Oct. 6, 1942. C. W. TRAUTMAN ET AL 2,297,924

MERCURY SWITCH

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Fig. 1.

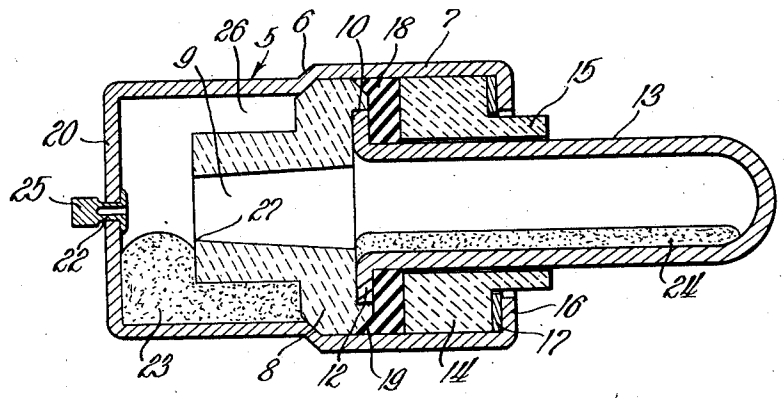


Fig. 2.

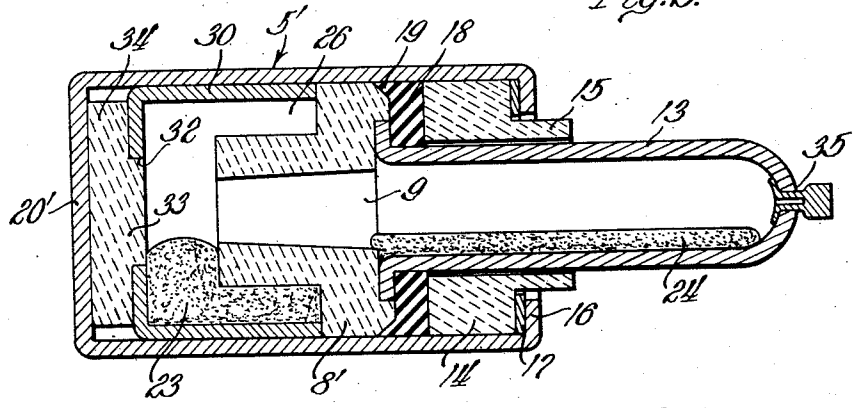
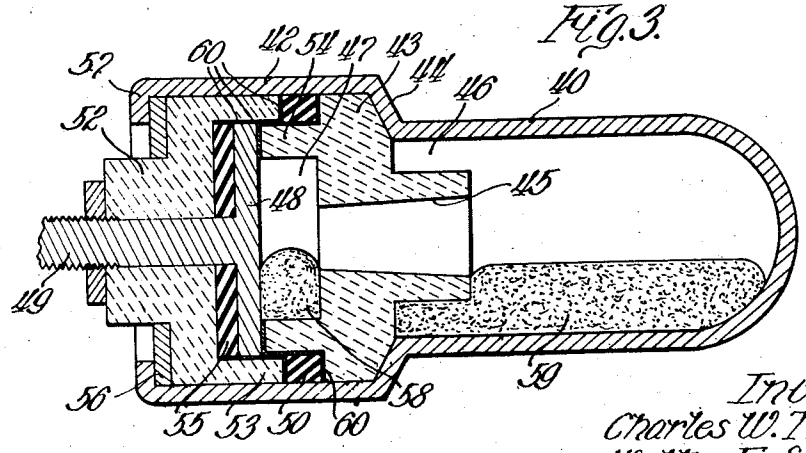


Fig. 3.



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Fig. 4.

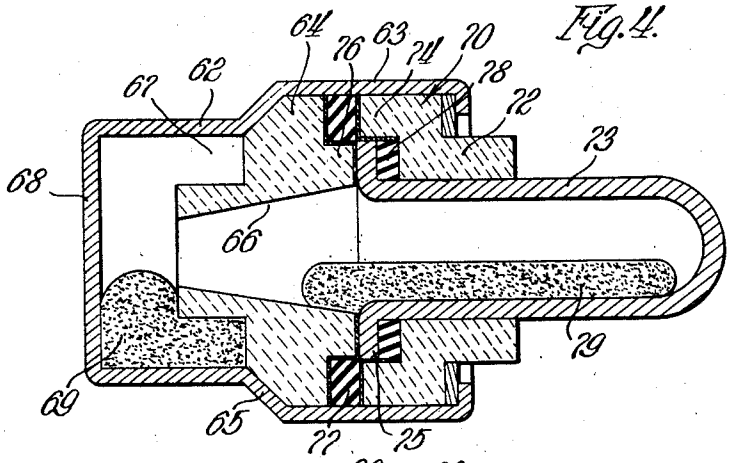


Fig. 5.

