May 21, 1940. C. N. WILES 2,201,602

MERCURY SWITCH

Filed March 27, 1939

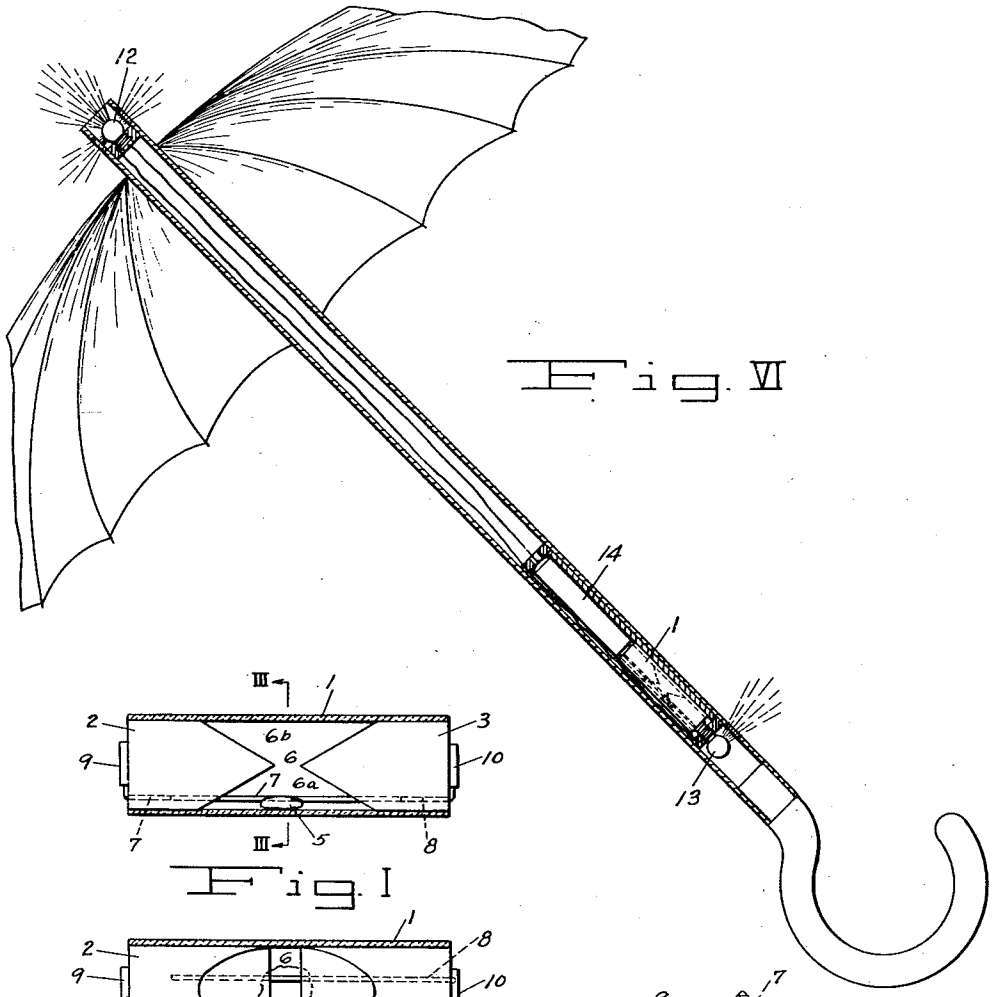


Fig. VI

Fig. I

Fig. II

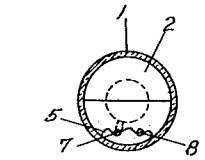


Fig. III

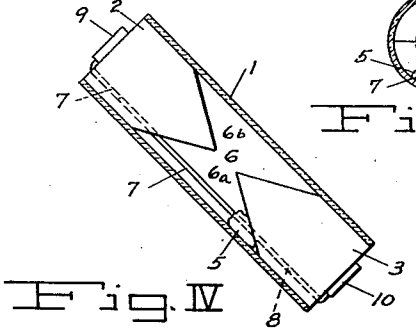


Fig. IV

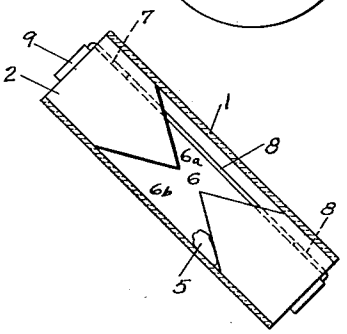


Fig. V

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MERCURY SWITCH

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7 Claims. (Cl. 200—152)

This invention relates to a mercury switch for electrical circuits where special characteristics are required.

