June 5, 1956 L. T. BORDNER 2,749,413

ELECTRIC SWITCH

Filed Oct. 6, 1952

Fig. 1

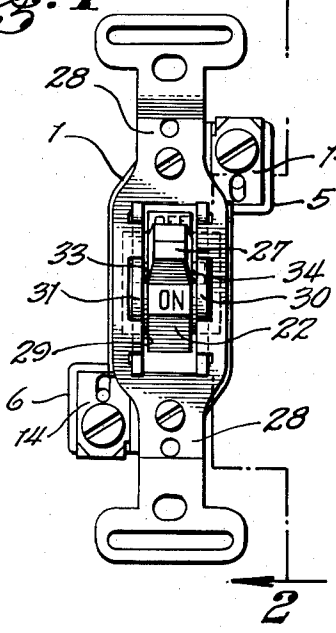


Fig. 2

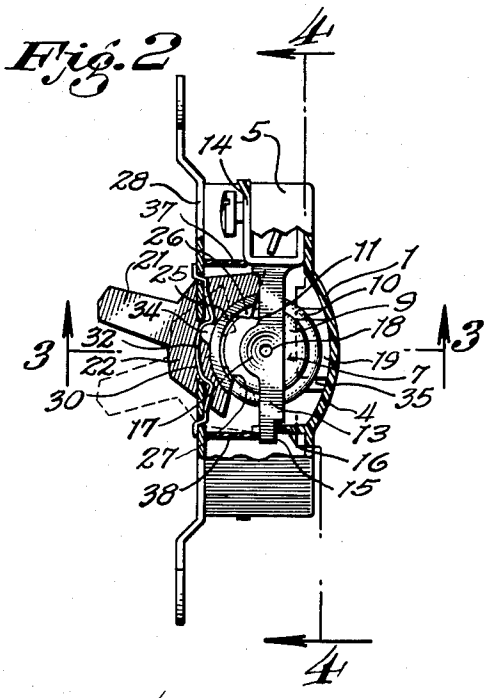


Fig. 3

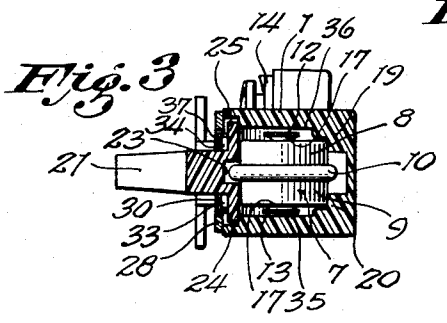
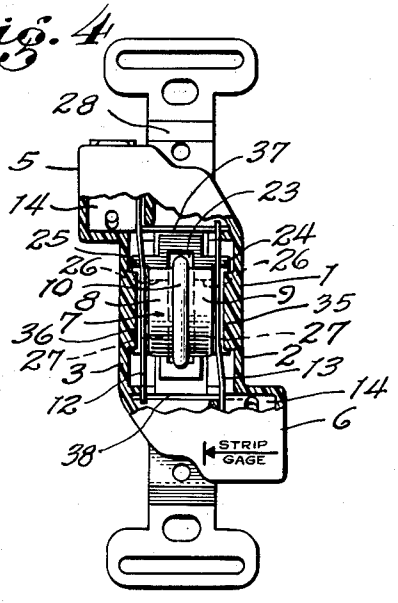


Fig. 4



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ELECTRIC SWITCH

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6 Claims. (Cl. 200—152)

The present invention relates to electric switches generally, and more specifically, to that type of electric switch which incorporates a liquid contact circuit controller. Generally, a liquid contact circuit controller uses mercury, the mercury being confined in two opposed cup-shaped metal members separated by an annular glass bead and provided with an insulating barrier between the cup-shaped members. This barrier is provided with an opening, and a pool of mercury is included within each cup-shaped member, rotation of the cup to what is termed an "on" position allowing the mercury to pass through the opening in the barrier and movement to an "off" position breaking contact between the two mercury pools through said opening. The character of the mercury button, as it is sometimes termed, does not form any part of this invention, other than that the present invention does utilize some form of liquid contact circuit controller.

The present invention has for an object the provision, in an electric switch of the type which includes a liquid circuit controller, of means for actuating the controller in a manner which is positive and at all times assures proper operation thereof, and one which relieves pressure from the controller.

It has been found that operators often abuse switches of the mercury type in use of the operating handle. The operating handle may be revolved too far, which may cause disengagement between the handle and the mercury button, or radial pressure may be exerted against the end of the handle so as to dislodge the mercury button from its mounting. The present invention includes among its objects the overcoming of faulty operation in the switch in the respects heretofore enumerated.

In the drawing:

Figure 1 is a front elevation of the switch as an entirety, showing the mounting strap for the switch housing, and associated elements;

Figure 2 is a sectional view on the line 2—2 of Figure 1;

Figure 3 is a cross sectional view on the line 3—3 of Figure 2; and

Figure 4 is a fragmentary view, partly in section, on the line 4—4 of Figure 2.

