March 12, 1963 R. F. COX 3,081,388

THERMOSTATIC CONTROLS

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FIG. 1

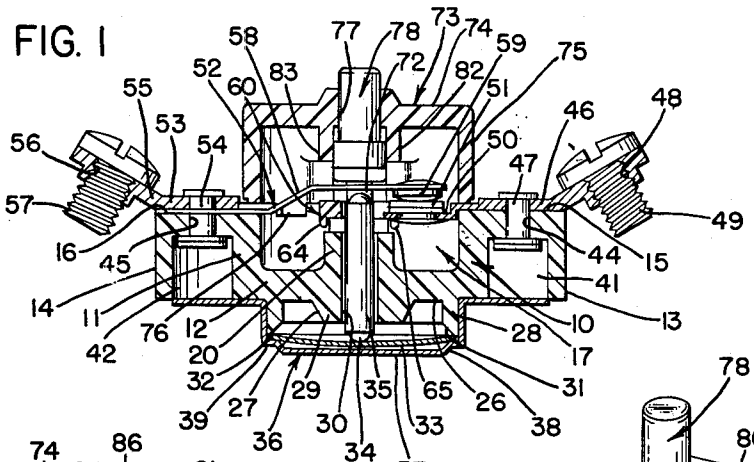


FIG. 3

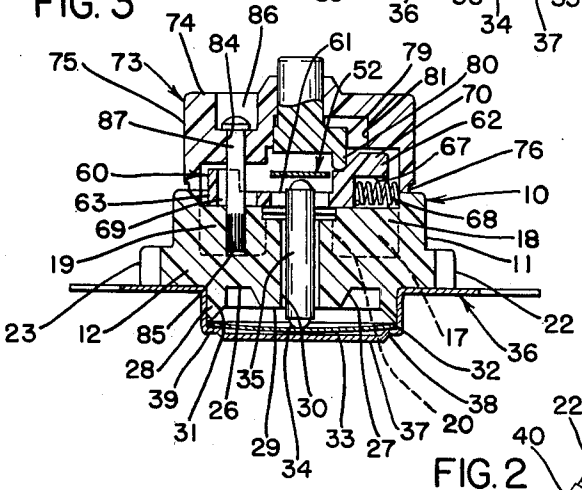


FIG. 5

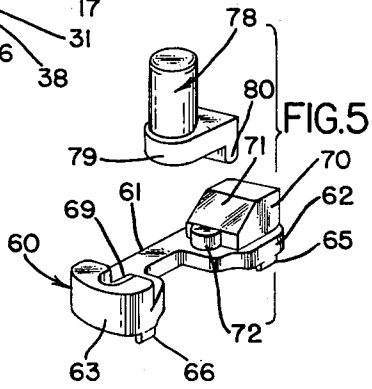


FIG. 2

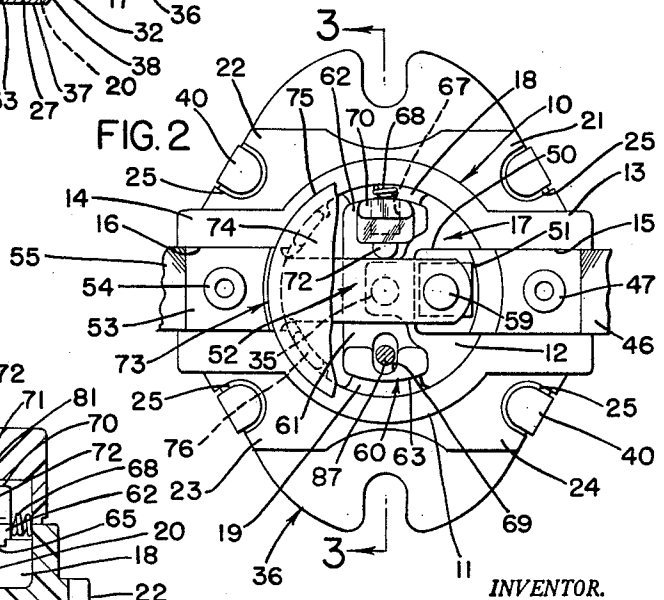
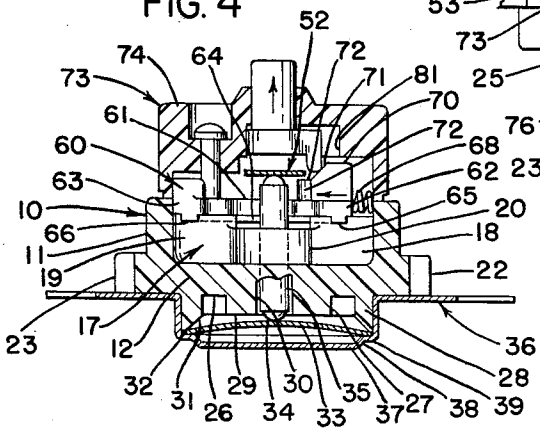