It is an object of the invention to produce a mercury switch that is adapted to use as an ignition switch for a motor car and having the special characteristic of breaking the electric circuit in the event of an upset, but which is unaffected by inertia, grade of the road, or any other ordinary incident of driving.

It is especially adapted for use in an illuminated umbrella, for use where there is a traffic hazard. The lighted umbrella is an old idea that has never gone into public use, because of the non-weather proof switches used with consequent rapid destruction of the necessary battery. The umbrella is illustrated but not claimed herein.

The mercury switch has many inherent advantages, well known and widely availed of, but it also has a limiting feature. The mercury switch of commerce is sensitive to shock, inertia, change of level of its support and the like, which tends to limit its use. It is a further object of the present invention to make the known mercury switch principle more adaptable to wide use by simple and inexpensive changes in the element that holds the globule of mercury, always used.

These and other objects that will be apparent from the following disclosure constitute the purpose of the present invention, the novel features of which will be hereinafter described and which are definitely pointed out in the claims.

I have chosen an illuminated umbrella to illustrate the invention since such illustration lends itself readily to explaining the novel qualities of the switch.

A drawing showing six figures, accompanies this specification as a part thereof, but except as hereinafter indicated is not to be regarded as setting a boundary to the invention.

In the drawing—

Fig. I is a side view of the mercury switch of the invention, showing a tubular structure containing the switch elements with the tube walls in section and the switch in closed position;

Fig. II is an orthographic projection of Fig. I with the tube walls sectioned on a plane normal to the section of Fig. I, the switch remaining in closed position;

Fig. III is a cross-section on the line III—III, Fig. I;

Fig. IV is the same structure shown in Fig. I except that the switch has been tilted much the same as it is shown in smaller scale in Fig. VI;

Fig. V is the same structure shown in Figs. I, II, III and IV except that the tubular member has been rolled about 180 degrees which makes the switch inoperative or open; and

Fig. VI is a general view of an illuminated umbrella that employs a carried dry battery as a source of current, lights energized by the battery and a switch according to Figs. I, II and III for a control element.

In the drawing, 1 is a tubular member, shown as of glass, but which may be made of any material that is a non-conductor of electric current and not subject to amalgamation by mercury. The ends of the tubular member 1 will be hermetically sealed in any convenient manner.

Within the tubular member 1, are two similar end plugs 2 and 3, which may be formed from any suitable non-conducting material, synthetic plastics being preferred. These plugs will be hermetically sealed in the respective ends of the tubes, are wedge pointed on their inner ends and are so proportioned that the sharpened wedge points are adjacent but not touching, to provide a gap 6, therebetween and chambers on opposite sides of the tubular member 1, 6*a* and 6*b*.

The chamber 6*a* or 6*b* inside the tube 1, between the ends of the wedge pointed plugs will contain a globule of mercury 5 dependent on which side is down, and the balance of the space will be preferably filled with oxygen free gaseous filler, such as nitrogen.

Two electrodes 7 and 8, extend into and across the space 6, being positioned near the wall of the tubular member 1, hence eccentric to the axis of the tube 1. They will be spaced apart, according to the voltage of current to be employed and close enough to the wall of the tube 1 so that the globule of mercury used to complete electrical connection between the electrodes cannot get out of double contact with the electrodes when the tubular member is right side up, as shown in Figs. I and II, unless the tube 1 is held horizontal or nearly so, when the increased space provided by the wedge shaped points of the plugs 2 and 3 permit breaking contact with much less rolling motion.

The electrodes 7 and 8 are in electrical contact with the metal end plates 9 and 10, respectively, the end plates being a diagrammatic representation of a source of current and the point where the current is usefully employed. Both outside electrical connections may be on the same end if desired.

From Figs. I to IV inclusive, it will be at once apparent that if the switch is right side up, as in Fig. I, and in the handle of the umbrella, Fig.

