G. R. RADLEY.

ELECTRIC SWITCH.

APPLICATION FILED DEC. 18, 1911.

1,255,225. Patented Feb. 5, 1918.

Fig. 1.

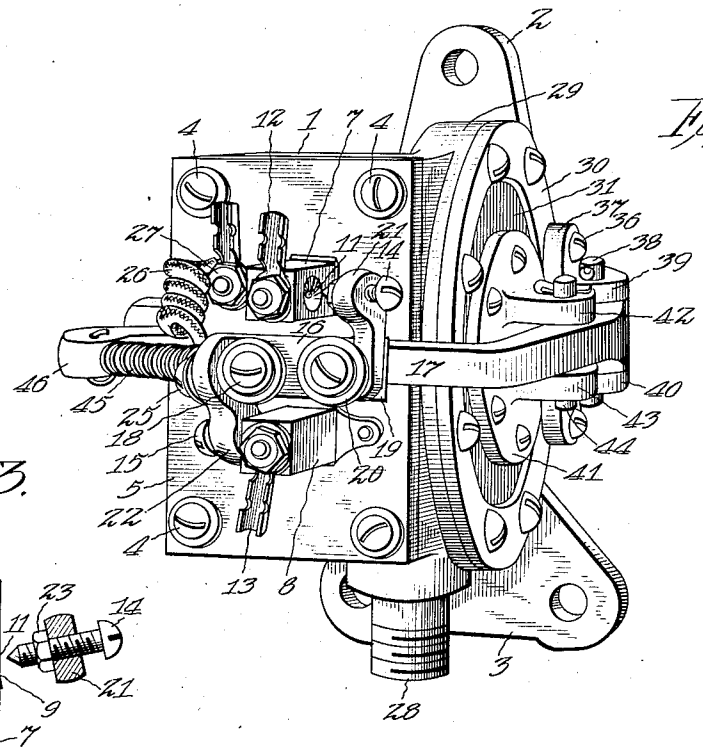


Fig. 3.

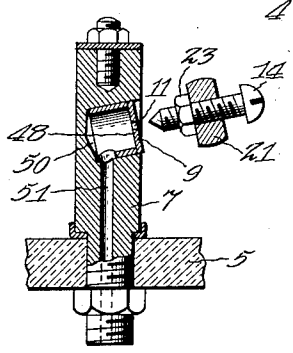
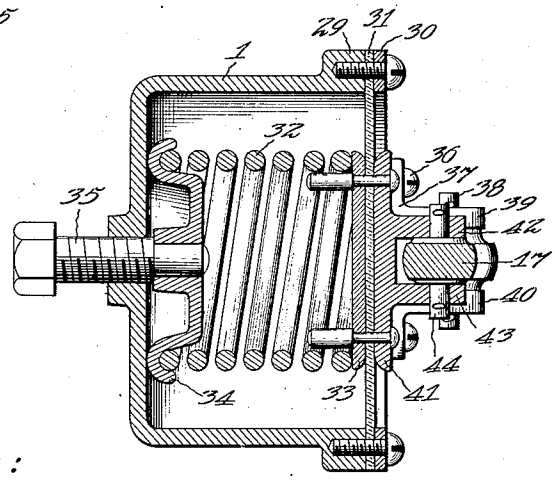


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

1,255,225. Specification of Letters Patent. Patented Feb. 5, 1918.

Application filed December 18, 1911. Serial No. 666,538.

To all whom it may concern:

Be it known that I, GUY R. RADLEY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Electric Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in electric switches and a method of disrupting the arcs produced between the switch contacts.

The various objects and advantages of my invention will be hereinafter clearly and fully set forth.

For the purpose of clearly and fully setting forth the nature and characteristic features of my invention, I shall describe the embodiment thereof disclosed in the accompanying drawing. It should be understood however, that my invention is not limited to the specific embodiment thereof chosen for the purpose of this disclosure.

In the accompanying drawings:—

Figure 1 is a perspective view of a diaphragm operated switch.

Fig. 2 is a sectional view through a portion of Fig. 1 and

Fig. 3 is a detail sectional view of one set of contacts.

