May 23, 1950 C. A. ANDERSON 2,508,986

MERCURY SWITCH

Filed Dec. 21, 1946

Fig. 1.

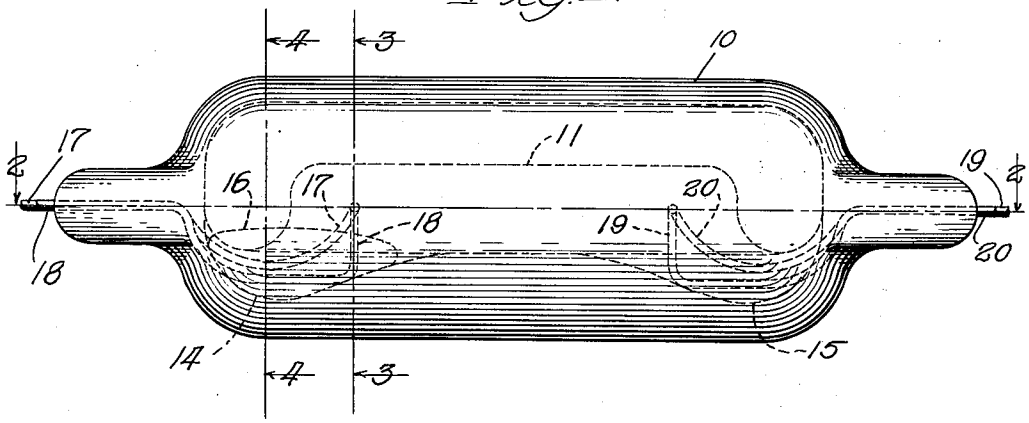


Fig. 2.

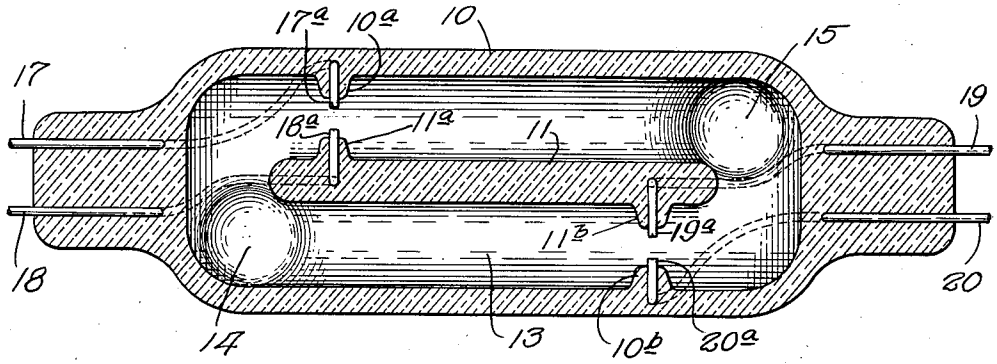


Fig. 3.

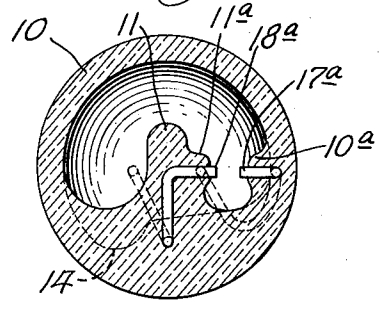
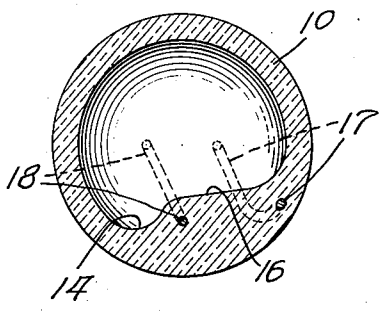


Fig. 4.



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Patented May 23, 1950 2,508,986

UNITED STATES PATENT OFFICE

2,508,986

MERCURY SWITCH

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Application December 21, 1946, Serial No. 717,734

5 Claims. (Cl. 200—152)

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This invention relates to a mercury switch, and more particularly to a momentary-contact mercury switch.

