

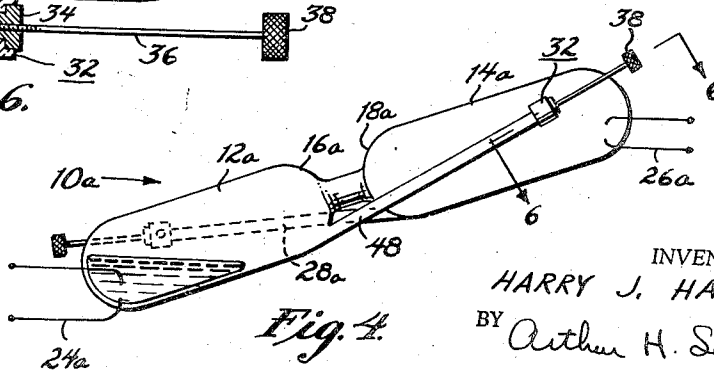
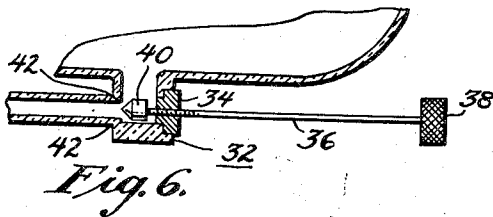
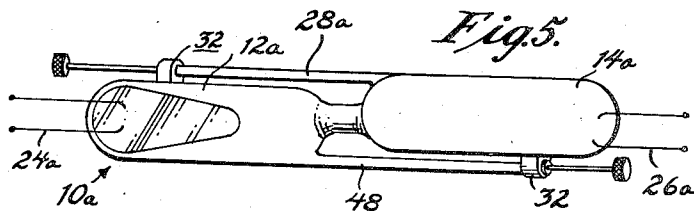
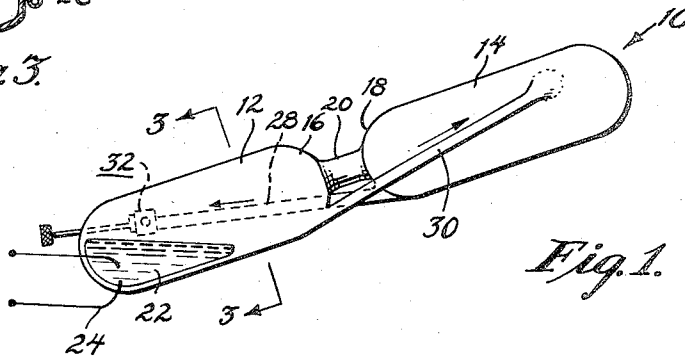
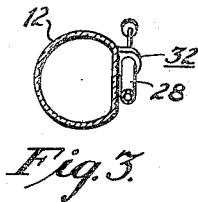
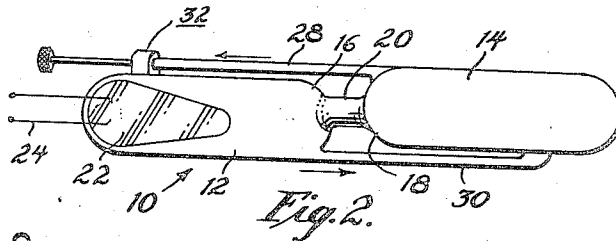
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TIME DELAY MERCURY SWITCH

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## TIME DELAY MERCURY SWITCH

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5 Claims. (Cl. 200—33)

The present invention relates to a time delay mercury switch, and more particularly to a time delay mercury switch in which accurate control of the time delay may be achieved.

Mercury switches are well known. Moreover, it has heretofore been suggested to construct such switches in such a fashion that there is a time delay between the tilting of the switch and the time the electrical contact is made, or broken, as the case may be. Generally such prior switches have depended solely upon the delay caused by restricting the flow of the mercury through a small orifice. However, experience with such forms of switches has shown that the use of fixed orifices in such switches does not permit any degree of regulation of the time delay. As there are many uses in existing electrical circuitry in which regulated time delay is desirable, such prior switches have in the main proved to be unsatisfactory.

