Nov. 26, 1957 W. C. MOODIE, SR 2,814,694

THREE WIRE THERMAL SWITCH

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Fig. 1.

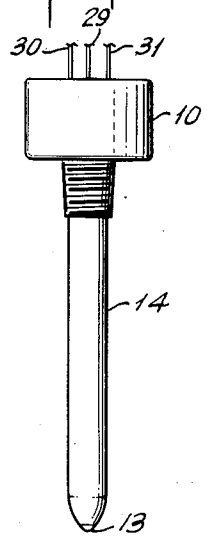


Fig. 2.

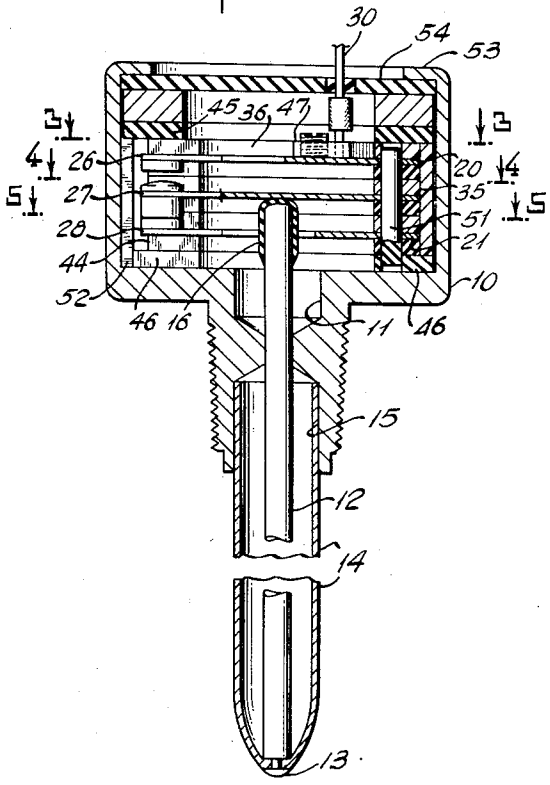


Fig. 3.

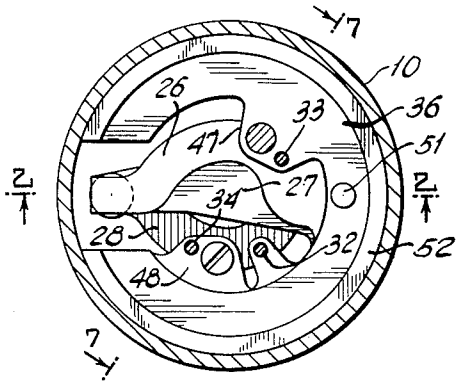


Fig. 4.

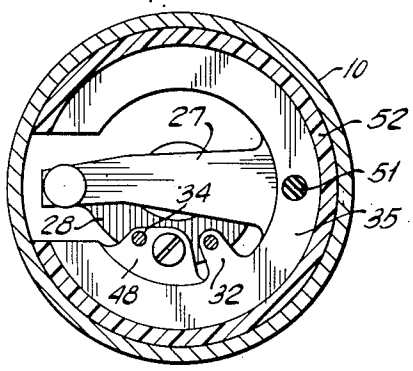
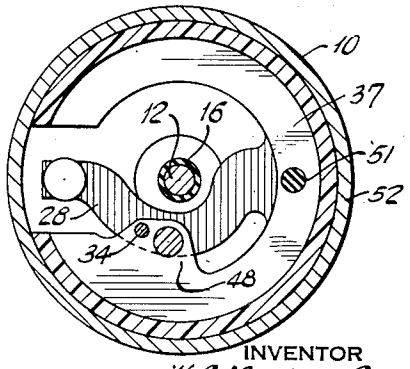


Fig. 5.



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Fig. 6.