The switch illustrated is of the diaphragm operated type and particularly adapted for use in a vacuum system. It should be understood however, that the switch might be readily modified to adapt it to use in a pressure system.

The various parts of the switch are supported by a hollow box member 1 having suitable supporting lugs 2 and 3. On the front of the box member is secured by means of screws 4 an insulating panel 5.

Mounted upon this panel are hollow contact posts 7 and 8 each provided with contact surfaces 9 each having at its center an opening 11 communicating with the interior of its respective contact post. The contact surface of the post 7 is on the right hand side thereof, while the contact surface of the post 8 is on the left hand side thereof. The contact posts 7 and 8 are provided at their outer extremities with terminal lugs 12 and 13 respectively. These lugs may be secured to the posts by the means illustrated or by any other suitable means. Said lugs provide means whereby the contact posts may be connected in electric circuits. The openings 11 in the contact posts as will later be described communicate with the interior of the box member 1 which constitutes a vacuum chamber.

Coöperating with the contact posts 7 and 8 respectively are movable contacts 14 and 15. The contacts 14 and 15 are carried upon a bracket 16 mounted upon a pivoted arm 17. The bracket 16 may be conveniently secured to the arm 17 by screws 18. In practice the bracket is preferably insulated from the arm 16. This insulation of the two parts may be afforded by the insulating strip 19 and the insulating washers 20 as illustrated, or by any other suitable means.

The contacts 14 and 15 which preferably comprise conically pointed screws are threaded into lugs 21 and 22 respectively provided upon the bracket 16. The contacts 14 and 15 are so disposed that the conical points thereof will enter and close the openings 11 in the contact surfaces of their respective contact posts at the same time making electrical contact with said posts. Accordingly as will be hereinafter more clearly set forth, each set of contacts constitutes a combined valve and circuit making and breaking device.

By virtue of the screw threaded engagement of the contact screws 14 and 15 with the bracket 16 said contacts may be readily adjusted to require a greater or less movement of the lever 17 to move the same into engagement with their respective contact posts. The contact screws 14 and 15 are provided with lock nuts 23 for locking the same after proper adjustment thereof.

At its left hand end the bracket 16 is provided with a binding screw 25 to which is connected one end of a flexible conductor 26. The opposite end of the conductor 26 is secured to a binding post 27 provided upon the insulating panel 5. This affords an electrical connection for the bracket 16 and accordingly the movable contacts 14 and 15.

The box member 1 as before stated constitutes a vacuum chamber, the same being provided at its bottom with an outlet pipe 28. At its right hand side the box is provided with an opening surrounded by an annular rim 29 to which is adapted to be

bolted an annular ring 30. The opening in the side of the vacuum box is closed by a suitable diaphragm 31 clamped at its periphery between the annular ring 30 and the annular rim 29 of the box. The vacuum produced within the box 1 of course tends to suck the diaphragm inwardly. The diaphragm is normally pressed outwardly by a helical spring 32 contained within the vacuum box and confined between plates 33 and 34, the former pressing directly against the diaphragm and the latter being stationary. In practice I prefer to mount the plate 34 upon the extremity of a bolt 35 threaded through the wall of the box 1 opposite the diaphragm. With this arrangement the plate may be readily adjusted within the vacuum box to vary the pressure upon the diaphragm by merely turning the bolt 35 in one direction or the other according to the results desired.

Secured to the ring 30 by any suitable means such as screws 36 is a supporting bracket 37 for the arm or lever 17. The lever is fulcrumed to this bracket by a pin 38, the lever closely fitting between lugs 39 and 40 provided on said bracket. The arm or lever 17 is adapted to be actuated by the diaphragm. It is connected to the diaphragm by the following means:—

Disposed on the outside of the diaphragm directly opposite the plate 34 is a plate 41. Both of these plates 41 and 34 are bolted or otherwise secured together through the diaphragm with the result that both move with the diaphragm in both directions. The plate 41 is provided with lugs 42 and 43 disposed on opposite sides of the arm or lever and connected thereto by a pin 44 passing through said lugs and said arm. With this connection it will be obvious that the arm or lever will move with the diaphragm in both directions; that is to say both when the diaphragm is drawn inwardly by vacuum and when forced outwardly by the spring 32.

