Feb. 23, 1943. E. D. BACON 2,311,808

MERCURY SWITCH

Filed Oct. 23, 1941

FIG. 1

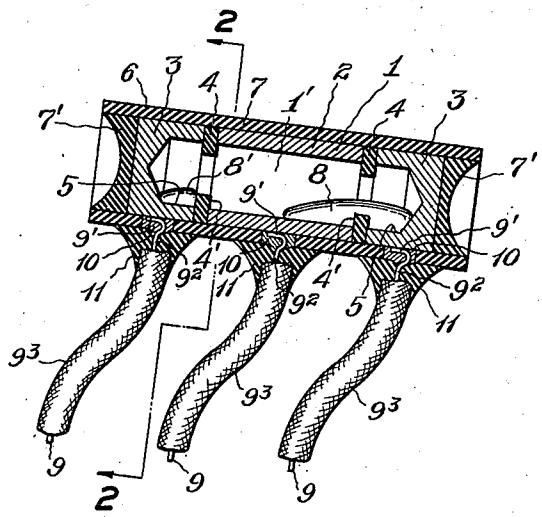


FIG. 2

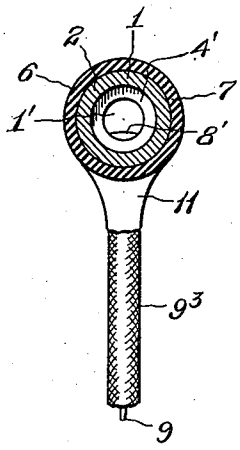
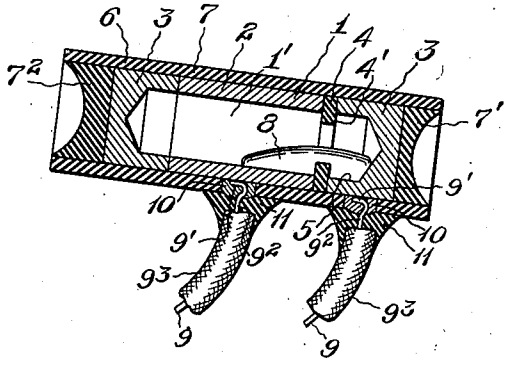


FIG. 3



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MERCURY SWITCH

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4 Claims. (Cl. 200—152)

The instant invention relates to electric connections, and particularly to an improved form of mercury switch for making and breaking such connections and to improved electrical connections for such switches and the like.

The purposes of the invention are the designing of an improved electric switch in which the contacts are of the mercury to mercury type and are enclosed in a cartridge which is metallic so as to eliminate breakage, which cartridge, however, is so completely electrically insulated that no arcing takes place. Furthermore, the assembly making up the improved mercury switch is such as to prevent burning and sticking of points thus assuring long life of satisfactory operation.

The annexed drawing and the following description set forth in detail certain means illustrating my improved mercury switch and electrical connection, such means constituting, however, but two of the various forms in which the principle of the invention may be embodied.

In said annexed drawing:

Figure 1 is an axial section of the improved mercury switch of the double-pole type and the improved electrical connection therefor;

Figure 2 is a transverse section, taken in the planes indicated by the line 2—2, Figure 1; and

Figure 3 is an axial section of the improved mercury switch of the single-pole type and the improved electrical connection therefor.

Referring to the annexed drawing in which the different parts are indicated by the same respective numbers in the several views, a metal cartridge 1, made from Swedish iron, for instance, is comprised of three parts, which are an intermediate part 2 of open-ended tubular cylindrical formation, and two recessed cylindrical end portions 3, having each one closed end so that if the three parts 2 and 3 were assembled in closely adjacent formation, they would form a closed and chambered metal cylindrical formation having inwardly-extending frusto-conical ends. The parts of the cartridge 1, however, are not assembled in closely adjacent formation, but the intermediate part 2, in the double-pole type of switch, Figure 1, is spaced from the end parts 3 by insulation strips 4, shown in the accompanying drawing as washers, and having inside peripheral portions 4' extended into the chamber 1' of the cartridge 1, thus forming pockets 5 between the respective washers 4 and the end walls of the end parts 3. Preferably, the washers 4 are formed of mica.

In the single-pole type of switch shown in Figure 3, there is one such washer 4 forming one such end pocket 5, the opposite end of the intermediate cartridge part 2 being flush with and in tight contact with the adjacent inner end of the opposite cartridge end part 3.

The metallic cartridge and the insulated washer assembly is enclosed by a fiber or Bakelite or other suitable insulating housing 6 consisting of a main open-ended tubular cylindrical portion 7 provided with end plugs 7', preferably of sealing wax, which is deposited in tight sealing engagement with the inside surface of the housing portion 7 and with the outer ends of the two end parts 3 of the metal cartridge 1. In the single-pole type of switch, Figure 3, the plug adjacent the end of the cartridge 1 farthest removed from the washer 4 is of increased thickness for accommodation in a housing portion 7 of standard length and is designated "7^2."

Preferably, the chamber 1' of the sealed cartridge 1 is filled with hydrogen, and within this chamber is contained a suitable body 8 of mercury sufficient, in any tilted position of the switch incident to its customary closed position, to insure a level of mercury above the inner peripheral edge of the washer portion 4'. Also, the body of mercury is such that any desired tilted open position of the switch, Figure 3, or either end thereof, Figure 1, results in a breaking of the mercury continuity across the switch portion 4' and the retention of a small portion of mercury 8' within the end pocket 5.

