

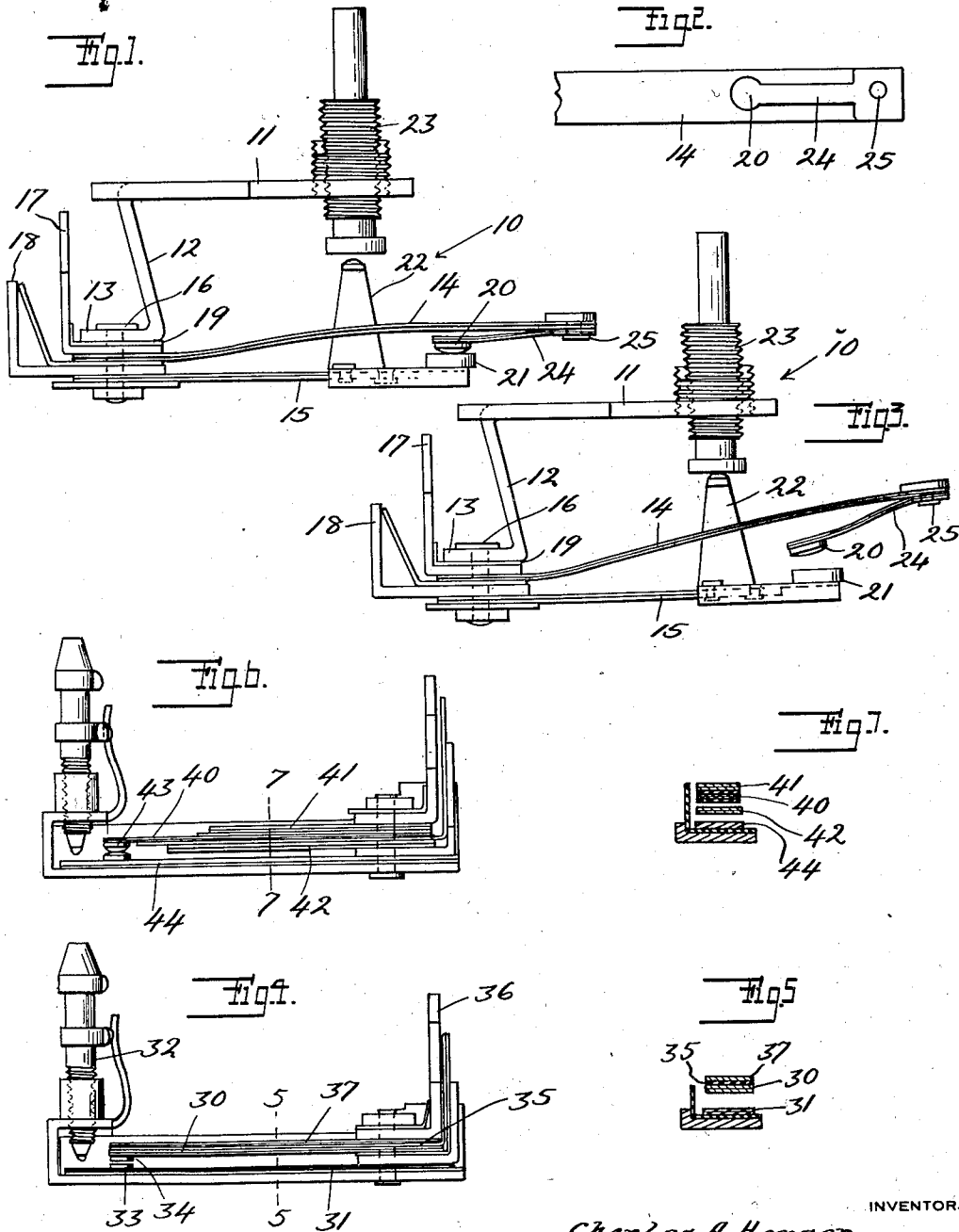
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THERMOSTAT

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THERMOSTAT

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This invention relates to thermostats and refers more particularly to thermostatic switch constructions for controlling electric circuits in accordance with variations in temperature.

One of the principal objects of this invention is to provide an improved thermostatic switch construction especially designed for use in connection with electric irons wherein it is desirable to maintain an approximate predetermined temperature without too frequent operation of the circuit breaker.

