May 20, 1941. A. E. JURS 2,242,676

HYDRAULIC ACTUATOR

Filed Oct. 31, 1938 2 Sheets-Sheet 1

FIG_1_

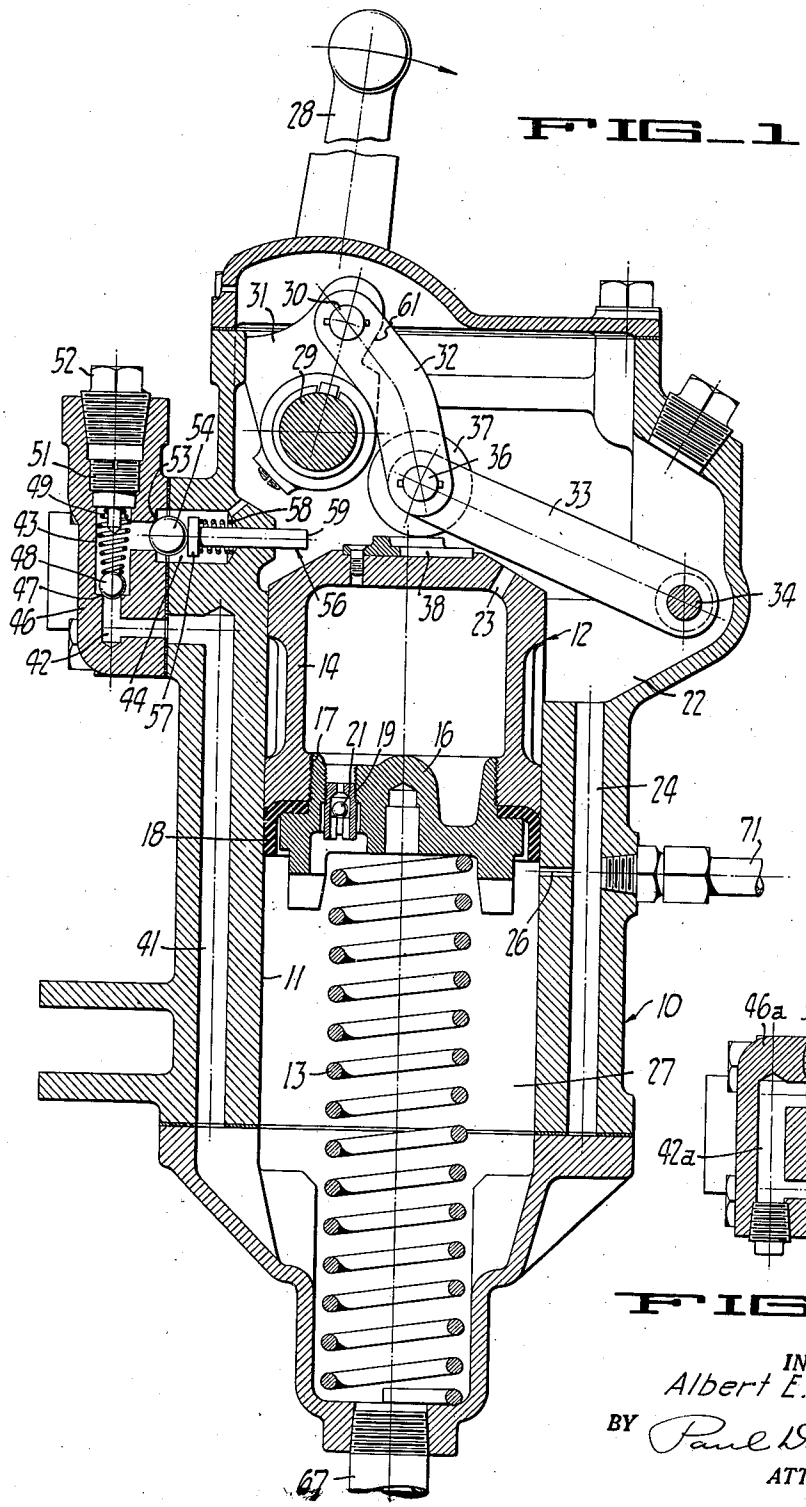


FIG_4_

INVENTOR.
Albert E. Jurs
BY Paul D. Flehr
ATTORNEY

