Oct. 23, 1951 E. A. MILLER 2,572,505

MERCURY-TO-MERCURY DOUBLE CONTACT SWITCH

Filed Oct. 15, 1947

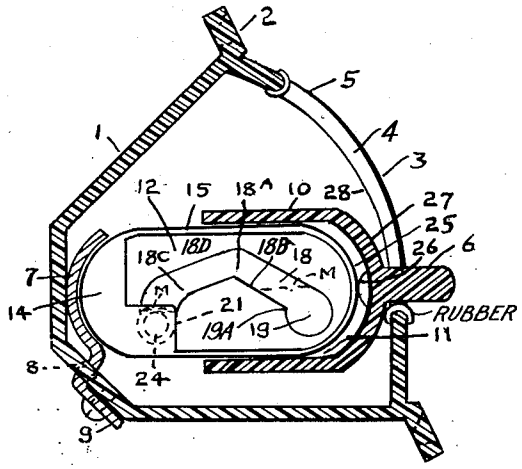


FIG 1

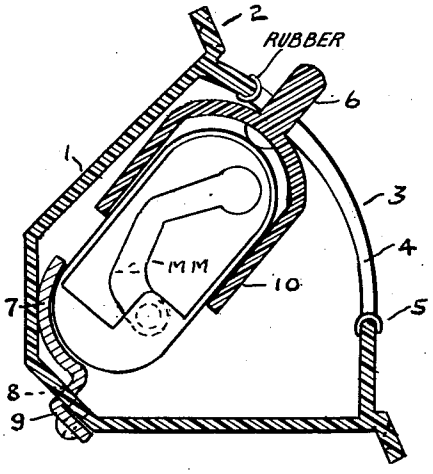


FIG 2

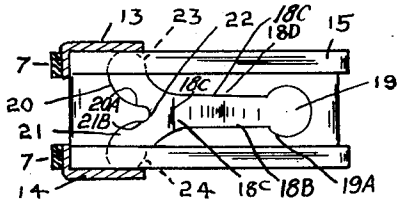


FIG 3

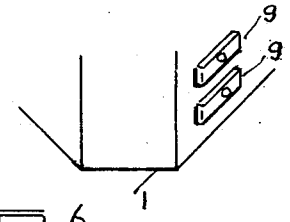


FIG 6

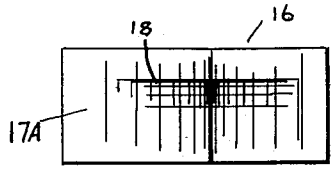


FIG 4

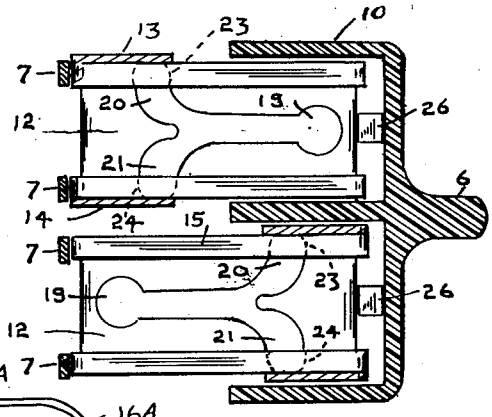


FIG 7

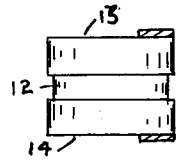


FIG 5

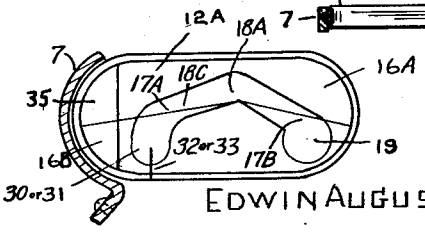


FIG 8

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MERCURY-TO-MERCURY DOUBLE CONTACT SWITCH

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Application October 15, 1947, Serial No. 780,054

1 Claim. (Cl. 200—152)

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This invention relates to mercury to mercury contact switches and especially to a double break contact of the tilting type having a noiseless snap-action.

The applicant is aware that the previous art discloses mercury to mercury contact switches, but the switch about to be described is an improvement thereon.

The objects of the invention are to provide high current-carrying capacity in a double break mercury switch; to provide in such a mercury switch double break contact with a double amount of contact air-gap as compared with that of a single break switch; to provide such a mercury switch in which sustained arcing is wholly eliminated; to provide for such a switch an off-position in which there are distinct mercury deposits at both ends of a mercury path, each of the mercury deposits at the double contact end of said path being in constant current-carrying connection with a terminal; and to provide such a switch in which a deposit of mercury, at the upper end of a tilted mercury path, is moved with a snap action to unite with and bridge the mercury deposits at the double contact end of said path, the contour of the mercury container being symmetrical and therefore reversible.

