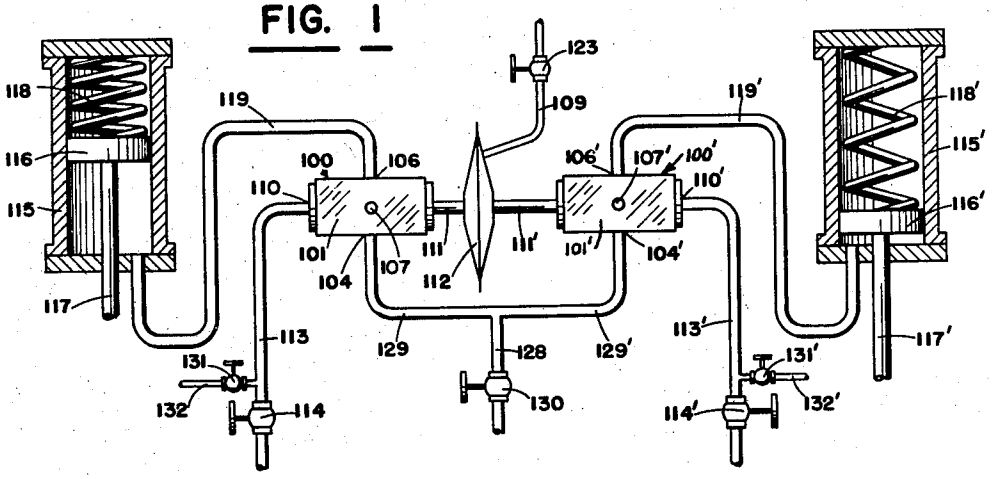
Nov. 29, 1949 R. R. CROOKSTON 2,489,450

VALVE ASSEMBLY FOR PLURAL MOTOR OPERATION

Filed Aug. 30, 1946

FIG. 1



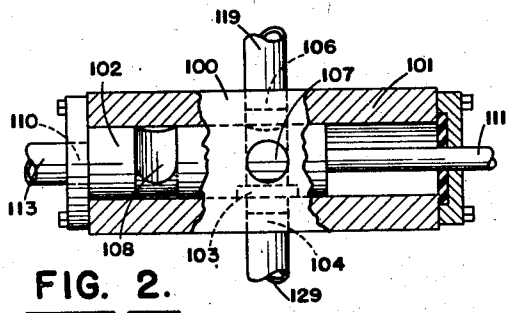


FIG. 2.

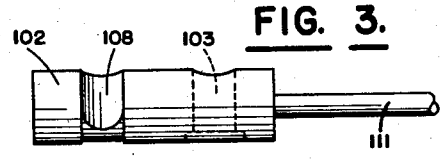


FIG. 3.

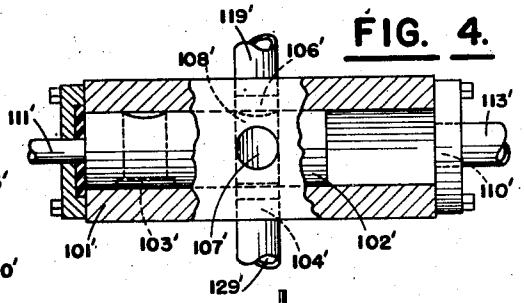


FIG. 4.

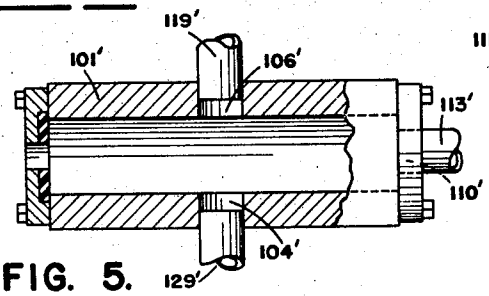


FIG. 5.

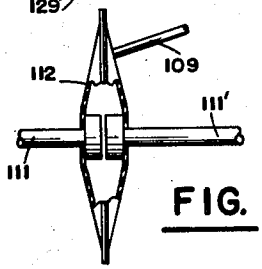


FIG. 6.

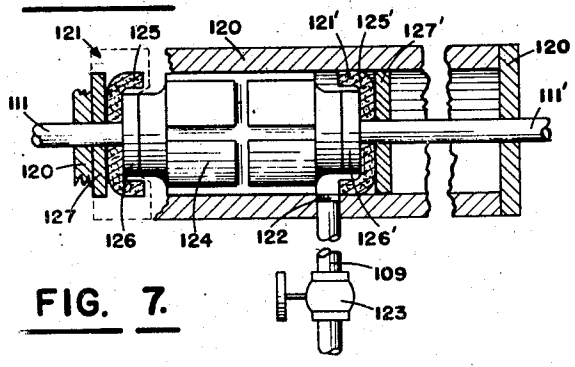


FIG. 7.