May 20, 1941. A. E. JURS 2,242,676

HYDRAULIC ACTUATOR

Filed Oct. 31, 1938 2 Sheets-Sheet 2

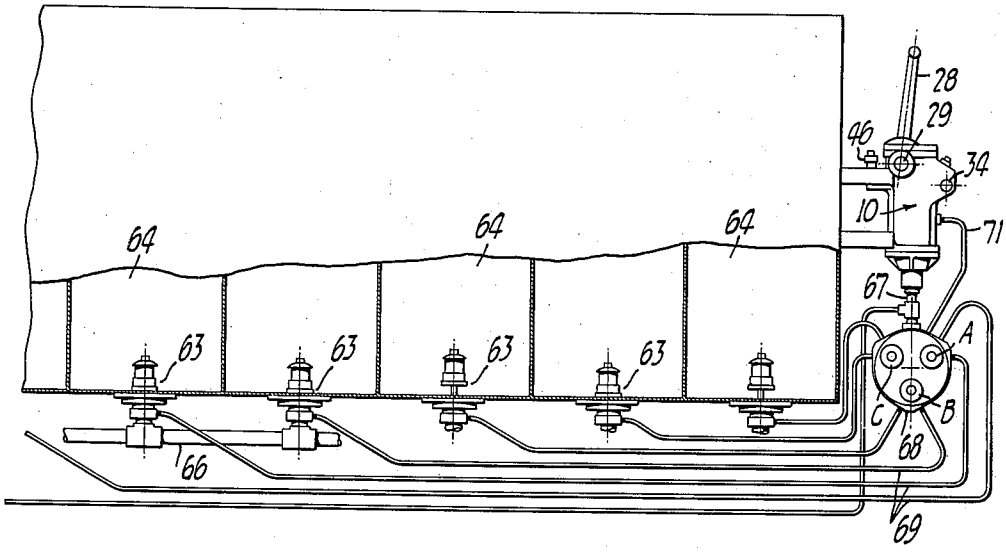


FIG. 2.

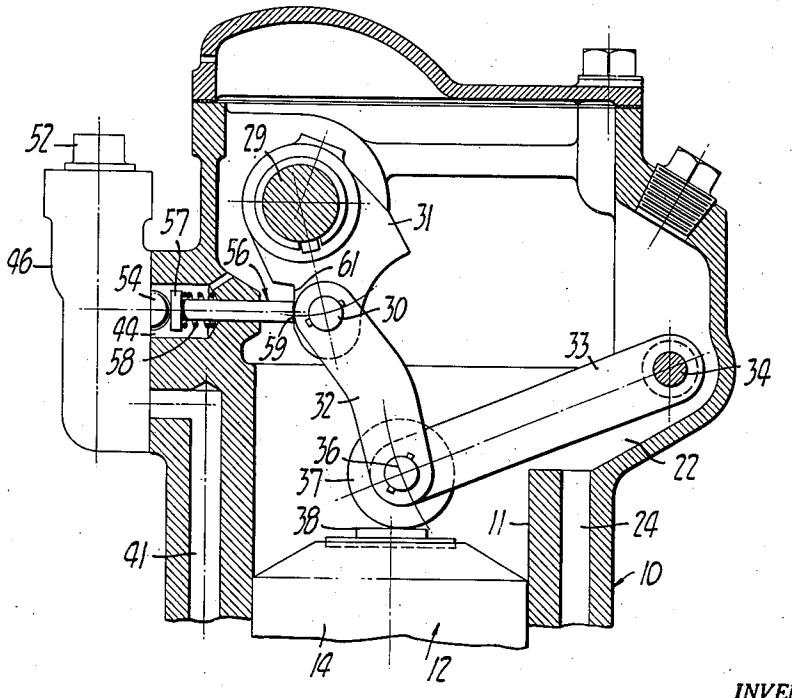


FIG. 3.

