Aug. 9, 1927. 1,638,410

G. A. ROBERTSHAW ET AL

ELECTRIC THERMOSTAT

Filed June 27, 1923 2 Sheets-Sheet 1

Fig. 1.

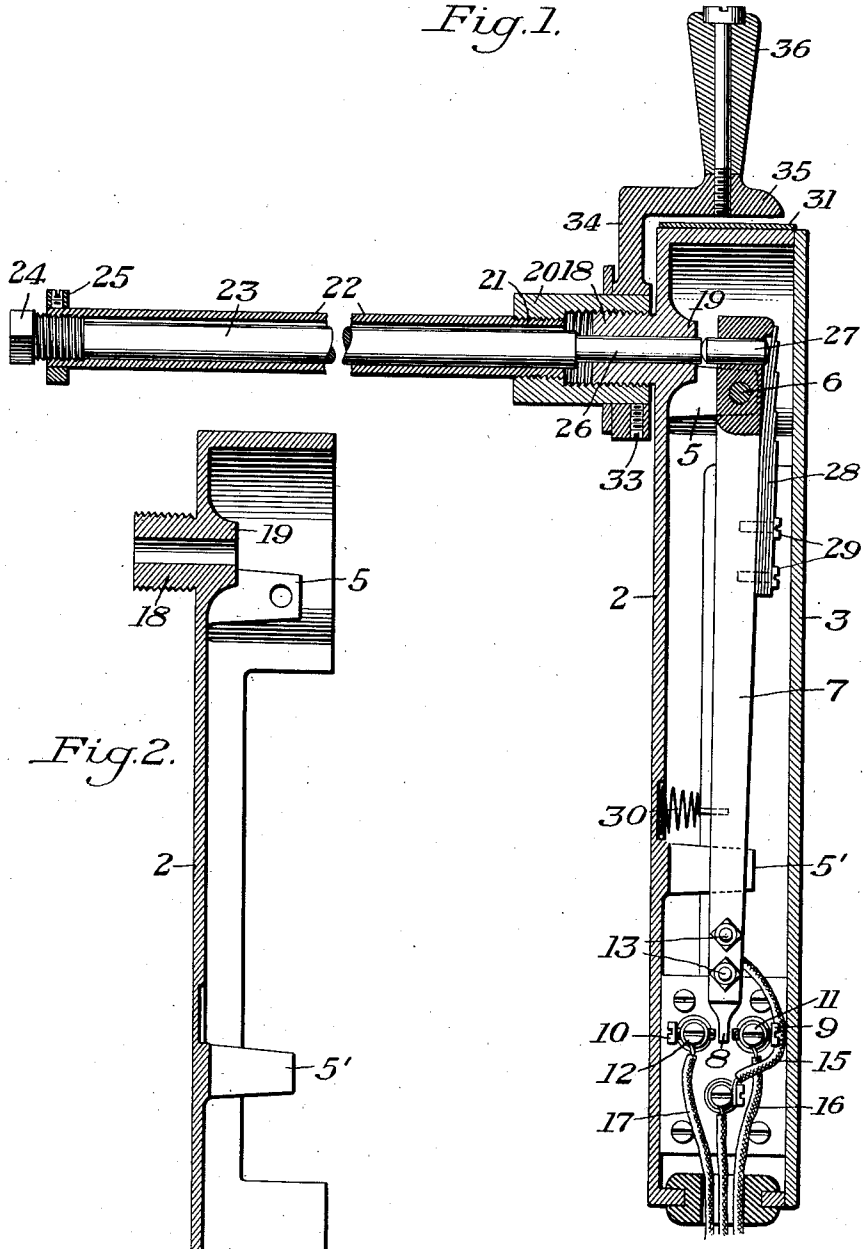


Fig. 2.

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Fig. 3.

