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CONTACTS FOR MERCURY SWITCHES INCLUDING MERCURY RECOVERY COWLS

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FIG. 1

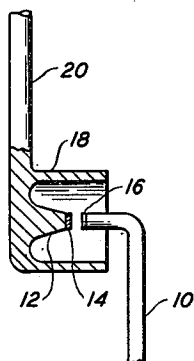


FIG. 2

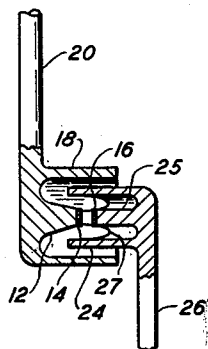
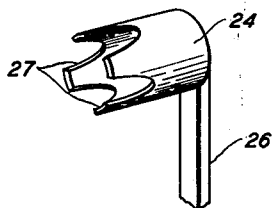


FIG. 3



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3 Claims. (Cl. 200—166)

This invention relates to "mercury switches," that is, switches employing mercury-wetted contacts. More particularly, it relates to contacts for such switches.

In the copending application of W. D. O'Brien and C. E. Pollard, Jr., Serial No. 149,691, filed November 2, 1961 and assigned to applicant's assignee, the problems encountered in designing an "all-position" sealed "mercury switch" are disclosed and discussed in detail. The above-mentioned copending joint application matured as Patent No. 3,116,384, granted December 31, 1963. The solution proposed by said joint application is to carefully limit the amount of mercury initially sealed into the switch assembly to that which will adhere to the "active" metallic members of the switch assembly without resulting in a troublesome excess of mercury at any point during the normal operation of the switch. Service life in excess of a million operations has been achieved by such mercury switches.

However, as explained by the same joint inventors in their Patent 3,054,873 granted September 18, 1962 and as illustrated in the Bell System Technical Journal, volume 32, November 1953, at pages 1397 through 1399, at each opening of a pair of mercury-wetted contacts one or more small particles, or very small globules, of mercury are "lost" from that adhering to the contact members and may be permanently removed from the effective mercury supply within the sealed switch by striking and adhering to the walls or other portions of the assembly enclosure where no further active participation in the operation of the device is likely. Similar losses of mercury may also result from "splashing" when the contacts are rapidly closed. The elimination of such losses of mercury should, obviously, still further increase the number of fault-free operations of which "mercury switches" are capable.

Accordingly, it is a principal object of the present invention to prevent the loss of mercury from the effective supply of mercury in a sealed "mercury switch" assembly.

This object applicant proposes to accomplish by equipping one or both of each pair of cooperating mercury-wetted contacts with a shroud, hood, or cowl of a rigid material. This member (or these members, if both contacts of a pair are so equipped) is shaped and dimensioned to effectively intercept mercury particles leaving the contacts when they separate to open the circuit in which they are connected, or when the contacts are rapidly closed. Obviously such arrangements must not interfere with the normal functioning of the associated pair of contacts, that is, they must in no position short circuit the contacts nor interfere with their normal movements.

Other objects, features and advantages of the arrangements of the invention will become apparent during the contacts, the cowl being adapted to return intercepted embodiments taken in conjunction with the accompanying drawing in which:

FIG. 1 illustrates, in partial cross section, a first contact pair utilizing a cowl of the invention;

FIG. 2 illustrates, in partial cross section, a second contact pair utilizing two cowls of the invention; and

FIG. 3 illustrates a scalloped cowl for use in arrangements of the invention.

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In more detail in the partially cross-sectional showing of FIG. 1, reed 10 supports a contact 16 in juxtaposition to contact 14, the latter being supported by a stub member 12 centered within a cylindrical cup-like cowl 18. A rod 20 supports cowl 18. This combination can then serve as a contacting pair for use in a switch of the general type illustrated for example in FIG. 1 of the above-mentioned copending application of O'Brien and Pollard. The upper end of reed 10, carrying contact 16, may be movable, for example, to close and open an electrical circuit through contact 14, under control of a conventional magnetically actuated arrangement, not shown. Stud 20 may be rigidly held by an over-all enclosing member, not shown. Alternatively, the lower end of stud 20 could be arranged to be movable and the upper end of reed 10 could be rigidly held. Such details may be, for example, substantially as illustrated in the copending application of O'Brien and Pollard, mentioned hereinabove. For clarity the showing of FIG. 1 is, in general, made to a substantially enlarged scale insofar as structures for switching in low power communication circuits and the like are concerned.