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2,489,450

VALVE ASSEMBLY FOR PLURAL MOTOR OPERATION

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Application August 30, 1946, Serial No. 693,992

2 Claims. (Cl. 60—97)

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The present invention is directed to a valve assembly adapted to control the flow of fluid into a plurality of containers.

In commercial operations it is at times desirable to provide a valve mechanism which will control the flow of fluid into a plurality of containers whereby fluid is allowed to flow into first one and then the other container in sequence but which, at the option of the operator, allows the fluid to flow into both containers simultaneously. An example of such an operation is disclosed in my copending application Serial No. 691,486 entitled "Brake assembly," filed August 19, 1946, wherein a hoisting drum is provided with two brake bands arranged for limited arcuate movement about an axis coinciding with the axis of the hoisting drum and control means are provided for engaging and disengaging the brake bands with the hoisting drum in sequence during the normal operation of paying out line and which allows both brake bands to be engaged with the hoisting drum simultaneously to stop the rotation of the hoisting drum. The present application is directed specifically to the valve mechanism described and shown in the aforesaid copending application.

The assembly of the present application involves a first valve housing having at least an inlet and an outlet, a first valve member slidably arranged in the first housing for assuming a first position wherein the inlet and outlet of the housing are in fluid communication and a second position wherein fluid communication between the inlet and outlet of the housing is prevented, a second valve housing having an inlet and an outlet, a second valve element slidably arranged in the second housing for assuming a first position with the inlet and outlet fluidly connected and a second position wherein fluid communication between the inlet and outlet is prevented and means mechanically connecting the first and second valve members wherein, during what may be called normal operation, the first valve member is in its first position when the second valve member is in its second position; the first valve member is in its second position when the second valve member is in its first position but which means is capable of causing both valve members to assume simultaneously their first positions.

The two valve housings, the two slidable valve members and the member mechanically connecting the valve members in the arrangement above described may be considered as a master valve unit. This master valve unit is advantageously employed for controlling the positions of pistons slidably arranged in cylinders.

The present invention will now be described in greater detail in conjunction with the drawing wherein—

Fig. 1 is in the form of a flow diagram showing

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the master valve unit fluidly connected to cylinders having pistons slidably arranged therein;

Fig. 2 is a view showing in detail one of the valves of said master valve unit;

Fig. 3 is a view showing the member of the valve of Fig. 2;

Fig. 4 is a view showing the other valve of the master valve unit;

Fig. 5 is a view showing the interior of the housing of the valve shown in Fig. 4;

Fig. 6 is a view showing in detail an arrangement for mechanically connecting the two slidable valve members of the master valve assembly; and

Fig. 7 is a view showing another embodiment of a suitable means for mechanically connecting the slidable members of the master valve arrangement.

Turning now specifically to the drawing and first to the arrangement shown in Figs. 1 to 6, a valve 100 consists of valve housing 101 with slidable valve element 102 mounted therein. Slidable member 102 defines a passage 103. When the valve element is in its position with respect to housing 101, as shown in Fig. 2 and hereinafter referred to as its first position, the base of fluid passage 103 is in fluid communication with inlet 104 of housing 101 and the upper portion of the passage is fluidly connected to outlet 106; when the valve element is at the other end of the valve housing, hereafter referred to as its second position, fluid passage 103 has no communication with outlet 106. If slidable member 102 is in its first position, air may pass from inlet port 104 through passage 103 to outlet port 106; if the slidable member is in its second position, passage 103 is not in fluid communication with an outlet port so that compressed air cannot flow from inlet 104 through the valve. Slidable member 102 also defines a passage 108; this passage will hereinafter be referred to as an exhaust passage. When member 102 is in its second position exhaust passage 108 allows fluid communication between outlet port 106 and outlet port 107; when member 102 is in its first position fluid communication between the outlet ports 106 and 107 is prevented. Slidable member 102 is connected to rod 111 passing through a suitable fluid tight gland, not shown in detail, of housing 101.

Valve housing 101' corresponds to that of valve housing 101 except that the positions of the various parts are reversed, that is to say, the two valves 100 and 101 are related similarly to the right and left hands of a person. In valve 100', housing 101' has slidable member 102' arranged therein. Member 102' defines passage 103'. If slidable member 102' is in the position shown in Fig. 4, hereinafter referred to as its second position, air exhausts through the valve, passing from

port 106' through passage 108' to port 107'. If the slidable member is at the other end of housing 102', hereinafter referred to as the first position, air passes from inlet port 104' through passage 103' to port 106'. Slidable member 102' is connected to rod 111' passing through a suitable fluid tight gland, not shown in detail, of housing 102'.

