

June 5, 1934.

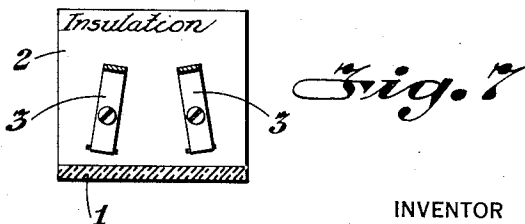
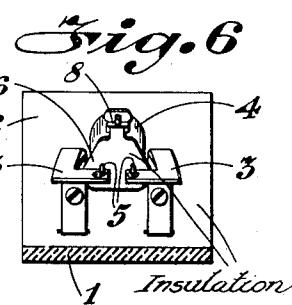
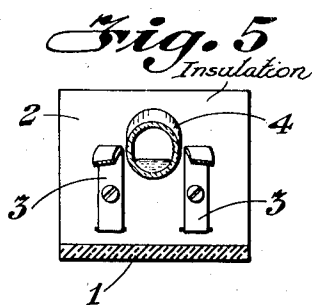
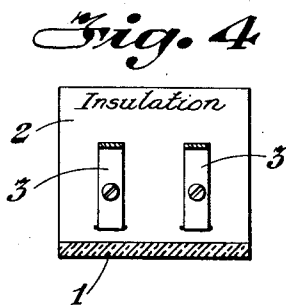
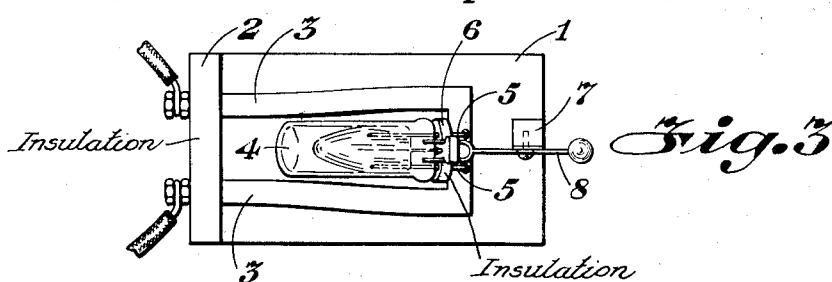
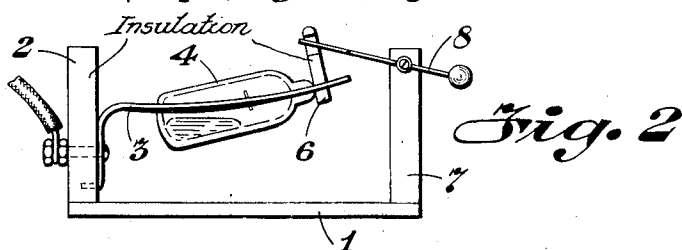
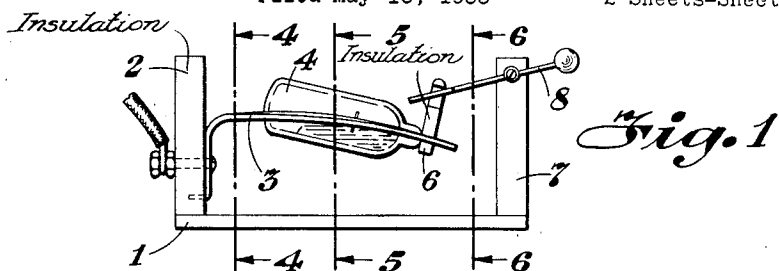
W. R. WALKER