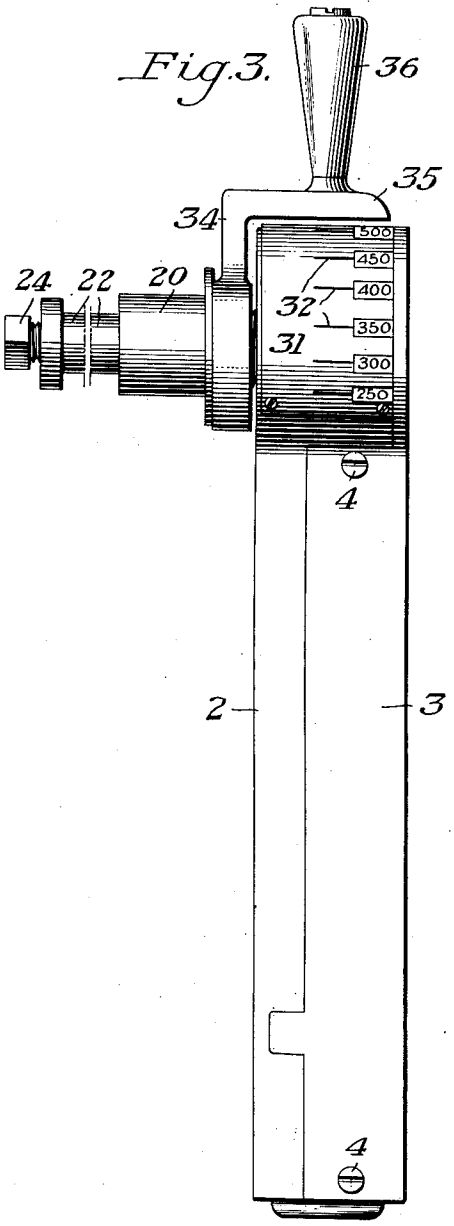
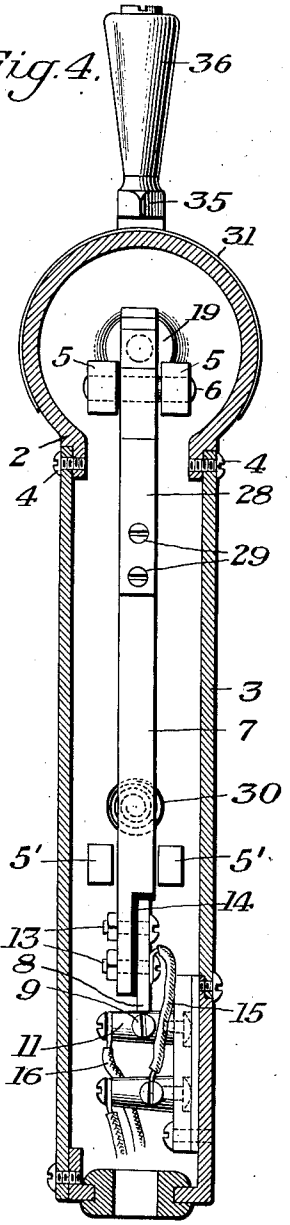


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRIC THERMOSTAT.

Application filed June 27, 1923. Serial No. 648,105.

This invention relates broadly to electric thermostats, and more particularly to thermostats adapted for use in connection with electric ovens and the like.

Heretofore electric thermostats have embodied flexible thermostatic elements, such as a bimetallic strip. This strip made contact with fixed stops, the result being that on extremes of temperature, the bimetallic strip became strained and set, thereby rendering the thermostat inaccurate and unreliable in operation. By the present invention we have provided an electric thermostat embodying rigid or non-yielding thermostatic elements for operating electric contact means. The electric contact means is also rigid under normal pressures, but is adapted to yield under abnormal pressures, thereby preventing breakage or damage to the parts of the contact means, and also preventing damage to the thermostatic elements or the setting up of any permanent strains therein.

An important feature of the invention is the provision of thermostatically operated electric contact means, the parts of which are readily accessible for adjustment or removal without affecting the setting of the thermostat.

Another important feature of the invention is the provision of a thermostat in which it is impossible to lose the original setting during ordinary use thereof.

