May 14, 1957 J. B. ACKERMAN 2,792,478

MERCURY SWITCH

Filed April 12, 1954

Fig. 1.

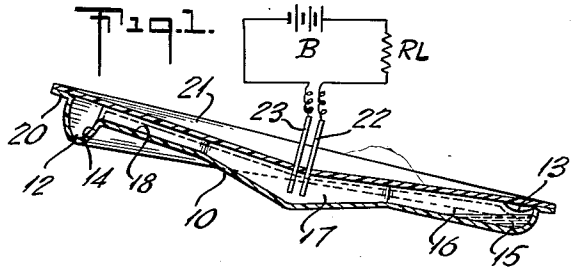


Fig. 2.

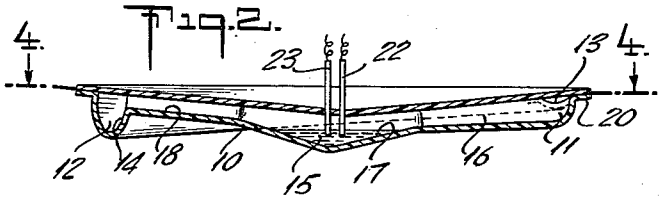


Fig. 3.

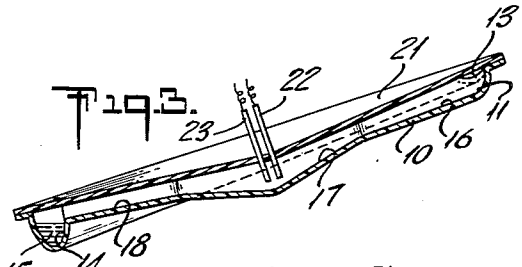


Fig. 5.

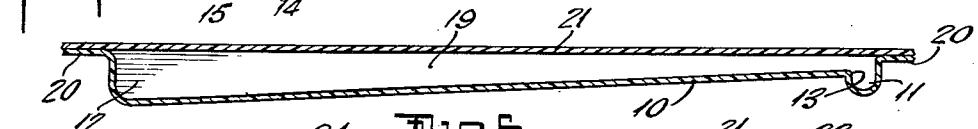


Fig. 6.

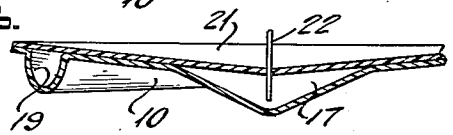


Fig. 4.

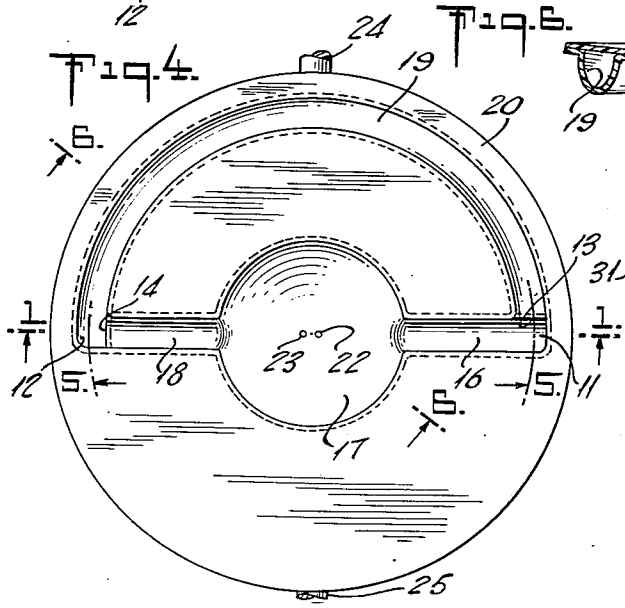
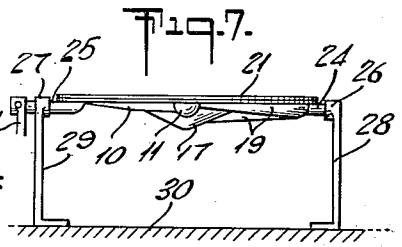


Fig. 7.