1,961,722

APPARATUS FOR OPERATING ELECTRIC SWITCHES

Filed May 16, 1933

2 Sheets-Sheet 1



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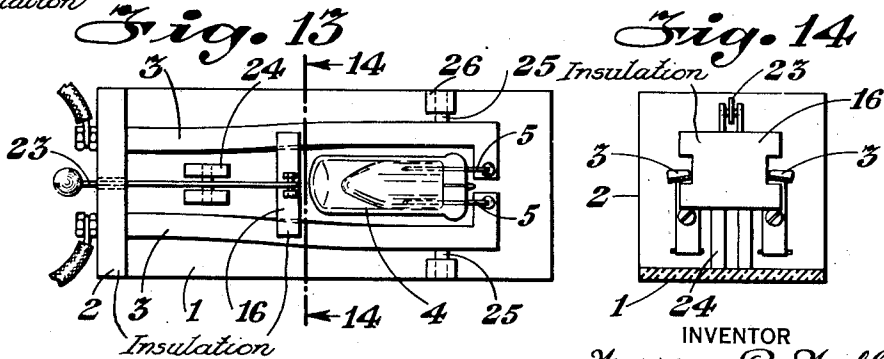
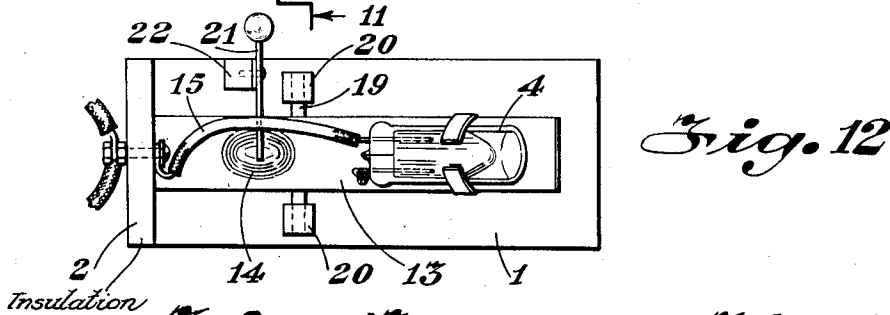
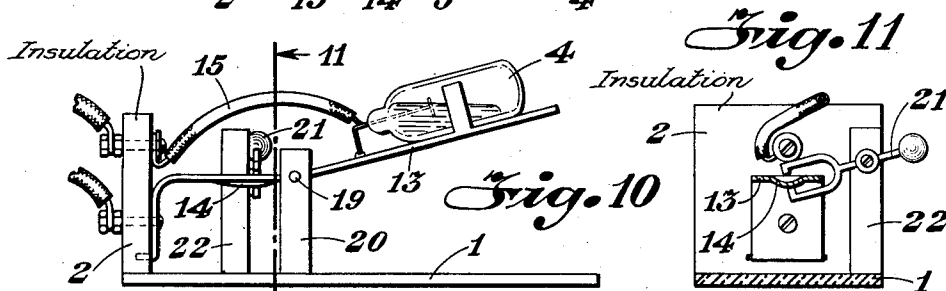
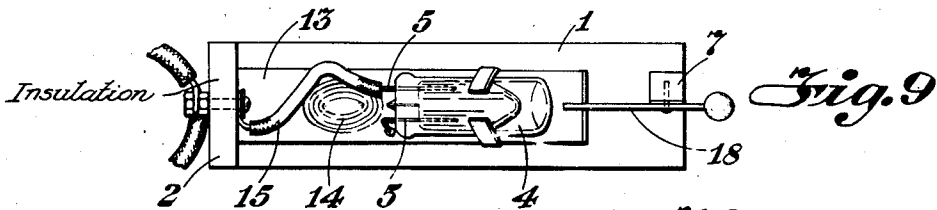
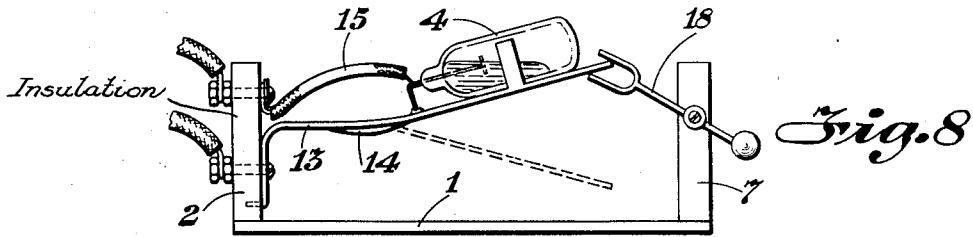
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APPARATUS FOR OPERATING ELECTRIC SWITCHES

Filed May 16, 1933

2 Sheets-Sheet 2



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1,961,722

APPARATUS FOR OPERATING ELECTRIC SWITCHES

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Application May 16, 1933, Serial No. 671,405

7 Claims. (Cl. 200—67)

The present invention relates to fluid flow switches, and more particularly to operating mechanism therefor.