The present invention contemplates the provision of a thermostat having thermostatic elements responsive to variations in temperature together with means for resisting operation of said elements upon slight temperature changes to reduce the frequency of operation of the elements. The foregoing may be accomplished in several different ways as will be more fully hereinafter set forth, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is an enlarged side elevational view of a thermostatic switch assembly constructed in accordance with this invention.

Figure 2 is a bottom plan view of one of the thermostatic strips.

Figure 3 is a view similar to Figure 1 showing the parts in a different position.

Figure 4 is a view similar to Figure 1 showing a slightly modified form of construction.

Figure 5 is a sectional view taken on the line 5—5 of Figure 4.

Figure 6 is a view similar to the above figures showing still another modified form of switch assembly.

Figure 7 is a sectional view taken on the line 7—7 of Figure 6.

Referring more in detail to the embodiment of the invention shown in Figure 1, it will be noted that there is illustrated in this figure a thermostatic switch assembly 10 comprising an attaching bracket 11 having a depending projection 12 terminating in a lateral flange 13. Carried by the bracket 11 is a pair of cooperating bimetallic thermo-

static strips 14 and 15 having the rear end portions thereof secured to the flange 13 by means of a single fastener element 16. As shown in Figure 1, the thermostatic strips 14 and 15 are supported in spaced relation to each other and to the flange 13 by the terminal members 17 and 18 for respectively connecting the strips 14 and 15 in an electric circuit. Both of the terminals 17 and 18 are secured in contacting relation with the strips 14 and 15, respectively, by means of the fastener element 16, hereinbefore set forth, and are insulated from metallic contact with each other and with the bracket by means of suitable insulating material designated generally by the reference character 19.

The thermostatic strips 14 and 15 are arranged in superposed relation and are provided with suitable contacts 20 and 21 adjacent the free ends thereof adapted to engage each other in the normal position of the strips to close the electric circuit. The bimetallic strips 14 and 15 are so constructed that upon a rise in temperature the free ends thereof move upwardly as a unit until the projection 22 extending upwardly from the lowermost strip engages the adjustable regulator designated generally by the reference character 23 with the result that further upward movement of the lowermost strip 15 is prevented. Upon a continued rise in temperature, the upper strip 14 continues to move upwardly with the result that the contacts 20 and 21 are separated and the electric circuit broken.

In order to effect a slight lag in the separation of the contacts 20 and 21 to reduce the frequency of operation of the switch, we provide a third bimetallic thermostatic strip 24 disposed below the thermostatic strip 14 with the outer end thereof secured to the free end of the strip 14 as at 25 and the inner end thereof disposed above the contact 21 and adapted to carry the cooperating contact 20 hereinbefore set forth. The arrangement is such that the current flowing through the strip 14 is compelled to flow through the third thermostatic strip 24 before reaching the contact 20. The strip 24 is so constructed that temperature changes effect a movement

thereof in directions opposite to the strip 14 set forth above. In other words, a rise in temperature causes the free end of the strip 24 to move downwardly or in a direction opposite the direction of movement of the free end of the strip 14 with the result that when the temperature rises to cause an upward movement of the strips 14 and 15, the contacts 20 and 21 are urged into more intimate engagement due to the tendency of the free end of the strip 24 to move downwardly relative to the strip 14 toward the strip 15.

With the construction as thus far described, it will be observed that when the temperature surrounding the thermostat rises sufficient to cause upward movement of the strip 14 relative to the strip 15 in the manner specified above, the contacts 20 and 21 instead of separating immediately to break the current are maintained in contacting relation due to the fact that the strip 24 moves downwardly upon a rise in temperature. In this connection it should be understood that the strip 24 is substantially smaller in cross-sectional area than the strip 14 and thereby offers a greater resistance to the flow of current there-through which tends to assist the surrounding temperature in heating the strip 24 to a greater degree than the latter strip 14 with the result that the strip 24 moves a greater distance than the strip 14 and thereby effects a more intimate engagement of the contacts 20 and 21 upon a rise in temperature. The strip 24 is also substantially shorter than the strip 14 so that upon an appreciable rise in temperature and upon continued upward movement of the strip 14 to the position illustrated in Figure 3, the contacts 20 and 21 are separated due to the inability of the strip 24 to bridge the space between the strip 14 and contact 21.