Referring now with particularity to the drawing, I have shown a type of switch which includes a housing or casing 1 of the type which is open at the front and has a pair of side walls 2 and 3, and an interconnecting back wall 4. The back wall is concavo-convex in section so as to accommodate the switch mechanism within the casing. In addition, the said casing is provided with top and bottom side extensions 5 and 6 adapted to house switch terminals. The housing 1 confines a liquid contact circuit controller 7 of the type which is ordinarily called or known as a mercury button. Mercury buttons are conventional in the trade and in the present instance, the button includes a pair of cups 8 and 9, sealed together by a glass bead 10, the interior of the cups being separated by wall or barrier not shown, but which barrier is provided with a perforation affording communication between the two cups. As is ordinary, both cups contain a pool of mercury and when the button is in one position, the two pools of mercury communicate through the perforation in the barrier. This provides for an electrical circuit and when the button is rotated to a different position, the perforation is raised out of the two pools so that the pools of mercury do not communicate and the electrical circuit is broken. The mercury button, other than its environment in the present invention, is not the subject of the present application. For those interested, a description of a mercury button of the type shown in my drawing is described in patents to Sambleson 2,142,153 and to Payne 2,101,093.

The sides of both cups 8 and 9 are provided with axial concavities or circular depressions which provide bearings and in certain constructions, also provided with axial pins which extend outwardly of said depressions or concavities. In addition, the rim or periphery of each cup is provided with a transverse curved depression as indicated in Figure 2 at 11. The mercury button is mounted within the housing 1 for rotation and the mounting therefor comprises a pair of arms 12 and 13, one end of each arm being secured to an electrical terminal 14, while the opposite end of the arm has a step 15 of reduced width, the step resting upon a wall 16 formed within and upon a side wall of the housing. In using the singular for the arm, the opposite arm is included, as both arms are identical in structure. Each arm is bowed, the convex portions of the arms facing the sides of the mercury button, and each arm at the apex of the bow is provided with an offset enlargement 17 of concave form, and provided with a transverse perforation 18 on the axis of said enlargement. The convex side of the enlargement of each arm is received within the concavity of a side wall of the button and if the button is provided with an axial pin, the pin is passed through the perforation 18. In this matter, the button is mounted for oscillatory rotation and the said button is held against side movement by the said arms, the mounting being quite rigid, due to the fact that both arms span the opening in the housing, with one end supported by the terminal fittings within the extensions 5 and 6 and by the walls 16. As a further support for the button, both sides 2 and 3 of the housing are internally provided with a spaced pair of parallel enlargements 19 and 20, the top edges of which are of concave form, the radius of curvature of the concavities being the same as the radius of curvature for the two cups of the button. The enlargements are of such height as to engage the peripheries of the cups.

To operate the mercury button, an operating handle 21 is provided, the said operating handle having an enlarged base 22, formed with a circular recess 23, adapted to receive the bead 10 of the mercury button. The base is provided with a pair of side flange extensions 24 and 25 of substantially uniform thickness, both the inner and outer surfaces of said flange extensions being curved and the inner curved surface being on the same radius as the radius of curvature of the cups 8 and 9. The flanges 24 and 25 are each provided with a projection at 26 adapted to enter the recesses 11 of the button, and substantially diametrically opposite said projections, and carried by said flanges, are a pair of bearing portions, designated generally as 27, which ride upon the periphery of the cups.

The strap 28 overlies the open front of the housing 1, and said strap is centrally slotted at 29 to allow projection therethrough of the handle 21, as well as a portion of the enlarged base 22. The handle is held within the casing and in button engagement by means of a pair of leaf springs 30 and 31, the leaf springs being carried by the mounting strap adjacent the slot 29. As best shown in Figure 2, each leaf spring has a central curved por-

tion 32 together with portions which extend from said central curved portion, and passed through an opening in the mounting strap in the manner shown in Figure 2. To provide friction to the movement of the handle, each curved flange 24 and 25 is provided with a projection on its outer surface, as shown at 33 and 34, and which projections bear against the inner surface of the central curved portion 32 of each spring. As is usual, the enlarged base portion of the handle carries an indication as to the "off" position and the "on" position of the switch, as shown in Figure 1.

