SELECTIVE FLUID-DISTRIBUTING DEVICE

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The present invention relates to pressure fluid distributors.

The main object of the invention is to provide a double pressure fluid distributor with a single control lever adapted to selectively assume one out of four predetermined positions in order to secure respectively:

1. The admission of pressure fluid into a first enclosure such as one of the chambers of a double acting jack, while a second enclosure, such as the second chamber of said jack remains open;

2. Removing pressure fluid out of said first enclosure while the second enclosure remains open;

3. Introducing pressure fluid into said second enclosure while the first enclosure remains open;

4. Maintaining the pressure fluid present in the first enclosure while the second remains open.

To this end the distributor according to the present invention is mainly constituted by two pairs of valves mounted in a fluid tight body in communication with both enclosures, with the source of pressure fluid and with a zone of low pressure, and each adapted to be operated by a push rod and a control lever adapted to operate said push rods so as to establish the communications which correspond to the four aforesaid combinations.

Other objects of the invention are to provide a number of constructional arrangements, such as the provision of check-valves and the design of the single control lever and the push rods for the valves, in order mainly to secure a perfect seal and a great simplicity in the control of the distributor.

Other and further objects and advantages of the invention will be apparent to those skilled in the art, from a consideration of the following description of one specific embodiment of the invention, shown by way of example in the accompanying drawings, in which:

Figure 1 is a longitudinal section of a distributor according to the invention in its neutral position.

Figures 2, 3 and 4 show, on a smaller scale, the same distributor in three different positions, namely a position in which it provides for the admission of pressure fluid into a first enclosure connected with the distributor, a position in which said pressure fluid is directed out of said enclosure, a second enclosure being connected to an exhaust port in each of these two aforesaid positions, and finally a position in which pressure fluid is admitted into the second enclosure while the first enclosure is connected to the exhaust, and

Figure 5 is a fragmentary section taken on the line 5—5 of Figure 1, on a larger scale.

Referring first to Figure 1 it will be seen that the distributor according to the invention comprises a single body 1 having six cylindrical recesses 2, 3, 4, 5, 6, 7, the perforated bottoms of which serve as seats for ball valves 8, 9, 10, 11, 12, 13 urged toward their respective seats by springs such as the spring indicated at 16 which bears at one end against the ball valve 13 and at its other end against the inner face of a screw threaded plug 17 which closes the recess 7. All the valves have a similar structure and operate in the same manner.

Both valves 8 and 9 are inlet valves the upstream side of which communicates with a pipe 21 into which a pump 22 is adapted to deliver a fluid under pressure, for instance oil, from a tank 23 through a pipe 24.

Both valves 10 and 11 are exhaust valves, the downstream side of which communicates with the tank 23 through a pipe 25 and the valves serve for returning the oil back to the tank.

Both valves 12 and 13 are check-valves, the upstream side of which communicates with the downstream side of the inlet valves 8 and 9 respectively, through channels 26 and 27 drilled in the body 1 and closed by screw-threaded plugs 28. The downstream side of the check-valves 12 and 13 communicates with the upstream side of the adjacent exhaust valves 10 and 11 through channels 31 and 32 respectively. The upstream side of the exhaust valves 10 and 11 also communicates with two utilization enclosures 50, 51 through pipes 33 and 34 respectively, so that said pipes are adapted to be placed into communication with the pipe 21 which serves for admitting pressure fluid through the inlet valves 8 and 9 and the corresponding check-valves 12 and 13.

The check-valves 12 and 13 are operated only by the pressure of the fluid, whereas the other four valves are adapted to be selectively operated by push-rods 36, 37, 38, 39 mounted for sliding movement in corresponding bores of the body 1 and capable of pushing the balls against the action of their respective return springs in order to remove the valves from their seats. The push-rods cooperate with a single control lever 42 pivoted on a spindle 43 (see also Figure 5) which is journaled in the body 1 inside a bore 44 closed by a screw threaded plug 45. The control lever 42 may be operated through a control arm 46 secured to one end of the spindle 43 which extends out of the body 1 through two bores each provided with a sealing device 43.

By virtue of this arrangement, the small amount of pressure fluid likely to leak along the push-rods is collected within the bore 44, and the body of the distributor being, as a whole, kept fluid-tight.

The lengths of the various push-rods are such that, when the lever 42 assumes the position represented in Figure 1, i.e. on the axis of the bore 44 of the body, the three push-rods 36, 38 and 39 are in contact with said lever, or, otherwise stated and more specifically, both push rods 36 and 38 are nearly in contact with the lever 42 in order to allow the balls 8 and 10 to rest against their seats, whereas the push-rod 39 is positively pushed by the lever 42 in order to keep the ball 11 away from its seat. Finally, the pusher rod 37 is short enough for the valve 9 not being operated upon, the lever 42 being rocked an angle α (see Figure 3) counter-clockwise (looking at the drawing), an angle which, however, is sufficient for permitting actuation of the valve 10. Furthermore, the arrangement is such that when the lever 42 assumes the position which is shown in Figure 3, the valve 11 does not yet rest upon its seat.

However, when the lever 43 has been rocked an angle α>α in the same direction (Figure 4), the valve 9 is opened and the valve 11 closed.

Finally, when the lever 42 assumes a fourth position, namely that illustrated in Figure 2, in which said lever is inclined in the opposite direction, both valves 8 and 11 are open.

