Aug. 19, 1952 K. G. DRUCKER 2,607,295

PUMP

Filed Jan. 15, 1947 2 SHEETS—SHEET 1

FIG. 1.

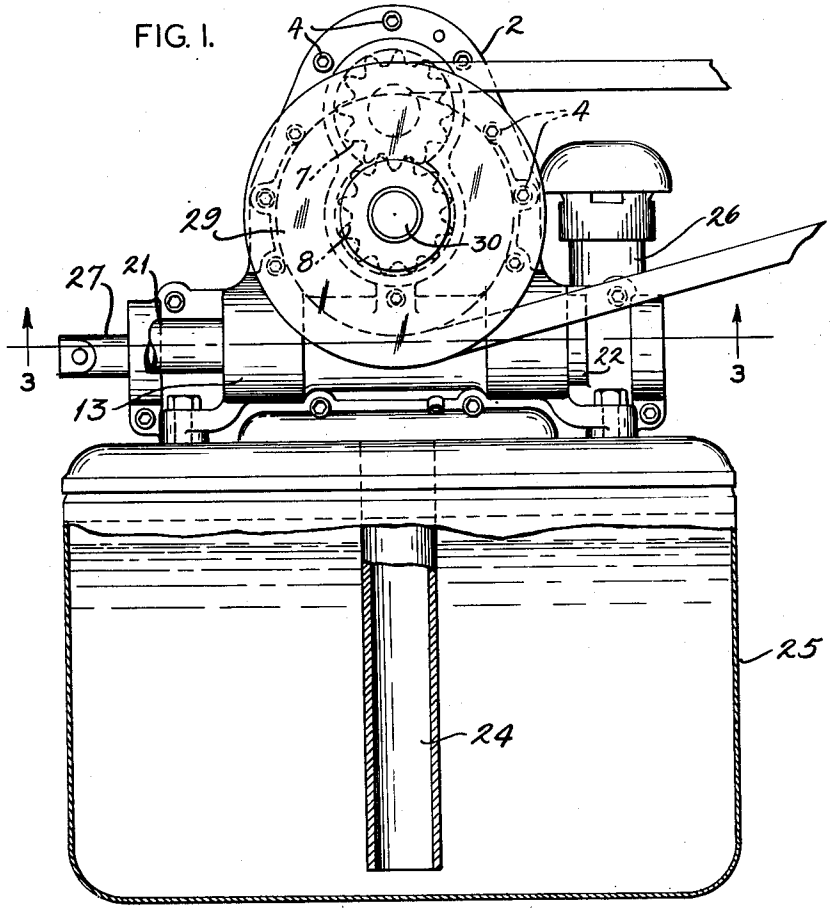
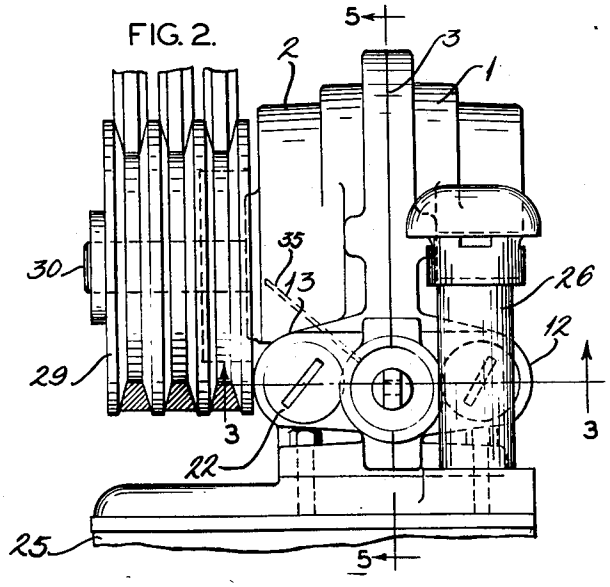


FIG. 2.



