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E. W. RICKMEYER

2,436,601

SWITCH ELEMENT.

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Fig. 1.

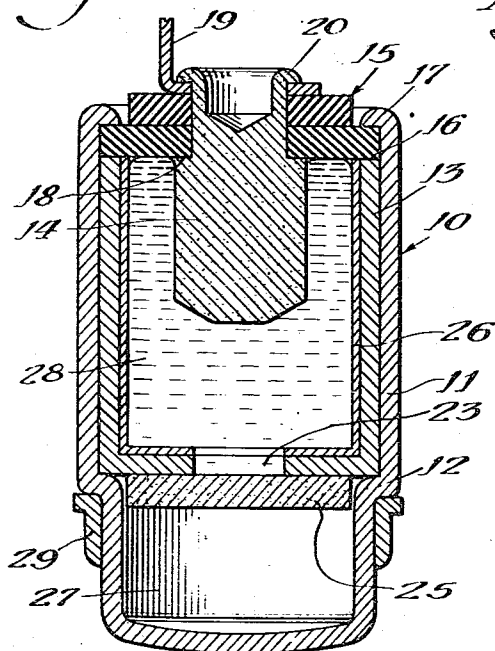


Fig. 2.

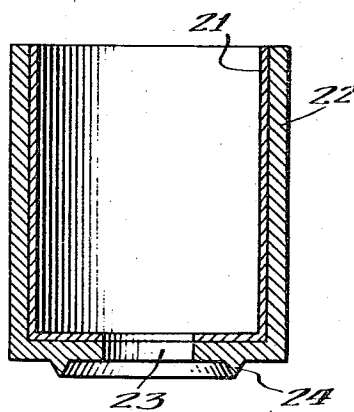


Fig. 3.

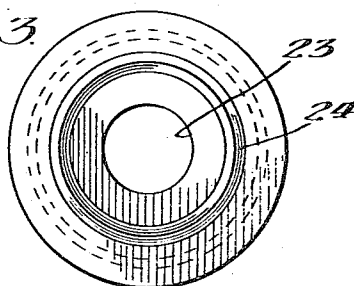


Fig. 4.

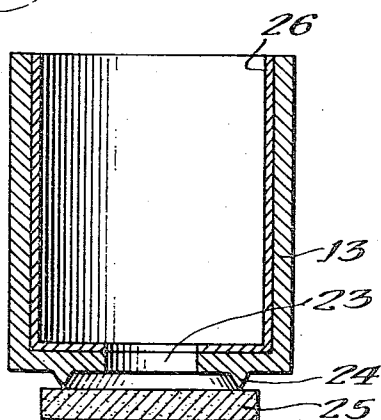
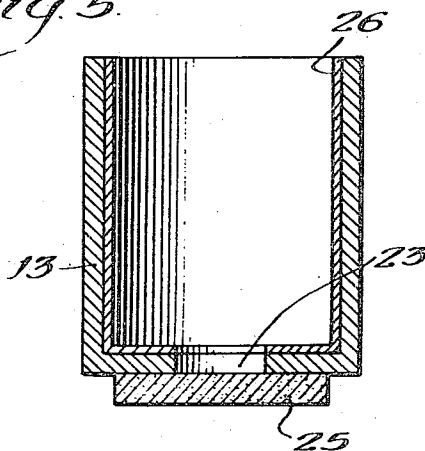


Fig. 5.



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SWITCH ELEMENT

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9 Claims. (Cl. 200—80)

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The present invention relates to mercury switches, and more particularly to the time delay element in a mercury switch of the centrifugal type.

In a switch of this sort, a shell or switch envelope is divided into two chambers separated by a partition having restricted passages therein. A body of mercury is disposed in the shell and is adapted to flow from one chamber into the other through the restricted passages. In one of the chambers are two electrical contacts or terminals normally insulated from each other, the gap between which terminals the mercury is adapted to close or bridge when the mercury fills, or substantially fills, the chamber. This closing of the gap completes the electrical circuit through the switch. This circuit is broken when at least a portion of the mercury has flowed through the restricted passages in the partition into the second chamber. The time required to break the circuit is dependent upon the rate of flow of the mercury through the restricted passages.

The invention is concerned with the dividing partition between the two chambers. This partition may be termed the time delay element of the switch, and it is intended that the present invention shall provide an effective element of the type that is dependable and accurate in its operation in allowing the mercury to flow between the two chambers under certain time delay characteristics.

The time delay element forming the subject matter of the invention is simple to install in a mercury switch under conditions of mass production.

The foregoing constitute some of the principal objects and advantages of the present invention, others of which will become apparent from the following description and the drawings, in which

Fig. 1 is a vertical sectional view through a mercury switch assembly embodying the present invention;

Fig. 2 is a vertical sectional view through the cup that is incorporated in the mercury switch shown in Fig. 1 and which supports the sintered wafer that serves as the time delay element for the switch;

Fig. 3 is a bottom view of the cup shown in Fig. 2;

Fig. 4 is a view corresponding to Fig. 2 but showing the wafer of sintered metal particles in its position against the rib of the bottom of the cup preparatory to welding the wafer in place; and

Fig. 5 is a view corresponding to Fig. 4 but

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showing the sintered metal wafer finally welded against the bottom of the cup.

A specific embodiment of the invention is shown for the purpose of illustration in compliance with the statutes. It is recognized that many changes will occur to the man skilled in the art, and it is intended that modifications may be made without departing from the intended scope of the invention.

