

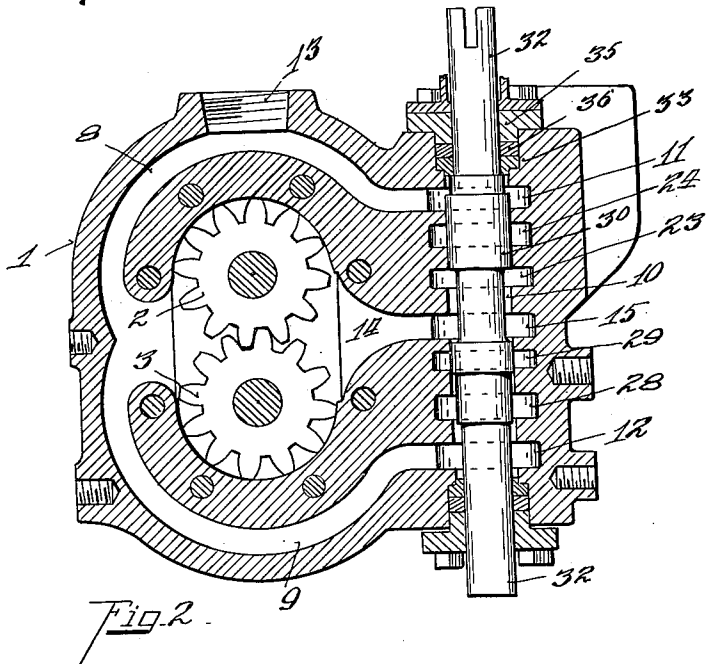
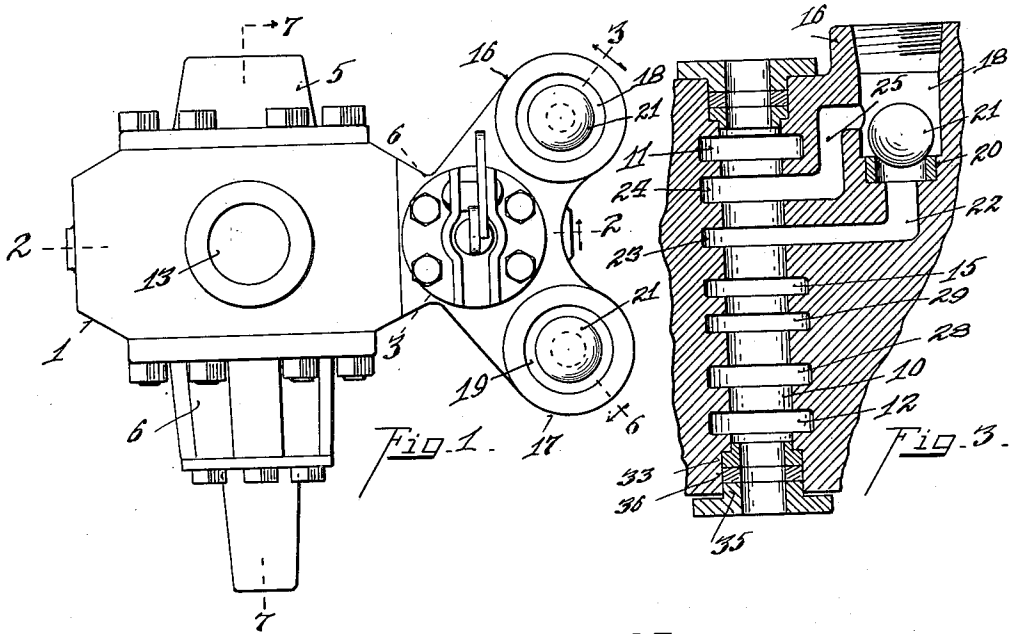
April 14, 1953