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Aug. 19, 1952 K. G. DRUCKER 2,607,295

PUMP

Filed Jan. 15, 1947 2 SHEETS—SHEET 2

FIG. 3.

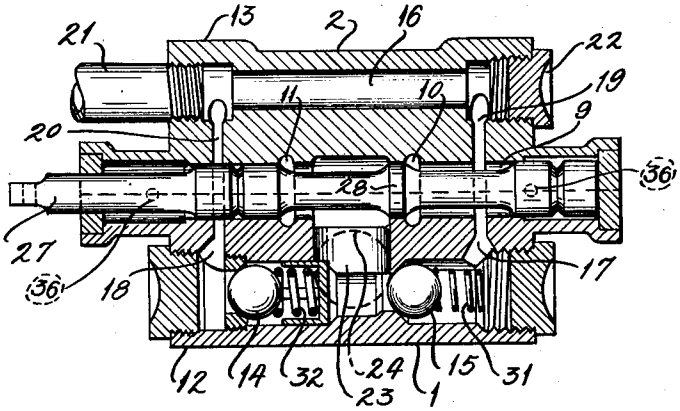


FIG. 4.

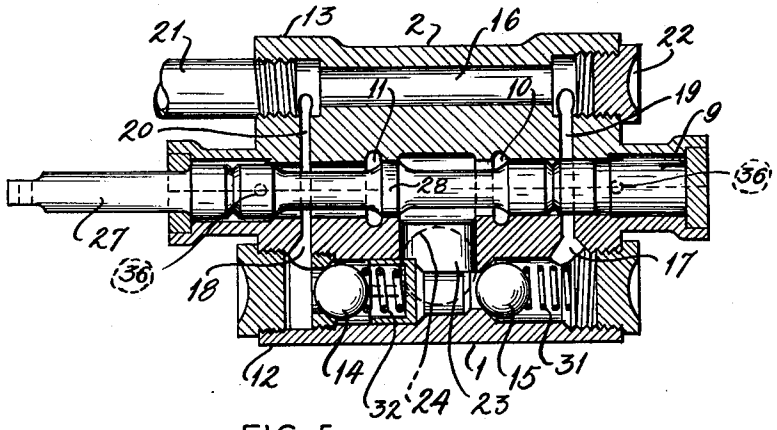
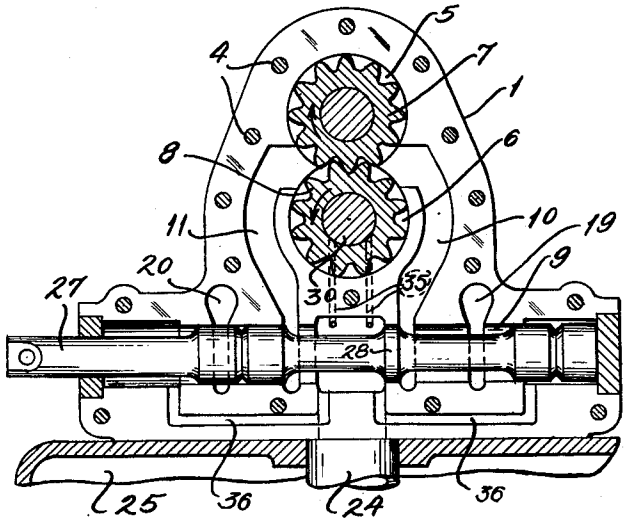


FIG. 5.



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Application January 15, 1947, Serial No. 722,225

4 Claims. (Cl. 103—3)

1

This invention relates generally to fluid pumps and particularly to pumps suitable for actuating any of a great variety of hydraulic mechanism.

A great variety of hydraulically operated labor-saving devices are being offered for use upon farms and in comparable situations where they may be driven by whatever source of motive power as, for instance, a farm tractor, may be available. All such hydraulic apparatus requires to be actuated by a pump and, in view of the fact that the tractors or other sources of motive power at hand have their power take-off mechanism arranged in a variety of different forms, difficulties are presented in providing a pump which is universally applicable in such situations.

