March 28, 1939. E. B. HUDSON 2,151,701

ELECTRIC SWITCH

Filed May 2, 1936

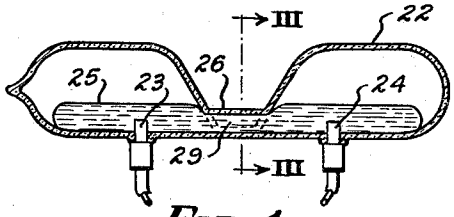



FIG. 1.

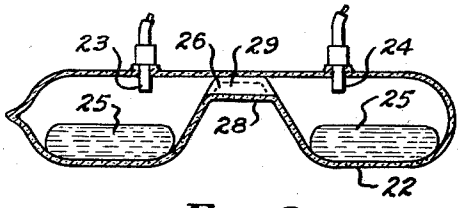



FIG. 2.

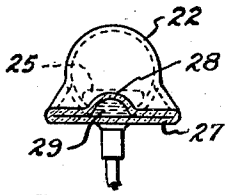



FIG. 3.

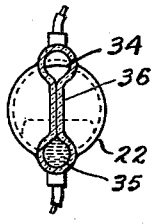



FIG. 8.

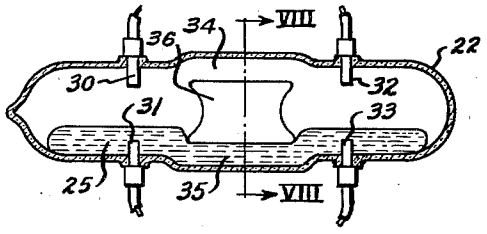



FIG. 7.

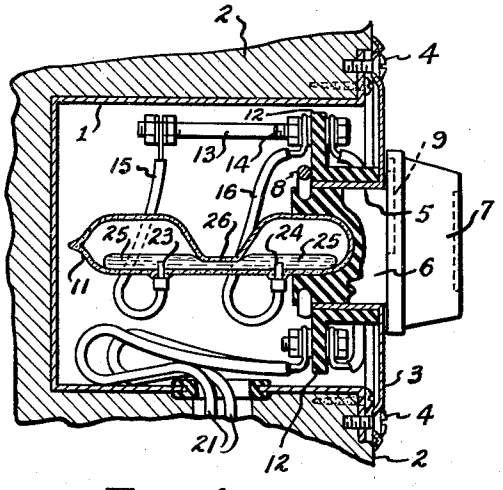



FIG. 4.

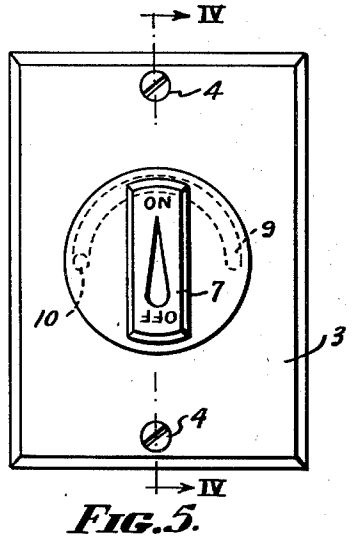



FIG. 5.

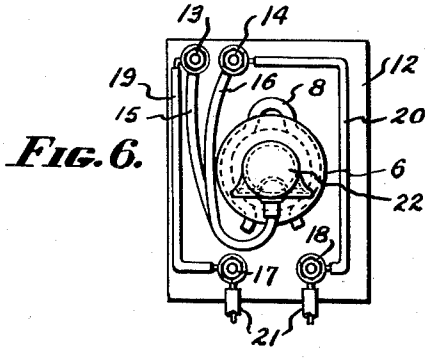



FIG. 6.

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## ELECTRIC SWITCH

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Application May 2, 1936, Serial No. 77,558

6 Claims. (Cl. 200—152)

My invention relates to a new type of electrical switch mechanism and a novel current making and breaking element therefor, of the so-called mercury switch type, and the more specific objects and advantages of my invention will be set forth hereinafter or will be apparent to one skilled in the art upon reading this specification.

In the accompanying drawing:

Figure 1 is a horizontal section of the current making and breaking mechanism in one position.

Fig. 2 is a corresponding section thereof in inverted position.

Fig. 3 is a central sectional view thereof taken along the lines III—III of Fig. 1.

Fig. 4 is a vertical section through my switch, taken on the line IV—IV of Fig. 5.

Fig. 5 is a view of the face plate of the switch with the operating knob.

Fig. 6 is a rear elevational view of the switch mechanism showing the wiring thereof in a diagrammatic way.

Fig. 7 is a view similar to Fig. 1 of a modified form.

Fig. 8 is a cross section of the same on the line VIII—VIII of Fig. 7.