Assuming that the parts are in the position illustrated in Figure 3 wherein the circuit is broken and no current is being conducted through the strip 24, it will be observed that the temperature of the strip 24 immediately falls and approaches the temperature of the strip 14 causing the same to move upwardly toward the strip 14. As the surrounding temperature falls, the strip 14 being of larger cross-sectional area than the strip 24 moves the latter downwardly until the contacts 20 and 21 come into engagement with each other to again close the circuit. The above construction is such as to prevent the contacts 20 and 21 from coming into engagement with each other to close the circuit until the strips 14 and 15 assume their lowermost positions illustrated in Figure 1. Thus, from the foregoing it will be apparent that the strip 24 functions to resist separation and engagement of the contacts without materially interfering with the movement of the thermostatic strip 14 and also that the lag in operation, effected by the strip 24, may be regu-

lated by varying the cross-sectional area of the strip 24 and the length thereof.

Referring now to the embodiment of the invention illustrated in Figures 4 and 5, it will be observed that the thermostatic switch shown in these figures is substantially the same in construction as the switch hereinbefore discussed in that the cooperating bimetallic thermostatic strips 30 and 31 are constructed to move upwardly as a unit upon a rise in temperature and upward movement of the lowermost thermostatic strip 31 is intercepted by an adjustable stop 32. The present switch assembly differs from the one described above in that the cooperating contacts 33 and 34 are secured directly to the free ends of the thermostatic strips 30 and 31, respectively, and the upper thermostatic strip 30 is insulated as at 35 from contact with the terminal member 36 with the result that the current is prevented from flowing through the upper thermostatic strip but, on the other hand, is conveyed to the contact 33 by means of a third bimetallic thermostatic strip 37 having one end secured to the terminal 36 to receive electrical energy therefrom and the opposite end secured to the contact 33. The third thermostatic strip 37 is constructed in the same manner as the thermostatic strip 24, set forth in connection with the first-described form of the invention, in that a rise in temperature tends to move the thermostatic strip 37 downwardly and a drop in temperature tends to move the same upwardly. The arrangement is such that movement of the uppermost thermostatic strip 30 under temperature variations is opposed by the thermostatic strip 37. The strip 37 is substantially smaller in cross-sectional area than the strip 30 and offers an appreciable resistance to the passage of current therethrough with the result that the same is not only influenced by the surrounding temperature but also by the heat generated thereby. As a consequence, the strip 37 is normally at a greater temperature than the strip 30 and since, as pointed out above, the strip 37 is constructed to move downwardly upon a rise in temperature, it will be observed that this strip tends to move the contact 31 into more intimate engagement with the cooperating contact 34 upon a rise in temperature or, in other words, tends to resist upward movement of the thermostatic strip 30. The thermostatic strip 30, however, is considerably larger than the strip 37 with the result that upon an appreciable rise in temperature the same will move upwardly against the action of the strip 37 to break the contact between the points 33 and 34.

Assuming that the strip 30 is in its uppermost position wherein the contact between the points 33 and 34 is broken, it will be observed that since no current is flowing through the strip 37 the temperature of the latter will

immediately fall and approach the temperature of the strip 30 and owing to the fact that the strip 37 is adapted to move upwardly upon a drop in temperature, it will function to resist downward movement of the strip 30 for re-engaging the contacts 33 and 34. Thus, from the foregoing it will be observed that the strip 37 resists both upward and downward movement of the strip 30 and thereby effects a lag in the operation of the switch.

The construction shown in Figures 6 and 7 differs from the arrangement just described in that the bimetallic thermostatic strip 40 corresponding to the strip 37 in Figure 4 is interposed between a pair of bimetallic thermostatic strips 41 and 42 corresponding in construction to the strip 30 set forth above. As shown in Figure 6, the free end of the thermostatic strip 40 extends beyond the thermostatic strips 41 and 42 and carries a contact 43 for engagement with a cooperating contact secured to the free end of the lowermost thermostatic strip 44. As shown in the construction illustrated in Figure 4, the electric energy in the present instance is transmitted to the upper contact 43 through the thermostatic strip 40 which, like the strips 24 and 37 hereinbefore described, is substantially small in cross-sectional area to offer an appreciable resistance to the passage of current therethrough with the result that the temperature thereof is normally higher than the temperature of the strips 41 and 42.