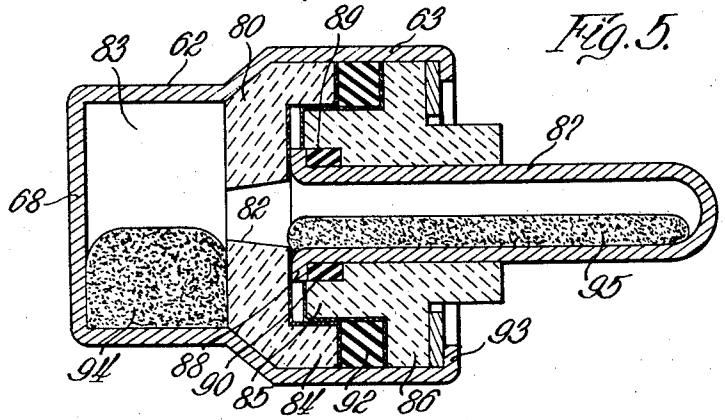
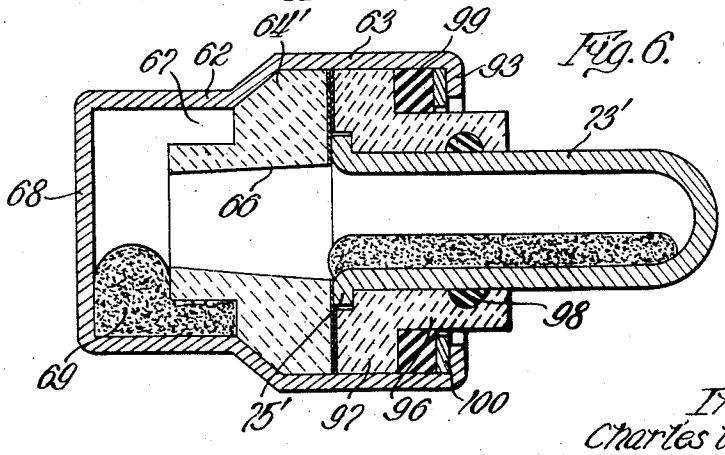


Fig. 6.



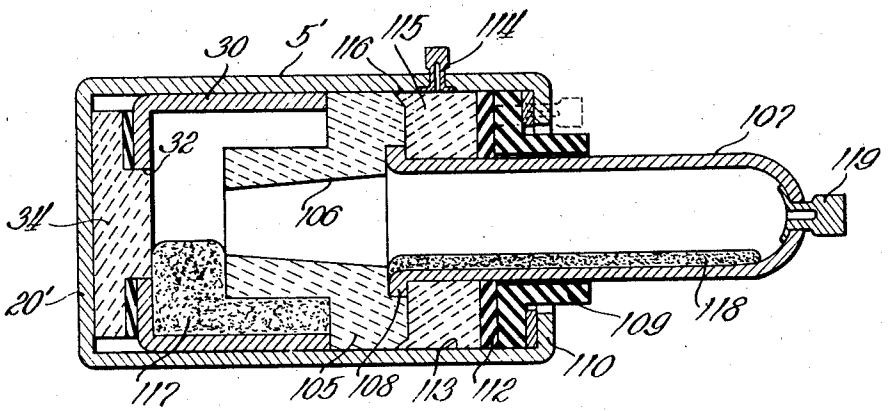
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MERCURY SWITCH

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Fig. 7.



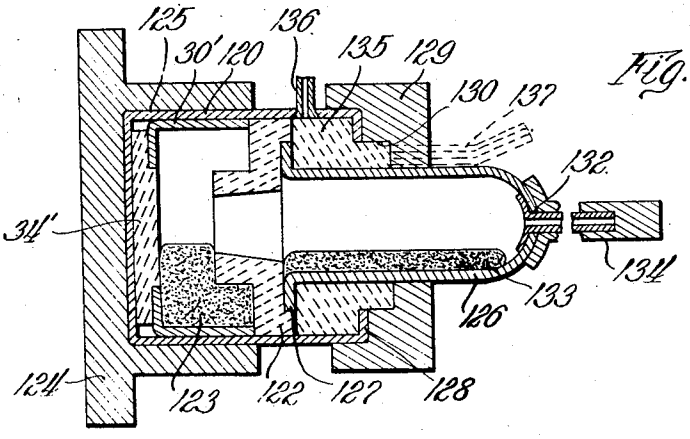


Fig. 8.

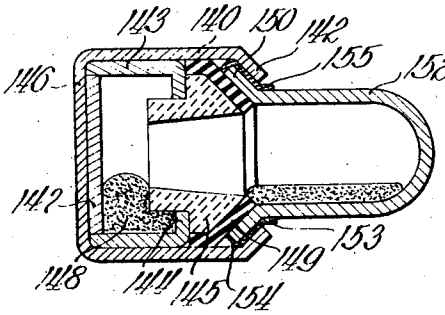


Fig. 9.

