July 14, 1936. G. R. BROWN 2,047,931

ELECTRIC SWITCH

Filed Nov. 15, 1935

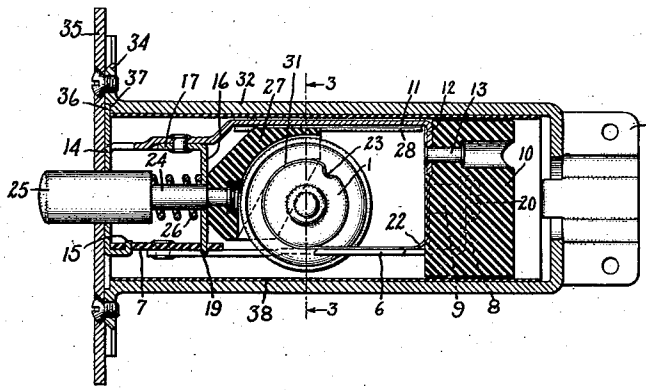


Fig. 1.

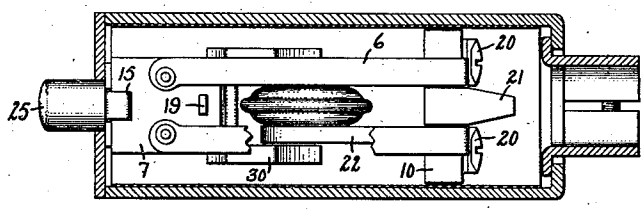


Fig. 2.

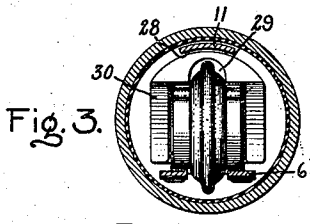


Fig. 3.

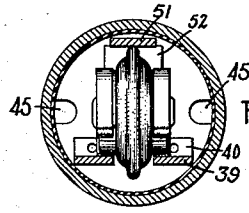


Fig. 6.

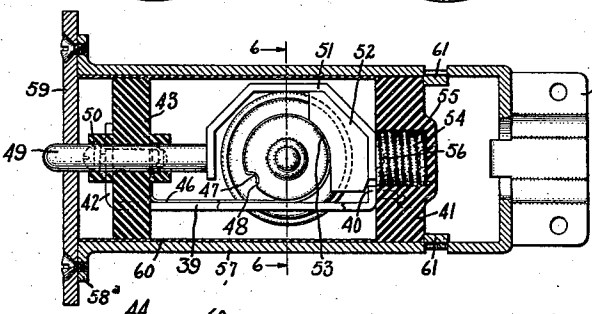
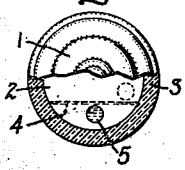


Fig. 4.

Fig. 7.



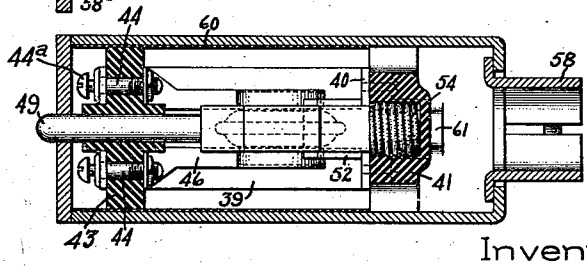


Fig. 5.

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2,047,931

ELECTRIC SWITCH

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Application November 15, 1935, Serial No. 49,943

9 Claims. (Cl. 200—152)

The present invention relates to electric switches of the type having liquid contact circuit closers for controlling the flow of current.

The object of my invention is to provide an improved construction and arrangement in switches of this type and for a consideration of what I believe to be novel and my invention attention is directed to the accompanying description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a sectional side elevation of a switch embodying my invention; Fig. 2 is a bottom plan view partly broken away of the switch shown in Fig. 1; Fig. 3 is a sectional view taken on line 3—3 of Fig. 1; Fig. 4 is a sectional side elevation of a modification of my invention; Fig. 5 is a bottom plan view partly broken away of the switch shown in Fig. 4; Fig. 6 is a sectional view taken on line 6—6 of Fig. 4; and Fig. 7 is a view showing the construction and operation of the liquid contact circuit closer.

