J. DESMOND.

ELECTRIC PNEUMATIC SWITCH.

APPLICATION FILED JULY 17, 1911.

1,053,581. Patented Feb. 18, 1913.

Fig. 1.

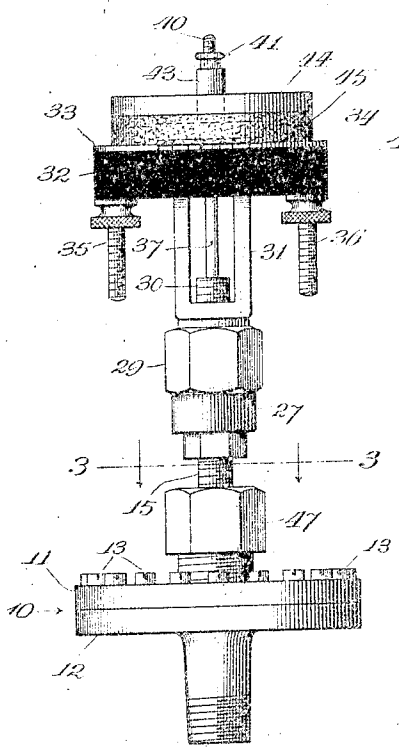


Fig. 2.

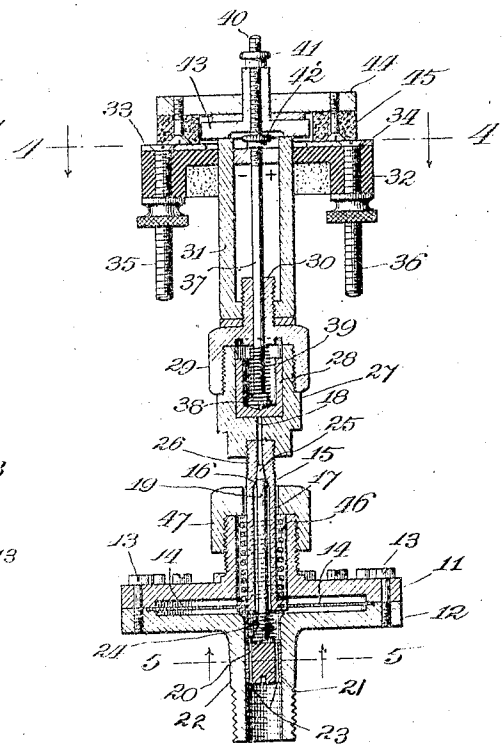


Fig. 3.

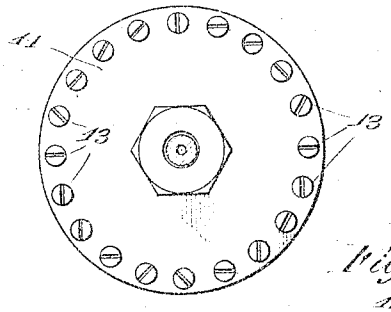


Fig. 4.

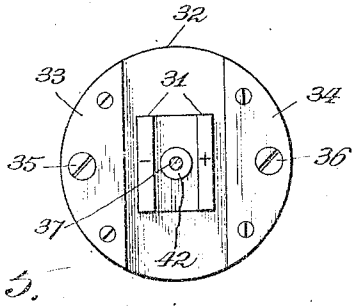
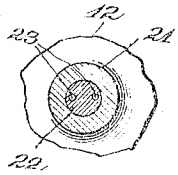


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRIC PNEUMATIC SWITCH.

1,053,581. Specification of Letters Patent. Patented Feb. 18, 1913.

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To all whom it may concern:

Be it known that I, JOHN DESMOND, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Pneumatic Switches, of which the following is a specification.

My invention relates to improvements in electric switches, and has more particular reference to switches that are adapted to be automatically operated as a result of a change of pressure within a container with which it may be associated.

One of the objects of my invention is to provide in a switch of the character to be described, means for producing a quick, arc-avoiding break between the members of an electric switch at a critical point with reference to the rise of pressure to which a receptacle may be subjected, and means for adjusting the operating mechanism, with reference to the pressure to be carried in the container, whereby a higher or lower pressure may be maintained therein, through the controlling agency of the switch exercised upon the pressure-producing medium.