INVENTOR
JEROME B. ACKERMAN
BY Stanley Wilder
ATTORNEY

United States Patent Office 2,792,478 Patented May 14, 1957

2,792,478

MERCURY SWITCH

Jerome B. Ackerman, New York, N. Y.

Application April 12, 1954, Serial No. 422,501

2 Claims. (Cl. 200—152)

Presently mercury switches which operate to close contacts at either or both ends of half a reciprocal cycle are well known. However, such switches are not effective to close a contact during an intermediate portion of a unidirectional half-reciprocal cycle for a predetermined period of time. In many applications such switching action is desirable.

An object of the present invention is to provide a tiltable mercury switch which will be operative over a predetermined portion of a half-reciprocal cycle.

Another object thereof is the provision of such a switch which will close contacts during one-half of the reciprocal cycle but will not close said contacts during the other half thereof.

The above and other purposes are achieved by a switch which includes a covered plate in which an endless path for a pool of mercury is formed by means of grooves therein, there being two stations in said grooves and means to tilt said plate on an axis perpendicular to a line between said stations, the height of said path preceding each such station being somewhat greater than the level of the path at such station, so that as said plate is reciprocated a pool of mercury in said path will be caused to travel thereabout unidirectionally; there being also a depression in said path intermediate said stations and a pair of electrical contacts positioned therein, so that when said pool enters said depression electrical communication between said contacts is established. Hence, as said plate is reciprocated during the period that the pool remains in said depression the switch will be closed.

Other objects and a fuller understanding of the present invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing which illustrates a preferred embodiment thereof, it being understood that the foregoing statement of the object of the invention and the brief summary thereof are intended to generally explain the same without limiting it in any manner.

Fig. 1 is a sectional view in elevation of a switch embodying the present invention, showing the same in a "set" position, taken along line 1—1 of Fig. 4, there being schematically illustrated an electrical source and a load connected to said switch.

Fig. 2 is a similar view thereof showing the same in a "closed" position.

Fig. 3 is a similar view thereof showing the same in an "unset" position.

Fig. 4 is a plan view of the switch housing, the mounting lugs being shown broken away.

Fig. 5 is a developed section taken along the periphery of line 5—5 of Fig. 4.

Fig. 6 is a partial cross-elevational view taken along line 6—6 of Fig. 4.

Fig. 7 is an elevational view of the switch, portions of the actuating crank being omitted.

Referring now to the drawings, the preferred embodiment of the present invention as shown consists of a bottom plate 10, preferably of glass or a plastic which is

not wetted by and not reactive with mercury, there being formed therein a closed loop or endless path in which there is a set or ready station 11 and an unset station 12. When proceeding clockwise about said path the lips 13 and 14 respectively at the entrance of each of said stations are higher than the floor of the stations themselves. A pool 15 of mercury is positioned in said path intermediate stations 11 and 12. Proceeding clockwise (the desired direction of the mercury travel) about said path there is first a forward leg which includes a relatively short linear leg 16, a cup or depression 17 therein, and a second linear leg 18. Station 12 then follows and then return arcuate leg 19.

Bottom plate 10 may have an upper peripheral flange 20. A dish-shaped cover 21 is tightly affixed to flange 20 of bottom plate 10 and other portions of bottom plate 10 which may reach it. Fixed into cover 21 in such a position as to extend into depression 17 are a pair of electrical contact rods 22 and 23 as shown in Fig. 1. Said rods may be connected into an electrical circuit including a battery B and a load R_L. As shown in Fig. 7 there may be affixed to oposite sides of bottom plate 10 a pair of cylindrical, axially aligned lugs 24 and 25 (the axis of alignment being the axis of tilt or pivot of bottom plate 10) which may be journalled in bearings 26 and 27 in standards 28 and 29 affixed to base 30. A crank 31 (only partially shown) may be keyed to lug 25 to provide a means for actuating the switch.