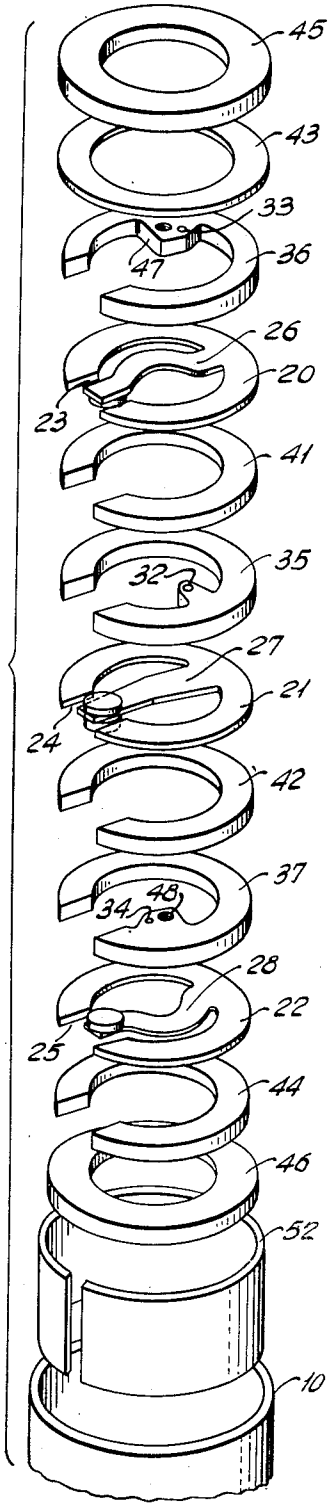


Fig. 7.

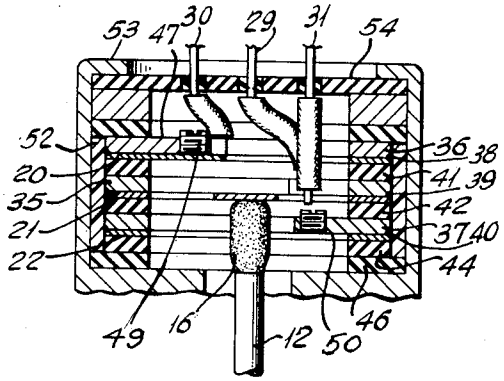


Fig. 8.

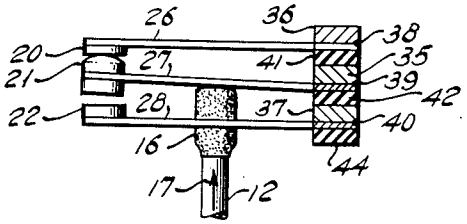
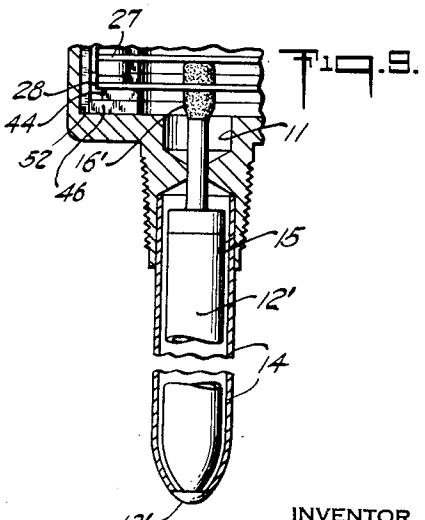


Fig. 9.



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THREE WIRE THERMAL SWITCH

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Application January 14, 1957, Serial No. 634,111

7 Claims. (Cl. 200—137)

This invention relates to thermal switch devices operative responsive to temperature changes. Pursuant to the present invention, a three wire thermal switch device is provided comprising three spring members having contact arms disposed in an arrangement such that the wires to two circuits may be connected to the uppermost and lowermost spring, the common wire of the said circuits connected to the remaining center spring. The contact arm of the latter is adapted to be engaged by the end of a rod which reciprocates responsive to temperature changes and thereby moves the arm of the center spring into contacting engagement with the arm of the lowermost spring or, selectively, with the arm of the uppermost spring. The invention includes the making of said spring members in a novel form rendering them more efficient and practical in operation, and in novel features of assembly in connection of the parts and adjustment thereof, and for aligning and maintaining the parts in proper registry for operation.