K. W. KERN, JR
PUMP AND VALVE ASSEMBLY

2,634,679

Filed Jan. 23, 1951

2 SHEETS--SHEET 1



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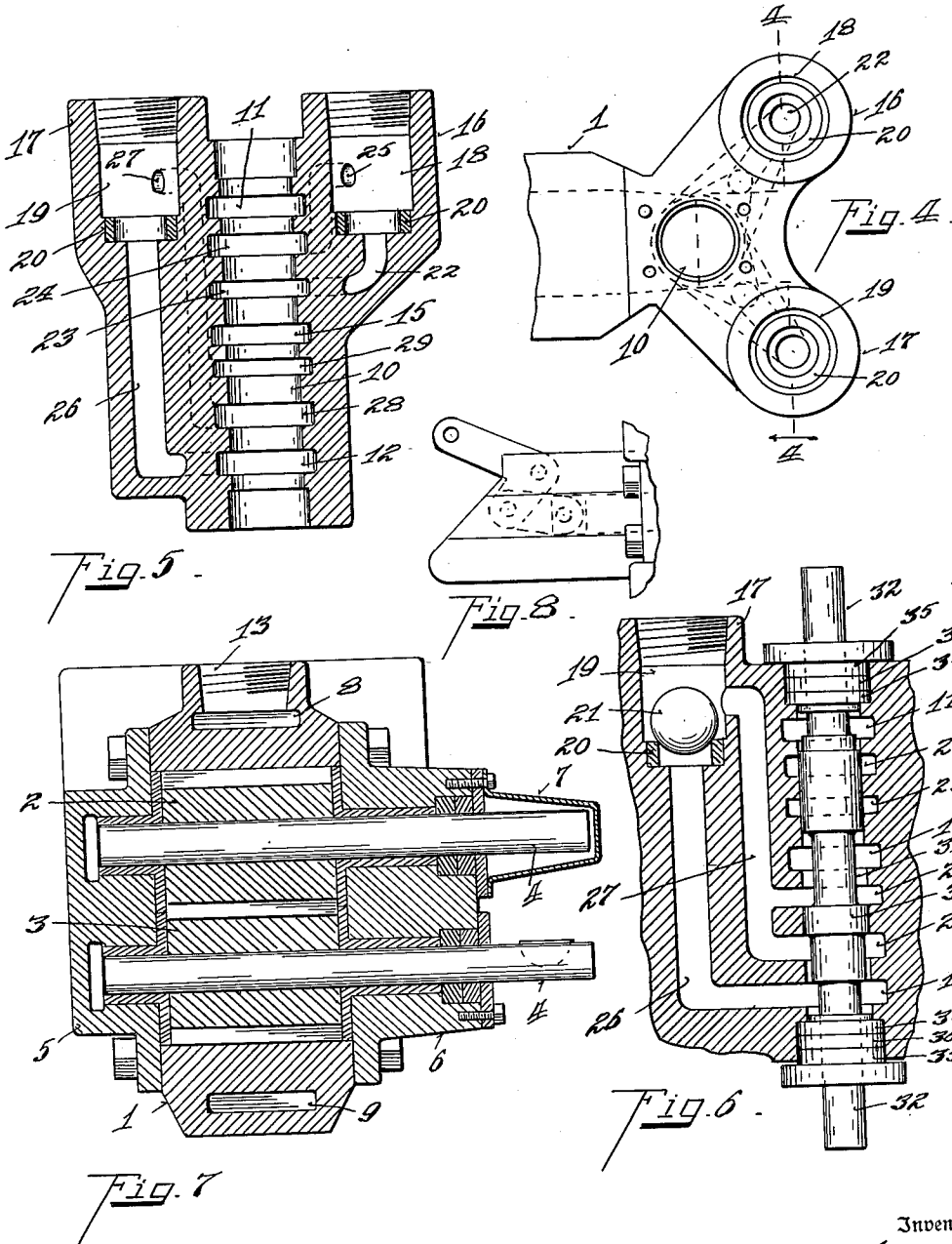
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PUMP AND VALVE ASSEMBLY

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This invention relates to a pump and valve assembly, primarily for the operation and control of a hydraulic hoist or ram as employed for tilting the dump body of a motor vehicle or truck and also for other service, the pump being continuously operative for a period that the hoist is moved in alternate directions of stroke motions to elevate and lower the dump body of the vehicle by power, either for the full or partial degree of ram reciprocating movement.

The control also provides for a retreating movement of the ram, as for lowering a vehicle body from a tilted position to its normal plane without the pump being operative, as in the event of pump failure or the power source for operating the pump.

