass conduit 43 becomes restricted which results in a further pressure rise in the fluid from the pump 12 at the inlet port 32. This rise in fluid pressure continues to move the element 44 in a forward direction to terminate fluid flow in the conduits 43 and 46 and, in addition, abuts the element 44' whereby both elements 44 and 44' move forwardly. The continued forward movement of the elements 44 and 44' causes the forward end of the element 44' to engage the drive pin 54' and moving the pin 54' forwardly to unseat or open the second check valve 49'. Now as the by-passing of fluid through the conduit 43 diminishes, the fluid pressure at the inlet port 32 increases to a point

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where it is sufficient to unseat or open the first check valve 49 thus allowing fluid flow through the service port 34 to the tube 29 into the rear cylinder chamber 28 of the motor 14. Thus fluid communication from the inlet port 32 to the rear cylinder chamber 28 is established to urge movement of the work member 15 of the motor 14 in a forward direction. The exhaust fluid from the front cylinder chamber 26 of the motor 14 passes through the tube 27 into the second service port 34' in reverse direction through the open second check valve 49' into the forward portion of the bore 31 and out through the discharge port 35 and pipe 36 to the reservoir 17. At this point the control valve mechanism 11 has shifted completely from the neutral position of Figure 1 to the operating position of Figure 4.

As the work member 15 of the motor 14 proceeds forwardly with the rod member 61, the beam 59 is caused to move pivotally about the point 62 which in turn moves valve plunger 37 forwardly until the plunger 37 again reaches a neutral position whereupon the motor 14 again becomes hydraulically locked and the control valve 11 re-establishes a fluid by-pass as shown in Figure 1. The hydraulic locking of the motor 14 occurs at the time when the lands 38 and 38' register completely with the respective openings of service ports 34 and 34' into the bore 31 thereby preventing fluid flow to and from the motor 14. Fluid pressure previously existing in the chamber 47 is then discharged through the by-pass actuating port 48 to the small circumferential groove 40 into the hole 41' thence through the axially disposed recess 41 into the forward portion of the bore 31 and out to the reservoir 17 through the discharge port 35 and pipe 36. Thereafter the movable elements 44 and 44' of the by-pass valve move to a central position in the bore 42 at the urging of the springs 45 and 45'. The fluid pressure at the inlet port 32 and by-pass conduit 43 then acts on the bevelled edges on the inner surfaces of the movable elements 44 and 44' causing the separation thereof to re-establish fluid by-pass therebetween as previously explained.

Now suppose the handle 55 of the control lever 13 is moved by the operator rearwardly from the position shown in Figure 1 to a position, for example, shown in Figure 2. Since the work member 15 is momentarily stationary the rod member 61 will also be stationary. Thus the movement of the control lever 13 causes the beam 59 of the link means 16 to pivot about the point 60. As a consequence of the movement of the beam 59 the valve plunger 37 is caused to move forwardly to a position illustrated in Figure 2. Immediately upon the movement of the valve plunger 37 from a neutral position shown in Figure 1 to an operating position shown in Figure 2 the by-pass valve and check valves 49 and 49' shift to the position shown in Figure 2. Fluid flow from the pump 12 entering the inlet port 32 is now permitted to enter the second service port 34' and the second by-pass actuating port 48' because the second land 38' has moved forwardly thus registering the large circumferential groove 39 with both ports 34' and 48'. From this it is seen that a rise in fluid pressure occurs in the second by-pass chamber 47'. At the same time the first by-pass chamber 47 may still exhaust fluid to the small circumferential groove 40 into the hole 41' and axial recess 41 to the forward end portion of the bore 31 and thence out the discharge port 35 to the reservoir 17 through the pipe 36. Thus a pressure differential exists between the first and second by-pass chambers 47 and 47' which pressure differential acts on the forward end of the movable element 44' in a rearward direction. As the element 44' moves rearwardly the flow of fluid through the by-pass conduit 43 becomes restricted which results in a further pressure rise in the fluid from the pump 12 at the inlet port 32. This rise in fluid pressure continues to move the element 44' in a rearward direction to terminate flow of fluid in the conduits 43 and 46 and, in addition, abuts the element 44 where-

