Nov. 16, 1926. 1,607,551

R. D. MAILEY

MERCURY SWITCH

Original Filed Oct. 27, 1923

Fig. 1

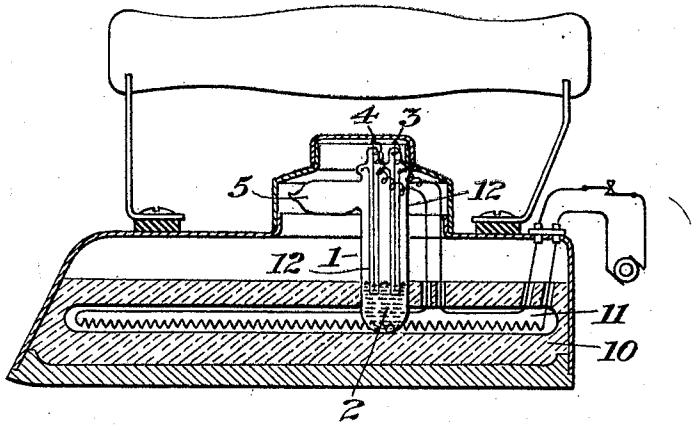
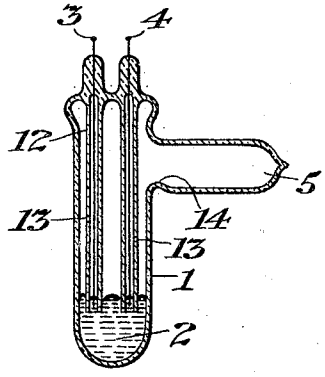


Fig. 2



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UNITED STATES PATENT OFFICE.

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MERCURY SWITCH.

Original applications filed October 27, 1923, Serial No. 671,104, and Serial No. 715,780, filed May 26, 1924. Divided and this application filed December 17, 1924. Serial No. 756,518.

My present invention relates to switches for electric circuits in which movements of the liquid mercury in said switches achieve the making and breaking of the electric conducting path therethrough. It particularly relates to such a switch in which provision is made for the automatic opening thereof at normal or at excessive temperatures when the switch is used with heating apparatus or apparatus which becomes or may become heated during use and availing of the temperature of the heating device to cause the transfer of the liquid mercury from between the terminals of the switch to open the circuit therethrough.

Electric heating apparatus especially of the domestic types are a recognized source of fire hazard and this is especially true in the case of electrically heated flat irons although my invention is applicable to heating or heated apparatus in the arts generally. Many devices are known whose object it is to eliminate or circumvent this hazard but heretofore results therewith have not been entirely satisfactory.

It is the object of my invention to provide a switch for electrical heating apparatus which will automatically open the circuit therethrough when such devices are left standing with the current turned on through the switch.

It is another object of my invention to provide such a thermostatic switch which is simple of operation, fool proof, and simple of construction.

It is another object of my invention to provide such a switch which will automatically open when the device in which it is used is out of its normal position.

It is another object of my invention to provide an electric flat iron switch which will continue to function to open at normal or excessive temperatures, which is automatically closed by the motion of the iron in its use, but will function to open and remain open if left standing in the operative position.

Fig. 1 is a vertical sectional view of an electrically heated flat iron to which the switch of my invention is applied.

Fig. 2 is an elevation view of a switch embodying my invention in which the electrode leads are sheathed in surrounding tubes extending below the lower extremities of the electrodes and providing spaces at the terminals for the making and breaking of arcs between the electrodes and the mercury body.

