March 14, 1933. L. REICHOLD 1,901,775

THERMOSTATIC SWITCH UNIT

Filed Oct. 19, 1931

FIG. 1.

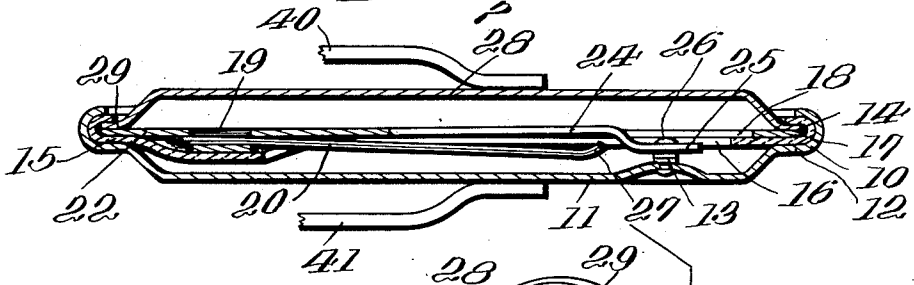


FIG. 2.

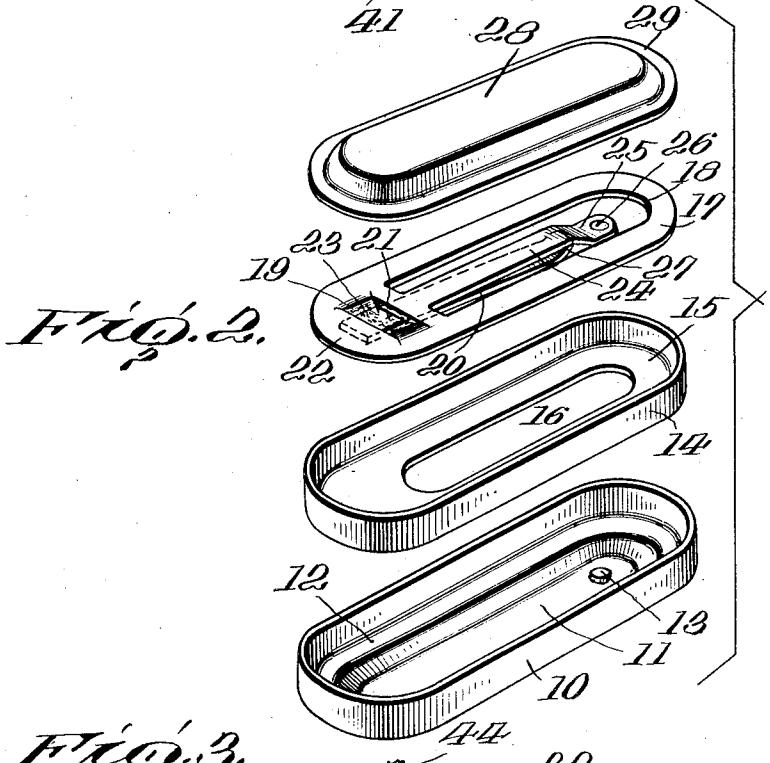
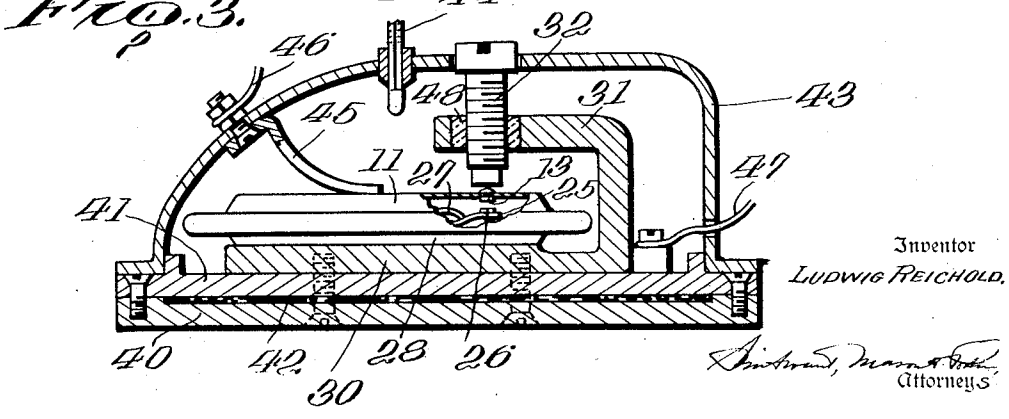


FIG. 3.