Referring to Fig. 1, the invention is shown in connection with a mercury switch, generally indicated at 10, that comprises a shell or switch envelope 11 that has an upper portion and a lower portion divided by a shoulder 12 that is adapted to support a cup 13 thereon. Through the open end of the shell 11 projects a contact member or electrode 14 about which are mounted a plurality of insulating washers generally indicated at 15. These washers 15 are supported on the top of the cup 12, as indicated at 16, and the upper edge of the shell 11 is crimped over onto the lowermost washer, as indicated at 17. The contact member 14 is provided with a shoulder 18 that rests against the lower face of the insulating washers 15. A terminal wire 19 surrounds the contact member 14 adjacent to the top thereof, and the upper edge of the contact member 14 is crimped over onto the terminal wire, as shown at 20.

The cup 13 is provided with an inner lining of copper, as shown at 21, and an outer wall of steel, as indicated at 22. This cup may be formed by a stamping process from a sheet of material that comprises a sheet of copper sweated onto a sheet of steel. When forming the cup, an orifice 23 is provided in the bottom thereof, and a rib 24 projects from the bottom wall and surrounds the orifice 23.

As shown in Fig. 4, a wafer 25, preferably of circular form, is placed against the rib 24 and is welded to the bottom of the cup 13. This wafer 25 comprises sintered metal particles, such, for example, as nickel or steel. A multitude of voids is provided between the particles, through which mercury and air are adapted to pass. In the welding operation, pressure is applied so as to force the wafer 25 against the rib 24, and, upon application of the welding heat, there is sufficient concentration of heat in the metal wafer 25 in the region of the rib 24 as to cause the rib 24 to merge or fuse into the wafer 25. In this manner, the wafer 25 is welded up against the bottom of the cup 13, so that the final assembly appears as shown in Fig. 5.

As indicated in Fig. 1, the diameter of the wafer 25 is such that when the switch is assembled this

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wafer projects into the narrower, lower portion of the shell 11, and when assembled the bottom wall of the cup 13 divides the interior of the shell 11 into two chambers 26 and 27.

The assembled switch contains a body of mercury, indicated at 28, that normally rises on the bottom of the cup 13 and is supported on top of the wafer 25. When the mercury is thus disposed, an electrical circuit is completed through the switch from the terminal wire 19 through the electrode 14 and the mercury 28, and then through the walls of cup 13 and shell 11 to a contact ring 29, to which latter ring is fastened a second terminal wire (not shown).

When the mercury switch 10 is spun or accelerated in a direction to force the mercury 28 by centrifugal force through the orifice 23 and against the wafer 25, the mercury is caused to flow through the voids between the sintered metal particles in the wafer. A certain predetermined centrifugal force is required to cause the mercury thus to flow, however, since under normal conditions of rest the mercury is supported on the wafer. When a certain portion of the mercury 28 has thus left the chamber 26 and flowed into chamber 27 so that the level of mercury in chamber 26 is disposed below the electrode 14, the circuit through the mercury switch is broken. The time required for this mercury to thus flow is, of course, dependent upon the time required for the mercury to pass through the voids in the wafer 25. Air in the chamber 27 must be displaced in order for mercury to take the place, and this displaced air must pass through the voids in the wafer 25 in a direction opposite to the flow of the mercury. The rate of air displacement, likewise, affects the rate of flow of the mercury from chamber 26 into chamber 27.

I claim:

1. A mercury switch comprising a switch envelope, a cup in the envelope having an orifice in the bottom thereof, the bottom of the cup being spaced from both ends of the envelope so as to divide the envelope into two chambers, a rib on the bottom face of the cup and disposed substantially circumferentially with respect to the orifice, and a wafer of sintered metal particles adapted to be welded to the rib.

2. A mercury switch comprising a switch envelope, a cup in the envelope having an orifice in the bottom thereof, the bottom of the cup being spaced from both ends of the envelope so as to provide two chambers, and a wafer of sin-

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tered metal particles disposed against the bottom face of the cup and covering the orifice.

3. A time delay element for a mercury switch comprising a cup having an orifice in the bottom thereof, a rib on the bottom face of the cup surrounding the orifice, and a metal wafer welded to the rib and having restricted passages there-through.

4. A time delay element for a mercury switch comprising a cup having an orifice in the bottom thereof, the inside of the cup being lined with copper and the outside of the cup comprising steel, a rib on the bottom face of the cup surrounding the orifice, and a metal wafer welded to the rib and having restricted passages there-through.

5. A time delay element for a mercury switch comprising a cup having an orifice in the bottom thereof, the inside of the cup being lined with a material that resists amalgamation with mercury, a rib on the bottom face of the cup surrounding the orifice, the said rib comprising a material that is readily weldable with steel, and a metallic wafer adapted to be welded to the rib and having restricted passages therethrough.

6. A time delay element for a mercury switch comprising a cup having an orifice in the bottom thereof, the inside of the cup being lined with a material that resists amalgamation with mercury, and a rib on the bottom face of the cup surrounding the orifice, the said rib comprising a material that is readily weldable with steel.

7. A time delay element for a mercury switch comprising a cup having an orifice in the bottom thereof, the inside of the cup being lined with a material that resists amalgamation with mercury, a rib on the bottom face of the cup surrounding the orifice, the said rib comprising a material that is readily weldable with steel, and a wafer comprising sintered metal particles having a multitude of voids between the particles.

8. A time delay element for a mercury switch comprising a cup having an orifice in the bottom thereof, and a wafer of sintered metal particles disposed against the bottom face of the cup and covering the orifice.

9. A time delay element for a mercury switch comprising a wall member having an orifice therein, and a wafer of sintered metal particles disposed against the bottom face of the wall and covering the orifice.

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