The members 102 and 102' are mechanically connected with an expansible member whereby the two slidable members are retained in a fixed relative position during what is hereinafter referred to as normal operation and the spacing between the two members altered in what is hereinafter referred to as an emergency operation.

In the embodiment shown in Figs. 1 to 6 the means mechanically connecting members 102 and 102' consists of rods 111 and 111' which in turn are connected to opposite sides of diaphragm 112. An inlet air line 109 controlled by valve 123 is fluidly connected to diaphragm member 112.

It will be seen that the end surfaces of member 102 cooperate with housing 101 to form a substantially fluid-tight seal and access to the space at the head end of housing 101 is provided by inlet port 110. Similarly, the end surfaces of member 102' cooperate with housing 101' to form a substantially fluid-tight seal and access to the space at the head end of the housing is provided by inlet port 110'.

An inlet air line 113 controlled by valve 114 is connected to inlet port 110 and similarly an inlet air line 113' controlled by valve 114' is fluidly connected to inlet port 110'. Air line 113 is provided with an outlet 132 for bleeding off pressure controlled by valve 131 and similarly line 113' is provided with outlet 132' controlled by valve 131'. It will be understood that in the commercial design of the equipment valves 114 and 131 may be provided by a single mechanism as may valves 114' and 131'.

A power unit consisting of a cylinder 115 with a piston 116 arranged to reciprocate therein has a piston rod 117 attached to the piston with one end projecting through the piston rod end of cylinder 115. A spring 118 is positioned within the cylinder between the head end thereof and piston 116 to bias the piston toward the piston rod end of the cylinder. A conduit 119 fluidly connects the piston rod end of the cylinder with outlet port 106.

Similarly, a cylinder 115' has a piston 116' arranged therein for reciprocation with a piston rod 117' attached thereto and passing through the piston rod end of the cylinder. A spring 118' is arranged in the space between piston 116' and the head end of cylinder 115' to bias the piston toward the piston rod end of the cylinder. A conduit 119' fluidly connects the piston rod end of the cylinder with outlet port 106 of valve 100'.

Another embodiment of the expansible means arranged to connect mechanically the two valve elements 102 and 102' is shown in Fig. 7. In this embodiment a housing 120 is provided with piston 121 consisting of flexible cup 125 and retaining members 126 and 127, and a piston 121' consisting of flexible cup 125' and retaining members 126' and 127'. Piston 121 is connected to rod 111 and a piston 121' is connected to rod 111'. A spacing element 124 is slidably arranged in housing 120 between pistons 121 and 121'. It will be seen that the outer surface of element spacing 124 is provided with grooves to allow the free passage of air from inlet 122 to the surfaces of pistons 121 and 121' adjacent spacing

element 124. As long as valve 123 remains closed to prevent the entry of compressed air into housing 120, pistons 121 and 121' remain in contact with member 124 as shown in Fig. 7, but when valve 123 is opened to allow compressed air to enter through inlet 122, the piston members are forced away from each other and into contact with the end portions of housing 120.

It will usually be desirable to employ the device of the present invention in the following manner. Assume the parts of apparatus are in the position shown in Fig. 1 with valves 114, 114' and 130 closed and bleeder valves 131 and 131' open. Assume also that the valve member 102 is in its first position and valve member 102' is in its second position. Upon opening valve 130 air is allowed to flow through inlet line 128 and branch lines 129 and 129' to valve housings 101 and 101'. Valve member 102' prevents passage of fluid through valve 100' but valve member 102 allows air to pass through line 119 into the piston rod end of cylinder 115 and the compressed air moves piston 116 toward the head end of the cylinder compressing spring 118. If it is desired to allow piston 116 to move away from the head end of cylinder 115 and piston 116' to move toward the head end of cylinder 115', this operation may be carried out by closing bleeder valve 131 and opening valve 114; air admitted via valve 114 and line 113 causes valve element 102 to move from its first to its second position and its movement is communicated through rod 111, diaphragm 112 and rod 111' to valve element 102' which in turn is moved from its second position to its first position and allows air to pass from inlet line 128, branch line 129', valve 100' and line 119' to the piston rod end of cylinder 115' and pushes piston 116' to the head end of the cylinder. The movement of valve element 102 to its second position allows fluid communication between ports 106 and outlet 107 whereby air is exhausted from cylinder 115 so that while piston 116' is moving toward the head end of cylinder 115' under the influence of compressed air, piston 116 is moving away from head end of cylinder 115 under the influence of spring 118 with the air being exhausted through line 119, valve 100 and outlet port 107. As the next step of normal operation of the device, valves 114 and 131' are closed, and valves 114' and 131 are opened; these changes in the valve settings allow air to enter the head end of valve 100' and this in turn moves valve element 102' from its first to its second position and this motion is mechanically transmitted through rod 111', diaphragm 112 and rod 111 to valve member 102 which in turn is moved from its second to its first position. This movement of the two valve elements allows air to be exhausted from cylinder 115' through conduit 119' and exhaust port 107' and at the same time allows compressed air to enter through line 129, valve 100 and line 119 to the piston rod end of cylinder 115 and the cycle may then be repeated.