The free end of the lowermost thermostatic strip 42 is normally spaced a slight distance from the adjacent surface of the thermostatic strip 40 with the result that upon an increase in temperature above a predetermined amount, the strip 42 moves upwardly into engagement with the strip 40 tending to move the latter in the same direction. However, the strip 40 is constructed to move downwardly upon a rise in temperature and as a consequence tends to resist upward movement by the thermostatic strip 42. However, upon an appreciable rise in temperature, the strip 42 forces the strip 40 upwardly to break the contact between the points 33 and 34. The function of the uppermost thermostatic strip 41 is to return the strip 40 to the position shown in Figure 6 upon a drop in temperature, it being understood that as the temperature of the strip 40 lowers, the same tends to move upwardly against the action of the thermostatic strip 41 thereby effecting a lag in the operation of the switch.

While in describing the invention particular stress has been placed upon the association of our improved means as used in connection with thermostats having cooperating bimetallic strips carrying contacts, it should be understood that the same may be employed with equal facility in connection with various other types of thermostats. For example, in Figure 1 the lowermost thermostatic

strip may be eliminated and the contact carried thereby may be fixed in any suitable manner to cooperate with the contact carried by the upper strip or the usual spring construction may be substituted for the lowermost strip. It should be understood that the inventive idea involved herein which is to provide means for effecting a lag in operation of a thermostatic switch may be accomplished in numerous different ways and accordingly reservation is made to make such changes as may come within the purview of the accompanying claims.

What we claim as our invention is:

1. A thermostat comprising cooperating thermostatic elements movable laterally relative to each other under temperature changes, and means for resisting relative movement of said elements.

2. A thermostat comprising thermostatic elements movable laterally relative to each other under temperature changes, and temperature responsive means for resisting relative movement of said elements.

3. A thermostat comprising cooperating thermostatic elements movable laterally relative to each other under temperature changes, and another thermostatic element associated with the elements aforesaid and movable in opposite directions to the latter elements under temperature changes for resisting relative movement thereof.

4. A thermostat comprising cooperating thermostatic elements movable laterally under temperature changes, means for intercepting movement of one of said elements permitting relative movement of the latter, and another thermostatic element movable in opposite directions to the elements aforesaid under temperature changes and operable to resist relative movement of said latter elements.

5. A thermostatic switch comprising thermostatic elements movable laterally under temperature changes, cooperating contacts movable relative to each other by said elements for controlling the circuit to the switch, and means for resisting relative movement of said contacts.

6. A thermostatic switch comprising thermostatic elements movable laterally under temperature changes, cooperating contacts movable relative to each other by said elements for making and breaking the circuit through the switch, and another thermostatic element movable in opposite directions to the elements aforesaid under temperature changes for resisting relative movement of said contacts.

7. A thermostatic switch comprising thermostatic elements movable laterally under temperature changes, cooperating contacts movable relative to each other by said elements for controlling the circuit through the switch, and another thermostatic element

operable by the first-mentioned elements and carrying one of said contacts, said last-mentioned element constructed to move in opposite directions to the elements aforesaid upon variations in temperature for resisting relative movement of the contacts.

8. A thermostat comprising cooperating thermostatic elements movable relative to each other under temperature changes, and another thermostatic element of substantially smaller cross-sectional area than one of said first-mentioned elements and associated with the latter, said second thermostatic element constructed to move in opposite directions to the first-mentioned elements under temperature changes for resisting movement of the said last-mentioned element.

9. A thermostatic switch comprising thermostatic elements movable laterally relative to each other under temperature changes to control the circuit to the switch, and temperature responsive means for effecting a lag in the operation of said thermostatic elements.

10. A thermostatic switch comprising thermostatic elements connected to a source of current and constructed to oppose each other under temperature changes, and means operable at predetermined temperatures to compel movement of said elements in the same direction.

11. A thermostatic switch comprising thermostatic elements connected to a source of current and constructed to oppose each other under temperature changes, cooperating contacts carried by the elements, another thermostatic element of substantially larger cross-sectional area than one of said first-mentioned elements and operable at a predetermined temperature to compel movement of the latter in the same direction as the cooperating element, and means for intercepting the latter element permitting separation of said contacts.

12. A thermostatic switch comprising a pair of freely separable contacts, an arm resiliently urging one of said contacts in one direction, a stop for limiting the movement of said arm, a second contact, a thermostatic strip operable to displace said second contact in the same direction as said first contact upon rising temperature conditions, a second thermostatic strip acting upon said second contact and operable to displace said second contact in the opposite direction upon rising temperature conditions.

In testimony whereof we affix our signatures.

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