Many electrical devices or control systems require only momentary contact in order to initiate or suspend their operation, as for example the start and stop buttons frequently associated with motors. In the past it has been usual to make such momentary contact by manually operated mechanical means or directly by manual means. Since it is often desirable that such momentary contact exist for a predetermined time or that such contact be controlled from a distance, or for other reasons, there has been a need for an automatically operable momentary-contact switch which is simple in construction and which operates in an effective manner.

I have devised and am here disclosing and claiming a novel momentary-contact mercury switch which may be used to simplify the operation of electrical devices or control systems which require only momentary contact, as the start and stop buttons mentioned above. My new mercury switch also finds efficient use as a starter control for electrical systems such as ventilating systems, reversing circuits, time clock devices, and many types of electrical systems requiring low current devices to control heavy load circuits. My new switch operates by routing or directing a flow of mercury past a pair of spaced terminals when the switch is tilted, the mercury momentarily bridging the terminals in the course of the flow. This construction makes it possible to incorporate two pairs of spaced terminals in the switch, the mercury being directed alternately past each pair each time the switch is tilted. By locating the terminals adjacent a constricted portion of the channel through which the mercury flows and by control of the amount of mercury used in the switch, the length of time the terminals will be bridged each time the switch is tilted can be accurately controlled. Other features and advantages of my invention will be apparent from the following specification and from the drawings, in which:

Figure 1 is a side elevation of a mercury switch constructed in accordance with my invention; Figure 2 is a longitudinal horizontal section through the switch of Figure 1, taken on the line 2—2 of Figure 1; Figure 3 is a vertical cross section taken on the line 3—3 of Figure 1; and Figure 4 is a vertical cross section taken on the line 4—4 of Figure 1.

In Figure 1 a sealed envelope 10, which is preferably of elongated generally cylindrical shape and may be made of glass or other suitable material, acts as a housing or container for the operating parts of the mercury switch. A longitudinal partition 11 is included within the envelope, said partition being integral with the envelope in the particular embodiment of my invention illustrated herewith, and extending longitudinally of said envelope, but terminating short of each end thereof, in such manner as to form a channel on each side of the partition, such channels being indicated as 12 and 13.

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In the bottom of the envelope 10 adjacent one side of one end thereof is the recess 14, and adjacent the opposite side of the other end of said envelope is the recess 15. As may be seen best in Figure 2, each of the channels 12 and 13 communicates with the recess 14, and the channel 13 terminates in the recess 14 and communicates with the recess 15. A quantity of mercury or other conducting liquid 16 is carried within the envelope, said mercury being adapted to be held in either of the recesses 14 or 15. As may be most clearly seen at 16 in Figure 4 the bottom of the envelope is so designed at each end that it slopes toward the recess at that end, and consequently when the switch is tilted (as for example if the left end of the switch as shown in Figure 2 were tilted out from the paper) the mercury would run through the channel 13, around the end of the partition 11 and come to rest in a terminal position in the recess 15. Then if the switch were tilted in the opposite manner, the mercury would be caused to flow out of the recess 15, through the channel 12, around the end of the partition 11 and into the recess 14. Thus it will be seen that the partition 11 directs the mercury to flow into a terminal position in accordance with the manner in which the envelope is tilted, and that as the envelope is tilted, the flow of the mercury or other conducting liquid is routed from one recess or terminal position to the other.

The partition 11 includes the protuberance 11*a* which cooperates with the protuberance 10*a* in the inner wall of the envelope to form a constricted portion in the channel 12 intermediate the two terminal positions of the mercury, and similarly the protuberance 11*b* in the partition cooperates with the protuberance 10*b* in the envelope to form a constricted portion in the channel 13 intermediate the two terminal positions of the mercury. Leads 17 and 18 are sealed into one end of the envelope, lead 17 running through the wall of the envelope and extending through the protuberance 10*a* into the channel 12, and lead 18 running through the wall of the envelope and into the partition 11 and extending through the protuberance 11*a* into the channel 12. Such leads thereby form spaced terminals 17*a* and 18*a* adjacent the constricted portion of the channel 12. Similarly leads 19 and 20 enter the other end of the envelope and terminate in the spaced terminals 19*a* and 20*a* adjacent the constricted portion of the channel 13.