In what may be termed emergency operation, air is allowed to flow from inlet line 128 simultaneously through valve members 100 and 100' to the piston rod ends of cylinders 115 and 115', respectively, simply by opening valve 123 to allow compressed air to expand diaphragm 112. The expansion of diaphragm 112 forces both valve members to assume their first positions. That is to say, if the apparatus has been in normal operation with valve member 102 in the first position and valve member 102' in the sec-

ond position, the expansion of the diaphragm drives member 102' from its second to its first position while valve member 102 is retained in its first position. Similarly, if the assembly has been in normal operation with valve member 102' in its first position and valve member 102 in its second position, the expansion of diaphragm 112 drives valve member 102 to its first position while valve member 102' is retained in its first position. In other words, the expansion of diaphragm 112 allows compressed air to pass simultaneously through valves 100 and 100' and simultaneously moves pistons 116 and 116' toward the head ends of cylinders 115 and 115'. If it is desired to go from emergency operation to a normal operation air may be released from diaphragm 112 to allow it to contract; thereupon either valve 114 or valve 114' may be opened to cause movement of the assembly consisting of valve elements 102, 102', rods 111, 111' and diaphragm 112 and the device again begins normal operation as heretofore described.

If the valve elements 102 and 102' are mechanically connected by the assembly shown in Fig. 7, it will be seen that the normal operation is carried out in the same manner as by the embodiment employing diaphragm member 112. In normal operation of the embodiment of Fig. 7, pistons 121 and 121' are in contact with spacing member 124. In an emergency operation, valve 123 is opened and forces the piston or pistons which are not in contact with the end of housing 120 to move away from spacing member 124; this in turn drives either valve member 102 or 102' from its second to its first position, while retaining the other valve member in its first position thereby simultaneously moving both pistons 116 and 116' toward the head ends of cylinders 115 and 115', respectively.

While I have described specific embodiments of the present invention, it will be obvious to a worker skilled in the art that various changes in the sizes and proportions of the several parts may be made as desired. It will also be obvious to a worker skilled in the art that instead of employing fluid pressure as the source of energy operating elements 102 and 102' other means may be employed. For example, these elements may be electrically operated by providing solenoids in the valve elements. Similarly, the extendable member mechanically linked to valve elements 102 and 102' need not necessarily be the fluid operated means shown in the drawing but may be operated by other means such as mechanical or electrical.

Having fully described and illustrated embodiments of the present invention, what is desired to be claimed as new and useful and to be secured by Letters Patent is:

1. A device adapted to control the position of pistons in cylinders comprising a first cylinder having a piston slidably arranged therein and having an inlet port at one end, a second cylinder having a piston slidably arranged therein and having an inlet port at one end, a first valve casing having an inlet port, an outlet port and an exhaust port, a conduit fluidly connecting the outlet port of said first valve casing with the inlet port of said first cylinder, a second valve casing having an inlet port, an outlet port and exhaust port, a conduit fluidly connecting said outlet port of said second casing with the inlet port of said second cylinder, an assembly adapted to move as a unit including a first valve member slidably arranged in said first valve casing and fluidly connecting the inlet port with the outlet port thereof when in a first position and connecting the outlet port with the exhaust port when in a second position, a second valve member slidably arranged in the second valve casing and fluidly connecting the inlet port with the outlet port thereof when in a first position and the outlet port with the exhaust port when in a second position and means including an extensible member mechanically connecting the first valve member with the second valve member, said extensible member being arranged to assume a normal position whereby said first and second valve members occupy unlike positions in their respective valve casings and arranged to assume an extended position to cause said first and second valve members simultaneously to assume their first positions in their respective valve casings.

2. A device in accordance with claim 1 in which said extensible member is a diaphragm adapted to be expanded by a compressed fluid.

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