A particular object of the invention is to provide a novel operating mechanism for a fluid flow switch. Another object of my invention is to provide an extremely simple mounting means for a switch which will bias said switch to either of two positions. A further object of my invention is to provide a switch mounting means which can be utilized as a flexible lead to said switch. Another object of my invention is to provide a novel method of producing my new apparatus. Still other objects and advantages of my invention will appear from the following detailed specification or from an inspection of the accompanying drawings.

The invention consists in the new and novel combination of elements, as hereinafter set forth and claimed.

It is frequently desirable that a fluid flow switch should be positively actuated from a fully open to a fully closed position, or vice versa, and that it should be positively maintained in either of these positions without the application of any external force. I have discovered that this result can be produced in a very simple manner by utilizing a spring support which is so deformed as to snap from one position to another. I have further discovered that this spring support can be utilized to conduct the current to said switch, thus eliminating the use of separate leads. In some cases this support may also be made of bimetallic material, in which case no external operating means will be necessary. In a preferred form the switch cooperates in a unique manner with two spring supports, which likewise serve as flexible leads, to maintain a desired deformity whereby the snap action is obtained.

For the purpose of illustrating my invention I have shown several embodiments thereof in the accompanying drawings, in which

Fig. 1 is an elevational view of a novel mounting and operating mechanism for a mercury switch, showing the switch in a closed circuit position,

Fig. 2 is a similar view of the structure of Fig. 1, showing the switch in an open circuit position,

Fig. 3 is a plan view of the structure of Fig. 1,

Figs. 4 to 6 are sectional views taken on the respective section lines of Fig. 1 and showing the deformity in the spring supports,

Fig. 7 is a sectional view similar to that of Fig. 4 of a modification of the structure shown in Fig. 1,

Fig. 8 is an elevational view of another modification of the structure of Fig. 1,

Fig. 9 is a plan view of the structure of Fig. 8, Fig. 10 is an elevational view of a modification of the structure of Fig. 8,

Figs. 11 and 12 are respectively a side elevation and a plan view of the structure of Fig. 10,

Fig. 13 is a plan view of another modification of the structure of Fig. 1, and

Fig. 14 is an end elevation of the structure shown in Fig. 13.

As shown in these drawings, with particular reference to Figs. 1-6, my novel structure has a suitable base 1 at one end of which there is mounted an insulating support 2. A pair of substantially parallel flat springs 3 of phosphor bronze or other suitable conducting material are affixed to said support 2, the free ends of said springs having projections which extend toward each other in the same plane. A mercury switch 4 is mounted between said springs, the inleads 5 thereof, which first pass through a block 6 of bakelite or other suitable insulating material, being soldered to said intumed projections of the springs 3. Said springs 3 are deformed or buckled by forcing the ends thereof from their natural position, preferably by slightly pulling them together at either end after the other ends thereof are firmly anchored, since the best snap action is thus obtained. Since the other end of these springs is firmly held by the inleads 5 the effect is that of a cupped ring whose inner edge will snap from one side to the other, carrying the switch 4 with it, as shown in Figs. 1 and 2. A support 7 mounted on said base 1 carries a forked operating lever 8 which engages with suitable notches in the insulating block 6, whereby said block and the associated switch 4 can be operated from one position to the other by said lever, while the final snap movement is independent of the movement of said lever. While this lever 8 is shown as hand operated, it is obvious of course, that it may be operated by any desired means. By making the springs 3 of a suitable bimetallic material the lever 8 can be dispensed with, the switch 8 being self operating in response to temperature changes. The electrical connections are conveniently made to the springs 3 by means of the screws which hold said springs on the support 2, so that separate flexible conductors are dispensed with.