Referring to the drawing, I have illustrated my invention using a liquid contact circuit closer having a pair of cup-shaped metal terminals 1 which are separated by an insulating diaphragm 2 of a refractory material, such as a ceramic material. The edges of the terminals are sealed by a bead 3 of glass which also seals the junctions between the diaphragm and the terminals. Within the space enclosed by the terminals is a suitable quantity of mercury 4 which forms the conducting medium between the terminals. In the manufacture of the circuit closer the space enclosed by the terminals is evacuated and filled with hydrogen at a pressure of one or more atmospheres which increases the current interrupting capacity of the circuit closer. As shown by the full lines in Fig. 7, the diaphragm 2 is provided with an opening 5 which is submerged in the mercury when the circuit closer is in the current-conducting position. When the circuit closer is in the current-interrupting position shown in dotted lines in Fig. 7, the opening 5 is above the mercury, and the circuit between the terminals is therefore broken by the insulating diaphragm 2. Due to the construction of the circuit closer, the interrupting of the circuit between the terminals takes place in the mercury as the circuit closer is turned so that the opening 5 in the diaphragm approaches the dotted line position. The above described construction is illustrative of liquid contact circuit closers which are suitable for use in a switch embodying my invention.

The switch in Figs. 1 to 3 inclusive has a frame which comprises two longitudinal tracks 6 riveted at one end to a piece of insulating material 7 and having flanges 8 at the other end riveted to inserts 9 held in a block 10 of insulating material. Above the tracks 6 is a metal strip 11 having a flange 12 secured to the block 10 by a rivet 13 and having a flange 14 at the other end provided with a tongue 15 which fits into the strip 7. Between the strip 7 and the strip 11 is a brace 16 having a flange 17 riveted to the strip 11 and having a tongue 19 fitting in the strip 7. The brace 16 holds the strip 11 in spaced relation to the tracks 6 and secures these parts in assembled relation.

The inserts 9 which are riveted into the block 10 have terminal screws 20 threaded therein to which the line conductors may be attached. The block 10 is provided with a projection 21 which provides an insulating barrier between the terminals 20. To the inner end of each of the inserts 9 is secured one end of a spring contact strip 22. The spring strips 22 rest on the upper surface of the tracks 6 and extend around the periphery of the terminals 1 of the liquid contact circuit closer. The other end of each of the strips 22 extends within depressions 23 in the terminals. The spring strips are given an initial set so that when the strips are placed on the termials the resilience of the strips holds them in place, and the portions of the strips which fit in the depressions 23 prevent slipping between the terminals and the strips. The strips 22 therefore provide flexible contacts for conducting electricity from the terminals 20 to the terminals 1 of the circuit closer. The strips 22 are flexible enough so that as the circuit closer is rolled along the tracks 6, the contact strips are wrapped around the periphery of the terminals. The strips 22 are stiff enough so that they tend to move the circuit closer to the left, as viewed in Fig. 1.

Slidably mounted in the brace 16 is a plunger 24 having a hollow cup 25 secured to its left-hand end. The cup 25 is slidable in the flange 14 of the strip 11, and a helical spring 26 arranged between the brace 16 and the bottom of the cup biases the plunger to the left, as viewed in Fig. 1. The right-hand end of the plunger 24 is riveted to a block or carriage 27. The upper side of the carriage 27 bears against the curved lower surface 28 of the strip 11 which guides the movement of the carriage. The lower side of the carriage is provided with a groove 29 which fits over the glass bead 3 of the circuit closer and also with depending sides 30 which extend on either side of the terminals 1. The carriage 27 is also provided with curved surfaces 31 which slidably engage portions of the contact

strips 22 on the periphery of the terminals 1. When the plunger 25 is pushed to the right, as viewed in Fig. 1, the circuit closer is rolled on the tracks 6, wrapping the contact strips 22 around the periphery of the terminals and thereby causing rotation of the circuit closer about its axis. When the plunger 25 is moved to the left under the action of spring 26, the resilience of the contact strips 22 causes the circuit closer to roll to the left, keeping the terminals 1 against the curved surfaces 31 of the carriage. The bead 3 of the circuit closer extends between the tracks 6 so that it serves to maintain the circuit closer on the tracks during the rolling movement.

The switch is assembled within a cylindrical housing 32 having a split coupling 33 at one end for clamping to a conduit containing the line conductors. At the other end of the housing 32 is a flange 34 to which is secured a cover plate 35. A tongue 36 on the flange 14 fits within a complementary depression 37 in the flange 34 and locates the switch within the housing 32. A sleeve 38 of insulating material is placed between the housing and the switch.

One use of the switch is as a door switch to control an electric circuit in response to the opening and closing of a door. In this use, the switch is mounted in the door jamb by means of the cover plate 35, and the line conductors are connected to the terminals 20. Opening and closing of the door will then cause reciprocation of the plunger 24 and thereby cause rotation of the circuit closer about its axis.