INVENTOR.
Albert E. Jurs
BY Paul O. Fleh
ATTORNEY

Patented May 20, 1941

2,242,676

UNITED STATES PATENT OFFICE

2,242,676

HYDRAULIC ACTUATOR

Albert E. Jurs, Piedmont, Calif.

Application October 31, 1938, Serial No. 237,837

1 Claim. (Cl. 60—54.6)

This invention relates generally to hydraulic systems making use of a hydraulic operator or actuator, in conjunction with one or more devices adapted to be operated by application of liquid under pressure. More particularly the invention relates to systems for effecting operation of valve units from a remote point, and is of particular value as applied to tank trucks or cars, for controlling the dispensing of inflammable liquids such as gasoline from tanks or tank compartments.

In my Patent No. 1,976,445, granted October 9, 1934, there is disclosed a system for effecting the hydraulic operation of valve units in order to control the dispensing of inflammable liquids such as gasoline from tanks or tank compartments. The system as disclosed in that patent is characterized by the use of a by-pass, whereby when the pressure of the liquid as applied to one or more of the valve units exceeds a predetermined value, liquid is by-passed to an auxiliary reservoir. Many systems of the type disclosed in said Patent 1,976,445, are now in successful commercial use. When gravity flow discharge conduits are attached to the outlets of the valve units, the valve units will remain in open positions as long as the operating handle of the hydraulic actuator remains in its actuated position. However, when the suction side of a pump is connected to a liquid discharge conduit, as is sometimes the case, a valve unit may be closed or partially closed even while the operating handle of the actuator remains in actuated position. This is because the differential pressure tending to urge the valve member of the valve unit towards closed position is of such magnitude as to cause the pressure of the hydraulic operating liquid to exceed the predetermined value for which the by-pass is set. Under such circumstances it is not feasible to merely set the by-pass for a higher pressure, because such an adjustment would require excessive force for moving the handle of the hydraulic actuator, and in addition the hydraulic connections and the pressure cells of the valve units might be damaged by excessive pressure.

It is an object of the present invention to provide a system which will overcome the difficulty outlined above, and which will prevent the by-passing of liquid back to the auxiliary reservoir when the handle of the actuator is in actuated position. This is accomplished by valve means for controlling the by-pass, with an automatic arrangement whereby the by-pass passage is closed when the handle of the actuator is swung to actuated position.

Further objects of the invention will appear from the following description in which the preferred embodiment of the invention has been disclosed in detail in conjunction with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a side elevational view, in cross-section, illustrating an operator or actuator in accordance with the present invention.

Fig. 2 is a diagrammatic lay-out showing the manner in which the actuator of Fig. 1 is applied in a valve system.

Fig. 3 is a cross-sectional detail showing the operating parts of the device in a different operating position.

Fig. 4 is a cross-sectional detail showing a modification of the invention.

The hydraulic actuator as illustrated in Figs. 1 and 3, consists of a casing 10, the interior of which is bored to form a cylinder 11. Fitted within the cylinder 11 there is a piston 12, which is urged upwardly by compression spring 13.

The representative type of piston illustrated is of simple design, consisting of a hollow body 14, and a lower end 16 which is attached to the body by means of a threaded connection 17. A cup washer 18 establishes a seal with the side walls of the cylinder 11, and is clamped between opposed flanges formed between the body 14 and the end wall 16. A small check valve 19 is mounted upon the piston part 16, and the ball 21 of this check valve closes against the pressure below the piston, when the piston is moved downwardly.