The object of the present invention, generally stated, is to provide a hydraulic pump capable of being driven in either direction and from either side with versatile control of the flow of pressure fluid therefrom irrespective of the direction of drive.

Another object of the invention is to provide a compact, cheap, and rugged pump suitable for actuating hydraulically operated labor-saving devices.

Other objects will become apparent to those skilled in the art when the following description is read in connection with the accompanying drawings, in which:

Figure 1 is a view in side elevation of the pump of the present invention assembled with a fluid reservoir;

Figure 2 is a right end view of the pump shown in Figure 1;

Figure 3 is a sectional view taken along line 3—3 of Figures 1 and 2;

Figure 4 is a view corresponding to Figure 3 but showing the valve mechanism in a different position; and

Figure 5 is a sectional view taken along line 5—5 of Figure 2.

The pump of the present invention is characterized by the feature that the housing therefor, which provides both pressure and valve changes, is split substantially centrally. The sections of the split housing are cast of suitable metal, such as aluminum, and may, if desired, be identical. In the casting of the sections of the split housing the mold is cored so as to form in each of the sections complemental recesses, which, when the sections are joined, become the pressure chamber, the valve chamber, and a pair of separate ducts connecting the valve and pressure chambers.

2

A further important feature of the invention is the provision of valve mechanism for the convenient and facile control of the flow of fluid impelled by the pump, irrespective of the direction of drive of the pump, and with provision for automatically opening a circuit directly connecting the output of the impeller to the input therefor under abnormal conditions.

Referring now to the drawings for an illustrative embodiment of the invention, the housing for the pump consists of two identical halves 1 and 2, which are joined together along a plane 3 and suitably connected as by screws 4.

Adjacent the plane of division between the housing sections 1 and 2, each of the sections is recessed at 5 and 6 to accommodate a pair of meshing gears 7 and 8. The recesses 5 and 6 are proportioned in relation to the proportions of the gears 7 and 8, respectively, so as to provide a pressure chamber, through which fluid is forced upon rotation of the gears in a manner common to the art of gear pumps.

The housing sections 1 and 2 are also cored to provide in each of them a recess 9, which, when the sections are assembled together, constitutes a valve chamber. Likewise, ducts 10 and 11 are formed of complemental recesses cored in the respective housing sections.

Each of the housing sections 1 and 2 is also provided with a barrel portion 12 and 13, respectively, extending parallel to and generally in the plane of valve chamber 9. The barrel portion 12 is appropriately bored to accommodate a safety valve 14 and a check valve 15. The barrel portion 13 is bored to form a manifold 16.

The section 1 is bored to provide a port 17 leading from valve chamber 9 to the space adjacent valve 15 and is likewise bored to provide a port 18 leading from valve chamber 9 to adjacent valve 14. The ports 17 and 18 are aligned, respectively, so as to be in permanent communication with ports 19 and 20 extending from the valve chamber 9 to manifold 16.

Each end of manifold 16 is threaded so as to permit the insertion of a pipe 21 leading to the hydraulic mechanism to be operated, the opposite end being closed by a plug 22. It will be understood that the position of the pipe 21 and the plug 22 may be reversed when desired.

Centrally of the valve chamber 9, in housing section 1, a bore 23 extends into communication with the space between valves 14 and 15, and therefrom in a vertical direction an inlet tube 24 extends downwardly into a tank 25 adapted to contain the supply of fluid to be pumped. The

tank 25 is also provided with a breather outlet 26, as shown in Figures 1 and 2.