The operation, uses and advantages of the invention just described are as follows:

Applicant lays no claim to any invention in the mercury button or any other liquid contact circuit controller as described, nor to any specific means for holding the operating handle within the casing or housing, nor to the projections on the base flange of the operating handle for moving the mercury button. However, it is a well known fact in this particular art that operators of electric switches are careless and it is a prime essential that the mercury button be operated properly, otherwise the switch will not function. Accordingly, it is essential that the mercury button at all times be in a position for rotation, and further essential that the operating handle be maintained in a given relationship to the mercury button so that the mercury button can be operated from an "on" to an "off" position, or vice versa. Obviously, if the handle slips relative to the periphery of the mercury button, the mercury button will not operate properly and may swing past its normal point one way or the other, resulting in loss of contact of the mercury pools through the perforation in the barrier. One of the great difficulties in mercury switches consists in the fact that an operator will push the operating handle too far, causing the projection on the base flange of the handle to move out of the depression or recess in the mercury button. When this occurs, it becomes essential to completely dismantle the switch, in order to restore the mercury button in proper position relative to the operating handle. This operation is too complicated for the average user of a switch in the household. Then, too, operators, who may be children, have a tendency to push on the end of the operating handle, and such pushing often dislodges the mercury button from its mount, with the result that the switch becomes inoperable. It is with the idea of overcoming these hazards that the present invention has been primarily directed, and the present invention incorporates a construction which effectively overcomes the hazards mentioned.

First, it is to be observed in viewing Figure 2 that the base flange for the operating handle in either the "on" or "off" position will strike and straddle the two bowed arms 12 and 13, so as to prevent further swinging movement of the handle. As the mercury button moves within the bearings provided therefor in both of the arms 12 and 13, the mercury button at all times rotates easily and the said arms 12 and 13, by being rigidly supported at their ends, one end by the terminals 14 and the opposite end by the stepped portion of each arm bearing against a wall portion, such as 16. Any tendency to push inwardly upon the end of the handle 21 is resisted by the provision of the molded portions at 19 and 20, these portions having concavities of substantially the same radius of curvature as the radius of the button, so that the button can rest lightly within said concavities and thus resist radial thrust. In the manner aforesaid, the mercury button is assured proper movement and cannot be dislodged from its bearings, nor will the operating handle projection portion escape from the recessed portions 11 of the mercury button. Hence proper operation for the particular switch is at all times assured.

Furthermore, the arrangement is such that a good electrical contact with the cups is afforded through the arms 12 and 13, due to the bowed nature of the arms and the fact that rotation of the button at all times tends to abrade the bearing surfaces so that a clean contact with the two cups of the button is afforded.

To further assure that the arms 12 and 13 shall not escape from their bearing engagement with the sides of the button or circuit controller, I have provided two embossments, having faces which are parallel and flat, formed on the inner surfaces of the side walls 2 and 3 of the housing, as shown at 35 and 36. The spacing between the embossments 35 and 36 and the sides of the circuit controller is just sufficient to allow the interposition of the arms 12 and 13 and still permit slight movement thereof, but not sufficient movement to dislodge the complementary bearing portions of the arms with the complementary recesses in the sides of the controller. In this manner, any side thrust against the button is resisted to the end that the bearings afforded by the arms with the sides of the controller are at all times maintained against dislodgment to the end that the controller will always rotate.

I have provided insertable stepped strips at 37 and 38, which bridge the two arms and are held within the housing in the manner shown in Figure 4, and which strips in part isolate the interior of the housing from the terminals of the switch. These strips also function to prevent any upward movement of the arms 12 and 13 when the mounting strap is secured over the housing, and encloses the mechanism therein, as shown in Figures 1 and 2.

I claim:

1. In an electric switch, a mercury button, a recessed switch housing having two spaced coaxial recesses for reception of the button, and also having two spaced side embossments with cylindrical forward ends coaxial with and diametrically opposite the recesses, an operating handle oscillatable with the mercury button, and means for holding the handle in constant engagement with the cylindrical ends of the two embossments, and for holding the button in light engagement with the two recesses.

2. The switch of claim 1 in which the means includes two spaced leaf springs urging the handle toward the axis of the button and of the recesses.

3. The switch of claim 1 in which the two recesses are in the rear wall of the housing and subtend an angle of roughly 60°.

4. A switch housing having an open face to receive a mounting strap, parallel side walls, a rear wall, and a terminal receiving extension at the upper right corner and at the lower left corner, each shallower in depth than the housing, each extension opening by a slot to the central recess between the two side walls, a flange extending laterally from each side wall at its end farther from the extension and having a shoulder near the rear wall, a mercury button, a pair of switch terminals each with an arm to hold the mercury button between them whereby the terminals and the button may be slipped as a unit into the open face of the housing with the terminals engaging the rear of the extensions and the free ends of the two arms resting upon the shoulders.

5. The housing of claim 4 in which a transverse strap flush with the open face of the housing rests upon and bridges the two arms and closes the slot between the extension and the central recess, whereby when the mounting strap is in place, the arms are rigidly held in place.

6. The housing of claim 4 in which each side wall has a central embossment extending forwardly from the rear wall, each embossment having a cylindrical end adjacent the forward open face, and coaxial cylindrical recess near the rear wall to prevent rearward movement of the mercury button.

References Cited in the file of this patent

UNITED STATES PATENTS

2,142,153	Sambleson	Jan. 3, 1939
2,434,065	Courtney	Jan. 6, 1948
2,575,318	Mattern	Nov. 13, 1951
2,670,421	Coutant	Feb. 23, 1954