Nov. 20, 1945. R. L. LEVY 2,389,374

HIGH PRESSURE HYDRAULIC PUMP

Filed May 4, 1943

Fig. 1

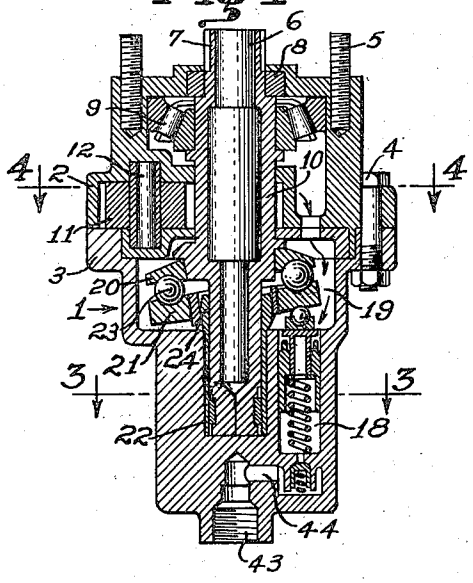


Fig. 2

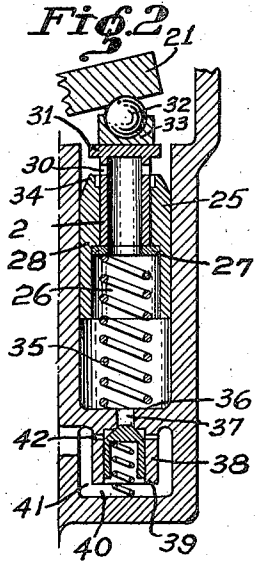


Fig. 3

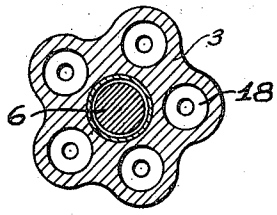


Fig. 5

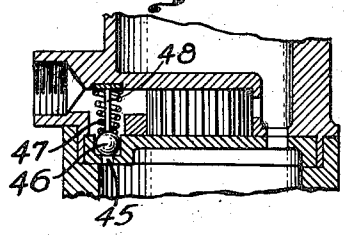
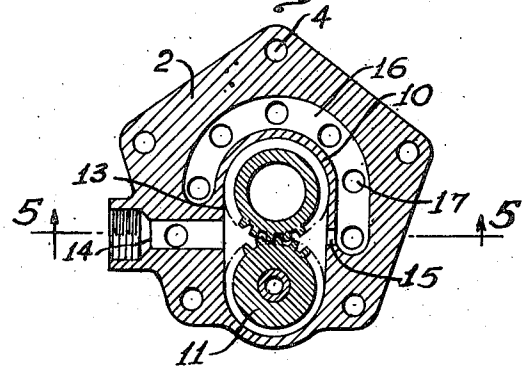


Fig. 4



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HIGH-PRESSURE HYDRAULIC PUMP

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1 Claim. (Cl. 103—178)

This invention relates to pumps and more particularly to improvements in devices of this character designed to improve the efficiency thereof and to simplify their construction.

An embodiment of the pump according to the invention will now be described with reference to the accompanying drawing in which:

Fig. 1 is an axial section of the pump;

Fig. 2 is a section view, on a larger scale, of the part adjacent to one of the cylinders of the pump;

Fig. 3 is a section along line 3—3 of Fig. 1;

Fig. 4 is a section along line 4—4 of Fig. 1;

Fig. 5 is a section along line 5—5 of Fig. 4.

The pump is constituted by a body 1, preferably made of light metal, comprising parts 2 and 3 connected by bolts 4. The upper part is of pentagonal prismatic form (Fig. 4) and the lower part, which is partly of the same form for its connection with the upper part, becomes of cylindrical form, and is provided with five wide hollow corrugations forming the five cylinders 18 of the barrel-pump. It is to be understood that the number of cylinders may be different from five, and, the outer shape of the pump may be changed accordingly. Upper part 2 is united with a suitable support by means of threaded pins 5.

The pump presents a central shaft 6, which receives the power through toothed member 7; it is mounted in upper part 2 by a bearing 9 with conical rollers for withstanding axial thrust.

