Nov. 4, 1930. S. M. CARMEAN ET AL 1,780,462

THERMOSTATIC CONTROL FOR ELECTRIC HEATERS

Filed Aug. 9, 1926

Fig. 1.

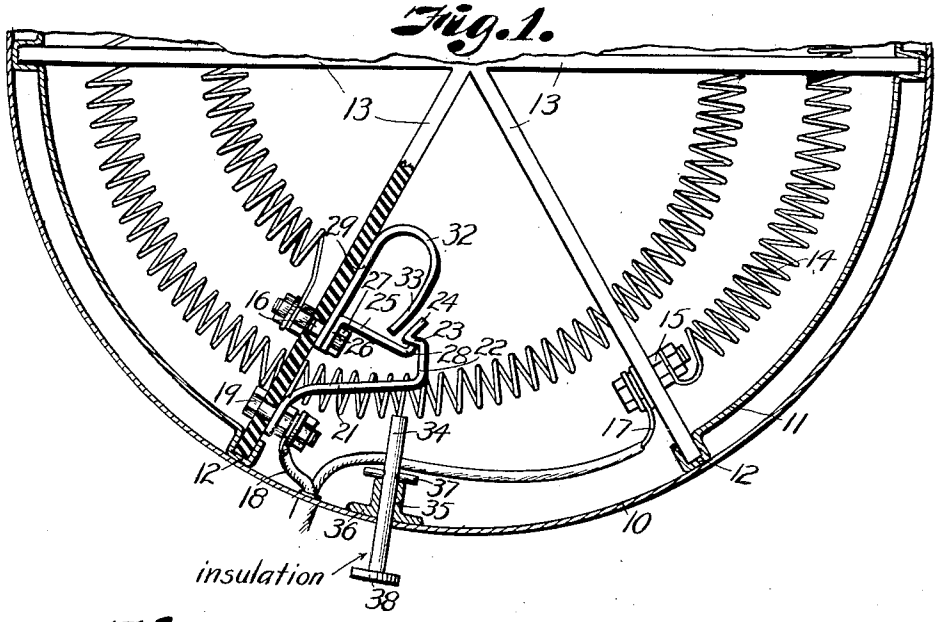


Fig. 2.

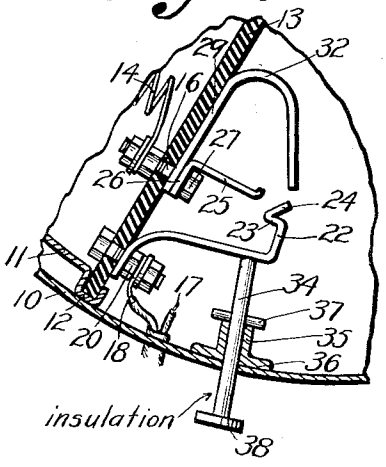


Fig. 3.

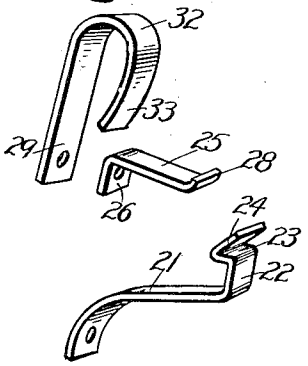


Fig. 4.

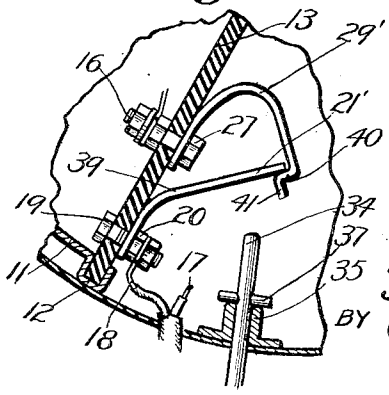


Fig. 5.



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UNITED STATES PATENT OFFICE

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THERMOSTATIC CONTROL FOR ELECTRIC HEATERS

Application filed August 9, 1926. Serial No. 128,086.

Our invention relates to switches and more particularly to a thermostatically controlled switch for electric heaters.

It is a purpose of our invention to provide a thermostatically operated switch for electric heaters that is extremely simple in construction, comprising a small number of moving parts and which can be applied in a small space without occupying an excessive amount of said space.