By way of illustration, a pressure gage 48 has been represented as mounted on the pipe 33 in order to indicate the value of the pressure that prevails within the enclosure 50.
The operation of the distributor which has just been described is as follows:

When the single control lever 42 assumes its neutral position, i.e. that illustrated in Fig. 1, the enclosure 50 is shut off since the valves 10 and 12 are closed, whereas the enclosure 51 is connected to the return pipe 25 through the pipe 34 and valve 5 now open. The pressure prevailing within the enclosure 50 may be read on the pressure gage 48. It will be noted that, in this position of the control lever, both inlet valves 8 and 9 are now applied against their respective seats, not only by the action of their springs but also under the effect of the pressure oil which is present upstream of these valves within the feed pipe 21 leading from the pump 22.

If it is desired to increase the amount of pressure fluid present within the enclosure 50, the control lever 42 is rocked clockwise (looking at the drawing) in order to be brought into the inclined position illustrated in Figure 2. The inlet valve 8 is operated under the action of the pusher rod 36 and some pressure oil flowing from the feed pipe 21 then flows through said valve, channel 27, check-valve 6 and pipe 33 in order to reach the enclosure 50. The pressure that prevails in the enclosure 50 then rises and, when the desired pressure is reached, the control lever 42 is brought back to its neutral horizontal position of Fig. 1. It will be noted that, when the control lever assumes the position shown in Figure 2, the enclosure 51 maintains its communication with the tank 23 through the pipe 34, open valve 11 and return pipe 25. In the case when the enclosures 50 and 51 are constituted by the two chambers of a double acting jack, the pressure fluid contained in the second of said chambers is thus freely exhausted and does not interfere with the admission of fluid into the former.

In contradistinction, if it is desired to reduce the amount of pressure fluid contained within the enclosure 50, the control lever is rocked an angle α in the opposite direction, as indicated in Figure 3, so that only valve 10 is opened while valve 11 does not close. A portion of the fluid contained in the enclosure 50, thus, may be discharged through pipe 35, open valve 10 and return pipe 25 back to the tank 23. It is to be pointed out that, in this position of the control lever, the enclosure 51 communicates with the tank 23, since pipe 34 is itself in communication with the return pipe 25 and tank 23 through the valve 11 which is kept open. Under such conditions, and still in the case of a double acting jack, no further pressure fluid pressure is forced into the fluid from the first enclosure 50 would be created. After the pressure in the enclosure 50 has dropped to the desired value, or else, after the desired amount of fluid has been removed, the lever is brought back to its horizontal position (Fig. 1) in order again to lock the inlet circuits to the enclosure 50.

Finally, when it is desired to introduce more fluid into the enclosure 51, it is sufficient to increase the inclination of the control lever in the same direction in order to bring it into the position illustrated in Fig. 4. In this position, the valve 9 is open and the pressure fluid flowing from the feed pipe 21 passes through said valve, channel 26, check-valve 13, channel 32, pipe 34 and back to the enclosure 51. In the meantime, the fluid occasionally present in the enclosure 50 is able to flow into the tank 23 through the pipe 35, open valve 10 and return pipe 25. Thus, in the case of the jack, the first enclosure remains open and does not interfere with the movement of the piston under the action of the fluid introduced into the second enclosure.

In order again to introduce fluid into the enclosure 50, as represented in Figure 1, it, of course, would be sufficient, as stated previously, to bring the control lever into the admission position indicated in Figure 2. It will be readily seen that this device, the operation of which is very simple, has a very flexible control and affords quick operations. As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope of the claim, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Thus, the distributor of the invention could be used with any suitable fluid other than oil, either a liquid or a gas, and the pressures prevailing in the enclosures 50, 51 may be independent or, on the contrary, a function of each other (double acting jack).

Finally, it is obvious that, in the position of Figure 1, the communication between the second enclosure 51 of Figure 1 and the tank could be desirably shut off by means, for instance, of a mere valve inserted in the pipe 34 so as to shut off both enclosures simultaneously (case in which it would be desired to lock a double acting jack in a particular position thereof).

What I claim is:

A distributor for selectively feeding pressure fluid into one of two enclosures, while controlling escape of fluid from the other one, comprising, in combination, a fluid-tight body, first and second spring-loaded inlet valves housed within said body, fluid-conducting means leading to said inlet valves and adapted to be simultaneously connected with a source of pressure fluid, fluid-conducting means leading from said inlet valves and adapted to be separately connected to said enclosures, a first and a second exhaust spring-loaded valves housed within said body, fluid-conducting means leading to said exhaust valves and adapted to be separately connected with said enclosures and fluid-conducting means leading from said exhaust valves and opening outside said body, a 4-position control lever pivotally mounted in said body and operable from outside, and linkage means to operatively connect said control lever with said valves to selectively establish one of four valve configurations viz. a first configuration in which only said second exhaust-valve is open, a second configuration in which only said first inlet valve and said second exhaust valve are open, a third configuration in which only said first and second exhaust valves are open and a fourth configuration in which only said second inlet valve and said first exhaust valve are open, the linkage means being defined by four operating rods, respectively interposed between the control lever and said valves, and adapted to be operated by the control lever, upon corresponding movement thereof from neutral position with a same leverage, the operating rods of said first inlet valve and said first exhaust valve having a same length, the operating rod of the second inlet valve being shorter than said length and the operating rod of the second exhaust valve being longer than said length.

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