FIG. 4



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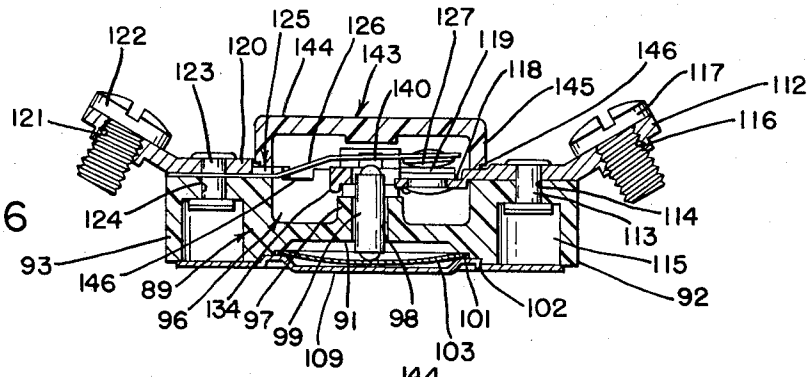


FIG. 6

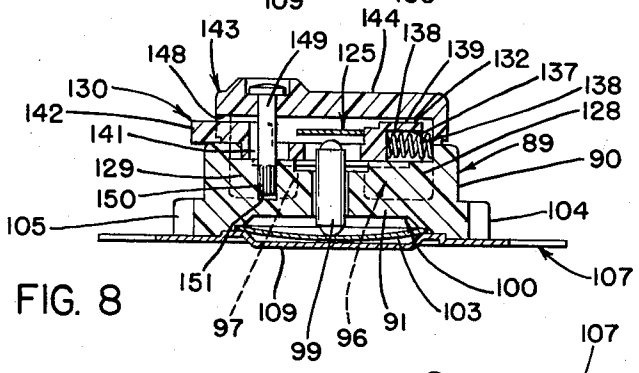


FIG. 8

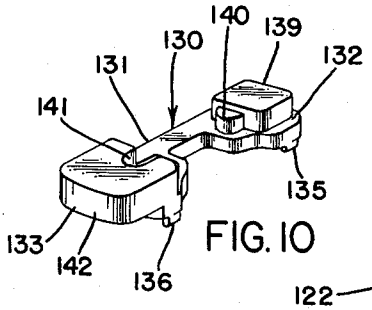


FIG. 10

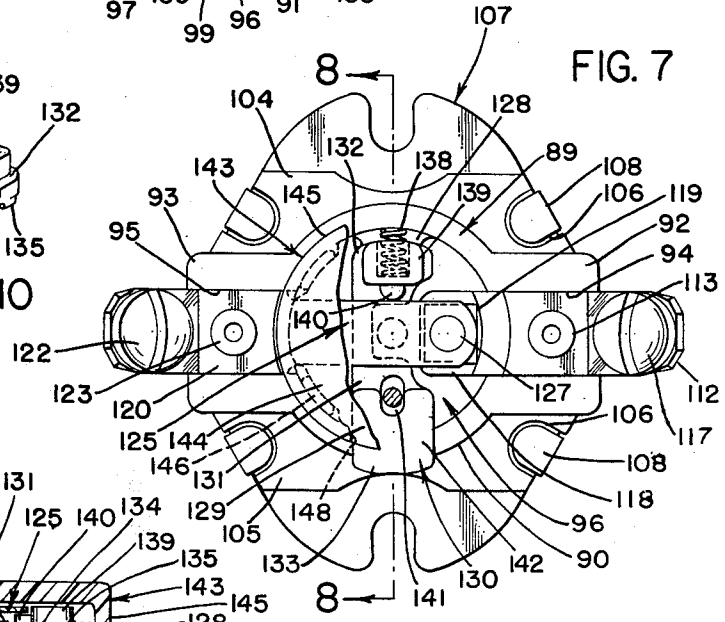


FIG. 7

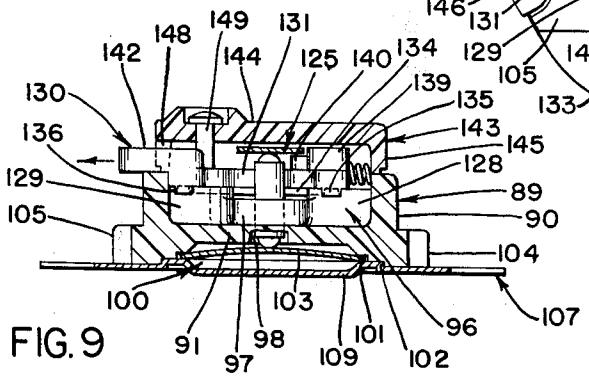


FIG. 9

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3,081,388
THERMOSTATIC CONTROLS

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Filed Mar. 22, 1961, Ser. No. 97,653
4 Claims. (Cl. 200—138)

This invention relates to electric switches and more particularly to a new and improved thermostatic control switch.

It is among the objects of the present invention to provide a new and novel thermostatically controlled switch which is adapted to interrupt or open an electric circuit automatically on a rise in temperature to a predetermined degree and requiring manual actuation to close the circuit after a decrease in temperature below a predetermined degree.

Another object of the invention is to provide in a new and improved thermostatically controlled switch, a thermo-responsive element having two positions of stability and which is free to pass from its first position of stability to its second position upon a change in temperature of a predetermined degree and is effective to actuate a switch in passing to the second position and is free to return to its first position upon a subsequent change in temperature irrespective of the position of the switch contacts.

Another object of my invention is to provide a new and novel manual reset thermostatic switch wherein the switch mechanism is trip free of the manual reset lever.

A further object of the invention is to provide a new and improved thermostatic control embodying a switch controlling a circuit through the control having a fixed contact and a movable contact and a manually actuated reset member operable upon the movable contact and wherein the switch contacts are free to open and close the circuit in the event that the manual reset member becomes inoperative.