These and other advantageous objects, which will appear from the drawings and from the description hereinafter, are accomplished by the structure of my invention, of which an embodiment is illustrated in the drawings. It will be apparent, from a consideration of said drawings and the following description, that the invention may be embodied in other forms suggested thereby, and such other forms as come within the scope of the appended claims are to be considered within the scope and purview of the instant invention.

In the drawings:

Fig. 1 is an elevational view of a three wire thermal switch device embodying the invention,

Fig. 2 is a vertical sectional view thereof, partly broken away, taken on line 2—2 of Fig. 3,

Fig. 3 is a transverse sectional view taken on line 3—3 of Fig. 2,

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 2,

Fig. 5 is a transverse sectional view taken on line 5—5 of Fig. 2,

Fig. 6 is an exploded view of parts of the device embodying one form of the invention,

Fig. 7 is a fragmentary sectional view taken on line 7—7 of Fig. 3,

Fig. 8 is a similar schematic view, showing the contact arm of the center spring moved into engagement with the contact arm of the upper spring responsive to movement of the thermally actuated rod, and

Fig. 9 is a fragmentary vertical sectional view of the device of the invention utilizing a different form of rod than that shown at 12 in Fig. 2, for the same purpose.

As shown in the drawings, the device of this invention comprises a casing 10 having an aperture 11 at the lower end thereof in which the rod 12 is movable. The lower end of the rod is fixed as at 13 to the tube 14 which, in turn, is secured to the casing 10 as at 15. The free end of the rod 12 may have an insulation cap 16 secured thereto. It will be understood, from the above description, that the rod 12 will move responsive to one temperature change in the direction of the arrow 17 (Fig. 8) and in the opposite direction upon an opposite temperature change. An upper spring 20, a lower spring 22, and an intermediate center spring 21 are positioned in the casing (Fig. 7) said springs being preferably, as shown in Fig. 6, in the form of rings split by openings 23, 25 and 24 therein, arms 26, 28 and 27 extending from points of said springs diametrically opposite said openings, the free ends of said arms preferably terminating and being movable in said openings. The center spring 21 is connected to the common wire 29 which, when connected with the wire 30 connected with the upper spring 20 for a first circuit, completes said circuit and, when connected with a wire 31 connected to the lower spring 22 for a second circuit, completes said second circuit. The parts may be so proportioned that normally the free end 16 of the rod 12 will hold the arm of the center spring in contact with the arm 26 of the upper spring (Fig. 8) thus completing the circuit through wires 29, 30 or to normally dispose arm 27 of the center spring in contact with the arm 28 of the lower spring and thus complete the circuit of the wires at 29, 31 (Fig. 2). Assuming the Fig. 2 form to be a normal condition for which the device is designed, then, responsive to movement of rod 12 in the direction of the arrow 17 in Fig. 8, arm 27 will be lifted off the arm 28 and into contact with the arm 26, thereby switching from the 29—31 wire circuit to the 29—30 wire circuit.

The device may be employed for any application wherein an automatic two, three or four wire thermal switch is required.

In the three wire form shown in the drawings, the wires 29, 30, 31 may, as above mentioned, be connected directly to the springs 21, 20 and 22, or they may be connected to the plates or (Figs. 3 and 6) points 32 of plate 35, 33 of plate 36 and 34 of plate 37. Said plates may be mounted in the casing 10 in frictional or other electrical contact with the springs 21, 20 and 22 respectively or may be welded to said springs at one or more points, as indicated at 38, 39 and 40 (Fig. 7). Suitable insulation spacers 41, 42 may be positioned (Fig. 6) between the center spring 21 and the upper and lower springs 20 and 22, said plates and insulators between the plates being preferably provided with openings corresponding with the openings in the springs 20, 21 and 22 in which the arms of said springs are movable. The plates 36 and 37 are preferably provided with movable means for engagement with arms of spring 26, 28 to move them relative to the arm of the center spring 21, to alter the spacing therebetween and the extent of movement required of the rod 12 for attaining contact between the arm of the center spring with the arms of the other springs. Said means may comprise (Figs. 3, 4, 6) bosses 47 and 48 on plates 36 and 37 in which set screws 49 and 50 are movable. The springs and associated plates and insulators are preferably provided with aligning apertures through which an aligning pin 51 (Figs. 2, 3 and 4) may be passed to align the parts in proper juxtaposition (either while being assembled or permanently), with the arms of said springs registered with the openings in the plates and insulator members.