An object of the invention is to provide a pump and valve unit of simple and compact construction, the pump having intermeshing gear type rotors, the valve controlling the pump fluid pressure delivery to one or alternately to a pair of ports of the unit adapted for connection with a hydraulically operated apparatus whereby when the pump fluid pressure delivery by the valve control is directed to one of the ports the other is in communication with the pump intake for movement of the hydraulic apparatus successively in reverse directions by power, and when one of the ports by valve control is sealed, movement of the hydraulic apparatus can be withheld without interruption of the propulsion of the pump rotors and further by the control permit the hydraulic apparatus to be moved in a retreating direction, as by gravity, when the rotation of the rotors is stalled.

Another object is to provide a pump and valve unit, the pump having intermeshing gear type rotors, a pair of ports, each respectively for making a coupling connection with a hydraulic operated ram or apparatus having a reciprocable piston for moving the same by fluid under pressure in alternate directions, controlled by the valve of said unit for alternately connecting said ports, one with the intake of the pump and the other with the fluid pressure delivery of the pump, the pump at its intake side having a port for making a conduit coupling connection with a fluid reserve holding reservoir or the like source to adapt the ports in conduit connection with the ram, when they respectively by the control of the valve are brought into communication with the pump intake, be in communication with the reservoir, to thereby release the fluid from one side of the ram piston and by-pass the pump to permit piston movement in a retreating direction in the event of pump failure or stoppage.

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Another object is to provide a pump and valve unit in which the body has a pump chamber with a pair of meshing gear type pump rotors rotative therein and a valve bore positioned at one side of the pump chamber and in connection therewith at the fluid delivery of the rotors, an arcuate passage in the body about the pump chamber and medially thereof in communication with the pump chamber at the fluid intake side of the rotors and with the opposite ends of said passage in communication with opposite ends of the valve bore and a pair of ports in the body for making a coupling connection with the valve bore intermediate of the pump connection with the bore and intake passage at the opposite ends of the bore for simultaneous control by the valve to connect each port alternately, one with the fluid intake of the pump and the other with the fluid pressure delivery side of the pump and to interconnect the pump intake and fluid delivery.

Various other features and advantages of the invention will be more fully set forth and apparent from the following description of the drawings accompanied herewith and forming a part hereof, depicting a preferred embodiment, in which:

Figure 1 is a top plan view of the pump and valve assembly as a unit having a pair of ports leading therefrom, for making a pipe or tube connection therewith as for communication with one of the opposite ends of the cylinder of a ram or apparatus to be operated and in valve controlled communication with the pump of the unit.

Figure 2 is a section on line 2-2, Figure 1, showing the valve in one of its adjusted positions.

Figure 3 is a section on line 3-3, Figure 1, with the valve omitted.

Figure 4 is a top plan view of a portion of the body of the unit which embodies the valve and corresponds to Figure 1 with the valve and its actuating means omitted.

Figure 5 is a section on line 4-4, Figure 4.

Figure 6 is a section on line 6-6, Figure 1, with the valve set to an intermediate position.

Figure 7 is a section on line 7-7, Figure 1.

Figure 8 is a detail side elevation of the valve actuating means.

The hydraulic pump unit, as a gear type is particularly adaptable for the operation and control of a hydraulic ram employed for swinging a dump body of a vehicle from its normal horizontal plane to and from an inclined position by power.

For some service it may be desirable to hold the vehicle body in an inclined position intermediate of the full stroke movements of the ram or to jog the same without controlling the action or

power for driving the pump whereupon when the valve is set to an intermediate or holding position the fluid inlet and outlet ports of the pump are interconnected and in communication with a pump fluid supply reservoir or tank and from the holding position the valve can be adjusted for a ram movement in either of alternate directions and also permits the vehicle body to be lowered by gravity in the event of failure of the pump or its power driving source.

Referring to the drawings 1 indicates the body of the unit, interiorly provided with an oblong pump chamber having a pair of intermeshing gear type pump rotors 2, 3, rotatable therein, each axially mounted upon and carried by a shaft 4, suitably journaled in gear supporting cover bearings 5, 6, removably fixed to opposite sides of the body as closure heads for the opposite sides of the pump chamber. The rotor shafts extend outwardly from one of the cover bearings or heads, as the head 6, so that either may constitute a drive shaft and the protruding end of the driven shaft is enclosed by a cap 7 mounted upon and fixed to the closure head 6.