Another object of the invention is to provide reset mechanism which may be readily adaptable for use with various types of thermostatic controls.

A still further object of the invention is to provide a thermostatically controlled switch of the manually reset type which is characterized by simplicity and compactness of construction, reliability, efficiency of operation and ability to control circuits of substantial current capacity.

These and other objects and advantageous features of the invention not at this time more particularly pointed out will become apparent as the nature of the invention is better understood from the following detailed description taken in conjunction with the accompanying drawings wherein like reference characters denote corresponding parts, and wherein:

FIGURE 1 is a transverse medial sectional view of a thermostatic device embodying the present invention,

FIGURE 2 is a top plan view of the device of FIGURE 1 with parts broken away,

FIGURE 3 is a vertical sectional view taken on the line 3—3 of FIGURE 2 showing the manually operable reset mechanism in position with the contacts of the switch closed,

FIGURE 4 is a sectional view similar to FIGURE 3 showing the reset mechanism in position maintaining the contacts of the switch open,

FIGURE 5 is a perspective view of the elements of the reset mechanism,

FIGURE 6 is a transverse medial sectional view of a modified form of the device,

FIGURE 7 is a top plan view of the control of FIGURE 6 with parts broken away,

FIGURE 8 is a vertical sectional view taken on the line 8—8 of FIGURE 7 showing the position of the elements of the control when the contacts are closed,

FIGURE 9 is a sectional view similar to FIGURE 8 showing the position of the elements of the control when the contacts are open, and

FIGURE 10 is a perspective view of the reset element used in the modification of the device.

