Oct. 29, 1963 L. M. SHELDON ETAL 3,109,079

THREE-WAY MERCURY SWITCH

Filed April 4, 1961

Fig. 1.

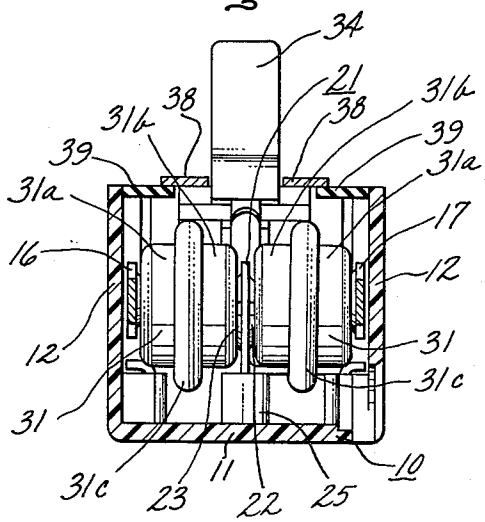


Fig. 2.

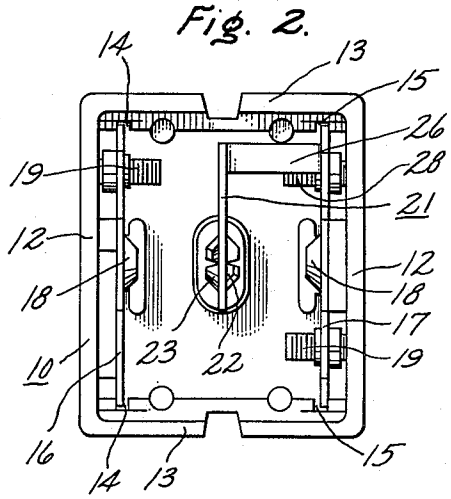


Fig. 3.

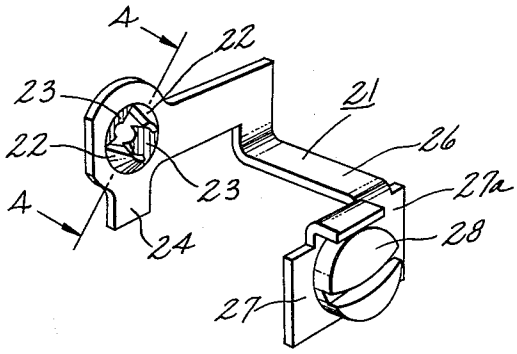


Fig. 4.

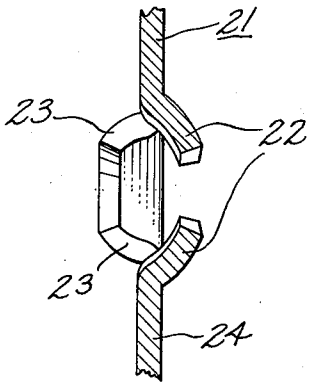
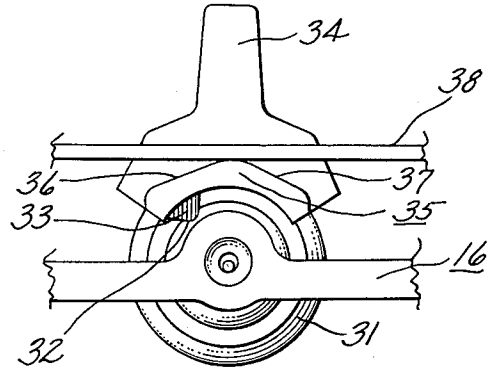


Fig. 5.



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THREE-WAY MERCURY SWITCH

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3 Claims. (Cl. 200—152)

This invention relates to a three-way mercury switch; more particularly, the invention relates to a three-way mercury switch in which a single contact between the mercury buttons serves as a bearing surface for both buttons.

In von Hoorn and Sheldon application Serial No. 47,891, filed August 2, 1960, and assigned to the same assignee as the present application, a mercury switch was disclosed in which tension on the single button of the switch was maintained by parallel contacts spring biased against the button in combination with a trigger incorporating an inverted V-shaped cam surface in engagement with the mounting strap of the switch, the arrangement being such that the button had limited movement in the direction of the trigger. The present invention is directed to an arrangement of parts whereby the inventive concept of the von Hoorn and Sheldon application is applied to a three-way mercury switch.

Three-way switches are used to control an electric circuit from either of two switch positions. These switches include two switching circuits which share a terminal connection in common. For a particular trigger setting, one of the switch circuits is open and the other closed and movement of the trigger to the complementary position transposes the "open" and "closed" relationship of the switch circuits.

One of the objects of the present invention is to provide a three-way mercury switch having a compact and simple arrangement of parts.

Another object of the invention is to provide a three-way mercury switch in which parallel contact members maintain spring tension against the mercury buttons.

Another object of the invention is to provide a three-way mercury switch in which a single center contact member serves as a bearing surface for two mercury buttons.

Other objects of the invention will be apparent from the following specification considered in conjunction with the attached drawing wherein

FIG. 1 is a partly sectional end view of the switch of this invention;

FIG. 2 is a top plan view with the cover, trigger, and mercury buttons removed;

FIG. 3 is a perspective view of the center contact of the switch;

FIG. 4 is a sectional view of the center contact taken along the line 4—4 of FIG. 3; and

FIG. 5 is a broken side view of a button, mounting, trigger and mounting strap.