Referring to the accompanying drawing, the Figure 1 illustrates, within a casing of insulation, a mercury switch holder, the casing and holder being illustrated in outline, and the holder tilted in an off-position wherein the transparent glass container of mercury thereby held makes visible the mercury path in which pockets at opposite ends contain deposits of mercury, the deposits within branch pockets at one end of the path each being constantly in current-carrying connection with a terminal of which only one is shown; Figure 2 illustrates the holder tilted in an on-position wherein the mercury deposit from the single pocket at one end of the path has united with both branch pockets at the opposite end, thereby making contact with both terminals of which only one is shown; Figure 3 illustrates a transparent mercury container exposing therethrough the mercury path in which each branch pocket has a side opening through the glass container over each of which opening there is provided a portion of a current-carrying metal cap having connected therewith a metal band extending around the container, each portion of cap being sealed over an opening; Figure 4 illustrates a one-half portion of the transparent glass container of which the meeting surfaces of each half-part being adapted to be sealed together; Figure 5 illustrates an end view of glass container with current-carrying cap portions; Figure 6 illustrates a fragmentary detail; the Figure 7 illustrates the use of two mercury containers of which one is in reverse position within a holder from that of the other; and Figure 8 illustrates a slight modification of the mercury path.

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With more particular reference to the accompanying drawing, the numeral 1 designates the casing of insulation material shown in outline. The forward end of the casing 1 is provided in Figures 1 and 2 with a wall attaching means 2 having a central arcuate front-wall portion 3 within which a slot 4 is provided. At either end of the slot 4 there is provided a rubber bumper 5 to silence the contact therewith of an actuator 6 sliding within the slot 4. At the opposite end of the casing 1, and fixed thereto, are relatively spaced arcuate companion cradles of current-carrying metal one of which cradles 7 is shown in Figures 1 and 2, an end of each cradle 7 being continued and inserted within and through a passage 8 of the casing 1 to provide a terminal 9, as illustrated by the Figures 1, 2 and 6.

Within the casing 1 is the holder 10 of insulation material, shown in outline, and of which the actuator 6 is a part, the holder 10 having therein the cavity 11. The holder 10 carries within the cavity 11, for a slight longitudinal movement therein, a transparent glass mercury container 12 having at one end a two-part current-carrying metal cap 13—14 sealed thereto in spaced relation, each cap part being connected to an end of a current-carrying metal band 15 extending around the rest of the container 12, and each cap-part 13—14 being pivotally seated within one of the companion cradles 7.

The transparent mercury container 12 is preferably made in two parts 16 and 16A the meeting faces 17 of the parts 16 and 16A being adapted to be sealed, one to the other, and together having a symmetrical contour for a purpose to be explained in connection with the Figure 7 showing reversed containers. In the process of making the mercury container 12 there is premolded in the said faces 17 of said parts 16 and 16A the mercury path 18, as illustrated as to one part by the Figure 5. The mercury path 18, as shown by the Figure 3, communicates the single mercury pocket 19 with the branch companion pockets 20 and 21 having between them the barrier 22 separating at that place the path 18. Each of the companion pock-

ets 20—21 is provided with a side opening 23 or 24 extending through the glass container 12, a current carrying metal cap-portion 13 or 14 being sealed to and over an opening 23 or 24 as permanent closure means therefor. Before sealing both of said openings 23 and 24, the proper quantity of mercury M is inserted through one of said openings 23—24 and into the mercury path 18.

The mercury path 18, as seen in the side view of the Figure 8, is shown to have a bed of varying depth over which the mercury deposit normally within the pocket 19 must pass upon the initial tilting movement of the glass container 12 to merge with retained mercury deposits within the pockets 20 and 21. The points from which the bed of the mercury path 18 rises and falls are shown more particularly by the Figure 3. The mercury path 18 confined within the premolded faces 17A and 17B of the parts 13A and 16B provides not only the bed of the mercury path 18 but also the remaining portions of confinement within the container 12 including the side walls of which 19A of the pocket 19 are a part. From the pocket 19 the mercury path 18 ascends along the line 18B to a high ridge 18A from which the mercury path 18 descends along the line 18D to the lower ridge 18C over which the mercury deposit from the pocket 19 is precipitated to suddenly merge that mercury deposit from the pocket 19 with the permanently retained mercury deposits of the pockets 20 and 21, the merged deposits altogether overflowing the barrier 22 upon both sides 20A and 21B thereof. Upon a tilted return movement of the container 12 a portion of the merged mercury deposits is precipitated over the ridge 18C and thereby suddenly is separated therefrom, leaving within each of the pockets 20 and 21 only the normally retained mercury deposit each insufficient in itself to flood the barrier 22.