The rotor shafts are supported within bearings within the pump heads 5 and 6 and each bearing has a flange which bears against an end or side of the gear it supports. A pair of arcuate passages 8 and 9 is provided within the body about the pump chamber which at one end are joined and in common communication with the pump chamber intermediate thereof and at one side of the intermesh of the pump rotors, as a fluid inlet for the pump. Each passage 8 and 9 at its opposite end is in communication with an annular port around and in communication with a valve bore 10 in said body positioned at one side of the pump chamber with which it is in communication through the arcuate passages at its opposite ends. The axis of the bore 10 extends in a direction substantially transverse to the rotor axes. The arcuate passage 8 connects with an annular port 11 at one end of the valve bore 10 and the passage 9, with another annular port 12 at the opposite end of the valve bore. One of said arcuate passages as the passage 8, intermediate of its length, connects with a fluid supply duct 13 in the body with which suitable conduit connection is made to a fluid supply source, as with a tank or reservoir.

A passage 14 centrally within the body and intermediate of the ends of the arcuate passages 8 and 9, joins with the valve bore and extends transversely medially from the pump chamber and at a side from the pump rotors opposite from the inlet, and has its opposite end in connection with an annular port 15, between the annular ports 11 and 12 at the opposite ends of the valve bore 10.

The annular port 11 at one end of the valve bore is suitably spaced from the centrally located annular port 15, to provide for a pair of annular ports intermediate thereof, which is duplicated between the annular port 12, at the opposite end of the valve bore and the annular port 15. The unit therefore provides a series of seven axially spaced annular ports about the valve bore for control by a single reciprocal valve within the valve bore.

A pair of snouts 16 and 17 extends from the body, arranged in parallelism and at opposite sides of the valve bore each for making a conduit connection with one of the opposite ends of the cylinder of a hydraulic ram for moving the plunger or piston of the ram by pressure in

alternate directions. Each snout has a port axially therein and for the purpose of identification the port 18 of the snout 16 will be designated as a raising port while the port 19, within the snout 17 has a lowering port. Each port 18 and 19 at the base end thereof has an annular seat 20 therein for seating a ball type check valve 21 within the port. The ports each has a pair of passages in communication therewith at different elevations with the opposite ends of the passages in communication with the valve bore at spaced points.

The raising port 18 at the base thereof connects with a passage 22, which is check valve controlled by a ball check valve 21 within said port and the opposite end of the passage 22, as shown in Figures 3 and 5, connects with an annular port 23 axially about the valve bore 10, as one of the pair of annular ports intermediate of the pump fluid delivery annular port 15 and the annular port 11 at the upper end of the valve bore. The annular port 23 is appropriately spaced from the central annular port 15 and from a second annular port 24 of the pair which is in communication with one end of a passage 25 and the opposite end of the passage 25 is in communication with the port 18 from and at an elevation non-affected by the check valve controlling the passage 22.

Correspondingly the lowering port 19 at the base end thereof connects with a passage 26 which is check valve controlled by the ball check valve 21 within said port and the opposite end of said passage 26, as shown in Figures 5 and 6 connects with the annular port 12 axially around and at the lower end of the valve bore 10. A second passage 27, connects at one end with the lowering port 19 at an elevation or point non-affected by the check valve controlling the passage 26 and at its opposite ends connects with both of a pair of annular ports 28 and 29, spaced from each other and intermediate of the pump fluid delivery port 15 centrally of the valve bore and the annular port 12 at the lower end of the valve bore.

As disclosed in dotted lines Figure 4, the ends of the passages 22, 25, 26 and 27, are of tapering design in their connection with respective annular parts about the valve bore, thus presenting their opposite side walls tangential with the periphery of the port with which it joins so as to be non-retarding to the flow of the fluid in its movement either to or from the valve bore.