I shall first proceed to a description of the switching mechanism as such. It is maintained in the ordinary switch or ordinary outlet box 1, adapted to be let into a wall 2, and held by screws or other means. The switch is provided with a face plate 3 adapted to be held to the box by the usual screws 4. The face plate is in this instance provided with a sleeve member 5 in which the barrel portion 6 of an operating knob 7 is journaled. The knob itself is larger than the internal diameter of the sleeve and bears against the face plate on one side, as shown. On the other side a split ring or equivalent device 8 is caused to engage in a groove in the barrel 6 of the operating knob, as shown, and to bear against the inner end of the sleeve 5, so that the knob 7 may be rotated but cannot be withdrawn from the sleeve. The operating knob may be provided with a semi-circular groove 9 on its under face, and a pin 10 solidly mounted on the face plate 3 may engage in this groove so that the knob may be rotated only through 180 degrees. The knob may be provided with any suitable indicia, as will be apparent.

A feature of my invention is the mounting on this knob directly, of a mercury type make and break switch, which I have indicated generally in Fig. 4 at 11. This element may be let into a recess in the knob and cemented directly thereto. It is of a type which makes and breaks a circuit upon rotation, as will presently be explained.

A base plate 12 forms a part of my switch, and in the embodiment shown is conveniently mounted upon the face plate sleeve 5 and may be held in place by the split ring 8. This plate 12 is provided with mounting posts 13 and 14 to which the leads 15 and 16 of the mercury switch 11 may be attached. These posts 13 and 14 are in turn wired, respectively, to terminals 17 and 18 by means of leads 19 and 20. The connection with the household lighting circuit, or whatever other circuit the switch is desired to control is made to the posts 17 and 18 by means of the usual wires indicated collectively at 21. This switch construction is, it will be observed, extremely simple as well as economical to construct, and it has a number of salient advantages such as silence and smoothness of operation, mechanically, as well as those advantages which accrue from the type of make and break element employed in connection therewith, which element I shall now describe in detail, and which is best shown in Figs. 1, 2, and 3.

The element is an element of the mercury type comprising the sealed envelope 22 of tube like shape, and having a pair of electrodes 23 and 24 sealed into it upon one side. The envelope is, of course, closed, and may be evacuated and/or provided with an atmosphere of inert gas. The envelope also contains a quantity of mercury indicated at 25. In the process of manufacturing this element, the central portion of it is depressed, as shown generally in Figs. 1 and 2 at 26. When the central portion of the tube is heated this depression may be made by means of an appropriate squeezing tool which folds the sides of the tube down and together, as shown at 27 in Fig. 3, but leaves a raised portion 28 providing a passageway 29 from one end of the tube to the other.

When the element is in the position shown in Fig. 1, the body of mercury extends from one electrode to the other through the restricted passageway 29, and electrical connection is established between the electrodes 23 and 24. When the tube or element is rotated out of the position shown in Fig. 1, while the mercury is still in contact with the electrodes 23 and 24, it breaks in the passageway 29 thereby breaking the circuit. As the tube is further rotated the mercury collects in two parts 25a in the position shown in Fig. 2.

What this structure does is to enforce a breaking of the circuit between adjacent bodies of mercury rather than between the body of mercury

and one or both contacts, whereby destructive action on the contacts or electrodes is done away with. Moreover, the construction of this element is such that the make and break is very positive and very rapid, and the ordinary shocks and jars to which the element may be subjected in use, do not disturb its operation. Thus an undesired rapid opening and closing of the circuit as sometimes happens under conditions of shock and jar in the ordinary type of tilting mercury switch, cannot happen in the mercury switch of my invention.

In Figs. 5 and 6, I have shown a modified structure comprising a single pole, double throw switch. The differences between the construction of this device and the device of Figs. 1 to 3 inclusive, are that four electrodes are provided at **30**, **31**, **32** and **33**, and that the tube **22** is pinched together in the middle as at **36** to form upper and lower passageways **34** and **35**. The outside connections have not been shown as they are within the knowledge of those skilled in the art.

Modifications may be made in my invention without departing from the spirit thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a switch, a face plate having a sleeve, an operating member journaled in said sleeve, a knob and a retaining device on said operating member to cooperate with said face plate and sleeve respectively to retain said operating member in operative position, and a mercury switch securely held in a recess in said operating member.

2. In a switch, a face plate having a sleeve, an operating member journaled in said sleeve, means for retaining said operating member in operative position, and a mercury switch securely held in a recess in said operating member.

3. In a switch, a face plate having a sleeve, an operating member journaled in said sleeve, means cooperating with said face plate and sleeve respectively, for retaining said operating member in operative position, and a mercury switch securely held in a recess in said operating member.

4. A switch element comprising a substantially tubular envelope arranged to oscillate on its longitudinal axis, electrodes projecting into said tube, a pool of mercury in said tube, the formation of said electrodes and the quantity of mercury being such that the electrodes make contact with the mercury throughout only a limited oscillatory movement of the tube, and a passageway formed by the walls of the tube extending uninterruptedly from electrode to electrode and so restricted in width that the mercury separates into two bodies before the electrodes separate therefrom.

5. A switch element according to claim 4 in which the passageway is located adjacent the wall of the tube.

6. A switch element according to claim 4 in which the passageway is substantially cylindrical in cross section.

EDWIN B. HUDSON.