by both elements 44 and 44' move rearwardly. The continued rearward movement of the elements 44 and 44' causes the rearward end of the element 44 to engage the drive pin 54 and moving the pin 54 rearwardly to unseat the first check valve 49. Now as the by-passing of fluid through the conduit 43 diminishes, the fluid pressure at the inlet port 32 increases to a point where it is sufficient to unseat the second check valve 49' thus allowing fluid flow through the service port 34' to the tube 27 into the front cylinder chamber 26 of the motor 14. Thus fluid communication from the inlet port 32 to the front cylinder chamber 26 is established to urge movement of the work member 15 in a rearward direction. The exhaust fluid from the rear cylinder chamber 28 of the motor 14 passes through the tube 29 into the first service port 34 in reverse direction through the open first check valve 49 to the small circumferential groove 40 into the hole 41' and axial recess 41 to the forward portion of the bore 31 and out through the discharge port 35 and pipe 36 to the reservoir 17. At this point the control valve mechanism 11 has shifted to the operating position of Figure 2.

As the work member 15 of the motor 14 proceeds rearwardly with the rod member 61, the beam 59 is caused to move pivotally about the point 62 which in turn moves the valve plunger 37 rearwardly until the plunger 37 again reaches a neutral position whereupon the motor 14 again becomes hydraulically locked and the control valve 11 re-establishes a fluid by-pass as shown in Figure 1 in a similar manner as that described for operation in the opposite direction.

From the above it can be seen that the work member 15 of the motor 14 will always be urged by fluid flow through the control valve 11 to a position in its stroke corresponding to the relative position of the stroke of the control lever 13 and when the member reaches such position the motor 14 becomes hydraulically locked from further movement in either direction. Furthermore in the event of failure of the pump 12 the movement of the plunger 37 will not release the check valves 49 and 49' to open the hydraulic lock of the motor 14 thus preventing accidental damage to the load on the motor 14 such as the dropping of a plow in transport position on a tractor to the ground.

Having thus described an embodiment of the invention, it can now be seen that the objects of the invention have been fully achieved and it must be understood that changes and modifications may be made which do not depart from the spirit of the invention nor from the scope thereof as defined in the appended claims.

What is claimed is:

1. A control valve for an hydraulic system comprising a housing having an inlet port and a discharge port, a first bore disposed in said housing, one end of said first bore extending through an external wall of said housing, a first service port and a second service port disposed in said housing, said service ports being communicatively connected for fluid flow with said first bore, a movable main valve plunger slidably disposed in said first bore, one end of said valve plunger protruding externally of said housing, a first land and a second land disposed on said valve plunger, said first land being positioned to register with said first service port when said second land is in registration with said second service port, a large circumferential groove disposed on said valve plunger, said large circumferential groove being positioned between said lands and in continuous registration with said inlet port, a small circumferential groove disposed on one end portion of said valve plunger adjacent said first land and registerable with said first service port, a fluid passage disposed in said valve plunger, said passage communicatively connecting for fluid flow said small circumferential groove with said discharge port, a first check valve disposed in said housing, said first check valve being interposed in and connected in series relation with said first service port, a second check valve disposed in said

housing, said second check valve being interposed in and connected in series relation with said second service port, said check valves being openable responsive to fluid pressure in one direction, said check valves each being provided with a drive pin, said drive pins being movable for selectively opening said check valves for permitting fluid flow therethrough in the other direction, a second bore disposed in said housing, a first by-pass actuating port and a second by-pass actuating port disposed in said housing communicatively connecting for fluid flow said first bore with said second bore, a fluid pressure actuated by-pass valve disposed in said second bore, a by-pass conduit communicatively connecting for fluid flow said inlet port with said second bore, a discharge conduit disposed in said housing communicatively connecting for fluid flow said second bore with said discharge port, said by-pass valve having a pair of movable valve elements slidably disposed in said second bore, resilient means disposed on the outer ends of said movable elements positioned for urging said movable elements toward each other in opposed relation, the outer end of one of said movable elements being positioned to engage the drive pin of said first check valve and the outer end of the other of said movable elements being positioned to engage the drive pin of said second check valve, said control valve being operable to by-pass fluid flow from said inlet port through said by-pass valve while said check valves hydraulically lock the movement of fluid in said service ports and alternatively connecting for fluid flow said inlet port with one of said service ports and connecting for fluid flow said discharge port with the other of said service ports while terminating fluid flow from said inlet port through said by-pass valve to said discharge port.