Another object of my invention is to provide an electric switch of this general character that is operable independent of the electric current, whether alternating or direct in character, and to some extent regardless of the electric difference of potential at the switch terminals.

Other and further objects of my invention will become readily apparent from a consideration of the following description taken in conjunction with the drawings, wherein—

Figure 1 is a vertical elevation of the device; Fig. 2 is a central section of the same; Fig. 3 is a section taken on line 3—3 of Fig. 1; Fig. 4 is a section taken on line 4—4 of Fig. 2; and Fig. 5 is a section taken on line 5—5 of Fig. 2.

In all of the views, the same reference characters indicate similar parts.

A diaphragm casing 10 is composed of two parts, 11 and 12, upper and lower parts respectively, secured together by a series of screws 13. The parts are counterbored to provide space for movement of a pressure-responsive diaphragm 14. The diaphragm is clamped between the casing parts at its periphery and is centrally perforated. In the central perforation is secured a vertically extending nozzle 15 provided with an internal valve seat, as at 16, where the two diameters 17 and 18 conjoin. A stem 19 is provided with a head 20, that rests upon an adjustable plug 21. The plug is screw-threaded and is vertically adjustable within the integral perforated hub 22. It is perforated axially, as at 23, to permit free passage of air or other fluid to the under side of the diaphragm from the container (not shown) to which it may be attached. The stem 19 is held with its head 20 against the plug 21 by means of a light helical open spring 24, one end of which rests against the lower surface of the diaphragm and the other on the plug 21. The upper end 25 of the stem is a valve that seats tightly in the valve seat 16 and closes communication with the bore 18 when the parts are in the positions shown, as when the pressure is low. When the pressure reaches the critical point at which it is desired that the electric switch shall be opened, the diaphragm will be raised, thus moving the nozzle 15 so as to carry the valve seat 16 above the valve 25, thus permitting the air to pass into the bore 18.

The switch parts and their operation will now be described.

The nozzle is screw-threaded at its upper end, as at 26, upon which is supported the entire switch mechanism. A casing or cylinder 27 has screw-threaded engagement with, and is supported on, the end 26 and contains a hollow plug or piston 28 that moves freely, but fits snugly in the bore thereof. A screw-threaded cap 29, overlies the upper end of the casing 27 and provides an upwardly projecting screw-threaded stem guide 30. Upon this guide a permanent magnet 31 is supported. The magnet is perforated through its yoke and the perforation is threaded for engagement with the guide 30, the salient poles of the magnet being turned upwardly. To the legs or poles of the magnet 31 is secured a disk 32 of insulating material, perforated for receiving the legs of the magnet. The disk 32 carries two plates of conducting material, 33 and 34, such as brass, copper, or the like, to which the switch terminals 35 and 36 are connected respectively. A stem 37 passes freely through the guide 30 into the interior of the hollow piston 28, and has a head 38 that normally rests upon the interior bottom of

said piston. An open helical spring 39 surrounds the stem 37 and rests upon the head thereof, the upper end abutting against the inner surface of the cap 27. The spring serves to hold the stem 37 in its contact with the piston. The upper end of the stem 37 is screw-threaded, as at 40, and carries, between the nuts 41 and 42 an armature 43, composed of a disk of iron or other material, susceptible of magnetic induction, and which in the position shown closes the magnetic circuit of the permanent magnet 31.

Superposed above the disk 43 and surrounding the stem 37 is a disk 44 that carries an annulus or ring 45 of electrically conducting material shown in the drawing as carbon. This ring, in the position shown, rests upon the conducting plates 33 and 34, and thus closes the electric circuit between the switch terminals 35 and 36. When the ring is lifted above these plates, the switch is thereby opened.