With reference to the accompanying drawings, particularly FIGURES 1 to 5 inclusive there is illustrated a preferred form of my thermostatic control embodying switch means for controlling an electric circuit made in accordance with the present invention and comprising a substantially cylindrical housing 10 having a side wall 11 and a bottom wall 12, which is preferably made of an electrical insulating material, heat resistant to a fair degree, such as a phenolic condensation product. Coextensive with the side wall 11 and projecting outwardly at diametrically opposite sides of the housing 10 are substantially rectangular housing portions 13 and 14, the upper surface of which are provided with elongated slots 15 and 16, respectively, extending through the side wall 11 of the housing 10. The housing 10 defines a cavity 17 which forms part of the space in which the switch contacts of the control are contained. Projecting inwardly from the inner surface of the side wall 11 of the housing 10 are diametrically opposed wall portions 18 and 19 which extend upwardly from the surface of the bottom wall 12 to a point spaced from the upper edge surface of the housing side wall 11. Filling the space between the inner edge surfaces of the wall portions 18 and 19 and extending upwardly from the central portion of the bottom wall 12 is a boss 20.

Integrally formed with the sides of the outwardly projecting housing portions 13 and 14 and the outer surface of the side wall 11 are flanges 21, 22, 23 and 24 each of which is provided with a semi-circular depression on the upper face thereof and extending inwardly from the edge thereof as shown at 25. The bottom surface of the housing is formed with a circular offset extending inwardly from the periphery thereof and having a bottom surface 26 and a side wall 27. Extending downward from the bottom surface 26 is a cylindrical wall 28 having a diameter slightly less than the diameter of housing 10. Concentric with the upstanding boss 20 in the cavity 17 and extending downwardly from the bottom wall 26 is a frustro-conical boss 29. The bosses 20 and 29 are provided with an aligned axial bore 30 extending therethrough. The inner edge surface of the cylindrical wall 28 is beveled as at 31 to provide a knife edge seat 32 for a disc-shaped composite thermal plate 33. The thermal plate 33 may be a composite bimetallic snap-acting thermostatic element being characterized in that its central portion has one position of stable equilibrium when cold and another relatively stable position of equilibrium when hot, such positions being of opposite concavity.

As illustrated in FIGURE 3, the thermostatic element is shown when the same is under normal temperature conditions having an outward curvature, and in FIGURE 4 the element is illustrated in the position when subjected to a condition of increased temperature being curved inwardly and engaging the lower end 34 of a cylindrical bumper member 35 which is slidably mounted within the bore 30. The peripheral edge of the thermal plate 33 is maintained seated on the beveled edge 32 of the wall 28 by a mounting plate 36. The mounting plate is formed with a central circular depression 37 which overlies the disc 33. The peripheral edge portion of the plate defining the depression 37 is bent inwardly to form the wall portion 38 and is then extended parallel with the portion 37 to form a narrow ring like seat 39 which engages the edge of the thermostatic plate 33 and holds the same on

the beveled edge portion of the end of the wall 28. The wall of the mounting plate 36 is bent to snugly fit along the outer surface of the depending wall 28 and then extends at right angles thereto along the outer face of the bottom of the housing 10. The mounting plate 36 is provided with a plurality of upstanding ears 40 which engage along the side wall of the flanges 21, 22, 23 and 24 and the free ends thereof are bent over and engaged within the cutaway slots or depressions 25 formed on the upper surface of the flanges. The housing portions 13 and 14 are provided with bores 41 and 42 which have openings 44 and 45, respectively, extending therefrom through the wall of the portions 13 and 14 and terminate in the slots formed on the surfaces thereof.

Mounted in the slot 15 of the housing portion 13 is a terminal member 46 which is secured in position by means of a rivet 47 extending through the opening 44. The outer free end of the terminal 46 is upturned as shown in FIGURE 1 and is formed with an aperture 48, suitably threaded to receive a terminal screw 49. The opposite end of the terminal member 46 extends into the cavity 17 where it is offset downwardly along the inner wall surface of the cavity and then projected horizontally to provide a contact-carrying portion 50 upon which is mounted the fixed contact button 51. Mounted in the slot 16 of the housing portion 14 is one end of a mobile contact-carrying arm 52 which is maintained in position by means of the terminal blade 53 mounted thereover and the two members are secured within the slot 16 in stacked relation by means of a rivet 54. The outer free end of the terminal blade 53 is upturned as at 55 and is provided with a threaded aperture 56 therethrough for the reception of a terminal screw 57.