Obviously, cowl 18 will intercept a major portion of the mercury particles leaving the mercury-wetted contacts 14 and 16 either as the contacts are brought together or as they are separated after making contact with each other. Portions of the assembly of FIG. 1, intended to carry electrical current should, of course, be of conductive material. Portions whose sole function is to intercept mercury particles and return them to contact 14 need not be of electrically conductive material though it will probably be more convenient in most instances to make them in one piece and of the same material as their associated conductive portions. The surfaces of cowl 18, stud 12 and reed 10 should be grooved or otherwise provided with capillary channels in any of several ways well known and widely used by those skilled in the art. For example, reference may be had to the copending application of G. T. Kohman (Case 14), Serial No. 152,776, filed November 16, 1961, and assigned to applicant's assignee. The above-mentioned copending application of Kohman matured as Patent No. 3,114,811, granted December 17, 1963. It is thus apparent that particles of mercury intercepted by cowl 18 will in due course be returned to contact 14 thus avoiding loss to the active or effective supply of mercury available for wetting the contacts of the switch.

In the partially cross-sectional showing of FIG. 2 an arrangement of the invention similar to that of FIG. 1 but making use of two cowls 18 and 24 as illustrated. The contact 14 and its associated stub 12, cowl 18 and rod 20 are the same as illustrated in FIG. 1 and are described in detail above.

Contact 16 in FIG. 2 is supported on stub 25 within cowl 24. Cowl 24 is supported on reed 26 which is movable as described for reed 10, hereinabove. Cowl 24 may be a cylindrical cup-like structure of the same general configuration as cowl 18 or alternatively its rim may include a number of cut-out or scalloped portions 27, as shown more clearly in FIG. 3, proportioned and arranged so that approximately equal quantities of the mercury particles leaving the contacts will be intercepted by the two cowls 18 and 24 respectively. Stub 25 and contact 16 are omitted from the showing of FIG. 3 so that the scalloped portions of cowl 24 will be more readily perceived. As for the assembly of FIG. 1, reed 26, cowls 18 and 24, stubs 12 and 25 should be grooved or otherwise provided with capillary channels or the like in manners well known in the art to induce the mercury particles intercepted by the cowls to return to the contact associated with each cowl, respectively.

Contacting arrangements as illustrated in FIG. 2 also obviously can be embodied in switches of the general type, for example, as those shown in the above-mentioned co-pending application of O'Brien and Pollard in the same manner as indicated above for the arrangement of FIG. 1.

For clarity, the showing of FIGS. 2 and 3 are also in general to an enlarged scale insofar as structures for switching in low power communication circuits and the like are concerned.

Numerous and varied modifications and rearrangements of the above-described specific illustrative embodiments may readily be devised by those skilled in the art without departing from the spirit and scope of the principles of the present invention.

What is claimed is:

1. A contacting arrangement for mercury switches comprising a pair of mercury-wetted contacts adapted to open and close an electrical circuit and a cowl of rigid material mechanically integral with one of said contacts, the cowl surrounding and partially enclosing said pair of contacts to intercept particles of mercury leaving said contacts, the cowl being adapted to return intercepted particles of mercury to said one of said contacts.

2. A contacting arrangement for mercury switches

comprising a pair of mercury-wetted contacts adapted to open and close an electrical circuit, a pair of cowls, each cowl being of rigid material mechanically integral with a single contact of said pair, respectively, one cowl being of sufficient size to permit the intrusion of the other cowl therein without mechanical contact between said cowls and to permit the free closing and opening of said pair of contacts, the pair of cowls together completely enclosing the pair of contacts to intercept particles of mercury leaving the contacts, each cowl being adapted to return intercepted particles of mercury to its respective integrally associated contact.

3. The arrangement of claim 2 in which the smaller cowl has portions of its rim removed to effect a more nearly equal distribution between the cowls of the mercury particles intercepted by the pair of cowls.

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