In electric heaters that heat by conduction instead of by radiation, it is particularly important that means be provided for breaking the circuit in which the heating elements are located in case the current of air through the heater is interrupted in some manner. This may be done by placing the heater too near to a wall or by placing something on the heater or against the heater at the point where the air either enters or leaves the same. As soon as the circulation of air is interfered with, the temperature within the heater rises rapidly, thus causing the thermostatic means to operate.

Our improved thermostatic means preferably comprises a resilient contact element that has a normal tendency to move toward open circuit position and co-operating contact means embodying a thermostatic element, one of said contact means being provided with a shoulder with which the other contact means engages when in closed circuit position and one of said contact means including thermostatic means for disengaging the shoulder from the other contact means, whereupon the resilient contact means moves to open circuit position by snap action. As the amount of current passing through the switching means is relatively large in a device of this character, it is quite important that a quick break in the circuit is obtained to avoid arcing and injury to the contacts.

Other objects and advantages of our invention will appear as the description of the accompanying drawings proceeds. However, we desire to have it distinctly understood that we do not intend to limit ourselves to the exact details shown or described, but that we intend to include as part of our invention all such obvious changes and modifications of parts as will occur to a person skilled in this art and as would fall within the scope of the claims.

In the drawings:—

Fig. 1 is a fragmentary view, partly in plan and partly in section of an electric heater, embodying our improved switching device.

Fig. 2 is a fragmentary sectional view showing the switching device in open circuit position.

Fig. 3 is a perspective view of the elements of the switching device separated.

Fig. 4 is a view similar to Fig. 2 of a slightly different form of our switching device in closed circuit position, and,

Fig. 5 is an enlarged section taken on the line 5—5 of Fig. 2.

Referring in detail to the drawings, our improved switching device is shown as being applied to an electric heater having an outer wall portion 10 and an inner wall portion 11 spaced therefrom by means of offset portions 12. Said offset portions provide inwardly facing grooves in which the radially extending insulating elements 13 are mounted, said elements forming a spider supporting the spirally arranged heating element 14 which extends from a terminal 15 in a continuous spiral to the terminal 16. The terminal 15 serves as a binding post to which the one conductor 17 leading out of the heater is connected. The other conductor 18 leading out of the heater is connected with a binding post 19 provided on one of the insulating members 13.

Mounted on the binding post 19 and held in position by means of a nut 20 is a resilient contact element 21 which is provided with an inwardly directed portion 22 which terminates in an offset portion 23 and an obliquely extending inclined cam portion 24. A shoulder is thus provided at the offset 23 adjacent the inclined or cam portion 24. Co-operating with the contact 21 is a contact member 25 which has an angular end portion 26 mounted on the binding post 16 and clamped between the head 27 thereon and the insulating member 13. The free end portion of the contact element 25 is preferably provided with an

offset portion 28 serving as a contact point which is in an engagement with the shoulder 23 when the elements 21 and 25 are in closed circuit position. A thermostatic element 29 which is made up of two layers or plies of metal 30 and 31, having different co-efficients of expansion as is customary in said elements, is mounted between the end portion 26 of the element 25 and the insulating member 13. Said thermostatic element is provided with a gradually curved portion 32 intermediate the ends thereof and with a substantially straight end portion extending from the curved portion 32 to the free end of the thermostatic element. The normal curvature of the portion 32 of the element 29 is such that the end portion 33 thereof is spaced from both the elements 25 and 21. In case of sudden rise of temperature within the heater, the arrangement of the plies of the two different materials in the thermostatic element is such that the tendency of the element is to straighten out, thus increasing the radius of the curvature of portion 32 and moving the end 33 of the element toward the position shown in Fig. 2. As this movement takes place, the end 33 of the element 29 engages with the end portion 24 of the contact element 21 and pushes the shouldered portion 23 thereof off the end of the contact element 25 causing the same to drop to the position shown in Fig. 2 with a snap action.

Means is provided for restoring the movable contact element 21 to normal position, said means comprising a plunger or rod-like member 34 of insulating material which is longitudinally slidably mounted in a guide member 35 which may be secured to the casing 10 in any desired manner as by means of the flange 36. A cross pin 37 is preferably provided for limiting the outward movement of the member 34 and an enlargement or head 38 is preferably provided on the outer end of the member 34 for engagement by the finger of the operator to move the member 34 inwardly so as to move the element 21 toward the element 25. As such movement takes place, the inclined end portion will engage with the end of element 25 to cam the element 21 over, so that the shoulder 23 will snap into engagement with the end 28 of the member 25. Furthermore, by providing the inclined portion 24 which is directed away from the element 25, the tendency will be for the arc, if any occurs, between the contact elements, to be broken, due to the divergence of the end 24 of the contact 21 from the contact 25.