As an illustrative example of the adaptability and use of my switch, I will assume that the switch terminals 35 and 36 are included in circuit with an electric motor and the motor is arranged to operate a pump to pump air into a container with which the part 22 is connected; and that it is desirable to maintain the air pressure in said container at a predetermined value. When the pressure reaches approximately that point, the diaphragm 14 will be raised and permit air to pass into the casing 27, through the bore 18 and under the piston 28. It will be observed that the stem 37 is held depressed by the permanent magnet 31 and its cooperating armature 43 and therefore the ring 45 cannot be moved upwardly and away from the contact plates 33 and 34 until the portative effect of the magnet has been overcome and then it will move quickly, thereby producing a quick break between the switch electrodes. The pressure operating upon the piston 28 will raise it in the casing or cylinder 27 and thereby lift the stem 37 and armature 43, overcoming the magnetic adhesion and causing the ring 45 to be moved upwardly quickly.

To vary the operation of the device with reference to the air pressure, I provide an open helical spring 46 which surrounds the nozzle 15 and rests upon the diaphragm 14, the tension of which may be varied by turning the cap 47. The cap 47 is in position, as shown, to cause the spring 46 to exert its greatest pressure upon the diaphragm.

When the valve 28 is raised, as described, its open end rests upon the valve seat 48, thereby providing a seal to prevent leak around the stem 37, and when the pressure in the container is below normal, the valve 25 provides a sealing means.

The circuit is broken at points within the fields of the permanent magnet and therefore the magnet exercises the dual function of holding the switch closed and causing a quick movement when it is opened and "blowing out" the arc or preventing the formation of arcs at the points of separation of the switch members.

While I have herein disclosed a particular embodiment of my invention, it is evident that considerable change can be made in the structure illustrated within the scope of the appended claims, without departure from the spirit of the invention.

What I claim is:

1. In a device of the character described, a pair of separated stationary contacts, a movable contact for connecting said stationary contacts, an armature secured to said movable contact between said separated contacts, and a magnet having its poles arranged between said stationary contacts, one pole adjacent each thereof.

2. In a device of the character described, a permanent magnet, an insulating block secured thereto, separated contacts on said insulating block, one adjacent each pole of the magnet, an armature spanning the poles of the magnet, and a movable contact secured to said armature and spanning said contacts.

3. In a device of the character described, a circular insulating block, a magnet secured in the center thereof, contacts on diametrically opposite sides of said block, each extending near a pole of said magnet, a ring-shaped movable contact to connect said contacts, and an armature mounted within said ring-shaped contact for coaction with the magnet.

4. In a device of the character described, a centrally perforated diaphragm arranged to receive pressure upon one side thereof, a switch, a pressure-responsive device for opening the switch, and a valve operable by said diaphragm to open and close the passage through said perforation therein for control of said pressure-responsive device.

5. In a device of the character described, for connection to a source of pressure supply, a centrally perforated diaphragm, a switch, a switch-opening pressure-responsive device, a valve normally closing a path from the pressure side of the diaphragm to the pressure-responsive device through the perforation in said diaphragm, one member of said valve being connected to said diaphragm for movement therewith to open said path.

6. In a device of the character described, a diaphragm having a central perforation, a valve member extending through said perforation, a coacting valve member carried by the diaphragm, a switch, and a switch-opening pressure-responsive device associated with said valve for operation upon opening thereof.

7. In a device of the character described, a diaphragm having a central perforation, a valve member extending through said perforation, a coacting valve member carried by the diaphragm, a switch, a switch-opening pressure-responsive device associated with said valve for operation upon opening thereof, and means to vary the projection of said first mentioned valve member through the perforation in the diaphragm.

8. In a device of the character described, a diaphragm having a central perforation, a valve member extending through said perforation, a coacting valve member carried by the diaphragm, a switch, a switch-opening pressure-responsive device associated with said valve for operation upon opening thereof, a cap guidingly surrounding the upper end of said diaphragm-carried valve member, and a spring between said cap and diaphragm to determine the critical pressure necessary to cause valve-opening movement of said diaphragm.

9. In a device of the character described, a pressure-responsive diaphragm, an electric switch superposed thereon and supported thereby, and diaphragm-controlled means between said diaphragm and switch for operating said switch.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

JOHN DESMOND.

In the presence of—
W. LINN ALLEN,
MARY F. ALLEN.