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UNITED STATES PATENT OFFICE

2,297,924

MERCURY SWITCH

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Application May 8, 1940, Serial No. 333,922

9 Claims. (Cl. 200—152)

This invention relates to mercury switches, and more particularly is directed to a metal envelope switch of the type in which two metal envelopes are arranged in telescoping relation and suitably insulated and sealed to define a switch chamber having an insulating barrier between the interiors of the two envelopes over which bodies of mercury contained in each of the envelopes are adapted to make and break circuit through the switch.

One of the primary objects of the present invention is to provide a switch construction of the type in which one metal envelope has a portion thereof radially larger than the other envelope into which the open end of the second envelope is adapted to project, with suitable means for clamping the two envelopes in telescoping relation and sealing and insulating them from each other in position to define a sealed switch chamber composed of the two envelopes and an insulating barrier therebetween.

Still another object of the present invention is to provide a construction in which two ceramic or refractory molded inserts are provided between which is clamped the flanged end of one of the metal envelopes. Preferably, suitable resilient sealing means are provided which are adapted to be compressed into sealing engagement between the two envelopes during assembly to prevent leakage of gas or the like into or out of the envelope.

Still another feature of the present invention is the provision of a structure in which separate gaskets are provided for sealing one of the envelopes with respect to the refractory inserts and for sealing the refractory inserts with respect to the other envelope. By the use of such sealing means, a cushioned action is provided in the assembly of the switch preventing any damage to the ceramics and at the same time insuring positive sealing of all possible leakage paths between the component parts of the switch.

Still another feature of the present invention is the provision of an insulator or insert of this type which has glazed surfaces to eliminate the passage of gas therethrough, thereby reducing the amount of sealing required so that the only seals necessary are those between the inserts and the respective envelopes, no seal being required between the two inserts themselves.

A still further feature of the present invention is the elimination from the sealing means of the function of centering or supporting the inner envelope in position, whereby this function is accomplished entirely by the inserts, thus relieving the sealing means of any of the stresses incident to such a function.

A still further object secured by the present invention is the provision of a structure in which one body of mercury is retained in contact with one of the envelopes and merely moves relative to the face of such envelope, while the other body of mercury is movable across the insulating barrier into and out of contact with the first body of mercury. Preferably, the two bodies of mercury are of substantially equivalent volume and the design is such that both have relative movement with respect to the point of making and breaking of circuit through the switch so that the rate of such making and breaking is the sum of the rates of movement of the two bodies.

Another important feature of the present invention is the provision of a switch structure in which, in place of a resilient seal such as rubber or the like for insuring sealing of all leakage paths from the interior of the switch chamber to atmosphere, a plastic or similar insulating material is poured in liquid form into a sealing recess, and when cooled, sets in position as a semi-elastic non-current carrying sealing means. The plastic is of such a type that it expands slightly upon setting, thereby insuring a positive seal in the structure, or, if desired, the plastic in liquid form may be maintained under pressure so that when it sets, it will retain this pressure against the surfaces to be sealed.

The plastic may be introduced through tubulation into the sealing recess, or may be merely poured into a form which defines the sealing recess after the switch parts have been assembled.

Another advantage secured by the present invention is that the two mercury bodies are in contact with exposed metal envelopes, whereby radiation and dissipation of heat is provided, producing cool operation and therefore increasing the current carrying capacity.

Other objects and advantages of the present invention will be more apparent from the following detailed description, which, taken in conjunction with the accompanying drawings, will disclose to those skilled in the art the particular construction and operation of a preferred form of the present invention.

In the drawings:

Figure 1 is a sectional view through one form of switch embodying the present invention;

Figure 2 is a corresponding view showing a slightly modified electrode construction;

Figure 3 is a view showing a telescoping arrangement for the inserts which separate the two

electrodes and which insures positive pressure contact upon each of the separated sealing means;

Figure 4 is a construction embodying the same principle as that shown in Figure 3 but employing a modified type of envelope structure;

Figure 5 is a view corresponding to Figure 4 with a further modification of one of the electrodes;

Figure 6 is a view corresponding to Figure 4 showing a different arrangement of the sealing means;

Figure 7 illustrates a switch structure employing a liquid setting cement or plastic as a sealing means;

Figure 8 illustrates a switch similar to Figure 7 with a modified type of sealing recess; and

Figure 9 is a sectional view of a two-envelope switch construction of simplified design.

