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VALVE DEVICE FOR USE WITH PUMPING STRUCTURES

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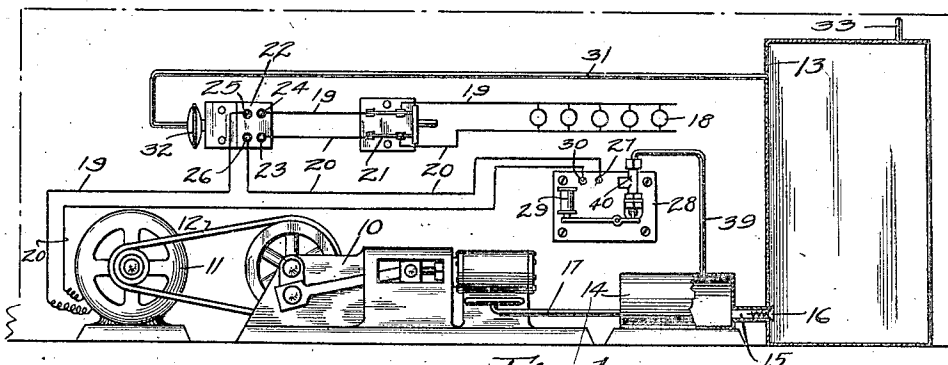


Fig. 1

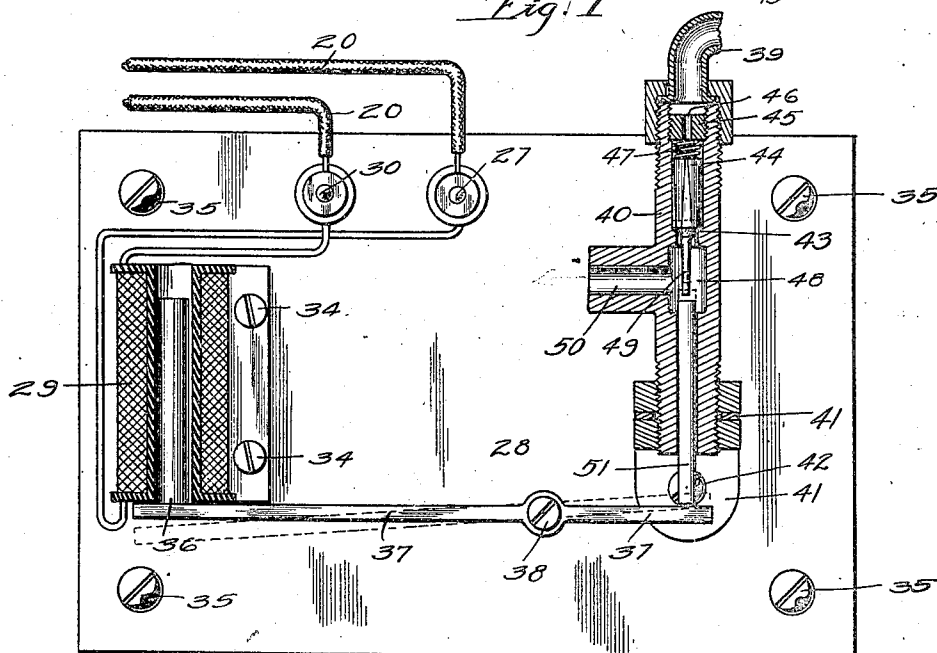


Fig. 2

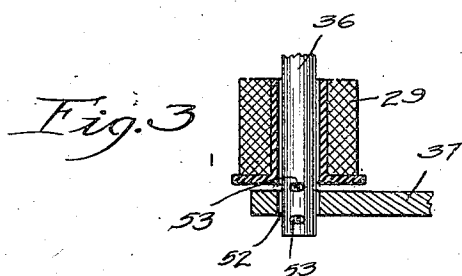


Fig. 3

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UNITED STATES PATENT OFFICE.

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VALVE DEVICE FOR USE WITH PUMPING STRUCTURES.

Application filed May 7, 1923. Serial No. 637,181.

The object of my invention is to provide a valve device for a pumping structure of a kind described which will be simple in its construction and operation, thereby enabling it to be manufactured and marketed at a comparatively low cost.