The assembly of cartridge and mercury so far described assures a large area of contact directly between good conducting metal and mercury, and also assures a quick break in the mercury when the switch is tilted toward open position.

Conducting wires 9 are soldered in contact with the outer surface of the cartridge parts 2 and 3, three such contacts in the double-pole type, Figure 1, and two such contacts in the single-pole type, Figure 3, this sealing and securing of the conducting wires 9 being effected as follows: Holes are formed through the insulating housing portion 7 and hooked terminals 9' of exposed end portions of the wires 9 are retained in close engagement with the outer surfaces of the cartridge parts 2 and 3 by means of solder plugs 10 which completely fill the holes in the housing portion 7 and entirely surround the contact terminals 9' of the wires 9. Exteriorly of the solder plugs 10 and surrounding the adjacent portions 9^2 of the wires 9 and overlapping and encasing the adjacent end portion of

the insulation 9^3 of the wires 9 and extended outwardly at their base portions over and in close sealing engagement with the adjacent portions of the housing portion 7 are seals 11 for the solder plugs 10 which completely insulate the joint formed by the ends of the wires 9 and the exterior surface portions of the cartridge parts 2 and 3. Preferably, the seals 11 are formed of an insulating sealing wax having a high melting point.

From the aforegoing description, in connection with the accompanying drawing, the action of the described improved mercury switch will be readily understood to be as follows: Upon a suitable tilting of the switch to closing position, the body of mercury 8 will be of continuous formation extending over an inwardly-extended peripheral portion 4' of one of the washers 4 so as to electrically connect the intermediate cartridge part 2 and one of the end cartridge parts 3, thus closing the circuit through the central contact and an end contact. When the switch is in inoperative tilted position, the major portion of the mercury body 8 will be retained between the two inwardly-extended peripheral portions 4' of the washers 4, Figure 1, or between the washer portion 4' and the far end of the cartridge 1, Figure 3, and the upper surface of such retained part of the mercury will be below the level of the top surfaces of the lowest parts of washer portions 4' and there will be no electrical continuity between the intermediate cartridge part 2 and either of the end cartridge parts 3, Figure 1, or the cartridge part 2 and the right hand end cartridge part 3, Figure 3. However, a portion 8' of the mercury body will be retained in the end pocket(s) 5, so that when the switch is tilted into closed position, there will be effected a mercury to mercury contact, over the washer portion 4', between the main body of the mercury in the intermediate part of the cartridge 1 and the small portion of mercury 8' retained in a pocket 5.

What I claim is:

1. A mercury switch comprising an outer closed casing, a closed cartridge within said casing, and a body of mercury within said cartridge, said cartridge including a metallic tubular part having an open end, a metallic recessed end part at said open end, and an insulating washer spacing said end part from said tubular part and extending inwardly of the inner peripheries of said tubular part and of the recess of said end part, said body of mercury being sufficient to bridge over the inner periphery of said washer to connect electrically said metallic parts when said cartridge is tilted to an appreciable extent but insufficient to bridge over the inner periphery of said washer when said cartridge is substantially horizontal, and said casing including a tubular portion of insulating material which receives the entire cartridge with a tight telescopic fit and end portions which tightly engage the ends of said cartridge, whereby the casing holds the parts of the cartridge in assembled relation.

2. A mercury switch comprising an outer casing of insulating material, a closed cartridge closely fitting therein, said cartridge including a metallic tubular member having open ends and metallic end parts for closing said open ends, an insulating washer spacing one of said end parts from the adjacent open end of said tubular part and extending inwardly of the inner periphery of said tubular part, and a body of mercury within said cartridge sufficient to bridge over the inner periphery of said insulating washer to connect electrically said metallic tubular part and said one end part when the cartridge is tilted to an appreciable extent but insufficient to bridge over the inner periphery of said insulating washer when the cartridge is substantially horizontal, said casing holding the parts of said cartridge in closely assembled relation.

3. A mercury switch comprising an outer casing of insulating material, a cartridge closely fitting therein, said cartridge including a metallic tubular part having an open end and a metallic end part, an annular insulating member spacing said end part from said open end of said tubular part and extending inwardly of the inner periphery of said tubular part, and a body of mercury within said cartridge sufficient to bridge over the inner periphery of said annular insulating member to connect electrically said metallic parts when the cartridge is tilted to an appreciable extent but insufficient to bridge over the inner periphery of said annular insulating member when the cartridge is substantially horizontal, said casing having end portions which tightly engage the ends of said cartridge and hold said cartridge in closely assembled relation within the casing.

4. A mercury switch as defined in claim 3 and in which the cartridge is filled with a gas inert to mercury and is sealed gas-tight by the casing, said casing has holes leading to the metallic tubular part and to the metallic end part of said cartridge, electrical conductors have terminals in said holes and in contact electrically with the metallic parts of said cartridge to which the respective holes lead, masses of solder completely encase said terminals and substantially fill said holes, and insulating material completely covers said solder masses and seals the joints between the latter and the adjacent portions of said casing.

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