While I am herewith illustrating two pairs of spaced terminals, it will be understood that my mercury switch could be operated equally well

in certain applications with only one pair of terminals, or with more than two pairs of such terminals. Furthermore, in certain applications it may be desirable to utilize a three wire circuit, and this may be done by connecting the two terminals in the partition 11, for example. Other variations of wiring or changes in the terminal arrangements will be obvious to those skilled in the art, and it will be equally obvious that varying arrangements may be made without departing from the spirit of my invention, as for example changing the arrangement of the terminals so they themselves form the constricted portion of either or both channels. I have found however that the construction shown in the drawing whereby the terminals emerge from the respective protuberances lend strength to the structure, as well as being simple in construction.

In operation, as the switch is tilted in such manner as to bring the recess holding the mercury to a higher level than the empty recess, the mercury flows from the first mentioned recess and the flow is directed by means of the partition 11 and the corresponding channel so that the mercury flows through the constricted portion of the channel, and one of the pairs of spaced terminals is momentarily bridged as the mercury flows past this constricted portion. The length of time that the terminals are bridged is dependent upon the area of the constricted portion of the channels, and my switch may be constructed to cover a wide time range in this regard. When the switch is tilted in the other direction the mercury is routed through the other channel and the other pair of spaced terminals adjacent the constricted portion of the channel is momentarily bridged before the mercury returns to its first terminal position. In commercial use the mercury switch may be held in tilting clips of a relay, a clock lever, a thermostat, or any other appropriate tilting device.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A momentary-contact switch of the character described, including: a sealed envelope adapted to be tilted and having a conducting liquid therein and a recess adapted to contain said liquid adjacent each of two opposite ends thereof; means within the envelope for directing said liquid to flow along one path into one of said recesses when the envelope is tilted in one direction and to flow along another path into the other recess when said envelope is tilted in the opposite direction, such means comprising a partition forming an elongated straight channel parallel to the longitudinal axis of said envelope and having a constricted portion; and spaced terminals adjacent said constricted portion and so spaced that they are only momentarily bridged as said liquid flows past said constricted portion.

2. A mercury switch of the character described, including: an elongated sealed envelope adapted to be tilted about a fixed axis and having a quantity of mercury therein and a recess adapted to contain said mercury adjacent opposite ends thereof; means within the envelope for selectively directing said mercury to flow into one of said recesses in accordance with the manner in which

said envelope is tilted, such means comprising an elongated longitudinally arranged partition forming a channel on each side thereof, said channels being approximately parallel to each other for a major portion of their length, and each channel communicating with said recesses and each channel having a constricted portion intermediate said recesses; and a pair of spaced terminals adjacent each constricted portion, each pair of terminals being so spaced that they are momentarily bridged as said liquid flows past said respective constricted portion.

3. A mercury switch of the character described, including: an elongated sealed envelope adapted to be tilted and having a quantity of mercury therein, a first recess adapted to contain said mercury adjacent one side of one end thereof, and a second recess adjacent the opposite side of the other end thereof; means within the envelope for selectively directing said mercury to flow into one of said recesses in accordance with the manner in which said envelope is tilted, such means comprising a longitudinally arranged partition forming a first channel on one side thereof and a second channel on the other side thereof, said first channel terminating in said first recess and communicating with said second recess, and said second channel terminating in said second recess and communicating with said first recess, said channels being parallel to the longitudinal axis of said envelope throughout a major portion of their length, and each channel having a constricted portion intermediate said recesses; and a pair of spaced terminals adjacent each constricted portion, each pair of terminals being so spaced that they are momentarily bridged as said liquid flows past said respective constricted portion.

4. Apparatus of the character claimed in claim 3, wherein the bottom of the interior wall of said envelope slopes toward each recess adjacent each end of said envelope.

5. A momentary-contact switch of the character described, including: a sealed envelope adapted to be tilted and having a conducting liquid therein; means within the envelope for directing said liquid to flow along one path into one terminal position when the envelope is tilted in one direction and to flow along another path into another terminal position when said envelope is tilted in the opposite direction, such means comprising a partition forming a channel having a constricted portion, said channel being horizontal throughout a portion of its length when the envelope is in a level position and having a recess at each of its ends; and spaced terminals adjacent said constricted portion and so spaced that they are momentarily bridged as said liquid flows past said constricted portion.

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