

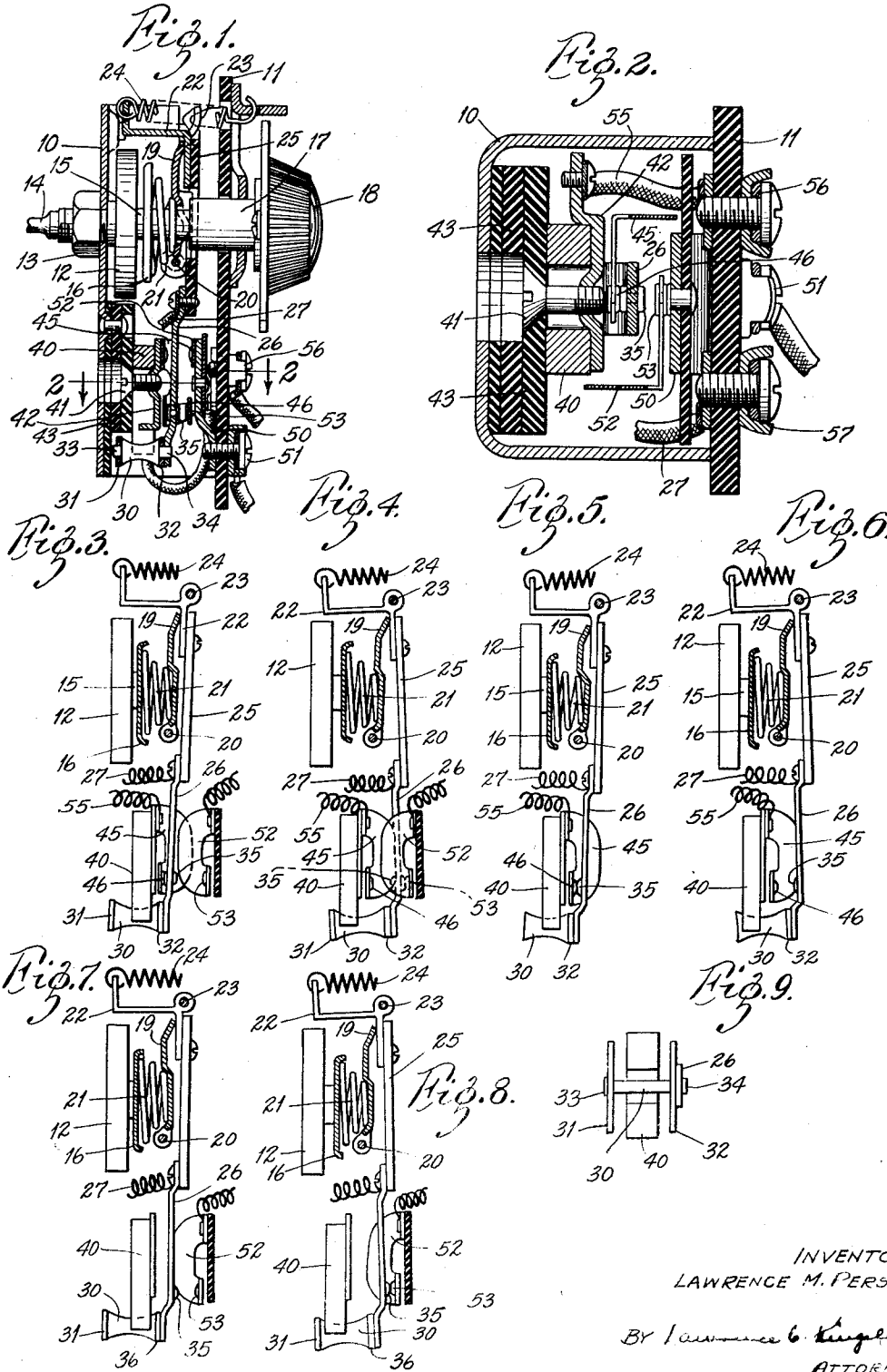
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MULTIPLE THERMOSTAT SWITCH SNAP-ACTION DEVICE

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MULTIPLE THERMOSTAT SWITCH SNAP-ACTION DEVICE

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1 Claim. (Cl. 175—21)

The present invention relates to a switch mechanism and, in particular, to one adapted for use as a single or double-acting switch and in which certain parts are interchangeable.

5 The invention further comprehends a switch having a magnet fixed to the base and an armature therefor fixed to the movable switch arm. This armature may consist of one or two elements, both of which are identical and which
10 elements are selectively adapted to be brought into the field of the magnet during the operation of the device.