Still another feature of the invention is the provision of thermostatically operated electric contact means having means for setting said contact means and independent means for correcting said setting.

In the accompanying drawings, there is shown, for purposes of illustration only, one embodiment of the present invention, it being understood that the drawings do not define the limits of the invention, as changes may be made in the construction and operation therein disclosed without departing from the spirit of the invention or scope of our broader claims.

In the drawings:

Figure 1 is a longitudinal sectional view through an electric contact means and its operating thermostat constructed in accordance with the present invention,

Figure 2 is a longitudinal sectional view of the casing, with the cover removed, in which the electric contact means is located,

Figure 3 is a side elevation of the thermostat, and

Figure 4 is a longitudinal sectional view through the casing which contains the electric contact means, the section being taken at right angles to the section shown in Figure 1.

Referring to the drawings, there is illustrated a casing 2 provided with a removable cover 3 secured thereto by screws 4. The casing is provided on its interior and near the upper end thereof with a pair of spaced lugs 5, in the ends of which is journaled a pin 6 extending through an electric contact lever 7 near the upper end thereof and forming a pivot for said lever. The lever 7 has fastened to its lower end a contact element 8 adapted to make contact either with a hot contact 9 or a cold contact 10. The contacts 9 and 10, as shown, are constituted by screws which are adjustably mounted in binding posts 11 and 12. The contact 8 is secured to the lever 7 by screws 13, and is insulated from said lever by insulation 14. Conductors 15, 16 and 17 are shown leading from the contact 8 and binding posts 11 and 12. These conductors may connect with a relay, if desired.

Extending rearwardly from the rear wall of the casing 2 adjacent the upper end thereof is a projection 18 in alinement with a boss 19 extending slightly into the casing. The projection 18 has its outer surface screw-threaded, and mounted upon said screw-threaded projection is a hollow coupling member 20 having an enlarged screw-threaded bore for cooperation with said projection and having a reduced screw-threaded bore to receive the threaded end 21 of a tube 22 constituting the expansible member of a thermostatic couple.

Located within the expansible member 22 is a non-expansible member 23, which may be a carbon rod. The member 23 abuts at one end against a screw-plug 24 in the rear end of the member 22. This screw-plug is locked in adjusted position by means of a clamping collar 25 mounted on the end of the member 22. The non-expansible member 23 abuts at its forward end against a pin 26, preferably of brass, slidably mounted in the projection 18 and boss 19 in alinement with said member 23. Slidably mounted in an opening extending transversely

through the upper end portion of the lever 7 is another pin 27, also preferably of brass. The pin 27 abuts at one end against one end of the pin 26, and said abutting end of the pin 27 is rounded, whereas the engaging end of the pin 26 is flat. This construction prevents slack and lost motion in communicating the rectilinear movement of the member 23 to the lever 7 through the pins 26 and 27, it being readily appreciated that the abutting end of the pin 27 moves in the arc of a circle. The opposite end of the pin 27 may also be rounded, and this end abuts against a leaf spring 28 fastened by screws 29 to the lever 7.

A coil spring 30 is interposed between the lever 7, adjacent the lower end thereof and the rear wall of the casing 2, and tends to move the lever in a direction to cause the contact 8 to engage the hot contact 9. The lever 7 is actuated between the hot and cold contacts 9 and 10 by the thermo expansion and contraction of the expansible member 22, the movement being communicated to the lever 7 by means of the non-expansible member 23. Upon cooling, the thermostatic member 23 actuates the lever 7 against the pressure of the spring 30 towards the cold contact 10. Upon heating, the pressure of the member 23 is removed, and the spring 30 then is free to actuate the lever 7 towards the hot contact 9.