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THERMOSTATIC SWITCH UNIT

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This invention relates to improvements in thermostatic elements and more particularly concerns an assembly and construction of such elements.

One of the features of the present invention is a self-contained thermostatic element including a thermostatically responsive device and a contactor, the assembly being of small size and limited thickness and particularly adapted for inclusion in heating devices of the flexible pad type.

Another feature is the provision of a thermostat switch unit which is self-contained and substantially air- and dust-tight.

Another feature of the invention is a thermostatic element including a thermostatically responsive device and a switch which may be permanently assembled together in manufacture, and the device calibrated during manufacture to a predetermined temperature of operation.

A further feature of the device is the provision of a thermostatic element comprising very few parts and adapted for immediate inclusion in a circuit by simple inclusion between contactors thereof.

A still further feature is the provision of a thermostat switch unit in which the contact devices are independent of the thermostatically responsive element, so that chattering between the contacts is avoided.

One form of construction of the device is shown on the accompanying drawing, by way of illustration, in conjunction with the following description.

In the drawing:

Figure 1 is a longitudinal section through the assembled thermostatic element.

Figure 2 is a view showing the several parts in position ready for assembly.

Figure 3 is a view showing a means of adjusting the device for operation at a predetermined temperature, during the course of manufacture.

In the drawing, the thermostatic element is shown to be comprised of an elongated cup 10 having a bottom wall 11 and a shoulder or flange 12, with a contact button 13 having a platinum contact surface, for example, and secured to the bottom wall 11 as by riveting. Within this cup is seated a cuplike insulating member 14 having walls extending above the upper edge of the wall of cup 10 when the bottom 15 of the insulating piece is seated on the shoulder 12. The bottom 15 has an aperture 16 through which the thermostat bar assembly, to be described hereinafter, may pass for engagement with the button 13.

A thermostat bar support 17 having an aperture 18 therein and a depressed portion 19 receives the bimetallic or thermostatically actuated bar 20 which is shown in Figure 2 to pass beneath the connecting bridge 21 and the extreme end 22 of the supporting piece 17, while passing over the depressed portion 19. A solder joint 23 is employed to hold the bimetallic bar fixedly in position and in constant electrical connection with the support 17. Integral with the supporting piece 17 is a spring tongue 24 having an offset end 25 carrying a contact button 26. The bimetallic bar 20 preferably has a slightly upturned end 27 for engaging the lower surface of the spring blade 24.

A dished cover piece 28 has a peripheral flange 29.

The operation of assembly comprises inserting the insulating member 14 in the cup 10, placing the supporting piece 17 with the bimetallic bar supported therein, in its proper position within the insulating member 14, and then locating the closing cover 28 in metal-to-metal contact with the piece 17. The upper edge of the outer cup 10 is then crimped over as shown in Figure 1 whereby it engages the edge of the peripheral flange of the insulating member 14 and forces the latter down upon the peripheral flange 29 of the cover so that a rigid assembly is produced, in which the bimetallic bar is entirely enclosed and protected from injury. The entire unit is substantially air- and dust-tight, as the insulating member 14 acts also as a mechanical seal.

Having thus assembled the devices, they are placed in an oven and heated to the predetermined temperature for operation. The plane bottom 11 is then depressed so that the contact 13 is moved inward as indicated in

Figure 1. For this purpose, the apparatus shown in Figure 3 may be employed, comprising the base piece 40 having the shoe 41 thereon. Between the base 40 and the shoe 41 is an electrically heated element 42. A cover 43 having a thermometer 44 therein and individually insulated contact springs 45 which are connected by conductors 46 to some suitable alarm device (not shown) is brought over the units, which are located on a clamp table 30 having an upstanding arm 31 carrying screws 32 for the units. A second conductor 47 leads to the clamp table so that the elements may be connected in circuit with the alarm device. It is preferred to insulate the end of the screw 32, for example, by providing an insulating bushing 48 so that the alarm circuit is not closed except through the particular unit being tested.

When the unit has been assembled, it is placed in the furnace apparatus described, and the heater 42 actuated until the thermometer 44 remains for a time at the predetermined temperature of operation. At this temperature, the thermostatic bar 27 will have moved from the position shown in Figure 2, for example, until it has engaged the spring blade 24 and moved contact 26 away from contact 13 as shown in Figure 3. The head of screw 32 is engaged by a screwdriver and the screw is thus employed to depress the bottom 11 until the contact 13 engages with the contact 26. The moment the contacts engage the alarm circuit is closed through the conductor elements 45, 46 and 30, 47 so that the alarm is given: and the operation may then proceed to the calibration of another unit.