Referring now in detail to the drawings, in Figure 1 I have illustrated a main switch envelope 5 which is of generally cup-shaped form having a slightly frusto-conical switch joining the main body portion to the enlarged cylindrical end portion 7. Disposed within the envelope 5 is a ceramic insulator or insert 8 which may be of any desired refractory having arc resisting characteristics, which is seated against the internal shoulder 6 and has an axially extending bore 9 extending for an appreciable distance toward the closed end of the envelope 5. At its outer end the insert 8 is provided with the annular recess 10 in which is centered the flanged end 12 of a second envelope or electrode 13, also of cup-shaped form which telescopes into the open end of the envelope 5 and is centered in the recess 10 of the insert 8. Extending about the cylindrical portion of the envelope 13 is a second insulating compression member or insulator 14 which, in the present form of the invention, is provided with a reduced cylindrically extending portion 15 serving as an insulating barrier between the spun-over end 16 of the envelope 5 and the lateral surface of the envelope 13. A suitable annular metallic retaining ring 17 may be provided between the spun-over flange 16 and the shouldered portion of the ceramic 15 to prevent possible cracking or chipping of the corners of the ceramic.

Intermediate the inserts 8 and 14 and closely embracing the annular surface of the envelope 13 is a resilient sealing gasket 18 which is preferably formed of rubber or the like, and which has a short tapered peripheral flange 19 adapted to radially overlap the insert 8. In the assembly of the structure thus far disclosed, the insert 8 is first positioned within the envelope 5, and the flanged end 12 of the envelope 13 is then centered within this insert. The gasket 18 is then forced over the envelope 13 against the outer face of the flange 12 and about the tapered end of the insert 8. The compression member is then placed in position and suitable axial pressure applied thereto to axially compress the sealing gasket 18, expanding the same into positive sealing engagement between the electrode envelope 5 and the envelope 13. The end 16 of the envelope 5 is then spun over to lock the compression member in position and maintain the gasket 18 under pressure. The end face 20 of the envelope 5 is provided with a short tubulation 22, and in the desired form of the invention this tubulation is employed to first introduce mercury comprising the mercury bodies 23 and 24 into the envelope or switch chamber, and is then used to evacuate the chamber for drawing from all cracks or crevices therein any occluded gases or the like. The tubulation is then connected to a source of hydrogen under pressure which is forced into the envelope under a pressure substantially above atmospheric, after which the tubulation is pinched and welded as indicated at 25 to seal the interior of the switch.

In the operation of the switch shown in Figure 1, tilting of the switch in a counter-clockwise direction results in the body of mercury 23 which lays in the annular groove 26 formed about the projecting portion of the bore 9 rising up over the internal face of the end 20 of envelope 5 to protect this face from the body of mercury 24, which is moving through the bore 9. As a result, when contact is made, it is effected between the bodies of mercury 23 and 24 approximately at the inner end of the bore at the point indicated at 27, which is at a point remote from the envelope 5 so as to prevent any possibility of arcing or transfer of heat thereto. Similarly, when the switch is tilted in the opposite direction, both bodies of mercury 23 and 24 tend to run at the same time, the body of mercury 23 tending to run back into the annular recess 26, while the body of mercury 24 tends to run outwardly through the bore 9. As a result, the circuit is broken over the edge 27, thereby insuring that any arcs produced in the switch will be produced adjacent this point. In order to insure this, the bore 9 is very slightly tapered with its small end disposed toward the electrode face so as to insure that the breaking point will occur at the edge 27.

Considering now the switch structure shown in Figure 2, similar reference numerals have been applied to similar parts. In this form of the invention, the envelope 5' is of uniform diameter and is of a slightly greater axial length than the envelope 5 of Figure 1. The insert 8' disclosed therein is of the same general form as the insulator 8 with the exception that it is not provided with the beveled shoulder for engaging the bevel 6, as described in connection with Figure 1, but instead has abutting engagement with the sleeve 30 secured within the envelope 5' as by welding or the like. The sleeve 30 forms the outer defining surface of the annular recess 26 in which is retained the body of mercury 23. However, in this form of the invention, to insure that there will be no metal to mercury contact within the switch, the base portion of the cup-shaped sleeve 30 is apertured, as indicated at 32, to receive the projecting portion 33 of an insulating disc 34, which may be formed of a ceramic or similar material which is thereby located between the base 20' of the envelope 5 and the sleeve in such manner that there will be no metal in direct alinement with the bore 9 through the insert 8', which bore is tapered in a manner corresponding to that described in connection with Figure 1. In this form of the invention, the tubulation is disposed at the closed end of the envelope 13, as indicated at 35, instead of being located in the envelope 5'. This is due to the fact that the insulator 34 precludes the arrangement shown in Figure 1. The switch is assembled, filled with mercury, evacuated and filled with hydrogen in the same manner as described in connection with Figure 1, and the same tilting action operates the switch in the same manner as described in Figure 1. Due to the fact that the volume of mercury 23 is in contact over an appreciable area of the sleeve 30, it is apparent that the internal resistance of the switch is thereby materially re-

duced and, as a result, such a switch is capable of handling relatively large currents. By use of the insulating center 33 in the sleeve 30, it is obvious that it will be impossible to produce a metal to mercury contact in a switch of this design, which therefore eliminates any possibility of pitting or corroding the metal due to arcing between the metal and the mercury.

