Sept. 19, 1933. A. J. OTTO 1,927,134

ELECTRICALLY ACTUATED VALVE

Filed Sept. 29, 1932

Fig. 1

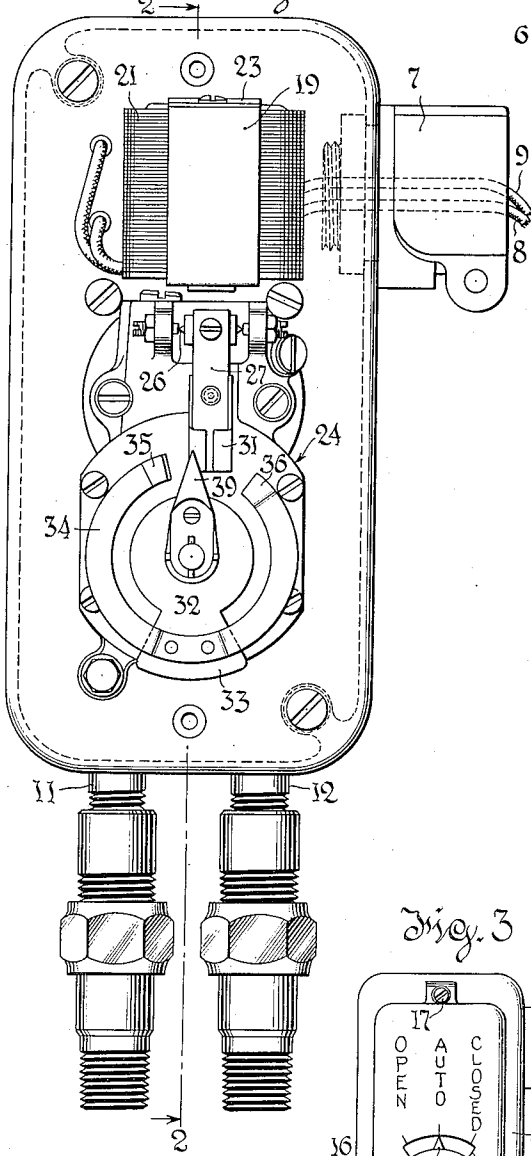


Fig. 2

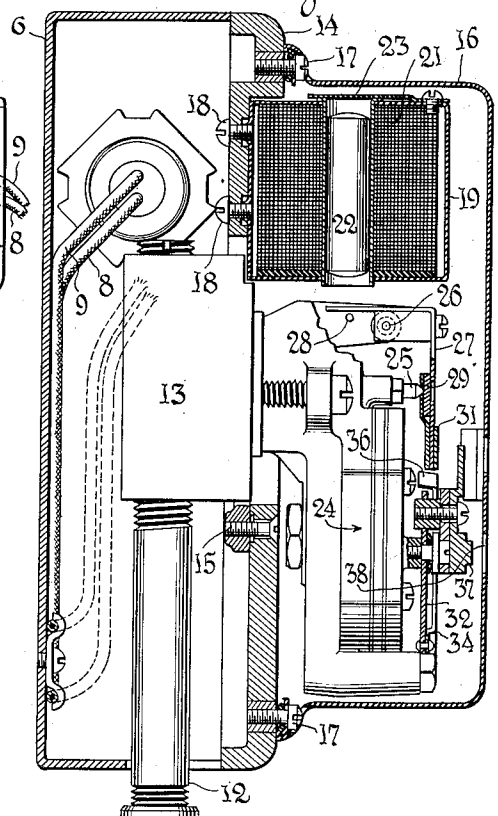
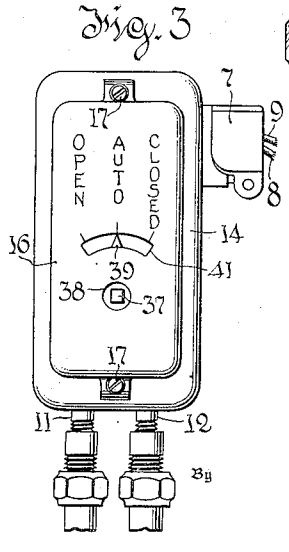


Fig. 3



Inventor

Arthur J. Otto

By Dodge and Dodge

Attorneys

Patented Sept. 19, 1933 1,927,134

UNITED STATES PATENT OFFICE

1,927,134

ELECTRICALLY ACTUATED VALVE

Arthur J. Otto, Milwaukee, Wis., assignor to Johnson Service Company, Milwaukee, Wis., a corporation of Wisconsin

Application September 29, 1932
Serial No. 635,436

2 Claims. (Cl. 137—139)

This invention relates to electrically actuated valves, and particularly to electrically actuated valves of the three-way (admission and exhaust) type.

In the ventilating and temperature controlling arts valves of this type have been used for a number of purposes, for example to cause a pneumatically actuated damper to open and close as an electric fan motor is started and stopped.

There has relatively recently been devised by another inventor a mechanism in which an electrically shifted armature controls a leak port valve, and, more specifically, controls the leak port valve of a pneumatic relay.

The principal object of the present invention is to provide mechanisms of the type just mentioned with manually set means to permit it to respond to electrical control, or to take it out of electrical control and lock it either open or closed as the occasion may require.

A preferred embodiment of the invention is illustrated in the accompanying drawing, in which,—

Fig. 1 is a front view of the complete device with the cover removed.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a front elevation on a reduced scale of the complete device with the cover in place.