Instead of providing the arrangement shown in Figs. 1, 2, 3, and 5, still a simpler arrangement of switching means may be provided such as shown in Fig. 4. The heater may be of the same construction in this form of the invention as previously described and the same numerals are accordingly applied to the parts of the heater shown as in Figs. 1 and 2. As the arrangement of the binding posts and switch restoring means is the same as in the form shown in Figs. 1, 2, 3, and 5, the same numerals are applied to these parts in Fig. 4 as in the other figures. The resilient contact element 21′ shown in Fig. 4, instead of being provided with a shoulder portion, and a cam portion is made substantially straight, extending from the curved portion 39 thereof, adjacent the secured end of the same toward the free end thereof at an oblique angle relative to the insulating member 13 but said obliquely extending portion being substantially straight. The thermostatic element 29′ which corresponds to the element 29 in Figs. 1, 2, and 3 is made in substantially the same manner as previously described, except that the same is provided with an offset at 40 providing a shoulder with which the free end of the contact element 21′ engages, said thermostatic element terminating in an inclined end portion 41 which serves as a cam portion for moving the resilient contact element 21′ into engagement with the shoulder 40. In the arrangement shown in Fig. 4, the contact element 21′ is under tension when in engagement with the shoulder 40 and has a normal tendency to move toward the member 34. Upon an abnormal increase in temperature in the heater, the shoulder portion 40 tends to move outwardly from the insulating member 13, due to the increase in radius of curvature of the element 29′ as the temperature adjacent the same increases. As a result, the shoulder is moved out of engagement with the co-operating contact element 21′ thus causing the element 21′ to move away from the shoulder with a snap action, the end portion 41 serving to break the arc in a similar manner to that in which the portion 24 of the contact element 21 serves to break the arc as previously described. In restoring the switch to closed circuit position, the end 41 acts as a cam in a similar manner to the end 24, as previously described.

What we claim and desire to secure by Letters-Patent is:—

1. A thermostatically controlled switch comprising a contact having an offset tip, a resilient contact normally tending to move toward open circuit position and having a free end provided with a hook for latching engagement with said tip to close a circuit through the contacts, and a thermostatic member having an arm movable against said hook for unlatching the hook from said tip.

2. In a thermostatic device of the character described, a relatively rigid contact having a hook-like tip, a resilient contact having an arm provided with a bent end movable in a path intersecting said tip and comprising a cam engageable with the tip and movable thereover to tension the arm and a hook movable into latching engagement with the tip

when the cam has passed the tip and the tension of the arm is relieved, and a thermostatic member having a finger movable against the hook to unlatch the hook from the tip by snap action.

3. In a thermostatic control for electric heaters, a pair of contact bars having free ends, the free end of one bar being bent to form a cam-like tip having a face engageable with the end of the other bar to enable the ends of the bars to pass each other when one of the bars is bent toward the other, said bent bar having a bend at the inner end of the tip forming a hook to engage the end of the other bar and latch the ends of the bars together, one of said bars being resilient and adapted to be moved toward the other bar to effect latching engagement therebetween, said bent tip being adapted to extend outwardly from the latched ends of the bars for the purpose described.

4. In apparatus of the character described including binding posts and a circuit, a rigid contact bar having one end fixed to one binding post and a free end bent to form a tip offset from the plane of the bar, a resilient contact bar having one end fixed to the other binding post and a free end bent to form a portion extending in the same direction as said tip, said portion being inbent to provide a hook and having an inclined tip forming a cam, said cam being movable in a path intersecting the end of the rigid contact upon flexing the resilient contact to engage said end and effect tensioning of the bent end of the resilient contact, said hook being adapted to move into latching engagement with the tip of the rigid contact when the cam has passed the same to close the circuit through the contacts and means for shifting the hook from the tip to permit the resilient contact to return to normal position by snap action.

In testimony whereof we affix our signatures.

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JAMES H. CARMEAN.