Briefly stated, in accordance with one of its aspects, the invention comprises a housing, two parallel side spring contacts and a center contact midway therebetween, the side contacts having facing embossments in the shape of a spherical segment and the center contact having embossments in the shape of spherical segments coaxial with and facing each of the embossments in the side contacts, a mercury button in engagement with the spherical segments in each space between the side contacts and the center contact, and a trigger in rotatable engagement with the mercury buttons, the trigger having an indexing cam in the form of an inverted V the sides of which engage the underside of the switch mounting strap.

Referring to the drawing, the switch of this invention comprises a housing 10 of insulating material formed into a bottom wall 11, opposed side walls 12, and end walls 13. The end walls 13 define two sets of opposed grooves 14 and 15 (FIG. 2) which support two parallel spring contacts 16 and 17, respectively.

The side contacts 16 and 17 are identical elongated spring metal elements each having a centrally positioned embossment 18 in the shape of a spherical segment. Each spherical segment has a central aperture and the contacts are positioned with the embossments extending toward each other with the apertures in axial alignment. Each of the contacts 16 and 17 has a leg extending from one end in which is mounted a terminal screw 19 accessible from the exterior of the housing 10 through apertures (not shown) in the housing.

Midway between the side terminals 16 and 17 is a center terminal 21 having embossments 22 and 23 in the shape of oppositely disposed quarter-circle spherical segments extending from each side thereof. A central aperture through the embossments is coaxial with the apertures through the spherical segments 18 of the contacts 16 and 17. The center contact 21 has a positioning arm 24 which rests upon an integral embossment 25 (FIG. 1) of the housing 10 and a long offset arm 26 terminates in a plate 27 in which there is mounted a terminal screw 28. One edge 27*a* of the plate 27 seats in a groove (not shown) immediately below the groove 15 of the housing 10 nearest to the contact 21. By making the embossments of the center contact 21 in the form of 90-degree spherical segments alternately extending in opposite directions, this invention provides bearing surfaces which are entirely adequate for a pair of mercury buttons 31 (FIG. 1).

The mercury buttons 31 are conventional in all respects and therefore are not described in detail here. They consist of two mating halves 31*a* and 31*b* composed of metal joined together by a glass seal 31*c*. Each metal piece 31*a* has a pin extending axially therefrom through the apertures in the embossments 18. The metal elements 31*b* have axial dimples which are in rotatable engagement with the embossments 22 and 23 of the center contact 21. Each metal shell of the mercury buttons 31 has an indexing notch 32 in engagement with a detent 33 on a trigger 34.

Referring to FIG. 5, the trigger 34 includes an inverted V-shaped cam 35 on each side thereof, the legs of the cam forming level surfaces 36 and 37. The cam 35 is at all times in tight engagement with the underside of a mounting strap 38, a rigid member which holds in place both the trigger 34 and a fiber cover 39 (FIG. 1). The positions of the elements are correlated such that the axial pins of the mercury buttons are centered within the apertures of the embossments 18 when the trigger 34 is in either an "Off" or an "On" position. When the trigger 34 is in a neutral position, as illustrated in FIG. 5, the mercury buttons 31 are forced toward the base 11 of the housing 10 until the axial pins engage the periphery of the apertures through the embossments 18. This produces a slight bowing action on the side contacts 16 and 17 with a resulting increase in spring bias against the buttons. Since the spring bias tends to decrease when the trigger 34 is in either extreme position, the effect is to give to trigger movement a positive "feel" coupled with an attraction for either an "On" or "Off" position.

The embossment construction of the center contact 21 provides plenty of surface to impart bearing properties. By employing a thin metallic strip at the center contact 21, the least possible space is provided for the mercury buttons 31. It is to be noted that all of the embossments of the three contacts have central apertures. With this construction, the axial pins of the mercury buttons 31 may both be facing outward, as previously described, or both inward so that the pins face each other.

While the invention has been described with reference

to a specific embodiment thereof, it is the intention that the invention be limited only as may be necessitated by the scope of the appended claims.

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

1. A mercury button switch comprising a housing of insulating material with a bottom wall and opposed side and end walls, the housing having an open top portion, two of the opposing walls defining vertical grooves for supporting the ends of a parallel pair of bowed spring contacts, a spring contact positioned in said housing by each pair of vertical grooves, the central portion of each contact having an embossment in the shape of a spherical segment extending toward the other, a center contact positioned midway between said parallel contacts, said center contact having embossments in the shape of oppositely disposed quarter-circle lanced spherical segments extending from each side thereof coaxial with the embossments maintained in rotatable position by the spherical embossments, each spherical embossment mating with a concavity in the side of a mercury button and being of a size to allow movement of said buttons with reference to said embossments, a switch trigger having means for rotatably engaging said buttons, and a mounting strap

detachably secured to the open top portion of said housing at the end walls thereof, said strap including an opening through which a portion of the trigger extends for manual operation, the trigger having an inverted V-shaped cam on each side thereof in tight engagement with the underside of said strap whereby shifting the trigger from one extreme position to the other will cause the cams of the trigger to drive the buttons down into the housing while spreading the parallel contacts farther apart, the inclined sides of the cams serving as positive stops to limit the stroke of the trigger.

2. A mercury button switch as claimed in claim 1 wherein the spherical segments embossed in the center contact consist of 90-degree spherical segments alternately extending in opposite directions.

3. A mercury button switch as claimed in claim 1 wherein each contact is provided with a screw terminal accessible from the exterior of the housing through an aperture therein.

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