In the modification shown in Figs. 4 to 6, inclusive, the switch has a frame which comprises a pair of spaced tracks 39 having flanges 40 at one end secured to a block 41 of insulating material and having flanges 42 at the other end secured to a block 43 of insulating material by sleeve nuts 44. The threaded sleeve 44 and the binding screws 44a serve as line terminals for conductors which extend through openings 45 in the block 41 and similar openings in the block 43. The sleeves 44 extend through the block 43, and the inner end of each is secured to one end of a spring contact strip 46. The spring contact strips 46 rest on the upper surface of the tracks 39 and the other ends of the strips are wrapped around the periphery of the terminals 1 and are provided with projections 47 which fit in depressions 48 in the terminals. As in the construction described in Figs. 1 to 3, inclusive, the strips are held in place on the terminals by the resilience of the strips, and the projections 47 prevent slipping of the terminals relative to the contact strips. The contact strips 46 have sufficient resilience so that when the liquid contact circuit closer is rolled to the left, as viewed in Fig. 4, the strips will be wound on the periphery of the terminals, but are stiff enough so that they tend to roll the circuit closer to the right.

For moving the liquid contact circuit closer, I have provided a plunger 49 which is slidable in a bearing 50 in the block 43. The right-hand end of the plunger is fixed to a carriage 51 which carries a block 52 of insulating material. The block 52 fits over the bead 3 of the circuit closer and is provided with a curved surface 53 which slidably engages portions of the strips 46 on the terminals 1. The plunger 49 is biased to the left, as viewed in Fig. 4, by a coil spring 54 which is carried in a recess 55 in the block 41. A tongue 56 on the carriage centers the spring with respect to the carriage.

The switch is enclosed by a cylindrical housing 57 having a split coupling 58 at one end for clamping a conduit containing the line conductors. At the other end of the housing 57 is a flange 58—a to which is secured a cover plate 59. The switch is held within the housing by an insulating sleeve 60 arranged between the cover plate 59 and the left-hand face of the block 41. The sleeve 60 forces the right-hand face of the block 41 against projections 61 struck up on the inner surface of the housing 57. In Figs. 4 and 5, the switch is shown in the position in which the plunger 49 has been pushed to the right. In this position, the contact strips 46 hold the terminals of the liquid contact circuit closer against the curved surface 53 of the block 52. When the plunger 49 is released, the spring 54 forces the carriage 51 to the left thereby causing the circuit closer to roll to the left on the tracks 39. The rolling of the circuit closer on the tracks 39 causes the circuit closer to rotate about its axis, thereby causing the operation of the circuit closer.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric switch, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having a curved portion on its periphery, a track on which said curved portion is adapted to roll, and means for rolling said circuit closer on said track.

2. In an electric switch, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having a curved portion on its periphery, a track on which said curved portion is adapted to roll, and a carriage slidably engaging the periphery of said circuit closer for rolling said circuit closer on said track.

3. In an electric switch, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having a curved portion on its periphery, a track on which said curved portion is adapted to roll, a spring strip fastened to said circuit closer and having a tendency to roll said circuit closer in one direction, and means for rolling said circuit closer on said track in opposition to the force of said spring strip.

4. In an electric switch, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having a curved portion on its periphery, a track on which said curved portion is adapted to roll, a spring strip fastened to said circuit closer and having a tendency to roll said circuit closer in one direction, and a carriage slidably engaging the periphery of said circuit closer for rolling said circuit closer on said track in opposition to the force of said spring strip.

5. In an electric switch, a frame having a pair of spaced tracks, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having portions adapted to roll on said tracks, and a portion extending between said tracks for holding the circuit closer on the tracks, and means for rolling said circuit closer on said track.

6. In an electric switch, a frame having a pair of spaced tracks, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having portions adapted to roll on said tracks and a portion extending between said tracks for holding the circuit closer on the tracks, and means including a plunger slidable in said frame for rolling said circuit closer on said track.

7. In an electric switch, a liquid contact circuit closer operable by rotation about its axis, a resilient strip secured to and wrapped around the periphery of said circuit closer, and means for

rolling said circuit closer on said strip for causing rotation of the circuit closer about its axis.

8. In an electric switch, a liquid contact circuit closer operable by rotation about its axis and having a cylindrical terminal, a spring strip having one end wrapped around the periphery of the terminal and held thereon by the resilience of the strip, said strip and said terminal having interfitting portions for preventing slippage between the strip and the terminal, and means for rolling said terminal on said strip for causing rotation of the circuit closer about its axis.

9. In an electric switch, a frame having a pair of spaced tracks, a liquid contact circuit closer operable by rotation about its axis, said circuit closer having a pair of cylindrical terminals adapted to roll on said tracks and having a portion projecting between said tracks for holding the circuit closer on the tracks, resilient strips resting on said tracks and having their ends wrapped around said terminals and secured thereto, and means for rolling said terminals on said strips for causing rotation of said circuit closer about its axis.

GEORGE R. BROWN.