In the embodiment shown in Figure 3, a cup-shaped metal envelope 40 is provided having the enlarged open end 42 in which is disposed the insulator 43 seated against the frusto-conical shoulder 44 formed in the envelope. The insulator 43 is provided with a tapered axial bore 45 opening at its larger end into the closed end of the envelope 40 and having the annular space 46 extending thereabout within the small cylindrical portion of the envelope. At its opposite end the bore 45 opens into an annular recess 47 which is closed at the outer end by means of the electrode disc 48 having the projecting shank 49. The cylindrical flange portion of the insulator 43 defining the recess 47 has an external diameter less than the internal diameter of the enlarged portion 42 of the envelope, thereby providing an annular recess which is adapted to receive the ring-like resilient sealing gasket 50. A suitable compression member 52 preferably formed of a refractory insulator or the like is inserted into the open end of the envelope, and is provided with a counter-bored portion receiving the electrode disc 48. The defining flange portion 53 of the compression member 52 has telescoping engagement about the flange 54 of the insulator 43, and upon axial inward movement, provides for axial compression of the gasket 50 to provide firm sealing engagement between the gasket and the insulator. Disposed in the base of the recess formed by the flange 53 of the compression member 52 is a disc-like resilient gasket 55 which is adapted to be compressed by abutment of the electrode disc 48 against the radial face of the flange 54. Upon axial compression of the assembly thus far described, it will be apparent that both of the gaskets 50 and 55 are compressed into sealing engagement as the two flanges 53 and 54 move in telescoping relationship. A suitable metallic retaining ring 56 is provided upon which pressure is applied to move the member 52 axially inwardly, and while the envelope is retained in this position, the end 57 of the envelope is spun over to lock the parts in sealed engagement.

A suitable body of mercury 58 is adapted to be retained in the bottom of the annular recess 47 in contact with the face of the electrode 48, and a second body of mercury 59 is disposed in the main body portion of the envelope 40, and upon tilting of the switch, is movable through the bore 45 into engagement with the body of mercury 58 which, at the same time moves across the central portion of the face of the electrode disc 48. By reason of such a construction, a positive mercury to mercury contact is provided.

The undercut 46 and bore 45 cooperate to control the angle of operation of the switch, and can be designed to provide any desired angle. By providing the undercut 46, the mercury 59 builds up in this space upon tilting, and thus the angle of tilting is increased.

Inasmuch as certain types of refractory inserts are porous in character and will allow slow dissipation of gas therethrough we preferably provide for glazing certain faces of the insulator 43 and the compression member 52 to render the same impervious to the passage of gas therethrough. These surfaces are indicated at 60 and may be glazed in any suitable manner to facilitate both the sliding engagement and also to insure that there will be no leakage path between the flange 54 and 53 where they lie in overlapping relation. Thus a positive seal is provided by this structure.

Considering now the form of the invention shown in Figure 4, a first envelope or electrode 62 is provided having the enlarged portion 63 within which is disposed the insulator 64, this insulator seating against the frusto-conical shoulder 65. The insulator 64 is provided with a frusto-conical axial throat or passageway 66 extending therethrough and opening at the small end of the bore into the annular recess 67 formed about the projecting lip defining the small end of the insert, with the small end of the bore being spaced an appreciable distance away from the end face 68 of the envelope 62. A suitable body of mercury 69 is retained in the recess and is of sufficient volume to rise radially to the small end of the bore, thereby overlying a portion of the face 68 of the envelope.

Also seated in the enlarged end 63 of the envelope is a ceramic compression member 70 which has a main body portion 72 bored to receive the second metallic envelope or electrode 73 and provided with a radially offset cylindrical flange portion 74 which is adapted to have telescoping engagement over the flanged end 75 of the envelope 73 and over the shoulder 76 formed on the outer end of the insulator 64 against which the flange 75 abuts. Two separate gaskets preferably formed of resilient insulating material, such as rubber or the like, are provided for sealing the interior of the envelope against leakage. One such gasket, indicated at 77, is disposed radially about the shoulder 76 of the insulator 64 and is adapted to be compressed by the inner radial face of the flange 74 of the compression member 72. The other gasket 78 of similar composition is compressed by the radial portion of the compression member 70 disposed radially within and axially offset from the face of the flange 74. This compresses the gasket 78 up against the outer face of the flange 75 of the envelope, thereby providing a positive and effective seal between the envelope and the compression member. Similarly, the gasket 77 provides an effective seal between the envelope 62 and the insulator, and by suitably glazing the adjacent surfaces of the insulator 64 and compression member 70 a positive leak-proof switch construction is provided. The envelope 73 is adapted to carry a movable body of mercury 79 which, upon tilting of the switch, moves upwardly along the frusto-conical throat 67 and into contact with the body of mercury 69 which, at this time, has moved out of the recess 67 to a point where it over-lies that portion of the end face 68 of the envelope 62 which is in alinement with the bore 66. Thus, a positive mercury to mercury contact is provided.