It is an object of the invention to provide a switch of this kind having a minimum number
15 of different parts.

It is a further object to provide a switch of this kind having a snap-action means designed so that the same part can be assembled to cause it to act with a quickened motion in either of its
20 directions of travel.

It is a further object to provide such a snap-action means that, by the addition of a part identical to the part mentioned in the previous paragraph, can be made to act with a quickened
25 motion in both directions of its travel.

It is a further object to provide such a snap-action means including a switch blade, and one fixed magnet, together with means adapted to be attached to the blade on either side of the magnet to cause the switch to operate with a snap-
30 action in either direction of its travel.

In the drawing:

Fig. 1 is a sectional view of the switch as a whole.

35 Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a partial diagrammatic view showing a double-action switch closed in one position.

Fig. 4 is a view of the same switch in its other position.

40 Fig. 5 is a partial view of a single-acting switch that opens upon expansion of the diaphragm.

Fig. 6 is a view of this switch in open position.

45 Fig. 7 is a view of a single-acting switch that closes upon expansion of the diaphragm.

Fig. 8 is a view of this switch in closed position.

Fig. 9 is an end view of the snap-action mechanism.

Referring to Figs. 1 and 2, a U-shaped frame element 10 is secured to a front plate 11 to form a housing. It is understood that around this housing, there may be placed an enclosing casing. A switch operating member here shown as comprising separable diaphragm elements 12, more
55 particularly described in my co-pending applica-

tion Serial No. 79,736 filed May 14, 1936, is supported on the frame by means of a nut 13 that secures the fluid containing tube 14 upon which the diaphragms 12 are mounted to the frame 10. It will be understood that the tube 14 extends
5 to the place, the heat of which is to be controlled by the switch and that it is full of a suitable fluid that expands upon heating.

Secured to the diaphragm is a stud 15 having a washer 16 fixed thereon. The stud likewise
10 supports a sleeve 17 adjustably threaded onto the stud. An operating handle 18 having a dial thereon operates for adjustment of the sleeve in and out toward the diaphragms. A primary lever 19 is pivoted at 20 to the frame. This primary lever is adapted to be engaged by the sleeve 17. A spring 21 coiled about the stud 15 holds the lever 19 against the sleeve 17 or against a secondary lever 22. This secondary lever is pivoted to the frame at 23 and comprises the
20 switch blade element. A relatively light coil spring 24 maintains the secondary lever 22 in its most clockwise position. The secondary lever passes back across the stud and sleeve and has a hole therein to permit their passage. The secondary lever may have interposed therein an insulating portion 25 and a conducting portion 26. To this latter is brought a switch lead 27. To the outer end of the secondary lever or switch blade 22 is secured an armature, comprising a
30 relatively non-permeable element 30 at opposite ends of which may be securely relatively permeable plates 31 and 32. Lugs 33 and 34 extend from the ends of the members 30 through suitable holes in the members 31 and 32, and support the said members thereon, the lugs 33 and 34 being peened over for this purpose. It will be seen that the lug 34 also maintains the armature assemblage onto the switch blade. A double contact 35 is secured to the element 26.
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A permanent magnet 40 of the horse shoe type is secured to the frame member 10 by means of a screw 41 and a switch backing-plate 42. The screw 41 passes through suitable insulating elements 43 secured to the frame 10 and to the switch backing-plate 42 to clamp the member 40 therebetween. A switch plate 45 of the type described in my co-pending application Serial No. 80,090, May 16, 1936, comprises a U-shaped
50 plate, the connecting portion of which is bent at right angles to the respective legs. One of the legs is secured to the switch backing-plate 42 and the other leg carries the relatively fixed contact 46 to permit limited movement thereof. A switch plate of this design permits a peeling

apart of the contacts if they become welded together.

An additional switch backing-plate 50 is secured to the front plate 11 of the frame by means of a screw 51 that also forms a terminal screw for the switch. A switch plate 52 identical with the switch plate 45 is secured to the switch backing-plate 50 and carries a relatively fixed contact 53. The first switch backing-plate 42 has an extension thereon to which the lead 55 is attached. This lead goes to a terminal 56 on the front panel 11. The lead 27 attached to the switch blade 26 goes to the terminal 57 also on the front panel 11.