In the use and operation of this apparatus, assuming the switch 4 to be in the position shown in Fig. 1, as the handle end of the lever 8 is forced downwardly the block 6 is caused to rise,

bringing the ends of the springs 3 upward therewith. While this results in a slight tipping of the switch 4 the circuit is not opened thereby. The springs 3 store up more and more energy, however, as they are thus deformed, until the inner edges thereof snap to a point below the outer edges, with an accompanying upward tilt of the ends by which the switch 4 is supported. Said switch is thereby rapidly tilted or snapped to the open circuit position shown in Fig. 2, where it is positively held until sufficient force is applied to snap it back in a similar manner to the original position. Thus the operation of the switch is made certain and at the same time is rendered entirely independent of any minor variations in the switch 4. This is especially important when the switch is to be operated by pressure or temperature responsive means or the like.

In some cases, it may be desirable to bias the switch 4 more to one position than the other. For instance, when the switch 4 is relatively heavy, it may be desirable to compensate for the weight of the switch, so that it will require the same force to move it either way. This is easily accomplished by modifying the structure of Fig. 1 in the manner shown in Fig. 7. In this modified structure the end of each of the springs 3 which is carried by the support 2 is rotated so as to make said springs tip inwardly at said support. With this construction the springs 3 have a greater tendency to assume the upward tilting position shown in Fig. 2, and thus compensate for the weight of the switch 4. The operation of this modification is otherwise the same as that of the apparatus shown in Fig. 1.

In some cases it may be desirable to mount the switch 4 on a single strip 13 of a suitable resilient metal, as shown in Figs. 8 and 9. In this modification the metal strip 13 is attached to the support 2 and extends horizontally therefrom for a short distance to a point where said metal strip is deformed by a dished boss 14 which is formed therein. At this point said strip 13 extends either upwardly or downwardly at a considerable angle, or above said strip 13. A forked operating lever 18 which is carried by the support 7 engages the end of said strip 13 and is adapted to snap it from one position of rest to the other. The switch 4 is mounted in any suitable manner on the sloping portion of said strip 13, one inlead 5 thereof being connected to said strip 13, while the other inlead 5 is connected by a flexible conductor 15 to a suitable binding post on the support 2.

The operation of this structure is quite similar to that of Fig. 1, it being apparent that as the lever 18 is moved in one direction or the other energy is stored up in the boss 14 until it suddenly snaps to the opposite side of the strip 13, whereupon the end of said strip 13 snaps to the other position of rest, carrying the switch 4 with it. The circuit through said switch is thereupon either abruptly opened or closed, and then maintained in that condition until sufficient force is again applied by the lever 18 to snap said switch to the opposite rest position.

A different means of supplying the actuating force to the strip 13 is illustrated in Figs. 10 to 12. In this structure the strip 13 has a transverse rod 19 affixed thereto at a point adjacent to the edge of the boss 14, said rod being journaled in the supports 20 which are carried by the base 1. The forked operating lever 21 is pivotally mounted on the support 22 which is affixed to the base 1 at a point opposite the boss

14. The forked end of said lever is adapted to engage the center of said boss 14 in order to force it over dead center in either direction.

In the operation of the modified structure shown in Figs. 10 to 12 when the lever 21 is actuated the switch 4 is maintained relatively stationary, due to the support given the strip 13 by the rod 19, until the boss 14 snaps past dead center. The switch 4 is thereupon abruptly moved from one position of rest to the other. This arrangement is thus especially desirable where it is essential that the switch movement, prior to the actual snap action, should be minimized. It is also to be noticed that the travel of the actuating means is relatively short.