The cavity 11 is of a length to provide at 25 slight tolerance for longitudinal movement of the glass container 12 therein. A bow spring 26, engaging the glass container 12 and the casing 1, maintains the container 12 with its cap-portions 13—14 in engagement with the cradles 7, while a shoulder 27 of the holder 10 is adapted to ride along the interior surface 28 of the arcuate wall 3 of the casing 1 upon the operation of the actuator 6.

Normally the actuator 6 lies in the position with respect to the slot 4, as illustrated by the Figure 1, in which the mercury path 18 is tipped slightly upward. In that position there is maintained a substantial deposit of mercury M within the single pocket 19 while there is constantly maintained within each of the companion pockets 20—21 a sufficient quantity of mercury M to maintain current-carrying engagement of each of said mercury deposits with a terminal 9.

It is to be noted that the contour of the mercury container 12 is exactly symmetrical thereby permitting the mercury container 12 to be inserted within a holder 10 either end first. In the Figure 7 the advantage of such symmetry is illustrated where two mercury containers 12 are held together within one holder 10 but each in reversed position to the other whereby the branch mercury pockets 20—21 of one container 12 is at opposite ends of the cavity 11 of the holder 10 to that of the other container 12, thereby providing means for a three-way make and break contact.

The Figure 8 illustrates a slight modification

of the mercury container 12A. In this form, instead of the openings 23—24 at one side of each of the companion branch pockets 20—21 the glass structure of the container 12A is provided with companion pockets 30—31 each having a wire 32 or 33 molded therein so as to have one wire end extending into and submerged in a mercury deposit of a pocket 30 or 31 and the other wire end connected with current-carrying cap parts 34—35. Otherwise the modified form of mercury container 12A is identical with the preferred form 12.

In manually operating the actuator 6 from the position illustrated by the Figure 1, the holder 10 is upwardly swung half way along the slot 4 while the mercury deposit M in the single pocket 19 remains therein due to the high ridge 18A. Upon further tilting of the holder 10 the retarded mercury deposit M of the single pocket 19 plunges suddenly over the ridge 18A in mass form to merge with both mercury deposits within the companion pockets 20—21 and over-flowing the barrier 22 with the entire mercury deposit MM within the mercury path 18 and thereby making a mercury to mercury double contact closing the circuit of the switch through the cap-portions 13—14, cradles 7 and both terminals 9.

With an initial reversed movement of the actuator 6 downwardly, the pivotal movement of the container 12 is not sufficient to cause the mass deposit MM to break up by reason of the holding ridge 18C retarding a gravitating movement thereof. Upon a further downward operation of the actuator 6, the mass deposit MM suddenly breaks up, leaving portions of mercury in each of the individual pockets 20—21 and gravitating down the mercury path 18 and into the single pocket 19. The sudden breaking up of the mass deposit MM causes a mercury from mercury double break in the switch circuit.

The parts 16 of the container 12, one of which parts 16 is illustrated by the Figure 4, are provided with inclined meeting surfaces 17 the lines 17A and 17B of which is illustrated by the Figure 8. Although the meeting surfaces 17 along the lines 17A and 17B are not illustrated by the Figures 1 and 2, it is to be understood that the container 12, in each of the Figures 1, 2 and 3, is of identical structure with respect to the parts 16.

I claim:

A mercury to mercury double electrical switch contact comprising an elongated insulation actuator mounted upon a base for tipping movement thereon, a single pocket within one end of said actuator, multiple pockets also within said actuator at the opposite end thereof and positioned along-side one another, each of said multiple pockets having an opening, a conductive metal closure provided by each of said openings, each of said closures including a terminal, a single passage connecting said single pocket with said multiple pockets, a barrier with which the floor of said passage is provided between said multiple pockets there dividing the course of said passage terminating in both multiple pockets, a ridge of elevation also provided by said floor intermediate said course, normally-separate deposits of mercury placed in each of said multiple pockets within which their respective metal closures are submerged, a substantial mercury deposit placed in said single pocket to an overflowing extent within said passage, and means for tipping said actuator in either direction; whereby, upon a longitudinal tipping of said actuator,

mercury from said single pocket flows speedily along said passage to said ridge from which it suddenly plunges down both sides of said barrier and overflowing said multiple pockets and around said barrier thereby making simultaneously a full double contact with said closures.

EDWIN AUGUST MILLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,688,217	Whalen	Oct. 16, 1928

FOREIGN PATENTS

Number	Country	Date
4,297	Great Britain	Feb. 19, 1913