Switches of this type are ordinarily required to be very sensitive and accurate. Accordingly lost motion of the switch parts should be eliminated so far as is possible. To this end I have connected the arm 17 by a light spring 45 to a stationary bracket 46 for the purpose of maintaining the arm at all times in close engagement with its pivot and thus eliminating any lost motion of the arm at this point.

While the vacuum in the box 1 is below a predetermined value the spring 32 maintains the diaphragm and accordingly the arm 17 in a position to cause contact 15 to engage contact post 8 closing the opening 11 in said post. When the vacuum in the box 1 increases above a predetermined value it draws in the diaphragm thereby actuating the arm to break circuit between contact 15 and post 8 and moving contact 14 into engagement with the post 7, at the same time closing the opening 11 in post 7. The contact 14 will then be held in engagement with post 7 until the vacuum decreases to such a value that the spring will influence the diaphragm to restore the arm and contacts into the position illustrated. In other words the arm will move back and forth upon predetermined fluctuations in the vacuum, moving one or the other of the contacts 14 and 15 into engagement with its respective contact post in accordance with the character of the vacuum fluctuation.

Assume now that the parts are in the position illustrated and that the vacuum rises sufficiently to actuate the diaphragm and arm 1 to disengage contact 15 from post 8. Under these conditions the instant that the point of contact 15 disengages the contact post it uncovers the opening 11 in said post with the result that the vacuum within the receptacle 1 with which the post communicates causes a forceful inrush of air between the contact surfaces of contact 15 and post 8. This inrush of air passes directly between the contact surfaces. Obviously therefore any arc produced between the contact surfaces will be blown toward the interior of the contact post. Further it will be observed that any arc produced between the contact surfaces will be substantially at right angles to the current of air and accordingly while being blown inwardly will at the same time be stretched until it breaks. Thus if the air blast be moderately strong it will be readily apparent that any arc produced will be very quickly disrupted.

The same arc disrupting effect is obtained upon separation of the contact 14 from the contact post 8.

The contact posts 8 and 9 may be of any preferred construction. In practice however, I prefer to construct the same as shown in Fig. 3. As shown in this figure the contact surface 9 is provided on a hollow cylindrical contact 48 closed at its outer end except for the opening 11. The cylindrical contact 48 is set into a recess 50 provided in the contact post which in practice may be conveniently drilled in said post from the side thereof. The recess 50 is preferably drilled at the angle illustrated so that the active face of the cylindrical contact 48 will be substantially radially disposed to the pivot of the arm carrying its coöperating contact. The post is otherwise solid except for a longitudinal passage 51 therein extending from an opening 52 in the contact 48 to the rear end of said post, or in other words to the end of the post within the vacuum box.

The contacts 48 and their coöperating contacts may be formed of any preferred conducting material. In practice however, I

prefer to provide these contacts with silver engaging portions.

What I claim as new and desire to secure by Letters Patent is as follows:—

1. In an electric switch, in combination, a pressure responsive member, a switch arm controlled thereby, a contact carried by said arm, a tubular support communicating with a source of reduced pressure and having a bored-out portion communicating with the interior thereof, a perforated cap fitted within said bored-out portion of said support, said cap serving as a coöperating contact for said first mentioned contact.

2. In an electric switch, in combination, a vacuum receptacle, a tubular support in communication with the interior of said chamber and provided with an enlarged counterbored portion, a perforated cap fitted within said counterbored portion to form a chamber, a switch arm mounted for actuation by pressure variations within said receptacle, a conically tapered pin carried by said arm to coöperate with said perforated cap both as a contact and as a valve, whereby upon separation of said pin from said cap circuit is interrupted therebetween and the incident arc is blown within said chamber.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

GUY R. RADLEY.

Witnesses:
H. P. Reed,
Frank H. Hubbard.