Therefore, as shown in Figure 1, the contact 13 in the finished structure lies above the position formerly occupied and hence the contact 26 on the spring blade, and the spring blade 24 itself are located higher, in Figure 1, than before the squeezing was accomplished. Hence, the bimetallic blade 20 must move a greater distance before engaging the spring blade 24 to separate contact 26 from contact 13. That is, the thermostatic element has thus been adjusted so that it will now open the associated circuit at say 150 degrees F.

It will thus be seen that by varying the amount of depression given to the contact 13 by the screw 31, the temperature at which the circuit will be opened may be definitely calibrated.

The element thus assembled may be connected in circuit by simply slipping it between the spring contact arms 40, 41 (Figure 1) which are connected in the circuit to be controlled by the element. As current flows, say, to the contactor 41, it passes to the outer cup 10 and thus to the contact 13. Thence, the current flows (in the "cold" position shown in Figure 1) to the contact 26, spring arm 24, supporting piece 17, cover 28 and thus to the other contactor 40. When the temperature of the bimetallic bar 20 has risen to such a point that the bimetallic bar 20 has sprung upward in response to the differential expansion of its component parts to the extent necessary to bring it in contact with the spring blade 24 and raise the same slightly, the circuit is broken between contacts 13, 26 and thus is interrupted.

This employment of a spring as a contact supporting element independently of the bimetallic or thermostatically actuated bar operates to prevent chattering between the contacts, with the resulting arcing which is injurious to the contacts themselves and may produce radial interference. As the spring is always under the same tension, it tends to exert a pressure against the thermostatic bar when the latter engages it, and thus to stop minute movements of the bimetallic strip when in the so-called "neutral position" corresponding to the predetermined temperature for breaking the circuit. At this position, the thermostatic bar itself does not create any effective pressure in either direction and is hence practically inactive and thus is easily moved back and forth with resultant arcing in former devices. The presence of the separate spring contact imposes a slight strain upon the bimetallic strip and stops the chattering.

It will be noted that in the particular form shown, the insulating member 14 has been formed with a flat bottom 15 which may be slightly depressed by the portion 19 of the supporting piece 17 in Figure 1. This assists in preventing any looseness of parts after the final assembly.

The structure is excellently adapted for employment in various electrical heating devices, and especially in such devices as heating pads where the thermostat must be of very small size to assure a proper flexibility to the pads.

It is obvious that the invention is not limited solely to the form of construction shown, but that it may be modified in many ways within the scope of the appended claims.

I claim:

1. In a thermostatic switch unit, a cup member and a cover member, said members including a peripheral seam to hold them fixedly together, insulation in said seam for holding the said members electrically insulated and including a portion extending inwardly between said members, an intermediate element located between said members and in electrical contact with one member and held by said inwardly extending portion against electrical contact with said other member, a contact on said other member, and a thermostatically responsive device fixed to said intermediate element and

including a contact for cooperating with said first contact.

2. In a thermostatic switch unit, a cup member and a cover member, said members including a peripheral seam to hold them fixedly together, insulation in said seam for holding the said members electrically insulated and including a portion extending inwardly between said members, an intermediate element located between said members and in electrical contact with one member and held by said inwardly extending portion against electrical contact with said other member, said intermediate element including a spring blade having a contact thereon, a contact on said other member cooperative with said spring contact, and a thermostatically responsive element mounted on said intermediate element and adapted to operate said spring blade.

3. In a thermostatic switch unit, a cup member having a flange, a cover member having a flange, a thermostatically responsive device including a conductive flange located between the flanges of said cup and cover members, insulation for electrically separating said device and one member from said other member, said flange on said device being in conductive relation with the flange on said one member, a contact on said other member cooperative with said device, said device responding to thermal changes by movement of a portion thereof toward and from said contact whereby to make and break the circuit, and conductor means engaged with said members whereby to include said unit in circuit.

4. In a thermostatic switch unit, a cup member, a cover member, an apertured insulating cup in said cup member, an intermediate element in said insulating cup and including a spring blade having a contact, a cooperating contact on said cup, said spring blade being adapted to move in said aperture for engagement with said cooperating contact, a thermostatically responsive bar on said intermediate element, and peripheral engaging means on said members to hold the same together and to hold said intermediate element in engagement with said cover member.

5. A thermostatic switch unit as in claim 1, including a depression in the wall of said other member at said contact whereby the contact is carried within the plane of the outer wall of said member.

In testimony whereof, I affix my signature.

LUDWIG REICHOLD.