The mobile contact-carrying arm 52 extends into the cavity 17 and is bent upwardly as at 58 and then continues across the center of the boss 20 carrying on the lower surface of the outer free end thereof a contact button 59 which is disposed above and in operative position with respect to the fixed contact button 51. The cantilever mounted arm 52 is normally biased downwardly to maintain the mobile contact element 59 and fixed contact element 51 in engagement. Separation of the two contacts is effected by the upper end of the slideable bumper member 35 engaging the mobile contact arm 52, responsive to movement of the thermal disc 33.

Mounted on the upper surface of the wall portions 18 and 19 of the housing 10 within the chamber 17 is a reset arm broadly indicated by the numeral 60. The arm 60 (FIGURE 5) is substantially U-shaped in configuration having a base 61 connecting enlarged end portions 62 and 63. The lower face of the base 61 (FIGURE 1) is provided with a depending flange 64 which is adapted to depend over the side of the wall portions 18 and 19 and guide the reset arm 60 as it slides across the top surface of the portions 18 and 19. Depending lugs 65 and 66 formed on the lower edge surface of end portions 62 and 63, respectively, co-operate with the depending flange 64 to maintain the reset arm on the upper surface of the members 18 and 19. The lower surface of the end 62 is provided with a semi-cylindrical slot 67 (FIGURE 3) which is adapted to receive a spring 68, one end of which bears against the inner end wall surface of the slot 67 and the other end engages the side wall 11 of the housing. Extending through the end portion 63 is an elliptical slot 69 (FIGURE 2).

The end 62 of the reset arm 60 is provided with an upstanding block 70 which has an inclined camming surface 71 formed thereon. As shown in FIGURE 4, the reset arm is biased to the left by the spring 68. The mobile contact-carrying arm 52 extends over the upper surface of the base 61 of the reset arm 60 and engages in front of a lug 72 formed in front of and below the camming surface 71. The end of the arm 52 is normally biased downwardly to maintain the contacts 59 and 51

in engagement. In such position the edge of the arm engages the lug 72 and holds the reset arm against the spring 68 in its retracted position. When the bumper member 35 is actuated by the bi-metal element 33 and moves the arm upwardly to break the contacts 59 and 51, the upper surface of the lug 72 slides under the arm 52 and maintains it in elevated position separating the contacts 59 and 51. In such position, when the contacts are separated the bumper element 35 can move freely from both extremes of its path of travel in response to the movement of the bi-metal disc 33 without having any effect on the mobile contact-carrying arm 52 until the reset arm and the lug 72 carried thereby is returned to its original position as shown in FIGURE 3.

A substantially cup-shaped cover member 73 comprising a bottom wall 74 and a side wall 75 is provided to close the cavity 17 of the housing 10. The side wall 75 is provided with a plurality of depending lugs 76 which engage within the cavity 17 and seat against the inner surface of the wall 11 to maintain the cover in position on the housing 10. The central portion of the bottom wall 74 is enlarged and provided with a bore 77 which receives a manually actuated button 78. The lower end of the button 78 is provided with a transverse flange 79 which terminates in a downwardly projecting cam actuating surface 80. The transverse flange 79 of the button 78 is adapted to be received within an elongated slot 81 formed in the cover 73 by means of depending wall portions 82 and 83 extending from the inner surface of the bottom wall 74 of the closure member 73. When the button 78 is depressed, the surface 80 is adapted to engage the camming surface 71 to move it against the bias of the spring 68 into its retracted position at which time the biased mobile contact-carrying arm 52 moves downwardly and brings the contact button 59 into engagement with the stationary contact 51 and the edge surface of the mobile arm 52 engages behind the lug 72. The cover 73 is provided with a bore 84 which is in alignment with the elliptical slot 69 of the reset arm 60 and an aperture 85 in the boss 19. The bore 84 is counterbored at 86 to receive the head of a retaining pin 87 having a knurled shank which projects through the bore 84, slot 69 and engages in the wall of the aperture 85 for securing the cover member in assembled position upon the housing 10.