The tilting of the switch in the opposite direction results in both bodies of mercury moving away from the acute angle at the small end of the throat 66 resulting in a rapid breaking of the circuit over this angle at a rate substantially equal to the sum of the rates of movement of the two bodies of mercury.

In the form of the invention shown in Figure 5, similar parts have been designated by similar reference numerals.

The insulator 80 in this form of the invention

is provided with the short tapered axial bore 82 opening into the annular recess or switch chamber 83 disposed between the end face 68 of the envelope 62 and the inner radial face of the insulator 80. The insulator is provided with a cylindrical peripheral flange portion 84 extending into the cylindrical portion 63 of the envelope 62 and adapted to receive therein the forwardly extending flange portion 85 of a compression member 86, which compression member is bored out to receive the second metallic envelope or electrode 87. The envelope 87 is provided with a flanged open end having the radial flange 88 bearing against the face of the insulator 80 within the flange 84. The compression member 86 is recessed, as indicated at 89, adjacent the flange 88, and a suitable gasket 90 is interposed therein and is adapted to seal the external surface of the envelope 87 with respect to the compression member 86. Similarly, a gasket 92 of resilient material is interposed between the end of the flange 84 and about the projecting portion 85 of the compression member 86, and is adapted to be compressed therebetween for sealing the compression member 86 with respect to the envelope 62. These two gaskets are compressed by axial inward pressure upon the member 86, this member being held in compressed position by spinning over the end 93 of the envelope 62. Preferably, the facing surfaces of the insulator 80 and compression member 86 are glazed, as described in connection with Figures 3 and 4, to prevent any possibility of gas under pressure, which may be introduced in the switch envelope from leaking out through the pores of the ceramics. It will be obvious with this construction that the volume of the body of mercury 94 retained in the envelope 62 is substantially equal to the volume of mercury 95 carried in the envelope 87. Both of these bodies are of sufficient size so that a substantial area of contact is provided between each of the bodies and their associated metal envelopes whereby upon making of current between the two mercury bodies, relatively low internal resistance is introduced into the switch.

The telescoping action of the compression member 86 into the insulator 80 serves not only to center the insulator in position but also provides for uniform unit pressure against both of the independent sealing means, thereby insuring positive sealing engagement at all points within the switch.

The form shown in Figure 6 is similar to that shown in Figure 4 except that a different type of compression member and sealing means is provided. The envelope 73' in this form of the invention has its flanged end 75' abutted against the insulator 64' about the opening of the frusto-conical throat 66. Disposed about the envelope 73' and recessed to receive the flange 75' is a compression member 96 having a radially enlarged abutting face portion 97 which engages against the planar radial face of the insulator about the flange 75' to hold the insulator in seating engagement against the shoulder on envelope 62. The compression member 96 is provided with a semi-cylindrical recess adapted to receive the resilent gasket 98, whereby when the envelope 73 is pushed through the bore of the compression member, the gasket 98 provides a positive seal about the lateral surface of the envelope. Disposed about the reduced portion of the compression member 96 is a sealing gasket 99 which is compressed through the retaining ring 100 and the spun-over edge 93 of the envelope into sealing engagement between the external surface of the compression member and the internal surface of the portion 63 of the envelope. As a result, the envelopes are both positively sealed through the gasket means 98 and 99, and preferably the two abutting faces of the insulator and the compression member are glazed to prevent leakage of gas therebetween. The switch is adapted to operate in the same manner as described in connection with Figure 4.