The present invention has as an object the provision of a time delay mercury switch in which regulated accurate control in respect to the time delay may be obtained between the tilting of the switch and the time the electrical contact is made, or broken, as the case may be.

This invention has as another object a time delay mercury switch in which a variable time delay may be secured.

The present invention has as a still further object the provision of a time delay mercury switch in which accurate regulated time delay may be achieved in respect to both of the positions assumed by the switch.

Other objects will appear hereinafter.

For the purpose of illustrating the invention there is shown in the drawings forms which are presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

Referring to the drawings wherein like reference characters refer to like parts:

Figure 1 is a side elevational view of one embodiment of the time delay mercury switch of the present invention.

Figure 2 is a plan view of the time delay mercury switch embodiment of Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 1.

Figure 4 is a side elevational view of another embodiment of the time delay mercury switch of the present invention.

Figure 5 is a plan view of the time delay mercury switch embodiment of Figure 4.

Figure 6 is a fragmentary sectional view taken on line 6—6 of Figure 4.

Referring to the drawings and initially to Figures 1, 2, 3 and 6, the time delay mercury switch shown in Figures 1, 2 and 3 is designated generally as 10. The switch 10 comprises a sealed container formed preferably of glass, although other inert insulating materials may be utilized. The switch 10 includes a chamber 12 and a chamber 14

which are joined together at their juxtaposed end portions 16 and 18 by a bridge 20 formed of solid glass.

A pool of mercury 22 is disposed within switch 10, and in the positions illustrated in Figures 1 and 2 is shown in chamber 12.

A pair of contact elements 24 are provided in chamber 12. The contact elements 24 form the terminal means of the switch 10. The switch 10 is pivotable between two positions (by conventional means not shown in the drawings). In one such position (shown in Figures 1 and 2) the chamber 12 is positioned beneath the chamber 14 with the pool of mercury connecting the contact elements 24. In the other position the chamber 14 is below the chamber 12 with the pool of mercury 22 disposed within the chamber 14 and out of contact with the contact elements 24.

Communication between the chamber 12 and the chamber 14 is had by means of the conduits 28 and 30 which may have the same bore diameter.

The conduit 30 extends from end portion 16 of chamber 12 at the side thereof which carries contact elements 24 to a point high on the side of chamber 14, and comprises an unrestricted passageway permitting free and ready traverse by the pool of mercury 22 from chamber 12 to chamber 14.

The conduit 28 comprises a variable restriction, with the degree of variation being controlled by the valve 32. Conduit 28 extends from the bottom side of end portion 18 of chamber 14 to a point on chamber 12 above its contact elements 24 and remote from its end portion 16. When valve 32 is fully open it presents no restriction to the traverse of mercury in conduit 28. Since the valve 32 used in the embodiment of Figures 1, 2 and 3 is the same as the valve used in the embodiment of Figures 4, 5 and 6, the construction of this valve may be understood from an examination of Figure 6.

The valve 32 may be formed of flexible plastic which may be press-fitted or otherwise secured in an end of conduit 28. Alternatively, the valve 32 may be formed of a metal which does not react chemically with mercury, and which may be joined to glass. The valve 32 includes a guide member 34 which is secured to the wall of conduit 28. The valve stem 36 is matingly threaded in guide member 34, and may be advanced from or drawn towards the guide member 34 upon rotation. Digital rotation of the valve stem 36 is accomplished through the handle 38 which is secured to the end of the valve stem 36.

The valve member 40 carried on the innermost end of valve stem 36 is disposed within the conduit 28. For maximum regulation of the size of the restriction in conduit 28, the valve member 40 may be conically tapered in the manner shown in Figure 6, and may seat against a matingly tapered surface 42 in conduit 28.

Alternatively, in place of the valve member 40, other shapes of valve members may be substituted, and the present invention comprehends the substitution of other forms of valves for valve 32 in conduit 28.