The atmosphere within the housing formed by bottom plate 10 and cover 21 may of course be air, but it is preferred that the air be evacuated therefrom or that an inert gas be substituted therefor to minimize arcing affects.

Assembly of the device is substantially self-evident from the device itself, the hermetical seal being effected by conventional means known to the glass and plastic industries.

The device operates as follows. The reciprocal cycle of actuation of the device may be deemed as starting in the "set" position shown in Fig. 1 wherein the pool 15 of mercury is likewise at ready station 11. It will be noted that bottom plate 10 is, in this position, tilted a number of degrees from the horizontal toward ready station 11. As the plate is then brought to a horizontal position the switch is closed, since pool 15 of mercury travels through linear leg 16 and into depression 17, where it simultaneously contacts rods 22 and 23 establishing communication therebetween. As the angular tilt or displacement is continued in the same direction, i. e. now toward unset station 12, pool 15 of mercury will flow from depression 17 into station 12 thus breaking the electrical contact previously established and placing the switch in the unset position. It will be noted that the angular displacement or tilt of the housing has been unidirectional and that the switch is closed not while it is in set or unset position, i. e. not while the switch is at either end of its half-reciprocal cycle, but during a period when the switch is intermediate the end portions of said half-reciprocal cycle.

The length of time during which the switch is closed will depend upon two factors: first, the speed of angular deflection or tilting; and second, the geometry of depression 17. As may be noted from Fig. 1, depression 17 has been so designed that when the switch is in the set or ready position the lip or entrance to depression 17 at the end of linear leg 16 is above the level of pool 15 of mercury at ready station 11. When the switch is in the unset position of Fig. 3 the exit lip of depression 17 at the beginning of linear leg 18 is above the level of pool 15 of mercury at station 12.

Were it not for arcuate leg 19, on the return half-

reciprocal cycle, the switch would be again actuated. However, since lip 14 in the entrance to station 12 is higher than the mercury level at station 12 when the return cycle is commenced, i. e. the housing is tilted towards ready station 11, the mercury does not back up into linear leg 18 but travels into return arcuate leg 19, and as the return half-cycle is completed the mercury pours across lip 13 into station 11 so that the switch resumes its ready or set position. Hence, the mercury is returned to its starting point in station 11, without again passing through depression 17.

In the course of one complete reciprocal cycle, during the forward half-cycle the switch will be closed for a predetermined interval which is exclusive of the beginning and end of said cycle, and during the return half-cycle the switch will not be closed at all but will merely be reset so as to be ready for the next reciprocal cycle.

Although the subject invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous additional changes in the details of construction, combination and arrangement may be resorted to without transcending the scope of the invention as hereinafter claimed.

What is claimed is:

1. A reciprocable mercury switch intended to be actuated for a predetermined portion of one-half reciprocal cycle only comprising a housing having an endless path

formed therein, a pair of spaced stations positioned in said path, the portions of said path precedent each of said stations being higher than the portions thereof immediately following each of said staitons, said path having a depression therein intermediate said stations, a pool of mercury in said path, a pair of electrical contact members positioned in said depression so as to be electrically connected when said pool is in said depression, and means to reciprocate said housing so as to alternately elevate one of said stations above the other whereby upon such reciprocation said pool of mercury is caused to move unidirectionally about said path once each full reciprocal cycle.

2. A mercury switch as described in claim 1, said means to reciprocate said housing including aligned members extending from opposite sides of said housing supported so as to provide a means of angular reciprocation of said housing about said members.

References Cited in the file of this patent

UNITED STATES PATENTS

822,325	Tornberg	June 5, 1906
1,974,411	Cole	Sept. 25, 1934
2,440,028	Swisher et al.	Apr. 20, 1948
2,508,986	Anderson	May 23, 1950

FOREIGN PATENTS

497,121	Germany	Apr. 10, 1930