More particularly, my invention relates to a valve device of this character for a pump structure, wherein the parts of the valve will so operate upon the breaking of the electric circuit to the motor for the pump that the valve will release any back pressure against the pump.

Still a further object is to provide for an unloading tank between a receiving tank and a compressor pump, a valve means in connection therewith for permitting the contents or air pressure within the unloading tank to be discharged upon the stopping of the pump.

Still a further object is to provide means arranged in connection with an electric circuit for manipulating the valve device in connection with the unloading tank, for opening the valve structure upon the breaking of the electric circuit from any cause.

Still a further object is to provide a solenoid coil, arranged in series with the rest of the electric circuit having a movable armature or core for operating a lever which will open the valve structure used in connection with the unloading tank for releasing the contents thereof upon the breaking of the circuit.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claim and illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a pump structure.

Figure 2 is an enlarged sectional view showing my means for opening the valve structure upon the breaking of the electric circuit of the motor; and

Figure 3 is a detail, sectional view of a slightly modified form of connection between the moving armature and the lever.

In the accompanying drawings, I have used the reference numeral 10 to indicate an ordinary compressor pump which is mounted on a base. An electric motor 11

is provided and is connected to the compressor pump 10 by means of a belt 12.

A receiving or storage tank 13 is connected to an unloading tank 14 by means of the passage way or pipe 15. A check valve 16 is mounted in the passage way 15 for normally closing the passage way. The unloading tank 14 is connected to the pump by means of a pipe 17.

From the construction and arrangement of the parts just described it will be seen that the unloading tank is mounted between the receiving tank 13 and the pump 10. It will also be seen that when the pump 10 is operated it will cause the compressed air to pass through the pipe 17 into the unloading tank 14 and then into the receiving tank 13. The purpose of the unloading tank will be hereinafter more fully set forth.

The motor 11 is connected to an electric circuit which includes a source of energy 18. Wires 19 and 20 lead from the source of energy 18 to a knife switch 21. The wire 20 then passes through the knife switch 21 and leads to an automatically operated switch 22. The automatic switch 22 is of a type illustrated by my co-pending application filed October 7, 1922, Serial No. 593,087.

The wire 20 leads to a binding post 23 on the switch 22. The wire 19 leads to a binding post 24 on the switch 22. The wire 19 then passes from the binding post 25 on the switch 22 to the motor 11. The wire 20 leads from the binding post 26 on the switch 22 to a binding post 27 which is mounted on a support 28.

This wire 20 then passes through a solenoid coil 29 and is brought back to a binding post 30 on the support 28. The wire 20 then leads from the binding post 30 to the electric motor 11.

It will thus be seen that the solenoid coil 29 is connected in series with the rest of the electric circuit. It will also be seen that when the knife switch 20 is in closed position and when the switch 22 is in closed position, the motor 11 will be operated.

A pipe 31 leads from the receiving tank 13 to the diaphragm chamber 32 of the switch 22. The switch 22 is so arranged that when the pressure within the receiving tank 13 reaches a predetermined amount, it will cause the switch 22 to be opened for breaking the electric circuit.

When the pressure or contents of the re-

ceiving tank lowers to a predetermined amount, then it will cause the switch 22 to move to closed position for making an electric circuit for operating the motor and the pump. A supply pipe 33 leads from the receiving tank 13.

The solenoid coil 29 is secured to the support 28 by means of the screws 34. The support 28 may be mounted on a wall or any other suitable support by means of the screws 35.

A solenoid coil is provided with a moving armature 36 which has its lower end rest upon one end of a lever 37 pivoted on the support 28 by means of the screw 38.

When the solenoid coil 29 is energized, it will hold the armature 36 in its raised position and the lever 37 will also be held in its raised position, as shown in solid lines in Figure 2 of the drawings.

A pipe 39 leads from the unloading tank 14 to a valve structure 40. The valve structure 40 is mounted on a bracket 41 which in turn is fixed to the support 28 by means of a screw or the like 42. The valve structure 40 includes a valve seat 43 having a movable valve member 44 arranged to normally rest upon the seat 43.

A plug 45 having a small opening 46 therein is received within the valve structure 40. A spring 47 rests below the plug 45 and upon the valve member 44. The valve structure 40 is provided with an enlarged open portion 48 in which is extended a pin 49 formed on the valve member 44.