When the lever 7 makes contact with the cold contact 10, it cannot move further in that direction, and to prevent excessive strain upon the parts, the relief spring 28 is provided. This is a strong stiff spring, and it is mounted in such a way that it is under sufficient initial stress, even when all pressure from the thermostatic member 23 has been removed, so it exerts a much greater effective pressure on the lever 7 than the spring 30. For this reason, the relief spring 28 must always be down in positive contact with its lever rest before the spring 30 can move the lever. This particular feature provides sufficient reserve power to operate the lever against the friction of the bearings and guides without requiring a temperature movement of the member 23, in order to build up the necessary differential in spring pressure, for the excess pressure required to start the relief spring off its lever rest is much greater than the effective friction pressure. In other words, we have combined a non-yielding thermostatic member 23 with an electric contact lever 7 of high ratio moving between close contacts, and provided with a means for relieving the excessive expansion or contraction of the non-yielding thermostatic member beyond the limits of the lever movements. Thus we have obtained the advantages of accurate temperature setting, a close range between on and off, and possible use of the thermostat throughout a wide temperature range, such as between 0 degrees and 1000 degrees Fahrenheit, or an even greater range, without danger of the parts taking a permanent set because of the strains due to an excessive temperature range.

Located on the exterior of the upper curved end of the casing 2 is a plate 31 having graduations 32 thereon which are marked to indicate different degrees of temperature at which it is desired to maintain the oven or the like with which the thermostat may be associated. Adjustably fastened to the coupling member 20 by suitable means, such as a set screw 33, is an arm 34 provided with a pointer 35 for cooperation with the graduations 32 and with an operating handle 36. By turning the coupling member 20 by means of the handle 36 and arm 34, said coupling member 20 is moved toward or away from the casing 2 because of the threaded projection 18, thereby adjusting the position of the thermostatic couple 22—23 to secure the desired approximate temperature setting in accordance with the indicia on the plate 31. By means of the screw-plug 24, the member 23 may be adjusted to the exact temperature graduations on the dial or plate 31. The coupling member 20 therefore constitutes means for adjusting the thermostatic couple with respect to the electric contact means, and the screw-plug 24 constitutes means for correcting such adjustment.

The casing 2 is provided on the interior thereof with a second pair of spaced lugs 5' located adjacent the lower end of the lever 7 and between which said lever is guided.

It will be apparent that with a construction of this kind, it is impossible to lose the original setting of the thermostat, as the handle 36 can only be rotated through a limited arc by reason of its engagement with the sides of the casing 2. The removable cover plate 3 provides means whereby access may be readily had to the parts of the electric contact means, and whereby these parts may be removed from the casing, if desired. It will furthermore be apparent that the setting of the thermostat is not affected by removing the parts of the electric contact means.

An important advantage of the present invention arises from the provision of non-yielding thermostatic means for operating electric contact means.

A further advantage arises from the provision of a connection between the non-yielding thermostatic means and the movable element of the electric current means, which connection is substantially rigid under normal conditions of operation, but which is adapted to yield when subjected to abnormal pressure.

A further advantage of the invention

arises from the provision of setting and correcting devices permitting an accurate operation of the thermostat at all times.

We claim:

1. A thermostat, comprising electric switch means having a movable operating member, an expansible member, a revolving coupling member connecting one end of said expansible member to said switch means, a correcting device at the opposite end of said member, and a non-expansible member cooperating therewith for operating said movable operating member, substantially as described.

2. A thermostat, comprising a supporting body, an electric contact member movably mounted thereon, an expansible member, a revolving coupling member connecting said body and said expansible member, and a non-expansible member cooperating with said expansible member for operating said electric contact member, substantially as described.

3. A thermostat, comprising an electric control device having a movable operating member, an expansible member, a revolving coupling member connecting said device and said expansible member, a non-expansible member cooperating with said expansible member for operating the movable member of said device, and means permitting removal of the parts of said controlling device without affecting the setting of the thermostat, substantially as described.

4. A thermostat, comprising non-yielding movable electric contact means, non-yielding thermostatic means, and a leaf spring carried by one of said means and extending substantially in the direction of such means in order to take up as little space as practicable, said leaf spring being engaged by the other of said means, substantially as described.

In testimony whereof we have hereunto set our hands.

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