On assembly of the device, an insulation collar 52 may be positioned within the casing 10 on a spacer 46 (Fig. 2) and the parts positioned therein and the wires connected to the springs as shown in Fig. 7. Adjustment may be made by means of set screws 49, 50 to fix the positions of the arms 26, 28 relative to the center spring arm 27, and then the top of the casing 10 may

be rolled as at **53**, Fig. 7, over an insulation closure plate **54** through which the wires **29**, **30**, **31** may suitably project for connection of the circuits as desired. It will be understood of course, that instead of the wires projecting, terminal posts may be secured to the wires and be disposed at the top of the casing, if desired.

The term "rod" as used herein shall be deemed to comprehend and include elongated members not only such as shown at **12** in Fig. 2, and there shown fixed by welding, riveting, or other securing means to one end to tube **14** and having the other, free end extending into the casing **10** for actuation of the switch responsive to thermal changes, but also any other members suited to the same end, as, for example, the elongated, hollow inner tube **12'** constitutes the "rod" in Fig. 9 disposed in the outer tube **14**, fixed at one end **13'** thereto and having the other end extended as at **16'** into the casing **10**, serving the same purpose as the elongated, solid rod **12** of Fig. 2.

I claim:

1. A switch device comprising an elongated casing having an aperture at the lower end thereof and an elongated rod movable in said aperture responsive to temperature changes, a first spring positioned in such casing in line with said aperture and rod, a second spring positioned in said casing in spaced relation to the first spring and in line therewith, and a third spring positioned in the casing intermediate the first and second springs and in line therewith, each of said springs being in the outline of a W with the center arm thereof extended transversely of the casing for vertical movement, the parts being so tensioned and proportioned that the arm of the third spring abuts the end of the rod and is thereby movable, responsive to movement of the rod, into contact with the arm of second or first springs, to thereby complete a circuit through wires connected to the third spring and to the first or second spring, selectively, on movement of the rod responsive to temperature changes.

2. In a switch device set forth in claim 1, the center arm of the first spring being offset so that the rod may pass freely therethrough and into contact with the third spring, to abut and move the latter.

3. In a switch device as set forth in claim 1, a plate positioned intermediate the third spring and the second spring, and movable means on said plate for engagement with the second spring to move the arm thereof relative to the arm of the third spring to thereby alter the spacing therebetween and therefore the extent of movement of the rod required for contact between the arms of the third and second springs.

4. In a switch device as set forth in claim 1, plates positioned intermediate the third spring and the second and first springs, and movable means on said plates for engagement with the second and first springs to move the arms thereof relative to the arm of the third spring to thereby alter the spacing therebetween and therefore the extent of movement of the rod required for contact between the arms of the third and other springs.

5. In a switch device as set forth in claim 1, said springs being formed as rings, with the arms so extending transversely therefrom, plates positioned intermediate the third spring and the second and first springs, in the form of rings, and bosses extending from said rings transversely, and means movable in said bosses for engagement with the second and first springs to move the arms thereof relative to the arm of the center spring to thereby alter the spacing therebetween and therefore the extent of movement of the rod required for contact between the arms of the third and other springs.

6. In a switch device as set forth in claim 1, means for aligning said springs in said casing and for maintaining them therein in registry.

7. In a switch device as set forth in claim 1, said springs having apertures aligned when the springs are so mounted with their arms in registry, and an aligning pin passed through said apertures to so align said springs and maintain them in registry.

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