2. An hydraulic power transmitting system comprising a source of fluid flow, a two-way acting fluid motor including a movable work member, a control valve, said control valve having a housing, an inlet port disposed in said housing, said inlet port being communicatively connected for fluid flow with said source of fluid flow, a discharge port disposed in said housing, said discharge port being communicatively connected for fluid flow with the fluid supply for said source of fluid flow, a first service port and a second service port disposed in said housing, said service ports being communicatively connected to said motor for energizing said motor when said control valve is in an operating position, a first bore disposed in said housing, one end of said first bore extending through an external wall of said housing, a movable main valve plunger slidably disposed in said first bore, one end of said valve plunger protruding externally of said housing, a first land and a second land disposed on said valve plunger, said first land being positioned to register with said first service port when said second land is in registration with said second service port, a large circumferential groove disposed on said valve plunger, said large circumferential groove being positioned between said lands and in continuous registration with said inlet port, a small circumferential groove disposed on one end portion of said valve plunger adjacent said first land and registerable with said first service port, a fluid passage disposed in said valve plunger, said passage communicatively connecting for fluid flow said small circumferential groove with said discharge port, a first check valve disposed in said housing, said first check valve being interposed in and connected in series relation with said first service port, a second check valve disposed in said housing, said second check valve being interposed in and connected in series relation with said second service port, said check valves being openable responsive to fluid pressure in one direction, said check valves each being provided with a drive pin, said drive pins being movable for selectively opening said check valves for permitting fluid flow therethrough in the other direction, a second bore disposed in said housing, a first by-pass actuating port and a second by-pass actuating port disposed in said housing, said first by-pass

port being poitioned to communicate for fluid flow one end portion of said first bore with one end portion of said second bore, said first by-pass actuating port being positioned for selective registration with said first land and said circumferential grooves, said second by-pass actuating port being positioned to communicate for fluid flow the other end portion of said first bore with the other end portion of said second bore, said second by-pass actuating port being positioned for selective registration with said second land and said large circumferential groove and said discharge port, a fluid pressure actuated by-pass valve disposed in said second bore, a by-pass conduit communicatively connecting for fluid flow said inlet port with said second bore, a discharge conduit disposed in said housing communicatively connecting for fluid flow said second bore with said discharge port, said by-pass valve having a pair of movable elements slidably disposed in said second bore, one of said movable elements forming a first by-pass chamber with one end portion of said second bore and the other of said movable elements forming a second by-pass chamber with the other end portion of said second bore, said first by-pass actuating port being in communication with said first by-pass chamber and said second by-pass actuating port being in communication with said second by-pass chamber, resilient means disposed on the outer ends of said movable elements positioned for urging said movable elements toward each other in opposed relation, the outer end of one of said movable elements being positioned to engage the drive pin of said first check valve and the outer end of the other of said movable elements being positioned to engage the drive pin of the said second check valve, said movable elements being position to separate from each other responsive to fluid pressure differential between said by-pass conduit and said discharge conduit for fluid flow therethrough, means for selectively connecting one of said by-pass chambers with said inlet port and connecting the other of said by-pass chambers with said discharge port for terminating flow of fluid through said by-pass conduit when said valve plunger is in an operating position, said control valve being operable to by-pass fluid flow from said inlet port through said by-pass valve to said discharge port while said check valves hydraulically lock the movement of fluid in said service ports and alternatively connecting for fluid flow said inlet port with one of said service ports and connect-

ing for fluid flow said discharge port with the other of said service ports while terminating fluid flow from said inlet port through said by-pass valve to said discharge port, a control lever, and link means connecting said valve plunger with said control lever and the movable work member of said fluid motor whereby said control lever is setttable to move said valve plunger to an operating position for energizing said motor for movement in a direction to return said valve plunger to a neutral position when said work member of said motor has reached a position corresponding to the position of said control lever.

3. An hydraulic power transmitting system comprising a source of fluid flow, a fluid motor having a movable work member, a control lever, a control valve disposed intermediate said source of fluid flow and said motor, said control valve being manipulative from a neutral position to accommodate fluid flow therethrough to energize said motor, said control valve being resettable to a neutral position for terminating fluid flow to said motor, a fluid pressure responsive by-pass valve having a pair of movable elements in opposed relation disposed in said control valve, said by-pass valve being operable to by-pass fluid from said source of fluid flow between said elements when said control valve is in a neutral position and alternatively terminate said fluid flow between said elements when said control valve is in an operating position, a pair of check valves disposed in said control valve, said check valves being positioned to prevent fluid flow from said motor when said control valve is in a neutral position, said by-pass valve elements being operable to open selectively one of said check valves for permitting fluid flow from said motor therethrough when said control valve is in an operating position, and link means connecting said control valve and said control lever and said work member whereby said control valve is moved from an operating position to a neutral position when said work member reaches a position corresponding to the position of said control lever.

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