An outlet box, indicated generally by the numeral 6, is mounted in the wall and is provided with a connection 7 for the usual metallic electric conduit through which the wires 8 and 9 are brought into the outlet box. Entering the outlet box are a pneumatic supply line 11 and a branch line 12. The line 11 brings air under pressure to operate the pneumatic relay valve mechanism and supply air to the branch line and the branch line 12 is connected to any suitable pneumatic motor. The relay valve mechanism hereinafter described either admits air from the line 11 to the line 12 or disconnects the two lines and vents the line 12 to atmosphere. The pipes 11 and 12 enter a ported mount or pipe-head 13, for which no novelty is here claimed, the mount 13 being rigidly supported in the box 6.

A base plate 14, which may be of molded plastic material, is connected to the head 13 by screws, one of which appears at 15, and carries a cover 16 which is connected to the plate 14 by screws which appear at 17. Mounted on the base plate 14, by means of screws 18, is a metallic shell 19 which encloses an electric winding or solenoid 21. Vertically slidable within the solenoid 21 is an armature 22 whose upward motion is limited by a yielding leaf spring stop 23. The wires 8 and 9 previously described are connected to complete a circuit through the solenoid winding 21.

Mounted on the pipe-head 13 is a pneumatic relay valve mechanism indicated generally by the numeral 24. This is of any suitable type adapted to be actuated by the opening and closing of a leak port 25. Devices of this character are well known and do not require detailed illustration. The preferred device and the one illustrated in the drawing conforms to the disclosure in the patent to Otto 1,500,260. In that device the leak port when opened vents the diaphragm chamber at a rate which exceeds the rate of supply of air to the diaphragm. Consequently the opening and closing of the leak port causes a variation of pressure acting on the diaphragm. The diaphragm forms a portion of a differential diaphragm mechanism which actuates a combined inlet and exhaust valve to admit air from the supply line to the branch line.

If the leak port 25 in the present structure be open, the valve mechanism functions to disconnect the supply line 11 from the branch line 12 and vent the branch line. If the leak port 25 be closed the relay valve mechanism functions to close the exhaust and to connect the supply line 11 directly with the branch line 12.

In the Otto patent, to which reference has just been made, the leak port 25 is controlled by a thermostatic valve. In the present case the leak port valve is actuated by the solenoid 22 and not thermostatically.

Pivoted at 26 on an arm formed integral with the body casting of the relay valve, is a bell crank 27, one end of which underlies the armature 22 and is limited in its downward motion by a stop 28. The other, and pendent end of the bell crank 27 is provided with a celluloid valve member 29 which is held to it by a clip 31, the clip being perforated so that the tip of the leak port 25 projects through the perforation and can engage the valve member 29. The bell crank 27 is so weighted that it tends to swing in a clockwise direction to cause the valve member 29 to seal against the end of the leak port 25. The aperture in the leak port 25 is extremely minute so that only a small quantity of air escapes and so that only a very slight pressure is necessary to seat the valve member 29 in sealing engagement with the leak port member. It follows that the bell crank 27 may be actuated by a very small force and may readily be held open by the weight of the armature 22.

When the winding 21 is excited the armature 22 is drawn upward and the bell crank 27 swings

in a clockwise direction, closing the leak port. The upward motion of the armature is buffed by the spring 23. When the winding 21 is deenergized the armature 22 drops and strikes the bell crank 27 and holds the valve 29 away from the leak port 25.

Swiveled on the front of the casing of the relay valve 24 is a disk 32 which is provided with a radial extension 33 to which is riveted an arcuate member 34 having an upwardly beveled cam end 35 and a downwardly beveled cam end 36. The cam ends 35 and 36 are so arranged that when the disk 32 is turned clockwise the cam end 35 rides over the lower end of the bell crank 27 and holds the valve 29 seated against the leak port 25. Conversely, when the disk 32 is turned counterclockwise, the cam end 36 will ride under the lower end of the bell crank 27 and hold the valve 29 away from the leak port 25. In the intermediate position the bell crank 27 is free to be actuated by the armature 22.

The disk 32 is arranged to be manually set by means of a head 37 designed to receive a key inserted through an aperture 38 in the cover 16. Mounted to turn with the disk 32 is a pointer 39 which may be read through an arcuate slot 41 formed in the front of the cover 16. The pointer reads against indicia marked on the cover 16, and indicating that the valve is open, closed, or set for automatic operation. The indicia are shown clearly in Fig. 3.

The arrangement above described provides a valve which may be set to hold the damper open at all times or closed at all times or in condition for electrical operation. It is not material what the electric circuit is but it would commonly be a shunt from the fan motor circuit. It will be observed that regardless of the setting of the disk 32, the armature functions normally so that even if the pneumatic part of the mechanism be set so as not to respond to electrical control, the action of the electrical part of the device is not affected in any way.

What is claimed is,—

1. The combination of a pneumatic relay including a leak port, said relay being actuated by the opening and closing of said port; a normally closed valve controlling said leak port; an electric motor including a winding and a gravitating armature lifted by said winding when the latter is excited and permitted to drop when the winding is deenergized, the dropping of said armature serving to shift said valve in an opening direction; and a manually adjustable member having three positions, in one of which it holds said valve closed despite the action of said motor, in another of which it holds said valve open despite the action of said motor, and in the third of which it frees said valve for control by said motor.

2. The combination of a pneumatic relay including a leak port; a yieldingly biased valve; an electric winding; a gravitating armature adapted to be held by said winding when the latter is excited in position to free said valve, and to be dropped by deenergization of said armature into engagement with said valve to shift the same; and a rotatable cam member adapted in its two limiting positions to engage said valve and hold it respectively open and closed and in an intermediate position to free said valve.

ARTHUR J. OTTO.