At the upper end of the cylinder 11 the casing 10 forms an auxiliary liquid reservoir 22. The interior of the piston 12 communicates with the auxiliary reservoir 22, through the port 23. Also a duct 24 in conjunction with a port 26, establishes communication between the auxiliary reservoir 22 and the pressure chamber 27 below the piston 12, when the piston is in its uppermost or released position, as illustrated in Fig. 1.

For the purpose of forcing the piston downwardly to a definite actuating position, operating mechanism is provided which includes the operating handle 28. This handle is mounted upon the outer end of a rock shaft 29, which in turn is journalled in the side walls of the casing 10. Within the casing there is a toggle linkage connected to shaft 29, which includes the arm 31 which is attached to shaft 29, a link 32 having a pivotal connection 33 with arm 31, and a link 33

having one end of the same pivotally connected to link 32, and the other end provided with a pivotal connection 34 to the casing. The pivot pin 36 forming the pivotal connection between links 32 and 33, also carries a thrust roller 37, adapted to engage a hardened pad 38 secured to the upper end of piston 12. It will be apparent that when the operating handle 28 is swung downwardly to its actuated position, arm 31 is swung counter-clockwise to the position illustrated in Fig. 3, whereby roller 37 forces the piston 12 downwardly. As shown in Fig. 3, for full actuated position the center of pivot pin 30 is just past dead-center position with respect to the centers of shaft 29 and pin 35. Therefore the parts are locked in actuated position until the operator again swings handle 28 upwardly.

For the purpose of forming a by-pass between the pressure chamber 27 and the auxiliary reservoir 22, the casing 10 is provided with a duct or passage 41, the lower end of which communicates with chamber 27, below the lowermost position of the piston 12. The upper end of passage 41 communicates through the additional ducts 42, 43 and 44 with the auxiliary reservoir 22. For convenience the ducts 42 and 43 are shown formed within a separate casing part or fitting 46, thereby facilitating the mounting and assembly of valve parts, as will be presently explained. A valve seat 47 is formed in the body part 46, and cooperates with the ball check 48. This ball is urged against its seat by the compression spring 49, the upper end of which is seated upon the adjustable screw 51. By removing the plug 52, screw 51 can be adjusted to secure the desired tension. It is the ball check 48, and its spring 49, which largely determines the pressure above which liquid is permitted to by-pass from pressure chamber 27, back to the auxiliary reservoir.

An additional valve seat 53 is formed in the body part 46, and cooperates with the ball 54. This ball is forced against its seat by means actuated when the handle 28 is moved to actuated position. The simple means illustrated in this instance consists of a pin 56, slidably mounted within the casing, and in substantial alignment with the seat 53. One end of this pin is provided with a head 57 for engagement with the ball 54, and a compression spring 58 normally urges pin 56 towards the ball. The other end 59 of the pin extends within the auxiliary reservoir 22, and is adapted to be engaged by shoulder 61 formed on the arm 31. Thus when the arm 31 is in the position corresponding to actuated position of the lever 28, shoulder 61 engages the end 59 of pin 56, thus continuously urging this pin against ball 54 and continuously urging the ball against the seat 53. When the pin 56 is not so engaged by the shoulder 61, pressure of liquid can force ball 54 away from its seat, to by-pass liquid back to the auxiliary chamber 22.

Fig. 2 illustrates the hydraulic actuator described above, incorporated in a hydraulic valve system of the type disclosed in said Patent 1,976,445. The individual valves 63 are shown mounted within the bottom walls of the tank compartment 64. These valves may connect with individual outflow conduits, or a common discharge conduit 66. The lower end of the actuator casing 10 is shown connected by pipe 67 with a selecting valve 68, which in turn is connected by the pipes 69 with the various valve units 63. A bleed pipe 71 also connects the selecting valve 68 with the auxiliary chamber 22 of the actuator casing 10. The selecting valve 68 is shown including three selecting knobs A, B and C, in the same manner as illustrated in Fig. 8 of said Patent 1,976,445. As described in said patent by changing the setting of knobs A, B and C, any one of the valve units 63 may be selected for individual operation, or any two or more of the valve units may be selected as a group for simultaneous operation, or all of the valve units may be operated in unison. A valve unit not selected for operation is placed in communication with pipe 71 and the auxiliary liquid reservoir 22, through its connecting pipe 69. The liquid used in the system may be a suitable lubricating oil and a sufficient excess of oil is ordinarily maintained in reservoir 22 to well cover the upper end of the piston, when the piston is in its uppermost or released position.