This modified application of the actuating force may also be used with the switch mounting of Fig. 1, as shown in Figs. 13 and 14. In this modified structure the insulating block 6 is omitted, an insulating block 16 being used in place thereof. Said block 16 is mounted between the springs 3 at a point substantially midway between the ends thereof, and has notches in either side which engage with said springs. Said block is connected to the operating lever 23 which is pivotally supported on the posts 24 and which passes through a suitable slot in the support 2. Each of the springs 3 has an outwardly extending stud 25 affixed thereto at a point some distance from the end thereof, said studs being suitably journaled in the posts 26.

With the structure shown in Figs. 11 and 12, when the lever 23 is actuated the insulating block 16 is moved against the inner edge of the springs 3 on the convex side thereof and gradually takes the twist out of said springs, with a storage of energy therein, until they snap past dead center and assume a new position of rest. Prior to this snap action there is little movement of the mercury switch 4, but as dead center is passed said switch is abruptly moved to open or close the circuit therethrough.

With any of the foregoing structures the mercury switch is positively actuated from a closed circuit to the full open circuit position, or the reverse thereof, without any opportunity for delay in the operation due to minor variations in the switch structure. Furthermore the switch is positively maintained in either of said positions, without external assistance. These results are in all cases obtained with an exceptionally simple structure which serves the triple purpose of support, biasing means, and flexible conductor for the switch.

While I have described my invention by reference to certain specific structures it is to be understood that they are for purposes of illustration alone, and that various substitutions, omissions, and changes, within the scope of the appended claims, may be made therein without departing from the spirit of my invention.

I claim as my invention:

1. In combination, a fluid flow switch, and a support therefor comprising a pair of substantially parallel resilient metallic strips electrically connected to the respective inleads of said switch, said strips being rigidly connected together at each end thereof but insulated from each other, each of said strips having a reversible deformity therein whereby said strips are caused to assume a slightly dished shape which can be reversed only with a snap action.

2. In combination, a fluid flow switch, and a support therefor comprising a pair of substantially parallel resilient metallic strips electrically

connected to the respective inleads of said switch, said strips being rigidly connected together at each end thereof but insulated from each other, the spacing at one end of said strips being different from the spacing therebetween when unflexed, whereby said strips are caused to assume a slightly dished shape which can be reversed only with a snap action.

3. In combination, a fluid flow switch, and a support therefor comprising a pair of substantially parallel resilient metallic strips electrically connected to the respective inleads of said switch, said strips being rigidly connected together at one end by an insulating member and at the other end by said switch, the spacing of said strips at one end thereof being different from the spacing therebetween when unflexed, whereby said strips are caused to assume a slightly dished shape which can be reversed only with a snap action.

4. In combination, a fluid flow switch, and a support therefor comprising a pair of substantially parallel resilient metallic strips electrically connected to the respective inleads of said switch, said strips being rigidly connected together at one end thereof by an insulating member and at the other end by said switch, the spacing of said strips at the end thereof which is adjacent to said insulating member being less than the spacing therebetween when unflexed, whereby said strips are caused to assume a slightly dished shape which can be reversed only with a snap action.

5. In combination, a fluid flow switch, a support therefor comprising a resilient metallic strip having a reversible deformity therein, one end of said strip being rigidly supported while the other end thereof is attached to said switch, a pivotal support for said strip at a point between said deformity and the point of attachment to said switch, and means to reverse said deformity.

6. In combination, a fluid flow switch, and a support therefor comprising a pair of substantially parallel resilient metallic strips electrically connected to the respective inleads of said switch, said strips being rigidly connected together at each end thereof, the spacing at one end of said strips being different from the spacing therebetween when unflexed, whereby said strips are caused to assume a slightly dished shape which can be reversed only with a snap action, the plane of one of said strips at one end being at an angle with the plane of the other strip at the adjacent end, whereby said strips are more dished in one direction than the other.

7. In combination, a fluid flow switch, a support therefor consisting of a single resilient metallic strip having a reversible deformity therein, one end of said strip being rigidly supported while the other end thereof is attached to said switch, a pivotal support for said strip at a point between said deformity and the point of attachment to said switch, and means to reverse said deformity.

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