Referring now to the modification of the invention shown in Figure 7, this comprises a switch envelope 5' corresponding to that shown in Figure 2, which envelope has seated adjacent its closed end the sleeve 30 provided with the aperture 32 receiving the projecting portion of the insulator disc 34. The insulator 105 corresponds to the insulator 8' in that it is centered within the envelope and held against axial movement by abutment against the forward end of the sleeve 30. The insulator is provided with the bore 106 opening into the second envelope 107 having the flange 108 centered in a facing recess in the insulator 105. Disposed adjacent the end of the envelope 5' is a refractory insert 109 which forms an insulating barrier between the envelope 107 and the spun-over edge 110 of the envelope 5'. Disposed against the inner face of the compression member 109 is a gasket member 112 which may be of Bakelite, or any other similar material having some degree of elasticity. This leaves an annular gap or chamber 113 between the forward radial face of the insulator 105 and the inner face of the gasket 112. A suitable tubulation 114 is adapted to extend through the envelope at this point to communicate with the chamber 113. Through this tubulation a liquid plastic of the self-setting type is forced under heat and pressure so that as it cools and dries, it sets within the chamber 113, as indicated at 115, to provide a semi-elastic non-current carrying sealing means. The liquid is introduced under pressure so that when cooled and set it expands slightly rather than contracts. To key the insulator 105 in position, a portion of the peripheral edge thereof is chamfered, as indicated at 116, to allow keying engagement therewith of the plastic sealing material. This material which is used as a seal in the chamber 113 may be of the type commercially known as "Durez," or may be any other liquid plastic material having insulating and sealing characteristics which does not contract when set. After the liquid has been introduced, the tubulation may be closed in any suitable manner and the switch is then ready for operation, it being understood that previous to this time or during the introduction of the liquid, the main body portion or switch chamber has been filled with the mercury bodies 117 and 118 through tubulation 119, and the interior of the switch envelope can then be evacuated, filled with hydrogen under pressure and sealed. The switch operates in the same manner as described in connection with Figure 2, and no further discussion is believed necessary insofar as its operation is concerned.

In the form of the invention shown in Figure 8, the same type of switch is employed but the fixtures are indicated for holding the switch parts in position during the filling operation. In this form of invention, the envelope 120 has therein the sleeve 30' provided with the insulating disc 34' against which the insulator 122 is disposed to form the annular recess in which is retained the body of mercury 123. This entire end of the switch envelope 120 is carried in a suitable fix-

ture 124 having a flanged recess 125 for receiving the envelope 120. A second envelope 126 has its flanged end 127 centered in the insulator 122, and the forward edge of the envelope 120 is then flanged over as indicated at 128 to receive a fixture 129 embracing the same and formed with an axially extending recess 130 disposed annularly about the body of the envelope 126. A suitable tubulation 132 is formed in the end of the envelope 126 for introducing the mercury bodies 123 and 133, and for then evacuating the switch chamber and filling the same with hydrogen under pressure. A suitable fixture 134, which may be hydraulically operated, presses against the outer end of envelope 126 to hold it in firm engagement in the recessed portion of the insulator 122. This is done prior to the evacuation and hydrogen filling of the switch envelope. As the parts are held in position by the fixtures 124, 129 and 134, the liquid plastic is forced into the space 135 and the recess 130 in the fixture 129 either through tubulation 136 in the lateral wall of the envelope 120, or as indicated in dotted lines through a tubulation 137 formed in the fixture 129. The plastic when poured into position takes the form of a compression insulator and sets in this position to provide a positive seal between the flanged end of the envelope 126, the insulator 122 and the envelope 120. After this seal has set in this position and hardened, the tubulation may be closed off if in the form of the tubulation 136 or the fixture 129 may be removed and the switch then evacuated and filled with hydrogen under pressure in the usual manner. This provides a simplified form of construction without requiring the use of resilient gaskets formed of rubber or the like, and without the necessity of providing for axial compression means for expanding the gaskets in sealing engagement.

The structure shown in Figure 9 employs a cup-shaped envelope 140 having the frusto-conical lip 142. Within the envelope is seated a reversely disposed sleeve member 143 having the radially inwardly extending flange 144 forming a centering means for the refractory bushing 145. Seated in the end 146 of the envelope 143 within the sleeve 140 is a disc 147 which may be formed of tungsten, molybdenum, or a similar highly conductive arc-resisting metal, and the body of mercury 148 therefore lies in contact with the sleeve 143, flange 144, and with the face of the disc 147. The bushing 145 has a frusto-conical forward peripheral surface about which is disposed a gasket 149, which also serves to radially over-lap the cylindrical portion of the sleeve adjacent the flange 144. The gasket 149 may be formed of a suitable insulating material such as paper fiber or a molded insulation, such as substantially pure rubber or a molded phenol compound. Lying in seating engagement about the surface of the gasket 149 is the frusto-conical flange end 150 of a second cup-shaped envelope 152 forming the other electrode of the switch. Suitable axial pressure is imposed between the envelopes 140 and 152 to provide for seating the flange 150 firmly in seating engagement over the gasket 149. A suitable gasket 153 is then laid over the flanged end of the envelope 152, and when so positioned, the end 142 of the envelope 140 is spun thereover to lock the parts in firm sealing engagement. It will be noticed that the inner end of gasket 153 lies over the flange 150, as indicated at 154, to provide insulation between the envelopes 152 and 140, and similarly, the outer end 155 of the gasket 153 overlaps the envelope 152 to insulate it from the flange end 142 of the envelope 140. As a result, a very simple form of two-envelope switch structure is provided which is capable of carrying currents, although, of course, not of the capacity such as is possible in switches in previous embodiments of the invention described.