Within the valve chamber 9, a plunger 27 is arranged to slide longitudinally with portions thereof in sealing engagement with the cylindrical wall of valve chamber 9. The cylinder-engaging portion 28 of plunger 27, when in the position shown in Figure 3, closes off direct communication between the inlet 24 and duct 10, but it will be observed that duct 11 is, in this position, in direct communication with the inlet 24. This position is shown in Figure 3. The opposite extreme position is shown in Figure 4, wherein the cylinder-engaging portion 28 has been moved to close off direct communication between duct 11 and inlet 24, while communication between duct 10 and inlet 24 is now open. An intermediate position of the portion 28 establishes direct communication between ducts 10 and 11, so that the pump will merely recirculate about itself.

Any suitable driving connection, such as a set of pulleys 29, may be provided on the shaft 30 upon which gear 8 is mounted. In the embodiment shown, a plurality of V-belts is employed for transmitting power from the source of motive power to the pump, but it will be understood that any desired transmission mechanism may be utilized.

Assuming that the gear 8 is being driven in a counterclockwise direction, as shown in Figure 5, the gear 7 will be driven in a clockwise direction. With plunger 27 in the position shown in Figure 5, under this condition of operation of the pump, fluid will be drawn from tank 25, through tube 24, to the valve chamber, thence through duct 11 to the pressure chamber defined by recesses 5 and 6. Rotation of the gears 7 and 8 forces the fluid out through duct 10 into valve chamber 9, from whence it flows through port 19 into manifold 16 and a portion of it flows through port 17 into the space about valve 15, so as to fill the latter space. With the arrangement shown, however, where the valve 15 is normally maintained upon its seat by a spring 31, the pressure of the fluid occupying the space thereadjacent merely assists in keeping the valve 15 closed, so that the only escape for the fluid under the pressure of the pump is through pipe 21. In view of the fact that ports 20 and 18 communicate with manifold 16, some of the fluid under pressure will be conducted to the space adjacent the left side of valve 14, as shown in Figure 3. Valve 14 is held upon its seat by a relatively strong spring 32 (considerably stronger than the spring 31 of valve 15) and, so long as the fluid pressure acting on valve 14 is insufficient to overcome the bias of spring 32, the valve 14 remains closed. When, however, the pressure at which valve 14 is set to open is exceeded, an escape for the fluid under pressure from manifold 16 is provided past valve 14 and to the inlet area 24, from whence it will be picked up again and recirculated through the pump without increasing the pressure upon the fluid, which may now be disposed in pipe 21 and the adjunct hydraulic mechanism.

After the desired amount of fluid has been pumped through pipe 21 and it is desired to operate the hydraulic labor-saving device in the opposite direction, such may be accomplished either by reversing the direction of rotation of the gears 7 and 8 or by moving plunger 27 from the position shown in Figure 3 to the position shown in Figure 4 with continued operation of gears 7 and 8 in the same direction as before. Such a movement of plunger 27 brings the portion 28 thereof into the position whereat duct 11 is in communication with manifold 16 through port 20, while duct 10 is now in communication with the inlet 24. Consequently, continued operation of the pump draws the fluid from pipe 21 through duct 11 and discharges it through duct 10 to inlet 24 and into tank 25. If, during this stage of the operations, the pressure in the valve chamber adjacent inlet 24 becomes excessive, spring 31 will yield in response thereto to permit unseating of valve 15 and thus equalize the pressure on opposite sides thereof, which is to say that the pressure in manifold 16 will be increased to effect a reduction of the pressure within the valve chamber 9.

In order to reduce the possibility of leakage past the bearings of shaft 30, a pair of small ducts 35 are drilled diagonally from the central portion of the valve chamber 9 to the hole in the housing through which the shaft 30 passes. Consequently any fluid forced along the shaft will be vented back to the intake area which, under normal circumstances, is under lower pressure. Likewise any oil forced lengthwise of plunger 27 is vented back to the intake area through ducts 36.