VI, no change of level from vertical with one end up to vertical with the other end up, will affect the mercury switch and cause it to break electrical contact between the electrodes 7 and 8.

When the tubular element 1 has been rolled through less than 180 degrees with the tubular element 1 held about level, the mercury 5 will roll out of contact with the electrodes 7 and 8 as shown in Fig. V, when again the tube may occupy any position whatever that does not include rolling it back and the mercury will remain out of contact with the electrodes; hence the switch remains open. It will be further noted that the switch assumes the off position far more readily than it can be turned on, hence if used as an ignition switch for a car or as an auxiliary safety switch, the circuit will infallibly be broken in case of an accident that upsets the vehicle.

When employed as shown in Fig. VI, the umbrella may be used as a signaling device, whether open or closed, by employing the electric lamp 12. When the handle is "up" as shown the switch will be operative; when rolled over it will not.

If the umbrella is raised as shown, I prefer in this employment of the switch to have also a telltale light 13, connected in series with the light 12, as shown; hence it is unnecessary for the user's attention to the road to be interrupted to ascertain that his signal light is showing.

In the employment shown, 1 represents as before the tubular shell of the switch shown at reduced scale and 14 represents a dry battery within the handle of the umbrella. Dry cells having an outside diameter of less than half an inch are now a standard article of commerce and can be used as shown without an unduly large umbrella staff, but for clarity the one shown is disproportionately large in diameter.

Having disclosed my invention so that its principle may be readily understood, and also indicated its place in the art, what I claim as new and desire to secure by Letters Patent is:

1. A mercury switch comprising a tubular member, sealing means for the ends of the tube comprising plugs with wedge shaped ends that project into the tube with their ends adjacent but not touching to define chambers on opposite sides of the tube with a space connecting them between the points of the wedges, electrodes that are side by side in one of the chambers and a globule of mercury that is adapted to connect the electrodes when it is the same side of tube as the electrodes.

2. A mercury switch of the character described including a hermetically sealed tubular member, said seal including a pair of plugs with wedge shaped ends that are inserted from opposite ends of the tube, to define chambers joined by a space between the ends of the wedges, parallel spaced electrodes in one of said chambers and a globule of mercury arranged to occupy whichever of the chambers is lowermost at any given time.

3. In a mercury switch, a tube-like mercury container, plug closures for the ends of the tube that are wedge shaped at their inner ends, to define chambers on opposite sides of the tube, connected by a space between the inner ends of the wedges, parallel spaced electrodes in one of the said chambers and a globule of mercury that is shiftable from one chamber to the other by gravitational influence and which is adapted to make electrical connection between the electrodes when in the same chamber with them.

4. In a mercury switch, a tubular container, wedge shaped end closures for the container having their wedge shaped surfaces adjacent but not touching, to define nearly separated inner chambers in said container, a pair of electrodes in one of the chambers that are normally out of electrical contact and a globule of mercury that is shiftable from one chamber to the other under gravitational influence, being of sufficient volume to connect the electrodes together when it is in the chamber containing them.

5. A mercury switch comprising a rotatably mounted tubular container member, means within said container that divide the interior thereof into two chambers, on opposite sides thereof, that are joined by a narrow slit like space, electrodes spaced side by side in one of the chambers that are normally out of electrical contact and a globule of mercury that is effective to connect the electrodes when the container is so turned that the mercury is contained in the chamber containing the electrodes.

6. A mercury switch comprising a tubular container member that is revoluble through a part revolution, a divisional wall member longitudinally of said container that divides it into two chambers save for an aperture in said wall member intermediate its ends, a pair of side-by-side electrodes in one of the said chambers that are adjacent but not electrically in contact, and a globule of mercury that is adapted to join the electrodes electrically when the chamber containing them is lowermost and to fall through the apertured wall into the other chamber when the container is turned part of a revolution.

7. A switch for an electric circuit comprising a turnable tubular body member, a longitudinal divisional member in said body that is provided with a median aperture, a pair of spaced electrodes on one side of the divisional member and a globule of mercury in said body that is free to pass from one side of the body interior to the other side when said body is turned, characterized by the said median aperture being biased on both sides, whereby the mercury will pass when the body is substantially out of level.

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