It is therefore believed apparent that the present invention provides a novel type of mercury switch structure employing two telescoping cup-shaped envelopes which are suitably sealed and locked together in such manner as to render the interior thereof closed against the escape of gas under pressure or the like, with certain forms of the invention embodying the feature of telescoping the ceramic inserts in such manner that relatively simple and economical forms of sealing gaskets may be employed.

In addition, by the use of a double envelope switch structure of this type, it is possible to provide a mercury switch construction in which no resilient rubber gaskets need be employed, but the seal is effected by self-setting plastic cement which is poured into place in liquid form and when cooled and dried, sets to form a perfect seal. This material preferably is of the type which does not contract upon setting, and, being introduced under pressure, fills all crevices and provides an absolutely positive seal for the structure.

We are aware that various changes may be made in certain of the details of the present construction, and we therefore do not intend to be limited except as defined by the scope and spirit of the appended claims.

We claim:

1. A mercury switch comprising a cup-shaped metallic envelope having a radial shoulder intermediate its ends and an enlarged open end, an insulator axially seated against said shoulder in said enlarged end and having a reduced outwardly directed extension, annular sealing means about said extension, an electrode disc in axial abutment with the radial face of said extension and having a reduced portion projecting outwardly of said envelope, an insulating compression member about said reduced portion and having an annular radial face portion axially overlying said disc and axially engaging said sealing means, said compression member having an axially offset radial face portion, resilient sealing means between said offset face portion and the outer face of said electrode disc about said reduced portion, and means at the end of said envelope holding said compression member in position to axially compress both said sealing means.

2. A mercury switch comprising a cup-shaped metal envelope having a ceramic in the closed end thereof, a cup-shaped sleeve telescoped into said envelope with the base apertured to receive said ceramic, an insulator axially abutting the annular edge of said sleeve having a tubular bore terminating short of the ceramic to provide a radial gap therebetween, a recess in the outer face of said insulator about the bore opening, a cup-shaped electrode having a flanged end centered in said recess and opening into said bore, sealing means engaging over the outer radial faces of said insulator and flange, and means for retaining said sealing means in sealing engagement between said envelope and electrode.

3. The switch of claim 2 wherein said last-named means includes an insulating compression member and a spun-over edge on said envelope.

4. In combination, in a mercury switch, a cup-shaped metal envelope having a sleeve therein forming a radial abutment, an insulator having an axial bore therethrough axially seated against said abutment, said insulator having an annular recess in its outer face about the bore, a second cup-shaped envelope having a radially outwardly flanged open end axially centered in said recess on the outer face of said insulator and telescoping within said open end of said first envelope, an oppositely extending flange on the end of said first envelope, and insulating and sealing means secured between said flanges.

5. A mercury switch comprising a cup-shaped metal envelope having a radial shoulder intermediate its ends, an insulator seated against said shoulder having a tapered axial bore, a second cup-shaped envelope having a radially outwardly flanged end abutting said insulator about the outer end of said bore, a ceramic compression member about said second envelope having a peripheral cylindrical extension telescoping over said flange end and having an outer radial shoulder portion engaged by the spun-over edge of said first envelope, sealing means compressed between said insulator and said extension of said compression member axially inwardly of said flange and of said second envelope, and separate sealing means between said compression member and the outer radial face of the flanged end of said second envelope.

6. A mercury switch comprising a first cup-shaped metal envelope having an enlarged open end, a ceramic insulator seated in said end and having an axial bore, a cup-shaped tubular electrode having a radially flanged open end abutting said insulator about said bore, a ceramic compression member about said electrode having a recess receiving the flanged end thereof and having radial abutment with said insulator about said flanged end, resilient sealing means carried by said compression member engaging the external annular surface of said electrode, and resilient sealing means compressed between the end of said envelope and the outer face of said compression member.

7. The switch of claim 6 wherein the abutting faces of said insulator and compression member are glazed to seal off interporous communication therebetween.

8. A mercury switch comprising a first cup-shaped metal envelope having an enlarged open end, a ceramic insulator sealed in said end and having an axial bore, a tubular cup-shaped electrode envelope having a flanged end abutting said insulator about said bore, a ceramic compression member carried on said electrode and fitting into said open end, telescoping flanges on said insulator and compression member, independent resilient sealing means compressed between said insulator and compression member and between said compression member and said flanged end upon axial inward telescoping movement of said compression member, and means at the end of said envelope for maintaining said member in seal compressing position.

9. In combination, in a mercury switch, a cup-shaped metal envelope having a sleeve therein forming a radial abutment, an insulator axially seated against said abutment, a second cup-shaped envelope having its open end in abutment against the outer face of said insulator, oppositely extending means on the ends of said envelopes, insulating and sealing means secured between said flange means, and a disc of arc-resisting metal centered in said sleeve at the closed end of said first envelope.

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