A stem type of valve 30, is reciprocable within the valve bore 10. The valve is subdivided by an annular groove 31 of a length to span a pair of adjacent annular ports to bring the same into communication with one another, as the central annular port 15 in communication with the pump fluid pressure delivery passage and either of the annular ports 23 and 29. The valve 30 has a shank 32 extending from each of its opposite longitudinal ends, each end traversing a stuffing box having a bearing ring 32, an annular gland 35 and a packing 36 interposed between the bearing ring and gland, said bearing ring, gland and packing being concentrically about the valve shank and engaged and seated within a counter-bore in the body of the unit at an end of the valve bore with which it registers. The gland has an annular head flange to cap the counter-bore and for securing the same to the exterior of the body in a conventional manner.

One of the shank ends of the valve connects with means, as a link and lever, illustrated in

Figure 8, to which a rod may be connected for remotely manually shifting or actuating the valve, the mechanism employed being optional and may follow various types of construction and arranged for locking or hold the valve in either of its adjusted positions.

Upon setting the valve 30 to its upper limit of movement or raising position for a given direction of ram movement, as illustrated in Figure 2, the annular port 15 about the valve 30 is in communication with the annular port 23 adjacent one side of the port 15, so that the fluid pressure from the pump delivery passage 14 is in communication with the check valve controlled passage 22 for fluid delivery to the ram to move the same by power in a forward stroke. The valve in such position closes communication of the second or companion passage 25, in communication with the annular port 24, and also with the annular port 11 connecting with the pump intake passage and through the valve bore with the annular port 24. The valve also closes communication of the fluid delivery port 15 with the annular port 29, at the opposite side thereof from that of the annular port 23, and opens the passage 27 leading from the opposite end of end of the ram cylinder to the pump intake passage 9 and fluid reservoir in communication with the pump intake port 13.

Thence moving the valve to its intermediate or holding position, as shown in Figure 6, the communication with both of the passages 22 and 25, with the pump delivery port 15 and the port 11 in communication with the pump inlet passage 8 is closed and both of the companion passages 26 and 27 are in communication with the pump inlet passage 9 and reservoir so that the pressure fluid delivery from the pump is ineffective, as the pump intake and delivery are in circuit with each other.

The valve may be moved from such position in either of alternate directions for either a forward or reverse movement of the ram to change the degree of inclination of the dump body or to jog the same. This permits the ram to be moved in alternate directions intermediate of its maximum raising or lowering degree of movement or its movement arrested at any point intermediate of the limits of movement, without disturbing the continuous operation of the pump as the pump intake and delivery passages are in intercommunication when the valve is in its intermediate position.

Moving the valve to its lowermost position, opens the passage 25 with the annular port 11 and pump intake and closes the passage 27 from communication with the annular port 28, while the pump delivery is in communication with the passage 27 through the annular port 29 in communication with the annular port 15. Thus the ram is moved in a reverse or lowering direction under pressure. Should, however, the pump become stalled, with the valve in its lowering position or moved to such position, the truck body can be lowered by gravity as the raising port 18 is in circuit with the pump intake passage 8 and fluid supply reservoir, without going through the pump, although it is blocked in the passage 27, because the pump is idle, as the ram in a descending movement, as due to its weight would force the liquid in a return direction through the snout 16, passage 25, annular port 11 and arcuate passage 8 back into a fluid supply reservoir.

There are three valve ports at the lower end of the valve bore which connect with the lower-

ing port 19 and pressure is applied by closing the port 28 from communication with the passage 27, whereby smoother lowering is obtained since fluid is in the passage, thereby eliminating surges, also the ball check valves make back surges against the pump impossible, therefore control is much smoother. The method allows the pump to build up pressure normally rather than taking the shock loads of an opened port with no check valves. The valve is completely hydraulically balanced which makes it easier controlled.

Having described my invention, I claim:

1. A pump and valve unit for the operation and control of a hydraulic apparatus in fluid connection therewith, comprising a body having therein a pump chamber and a valve bore at one side of the pump chamber, the bore medially of its length in intercommunication with the pump chamber as a pump outlet for fluid delivery under pressure into said bore, a pair of intermeshing gear type rotors in the pump chamber on parallel axes journaled in said body and at one end extending exterior thereof for making a transmission connection with either one of the axes, the body of the pump having an arcuate passage about the pump chamber in communication with the pump fluid intake and at its opposite ends with the valve bore at opposite sides of the intercommunication of the pump and valve bore, said body having a port therein for making an exterior fluid connection with a reservoir or fluid supply source in communication with said arcuate passage, a series of axially spaced annular ports around and in communication with said valve bore, at each of the opposite sides of the pump intercommunication and axially spaced therefrom, a pair of ports in said body for making connections with a hydraulic apparatus dependent upon the control setting of a valve in said valve bore, each of said ports in double passage connection with the valve bore, each passage in connection with one of the series of axially spaced annular ports at one side of the pump and bore intercommunication, and a valve reciprocable in said valve bore to move the same for different control setting positions, in one setting position to establish communication between said pump and valve bore intercommunication and one of said annular ports in communication with one of said ports for making connection with a hydraulic apparatus, and the other of said pair of ports in communication with the valve bore closed from communication with the pump and valve bore intercommunication and opened for communication with said arcuate passage and pump intake, in a second setting position to alternate from said first valve setting position for a reverse order of control of said pair of ports and in intermediate setting position to block communication of one of said pair of ports with the valve bore and maintain the other of said pair of ports open to communication with both the pump intake and outlet through the valve bore.

2. A pump and valve unit for the operation and control of a hydraulic apparatus in fluid connection therewith, comprising a body having therein a pump chamber and a valve bore at one side of the pump chamber, the bore medially of its length in intercommunication with the pump chamber as a pump outlet for fluid delivery under pressure into said bore, a pair of intermeshing gear type rotors in the pump chamber in parallel axes journaled in said body, the

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body having a passage therein in communication with the pump chamber for a pump fluid intake and with the valve bore at opposite sides of the intercommunication of the pump chamber and valve bore, a port in said body for making an exterior fluid connection with a reservoir of fluid supply source in communication with said pump intake passage, a series of axially spaced annular ports around and in communication with said valve bore at each of the opposite sides of the pump intercommunication and axially spaced therefrom, a pair of ports in said body for making connections with a hydraulic apparatus, each port for delivery and retraction to and from the hydraulic apparatus dependent upon the control setting of a valve in said valve bore, each of said ports in double passage connection with the valve bore, each passage in connection with one of the series of axially spaced annular ports at one side of the pump and bore intercommunication, and a valve reciprocable in said valve bore to move the same for different control setting positions, in one setting position to establish communication between said pump and valve bore intercommunication and one of said annular ports in communication with one said ports for making connection with a hydraulic apparatus, and the other of said pair of ports in communication with the valve bore closed from communication with the pump and valve bore intercommunication and open for communication with said pump intake, in a second setting position to alternate from said first valve setting position for a relative reverse order of control of said pair of ports and in an intermediate setting position to block communication of one of said pair of ports with the valve bore and maintain the other of said pair of ports open to communication with both the pump intake and outlet through the valve bore.

3. A pump and valve unit for the operation and control of a hydraulic apparatus in fluid connection therewith, comprising a body having therein a pump chamber and a valve bore at one side of the pump chamber, the bore medially of

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its length in intercommunication with the pump chamber as a pump outlet for fluid delivery under pressure into said bore, a pair of intermeshing gear type rotors in the pump chamber on parallel axes journaled in said body, both axes accessible from the exterior of the body for making a transmission connection with one thereof, the body having a passage therein in communication with the pump chamber for pump fluid intake and with the valve bore at opposite sides of the intercommunication of the pump chamber and valve bore, a port in said body for making an exterior fluid connection with a reservoir of fluid supply source in communication with said pump intake passage, a pair of ports in said body for making connections with a hydraulic apparatus, each port for delivery and retraction to and from the hydraulic apparatus dependent upon the control setting of a valve in said valve bore, each of said ports in independent double passage communication with the valve bore at spaced points axially thereof at one side of the pump and bore intercommunication and spaced therefrom axially of the bore, and a valve reciprocable in said valve bore to move the same for different control setting positions, in one setting position to establish communication between said pump and valve bore intercommunication and one of said ports for making a fluid delivery connection with a hydraulic apparatus, and the other of said pair of ports in communication with the valve bore closed from communication with the pump and valve bore intercommunication and open for communication with said pump intake, in a second setting position to alternate from said first valve setting position for a relative reverse order of control of said pair of ports and in an intermediate setting position to block communication of one of said pair of ports with the valve bore and maintain the other of said pair of ports open to communication with both the pump intake and outlet through the valve bore.

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No references cited.