The permeable elements 31 and 32 are identical. The switch may be made up with both of them, as is shown in Figs. 1 to 4 inclusive. It may be made up with only the permeable element 32, as shown in Figs. 5 and 6, or with only the element 31, as is shown in Figs. 7 and 8. The use of any of these combinations requires no new parts, because of the identity of these two permeable elements, the member 30 being used with any of the combinations. Where only one of the two permeable elements is used, the unused lugs 33 and 34 may be sprung off, or left on, as desired. Where the switch employs only the element 32, the connecting element 30 may be eliminated, or cut down, if desired. Where the element 31 only is used, an impermeable plate 36 may be used at the opposite end of the connecting element 30 if desired to maintain the same spacing of the parts. This, however, is not essential.

The operation of the switch is as follows:

Referring to Fig. 1, expansion of the diaphragms 12 shifts the stud 15 to the right, the stud carrying with it the sleeve 17. The spring 21 maintains the primary lever 19 as far to the right as possible; and unless this lever 19 is stopped by the secondary lever 22, the spring 21 will maintain it in contact with the sleeve 17. This movement of the primary lever, then, pivots the secondary lever about its pivot 23 to move this secondary lever in a counterclockwise direction. This moves the contact 35 away from the contact 46 and toward the contact 53. It will be seen that the expanding pressure of the diaphragm is transmitted through the spring 21, which is a stiff spring. When the contact 35 meets the contact 53 and is stopped thereby, the primary lever 19 is necessarily stopped. Any further expansion of the diaphragm, then, is absorbed by the spring 21.

In adjusting the mechanism to operate at different temperatures, the handle 18 is turned to move the sleeve 17. This shifts the initial setting of the primary lever 19 and, consequently, changes the temperature at which the secondary lever 22 will be moved thereby. This is described in detail in my co-pending application, Serial No. 79,736, above mentioned. As is seen in the several views, the member 30 rides between the poles of the magnet 40 during movement of the switch. In the position shown in Fig. 3, the member 32 has been brought within the field of the magnet and the member 31 removed therefrom. In shifting to the position of Fig. 4, the member 32 is taken out of the field of the magnet and at a later part of the shifting movement, the member 31 comes into

the field so that the final movement occurs with a snap-action to close the switch sharply. In reversing back to the position of Fig. 3, the converse is true, and the member 32 coming into the field of the magnet snaps the contact 35 to the contact 46.

It will be seen that the switch plate 45 spaces the contact 46 slightly above the backing-plate 42. The switch plate 45 is of light resilient metal so that when the contacts are brought together, the plate yields and permits the contact 46 to move until stopped by the backing-plate 42. As the switch opens, and during the time the contact 46 moves from against the backing-plate 42 to the "normal" position shown in the several views, very little resistance to its motion is produced in the switch plate itself. It is during this period that the magnet is most effective and applies most resistance to the openings of the contact. Beyond the position shown in the views, the switch plate itself sets up resistance to the following of the contact 35 by the contact 46, should they be welded together, the resistance being of such nature as to peel the contacts apart with a minimum of effort. It is, therefore, apparent that the resistance due to the switch plate is not brought into action until the armature element 32 is partially free of the magnetic field, and the switch thereby obtains a running start to assist in peeling the contacts apart. It will be understood that the switch plate 52 is of identical construction and operation.

The switch of Figs. 5 and 6 operates against a single contact that opens upon rise of heat. Such a switch would be used in a heating system. The switch of Figs. 7 and 8 closes upon rise of heat and such a switch would be used in a refrigeration system. All of these switches operate with the magnet and the same construction, save for the elimination of the unnecessary switch elements and the unused armature plate. By thus designing the switch, a minimum number of parts is required and the assembling operations are greatly simplified.

The switch is particularly applicable where diaphragm or bellows expanding means are used, with a so-called solid charge (i. e., free of gas). In such systems, any heat changes cause expansion of the liquid, which is relatively incompressible, whereby the action is positive. Furthermore, the movement produced is relatively small.

What is claimed is:

In a mechanism of the kind described, a magnet, a movable blade, an armature mechanism adapted to cooperate with said magnet to give either two-way or one-way snap action to said blade, said mechanism comprising a connecting member adapted to cross said magnetic field and having a lug projecting from each end thereof, and a pair of identical armatures each having a hole to receive one of the lugs by means of which said armatures may be attached to the connecting member, and said blade likewise having an opening through which one of said lugs may extend whereby one or both of said armatures may be secured to said blade to effect snap action thereof in either one or both directions.

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