The device of my invention comprises a body of mercury, or of some other movable and vaporizable substance electrically conductive in the liquid state, which is enclosed in the chamber of a vitreous envelope of such material as glass. Through the walls of the envelope and in contact with the said body of mercury, for example, are sealed electrical conductors which on their outer ends are suitably connected to electric mains and heating apparatus. Connecting with the same chamber near its top is a condensing chamber for the condensation and collection thereof of vaporized mercury or the like passing thereto from the main chamber. Means is provided for preventing the flow of the condensed mercury back into the main chamber. Such means as described below and shown in the drawings are embodied in a lower floor or boundary for such condensing chamber which recedes from the main chamber to form with the other walls of said chamber a liquid collecting pocket. Another embodiment shown and described is a raised rim or ridge at the confluence of the two chambers which rim or ridge serves as a dam to hold back and collect condensed liquid in the condensing chamber. Such recession of the floor or such raising of a rim is of such degree as to permit, for instance in the use of my switch in an electric heated flat iron, of a constant and continuous return of the mercury or other liquid collected in the condensing chamber through the normal movement of the iron in its use for ironing. When the iron is in use and the switch in almost constant motion the condensed mercury is continually returned to the main body and the switch left closed. Any cessation of motion will mean the accumulation of mercury in the condensing chamber and a continuation of such accumulation will result in the opening of the switch, and the discontinuing of current supply to the heating element, and the cooling of the iron. Further, some forms of the device of my invention provide for the opening of the switch either

by evaporation and condensation or by the flowing of the mercury therein from the circuit making position in any position out of the normal in which switch may be placed either accidentally or intentionally.

In the switch of my invention I use mercury within a sealed envelope having electrodes sealed through the walls thereof and a sub-chamber into which the mercury moves by distillation and condenses. This sub-chamber is so constructed with respect to the main envelope or chamber that the mercury which distills thereto and condenses therein can be easily and quickly moved back to the main chamber by a simple movement of the switch or of the apparatus in which the switch is installed or by its normal movement in the use of the apparatus in which it is installed.

As an example I shall describe the use of the switch of my invention in connection with an electrically heated flat iron.

In the drawings is shown an envelope 1 as of glass having a condensing sub-chamber near its top and the level of the bottom boundary of which lowers away from the main chamber. Through the walls of the envelope 1 are sealed electrodes 3 and 4 which in the normal position and condition of the switch are connected by the body of mercury 2, within said envelope. Under normal operating or excessive temperature, a part of the body of mercury 2 will be distilled therefrom passing into the sub-chamber or pocket 5 where it will condense and accumulate. This distillation and accumulation will continue while such normal or excessive temperature is maintained when the switch is at rest until sufficient mercury passes from the main body 2 to disrupt the electrical conducting path between electrodes 3 and 4.

In Figure 1 is shown flat iron 10 into the body of which is inserted the lower part of the switch envelope 1 the said lower part situated near the heating element 11 of the iron and showing the sub-chamber or pocket 5 as situated outside and away from said heating element. Said lower boundary of the sub-chamber or pocket 5 is substantially a plane terminating in a rim 14 at the juncture thereof with the main body 1 of the switch so that when the switch is sufficiently tilted in the direction away from said pocket any mercury therein will flow back into the main chamber 1. In this position the main body of mercury 2 is subjected to the temperature of the iron while the sub-chamber or pocket 5 remains always at a much lower temperature when the iron is heated and at a temperature at which any mercury distilled thereto from body 2 will condense and accumulate therein.

In the operation of the first form of the device of my invention, using the electrical heated flat iron application as an example, when the flat iron is in its normal position and current turned thereon a conducting path will continue therethrough until a temperature is reached such that will cause the distillation of mercury vapor from the mercury body 2 and the passing thereof to pocket 5 and the condensation thereof in said pocket where it will accumulate in a body. This distillation, accumulation, and condensation will continue while such temperature prevails until the conducting path between electrodes 3 and 4 is disrupted and the current through said heating element 11 is discontinued whereupon the temperature in said iron lowers and any danger of fire hazard through it is averted. To return the mercury accumulated in chamber 5 to the main body of mercury 2 the iron is simply shaken or tilted to cause said mercury to flow back to the body 2.