Valve 32 permits the time delay to be controlled when the switch 10 is pivoted from the position in which chamber 14 is beneath chamber 12 to the position in which chamber 12 is beneath chamber 14. When valve member 40 is closely adjacent the seat surface 42 the time delay is of protracted duration. When valve member 40 is remote from the seat surface 42 rapid traverse of the pool of mercury 22 will be achieved when the aforesaid pivotation is effected.

The switch 10a shown in Figures 4 and 5 includes contact elements in both chambers and permits predetermined adjustable regulation of the time delay between both of the pivotation positions, namely when the switch 10a is pivoted from the position in which chamber 12a is beneath chamber 14a to the position in which cham-

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ber 12a is above chamber 14a and conversely when chamber 14a is pivoted from the position in which it is beneath the chamber 12a to the position in which the chamber 12a is beneath the chamber 14a.

The switch 10a is provided with a conduit 28a which is identical to the conduit 28 of switch 10 shown in Figures 1 and 2. Thus, the conduit 28a extends from juxtaposed end portion 18a of chamber 14a at the side thereof which carries contact elements 26a to a point on chamber 12a above its contact elements 24a and remote from its end portion 16a. The valve 32 on conduit 28a is identical to the valve used in the switch 10 which forms the embodiment of Figures 1 and 2.

In place of conduit 30, the switch 10a is provided with a conduit 48 on its side opposite from the side which carries conduit 28a. The conduit 48 generally resembles conduit 28a except that it extends from the juxtaposed end portion 16a of chamber 12a, at the side thereof which carries contact elements 24a, to a point on chamber 14a which is remote from juxtaposed end portion 18a and is above the contact elements 26a. The large bore conduit 48 is provided with a valve 32 which is identical to the valve 32 which has heretofore been described.

By relative digital adjustment of the valves 32 of the conduits 28a and 48 it is possible to adjust the time delay in each direction, since the rate of traverse of the mercury between the chambers 12a and 14a can be regulated. Thus, when the switch 10a is pivoted from the position in which chamber 12a is beneath chamber 14a to the position in which chamber 14a is beneath chamber 12a the mercury will traverse the conduit 48 and its rate of traverse will be governed by the valve 32 in conduit 48. When the switch 10a is pivoted from the position in which the chamber 14a is beneath the chamber 12a to the position in which the chamber 12a is beneath the chamber 14a the mercury will traverse conduit 28a and its rate of traverse will be dependent upon the restriction provided by the valve 32 in conduit 28a.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. A regulatable time delay mercury switch compris-

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ing a first chamber and a second chamber spaced from said first chamber, a pool of mercury disposed within said switch, contact elements secured at the bottom outside end of said first chamber, a first conduit extending from the bottom of said first chamber to a point spaced above the bottom of said second chamber, valve means in said first conduit for regulating the rate of flow of mercury through said first conduit, and a second conduit extending from the bottom of said second chamber to a point spaced above the bottom of said first chamber, with valve means in said second conduit for regulating the rate of flow of mercury through said second conduit.

2. A regulatable time delay mercury switch in accordance with claim 1 in which contact elements are secured at the bottom outside end of the second chamber as well as at the bottom outside end of the first chamber.

3. A regulatable time delay mercury switch formed from a unitary integral glass body, said glass body comprising two hollow envelopes axially spaced along a common longitudinal axis and joined by a solid bridge of glass, said envelopes being sealed from communication with the outside atmosphere, a pool of mercury disposed within said switch, contact elements secured at the bottom outside end of at least one of said envelopes extending through the wall of said envelope into its interior, a glass conduit extending through the wall at the bottom of one of said envelopes to a point spaced above the bottom of the other of said envelopes, said glass conduit extending through the wall of said other of said envelopes at such point, valve means in said conduit whereby the rate of flow of mercury through said conduit may be regulated, and a second conduit extending between said glass envelopes and passing through the walls of such envelopes.

4. A regulatable time delay mercury switch in accordance with claim 3 in which contact elements are secured at the bottom outside ends of each of the two envelopes.

5. A regulatable time delay mercury switch in accordance with claim 3 in which valve means is disposed in said second conduit for regulating the rate of flow of mercury through said second conduit.

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