Operation of the equipment described above can be reviewed as follows: Assuming that an operator has set the selecting valve 68 to select certain ones of the valve units for operation, the operator pulls down upon the handle 28 whereby the piston 12 moves downwardly to displace liquid from the chamber 27. Liquid is thus delivered under pressure to the valve units selected for operation, whereby these units are moved to open positions. The volumetric displacement afforded by the piston when it moves from released to actuated positions, is such as to afford sufficient liquid under pressure for operation of all of the valve units simultaneously. Therefore when less than all of these units are being operated, the pressure will immediately rise beyond a predetermined value as the piston continues to move downwardly, and after the selected valve units have been moved to full open positions. Thus the pressure of the liquid moves balls 48 and 54 off their seats against the urge of springs 43 and 58, thus permitting excess liquid to by-pass back into the auxiliary reservoir 22, as the piston completes its movement towards actuated position. As the operating handle 28 reaches actuated position pin 56 is engaged by the shoulder 61 as previously described, and the force thus continuously exerted upon pin 56 serves in effect to lock ball 54 against its seat, to avoid any further by-passing. It will be noted that when the parts are in such position the compression spring 13 tends in effect to urge arm 31 in a clockwise direction, as viewed in Fig. 3, thereby affording a biasing force urging pin 56 against ball 54, in addition to the fluid pressure urging the piston upwardly. Should any additional forces be applied to the actuated valve units tending to urge these units closed, as for example by connecting the outflow conduit 66 to the intake of a pump, such forces can not be sufficient to cause further by-passing of liquid back to the auxiliary reservoir 22, because of the locking afforded by ball 54. When it is desired to return the valve units to closed position, hand lever 28 is swung back to released position, whereby the piston 12 likewise moves upwardly under the urge of spring 13, to the position illustrated in Fig. 1. During such return movement of the piston ball 21 of the check valve 19 permits flow of liquid through this check valve to the space below the piston.

In the foregoing description I have made reference to two separate valves for controlling by-passing of liquid through the passage 41. In the arrangement illustrated, both of the balls 48 and 54 will in effect determine the pressure beyond which these balls are opened to permit

by-passing of liquid. One may dispense with ball check **48**, and rely solely upon the ball **54**, provided that the seat for this ball is of proper size and provided that the spring **58** is of proper tension to properly determine the maximum pressure required to force the ball from its seat. Such a modification is shown in Fig. 4. In this instance duct **42***a*, in fitting **46***a*, leads directly to the seat of ball **54**, so that by-passing of liquid is controlled entirely by the one valve ball.

I claim:

In a system of the character described, a hydraulic actuator for selectively operating one or more of a plurality of pressure responsive devices, said actuator comprising a fluid pressure chamber, a piston movable between actuated and released position to displace liquid from said chamber, means including a valve member movable between open and closed positions for venting liquid from said chamber when pressure in said chamber exceeds a predetermined value, an operating lever, toggle mechanism operatively connecting the lever with the piston whereby movements of the lever between actuated and released positions serves to reciprocate the piston between corresponding positions, spring means for urging the piston toward released position of the same, the toggle mechanism having a dead center position intermediate actuated and released positions of the same, whereby when the lever is moved from released to actuated position it remains locked in actuated position against the pressure of said spring means, and means for transmitting motion from said toggle mechanism to said valve member to close said valve member when said lever is moved past said dead center position to actuated position, thereby preventing venting of liquid from said chamber while the piston is in actuated position.

ALBERT E. JURS.