In Figure 2 is shown a form of my invention in which the electrodes 3 and 4 are sealed through the top of the envelope 1 of the switch, each of said electrodes being surrounded by the glass tubes 12 which extend beyond the inner ends of the electrodes to provide restricted spaces about said ends and which serve to a degree to quench or dissipate any arcing that takes place on the movement of the mercury away from such ends. About midway between the ends of such tubes 12 are the holes 13 which serve to equalize vapor pressures throughout said tubes 12 and the interior of envelope 1. The rim 14 between chamber and condensing chamber 5 is of such height as to hold sufficient mercury on the substantially horizontal floor 15 of chamber 5 to result in the opening of the circuit between electrodes 3 and 4.

I have shown the tubes 12 as having holes 13 at the sides thereof intermediate of their ends, but I make the tubes 12 without such openings when desired or required.

When desired, the switches may be filled with suitable gas such as hydrogen, nitrogen, etc., for dissipating the heat at the instant of breaking of the circuit and to serve also in quenching any arc which would tend to form.

This application is a division of my application filed May 26, 1924, Serial Number 715,780 and of my application filed October 27, 1923. Serial Number 671,104.

I claim—

1. In a mercury switch, in combination, a sealed envelope comprising a main chamber and a condensing chamber connecting therewith, said condensing chamber having a substantially horizontal lower floor and a ridge extending across said floor at the confluence of said chambers, a body of mercury in said main chamber, electrodes extending from the top of said chamber and into said body of mercury, sheathings of vitreous insulat-

ing material surrounding said electrodes, fused to said envelope at the seal-ins of said electrodes and extending below the inner ends of said electrodes.

2. In a murcury switch, in combination, a sealed envelope comprising a main chamber and a condensing chamber connecting therewith, said condensing chamber having a substantially horizontal lower floor and a ridge extending across said floor at the confluence of said chambers, a body of mercury in said main chamber, electrodes extending from the top of said chamber and into said body of mercury, tubes of vitreous insulating material surrounding said electrodes, fused to said envelope at the seal-ins of said electrodes and extending below the inner ends of said electrodes.

3. In a mercury switch, in combination, a sealed envelope comprising a main chamber and a condensing chamber connecting therewith, said condensing chamber having a substantially horizontal lower floor and a ridge extending across said floor at the confluence of said chambers, a body of mercury in said main chamber, electrodes extending from the top of said chamber and into said body of mercury, sheathings of vitreous insulating material surrounding said electrodes, fused to said envelope at the seal-ins of said electrodes and extending below the inner ends of said electrodes, and each having an opening in its side substantially midway of its ends.

4. In a mercury switch, in combination, a sealed envelope comprising a main chamber and a condensing chamber connecting therewith, said condensing chamber having a substantially horizontal lower floor and a ridge extending across said floor at the confluence of said chambers, a body of mercury in said main chamber, electrodes extending from the top of said chamber and into said body of mercury, tubes of vitreous insulating material surrounding said electrodes, fused to said envelope at the seal-ins of said electrodes and extending below the inner ends of said electrodes, and each having an opening in its side substantially midway of its ends.

5. In a mercury switch, in combination, a sealed envelope comprising a main chamber and a condensing chamber connecting therewith, said condensing chamber having a substantially horizontal lower floor and a ridge extending across said floor at the confluence of said chambers, a body of mercury in said main chamber, electrodes extending from the top of said chamber and into said body of mercury, sheathings of vitreous insulating material surrounding said electrodes, fused to said envelope at the seal-ins of said electrodes and extending below the inner ends of said electrodes to form a chamber about each of said terminal ends.

6. In a mercury switch, in combination, a sealed envelope comprising a main chamber and a condensing chamber connecting therewith, said condensing chamber having a substantially horizontal lower floor and a ridge extending across said floor at the confluence of said chambers, a body of mercury in said main chamber, electrodes extending from the top of said chamber and into said body of mercury, tubes of vitreous insulating material surrounding said electrodes, fused to said envelope at the seal-ins of said electrodes and extending below the inner ends of said electrodes to form a chamber about each of said terminals.

Signed at Hoboken, in the county of Hudson and State of New Jersey, this 12th day of December, A. D. 1924.

ROY D. MAILEY.