A discharge opening 50 is in communication with the opening 48. A rod 51 is mounted in the valve structure 40 and has its upper end adjacent to the lower end of the pin 49 and has its lower end on the lever 37.

Whenever the solenoid coil 29 is deenergized, it will allow the lever 37 to swing on the pivot 38 (due to the weight of the armature), for forcing the rod 51 upwardly.

Movement of the rod 51 upwardly will cause it to engage the pin 49 for unseating the valve member 44 and permit air within the unloading tank 14 to pass out through the valve structure 40.

In Figure 3 of the drawings, I have shown the moving armature 36 as extending through an opening 52 formed in the lever 37. Pins 53 project through the moving armature 36 on each side of the lever 37 for holding the armature 36 in proper position relative to the lever 37.

Practical operation.

Assuming that the pump 10 is operating for pumping air into the receiving tank 13, it will first pump air into the unloading tank 14. Assuming that the pressure in the receiving tank 13 is 50 pounds, then it will require a greater amount of pressure in the

unloading tank 14 before the check valve 16 will open for permitting the air from the unloading tank to pass into the receiving tank 13.

The unloading tank, whenever the motor is not operating, is under only atmosphere pressure and for that reason, when the motor 11 starts it is able to gain its full speed before there is any appreciable back pressure against the pump 10.

When the pressure in the receiving tank 13 reaches a predetermined amount it will cause the switch 22 to operate for breaking the electric circuit A. As soon as the electric circuit A is broken the armature 36 will drop, thus raising the rod 51 and opening the valve structure 40. Any pressure within the unloading tank 14 will be relieved by opening the valve structure 40.

When the pressure in the tank 13 drops to a predetermined amount, then the switch 22 will operate for making a circuit for operating the electric motor. The establishing of the circuit will energize the solenoid coil and move the armature to position for permitting the valve structure 40 to close. The pump will then operate and will first fill the unloading tank 14 before any air is passed into the receiving tank 13. The motor 11 will gain its full speed before it will be necessary to overcome back pressure from the tank 13.

When the knife switch 21 is opened for breaking the circuit, it will immediately cause the lever 37 to swing on its pivot for opening the valve structure 40 and releasing the pressure from the unloading tank 14.

It will be seen that the valve structure 40 is operated either upon the opening or closing of the automatic switch 22 or, on the opening or closing of the knife switch 21.

It will also be seen that should a wire become broken, burned out, or if the circuit is broken in any other way, the valve structure 40, will be operated as before mentioned.

It is quite an advantage to have a structure wherein the parts will automatically operate either upon the temporary breaking of the circuit, as by the switch 22, or the permanent breaking of the circuit by means of the manually operated switch 21.

It will be understood that the pumping structure may be used for pumping gases of all kinds and may also be used in water systems. When the structure is used in water systems, the switch 22 is operated by a float structure and the valve 40 is positioned below the unloading tank 14 for draining the tank.

It will be seen that the elimination of any appreciable back pressure against the pump 10 until after the motor 11 has gained a sufficient amount of speed, is quite an advantage. A small size motor is capable of doing as good work as a large motor, when there is no back pressure against starting.

The elimination of back pressure will prevent burning out of a motor which might occur due to back pressure preventing it from starting properly.

5 Frequently, heretofore, it has been necessary to use over size motors to do a particular job in order to get proper starting ability. My structure overcomes this difficulty.

10 Some changes may be made in the construction and arrangement of the various parts of my invention, without departing from the real spirit and purpose of my invention and it is my intention to cover by
15 my claim, any modified forms of structure or use of mechanical equivalents which may be reasonably included within its scope.

I claim as my invention:

A valve structure of the class described comprising a valve body, a valve seat there- 20 in, a valve member adapted to coact therewith, a spring interposed between said valve member and said valve body for causing such coaction and electrically operated means for allowing said spring to maintain 25 said valve seated, said means comprising a solenoid, an armature therein, a pivoted lever having said armature normally resting on one end thereof whereby energization of said solenoid magnetizes the arma- 30 ture and causes it to exert a pull on said lever, the other end of which is adapted to coact with said valve member for opening the same when the solenoid is deenergized.

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