Shaft 6 is provided inside the pump with teeth 10 constituting a pinion meshing with a corresponding pinion 11, the shaft 12 of which latter is located in body 1. These two pinions constitute, together with inner partition 13 in body 1, a gear pump of known type. Inlet port 14 of this pump is provided in part 2 as also the outlet port 15 which ends in cavity 16, of semi-circular shape, and which latter is connected with the high pressure pump proper through holes 17.

The high pressure pump, of the barrel type, is constituted by the cylinders 18 regularly distributed around the axis of said pump. The cylinders are fed from a common chamber 19, connected with cavity 16 through holes 17. A ring 20, integral with shaft 6, is disposed obliquely in relation to the axis of said shaft. A cam 21 is, on the other hand, disposed around tube 22 which surrounds the lower end of shaft 6. Between the cam 21 and ring 20 is provided a circular series of balls 23. The cam 21 is fitted on tube 23 by means of spherical bearing 24 permitting the cam to undergo a rocking movement.

In each cylinder 18 is slidably mounted a piston 25, having an axial bore enlarged at its lower end to provide a shoulder forming a support for ring 27. In the top-end of said piston can slide a hollow cylindrical valve 29 which rests on ring 27 and is provided in its upper part with radial holes 30. Head 31 of valve 29 is engaged and operated by cam 21 through balls 32 located in seats 33. Head 31 of the valve 29 may cooperate with the upper surface of head 28 of the piston, which surface constitutes a seat 34. In cylinder 18 is a spring 35 which rests at the one end on the bottom 36 of said cylinder, and, at the other end on ring 27. The outlet 37 is bored in bottom 36 and is controlled by outlet valve 38 of conical shape and receives the action of spring 39 which rests on wall 40 of circular channel 41. Circular channel 41 is connected with the outlet 43 through radial ports 44 and communicates through ports 42 with the outlets 37 when the valves 38 are open.

Chamber 19 of the barrel-pump and inlet pipe 14 of gear-pump may be connected through an opening 45 the passage of which is controlled by a small ball 46 subjected to the action of a spring 47, of given strength guided by stem 48; so, the liquid can flow from chamber 19 back into inlet pipe 14, but not in the opposite direction.

The operation of this pump is as follows:

On account of the rotation of shaft 6, the liquid contained in a tank (preferably at a higher level than the pump) is sucked through port 14 of the gear pump. The effect of this pump is to put the liquid under a certain pressure and to force it through port 15. So, the liquid which fills up chamber 19 of the barrel-pump is placed under a predetermined pressure. When the said pressure in chamber 19 rises above a pre-determined value, ball 46 is lifted up and the liquid is by-passed to the port 14.

By rotation of shaft 6, barrel-pump is put into action, pistons 25 being moved downwardly in succession by the camming action of the cam 21. Just the admission valve 29 is pressed downwardly against the tension of the spring 35, the piston 25 remaining motionless on account of the friction of said piston against the inner wall of cylinder 18. By this movement, the valve 29 is brought on its seat 34 and isolates the corresponding cylinder from chamber 19. The piston 25 is then pushed down; the liquid in the cylinder is put under pressure and, when the pressure for discharge is reached, valve 38 opens and liquid escapes through ports 37 and 42, circular channel 41 and ports 44 to the outlet opening 43. At the

end of the working stroke, the valve 38 closes and valve 29 is opened by the spring 35, the piston 25 remaining motionless momentarily owing to its friction against the inner wall of cylinder, being greater than friction of valve 29 in piston 25. Thus the connection is re-established, through ports 30, between cylinder 18 and chamber 19, so that, during the following upward movement of piston 25 under the action of spring 35, the admission of liquid to the cylinder is effected.

I claim:

A high pressure pump comprising at least one cylinder, a piston slidable in said cylinder and including a hollow body and a head formed with a bore, a ring slidable in said bore, an internal shoulder in said bore forming a stop for said ring, the terminal of said bore at the end of the piston head constituting a valve seat, an inlet valve engageable with said seat and having a hollow stem slidable in said bore and abutting said ring, the portion of the stem adjacent said valve having a radial port therein, a spring tending to move the ring in one direction against the shoulder and thereby open said valve and actuate the piston, and means for closing the valve and moving the piston in the opposite direction.

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