From the foregoing description, those skilled in the art will readily understand that the flow of fluid under pressure from the pump may be controlled to draw from tank 25 and discharge to pipe 21, or vice versa, irrespective of the direction in which the gears 7 and 8 may be operating. Moreover, the valves 14 and 15, which may be individually adjusted to open at selected predetermined pressures, prevent the building up of such excessive pressures within the several chambers of the device as might rupture it or be otherwise detrimental to the mechanism. When either of the valves 14 or 15 is opened, and also when the portion 28 of plunger 27 is disposed intermediate the positions shown in Figures 3 and 4, a short circuit about the pump is provided so that further increase in pressure upon the parts of the adjunct mechanism is impossible.

While one complete embodiment of the invention has been disclosed in detail, it is to be understood that the invention is not limited thereto, but is susceptible to many and varied modifications and adaptations, which will suggest themselves to those skilled in the art without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A reversible pump comprising a centrally split housing having complemental recesses on each side of the split to form a pressure chamber, a valve chamber, and separate ducts connecting said chambers at opposite sides; a pair of meshed gears fitted in said pressure chamber for rotation in either direction; a plunger slidable in said valve chamber with its axis in the plane of the split of the housing to selectively control the flow of fluid to and from said ducts irrespective of the direction of rotation of said gears; said valve chamber having inlet and outlet ports controlled by said plunger; one section of said split housing having a header bore and the other section having a valve bore, both bores extending parallel to said valve chamber; each bore having two communications with said valve chamber; said valve bore having in addition a joint port with said valve chamber; and pressure responsive

normally closed valves in the valve bore between said joint port and said communications to the valve chamber.

2. A reversible pump comprising a centrally split housing having complemental recesses on each side of the split to form a pressure chamber, a valve chamber, and separate ducts connecting said chambers at opposite sides; a pair of meshed gears fitted in said pressure chamber for rotation in either direction; a plunger slidable in said valve chamber with its axis in the plane of the split of the housing to selectively control the flow of fluid to and from said ducts irrespective of the direction of rotation of said gears; said valve chamber having inlet and outlet ports controlled by said plunger; one section of said split housing having a header bore and the other section having a valve bore, both bores extending parallel to said valve chamber; each bore having two communications with said valve chamber; said valve bore having in addition a joint port with said valve chamber; and pressure responsive normally closed valves in the valve bore between said joint port and said communications to the valve chamber; one of said valves arranged to open in response to excess pressure in the header bore, and the other of said valves arranged to open in response to excess pressure at said joint port.

3. In a pump of the character wherein two meshed gears are mounted in a pressure chamber conforming peripherally thereto, and permanently open ducts extend into said pressure chamber at opposite sides of the axes of said gears and adjacent the region of meshing between said gears; the improvement which comprises a valve chamber permanently connected with said ducts, said valve chamber having a central port and two end ports, said end ports being permanently intercommunicating, said ducts communicating with said valve chamber respectively between said central port and said end ports, and a plunger slidable in said valve chamber, said plunger having a central sealing part engageable within said valve chamber to block fluid flow between either of said ducts and said central port, said valve chamber having an enlarged section between its communication with said ducts respectively to pass fluid therebetween when said sealing part is in said enlarged section.

4. In a pump of the character wherein two meshed gears are mounted in a pressure chamber conforming peripherally thereto, and permanently open ducts extend into said pressure chamber at opposite sides of the axes of said gears and adjacent the region of meshing between said gears; the improvement which comprises a valve chamber permanently connected with said ducts, said valve chamber having a central port and two end ports, said end ports being permanently intercommunicating, said ducts communicating with said valve chamber respectively between said central port and said end ports, and a plunger slidable in said valve chamber, said plunger having a central sealing part engageable within said valve chamber to block fluid flow between either of said ducts and said central port, said valve chamber having an enlarged section between its communication with said ducts respectively to pass fluid therebetween when said sealing part is in said enlarged section, and said plunger having other sealing parts arranged to block the flow of fluid through both of said end ports when said central sealing part is in said enlarged section.

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