With reference to FIGURES 6 to 10 inclusive of the drawings, there is illustrated a modified form of the thermostatic control embodying the present invention including a cylindrical housing 89 having a side wall 90 and a bottom wall 91. Projecting outwardly from diametrically opposite portions of the side wall of the housing 89 are substantially rectangular extensions 92 and 93 having slots 94 and 95 formed in the upper surface thereof. The housing 89 defines a switch chamber 96 having a boss 97 extending upwardly from the bottom wall 91 which is formed with an axial bore 98 for the reception of a cylindrical bumper member 99. The lower surface of the bottom wall of the housing 89 is centrally recessed to form a disc chamber 100, the side wall of which is offset as at 101 and at 102. The chamber 100 receives a thermal disc 103 having the periphery thereof seated within the offset 101 of the wall of the recess. Formed integrally with the outer surface of the side wall of the housing 89 are flanges 104 and 105 disposed between the extensions 92 and 93 and having slots 106 on the upper surface thereof. A mounting plate 107 is secured to the flanges 104 and 105 by means of a plurality of upstanding tangs 108 which are bent over the upper surface of the flanges 104 and 105 and seat within the slots 106. The central portion of the mounting plate 107, coextensive with the chamber 100 is depressed to form a dish shaped closure 109 for the disc chamber 100 and is so arranged as to provide adequate space for the central portion of the disc to move be-

tween opposite positions of concavity. The wall portion of the mounting plate adjacent the closure 109 is inwardly bent to define with the offset 101 a circular slot in which the peripheral edge of the disc 103 is adapted to freely flex as the central portion moves from one position of concavity to the other. The wall portion of the plate 107 is continued outwardly and seats snugly within the offset 102 of the wall of the disc chamber 100.

Mounted in the slot 94 of the housing portion 92 is a terminal member 112 which is secured in position by means of a rivet 113 extending through an opening 114 formed in the housing portion 92. The opening 114 is suitably counterbored as at 115 to provide a recess for the head of the rivet 113. The outer-free end of the terminal 112 is provided with a threaded aperture 116 for the reception of a terminal screw 117. The opposite end of the terminal member 112 extends into the chamber 96 where it is offset downwardly along the inner wall surface of the chamber and then projected transversely therein to provide a contact-carrying surface 118 upon which is mounted the fixed contact button 119. Disposed in the slot 95 of the housing extension 93 is one end of a terminal blade 120 which has the outer free end thereof bent upwardly and formed with a threaded aperture 121 for the reception of a terminal screw 122. Secured between the blade and the surface of the slot 95 by means of a rivet 123 passing through an opening 124 formed in the extension 93 is the end of a mobile contact-carrying arm 125 which projects transversely of the chamber 96 and is bent upwardly as at 126 and then extended horizontally over the boss 97. The arm 125 has mounted on the outer free end thereof a contact button 127 which is operatively positioned to engage the fixed contact button 119.

The bottom wall of the housing 91 is formed with diametrically opposed upstanding supporting bosses 128 and 129 which are adapted to have slidably mounted on the upper surface thereof a reset arm broadly indicated by the numeral 130. The reset member 130 (FIGURE 10) is substantially U-shaped in configuration having a base 131 and enlarged end portions 132 and 133. The lower face of the base 131 is formed with a longitudinally extending depending flange 134 (FIGURE 6) which in conjunction with lugs 135 and 136 formed on the end portions 132 and 133, respectively, serves to maintain the reset member 130 properly positioned on the upper surface of the bosses 128 and 129 as it is moved transversely of the chamber. The lower surface of the end 132 is provided with a semi-cylindrical slot 137 in which is mounted a spring 138, one end of which bears against the inner wall of the slot 137 and the other end engages the side wall 90 of the housing 89 and biases the reset member 130 to the left as shown in FIGURE 8.

The end 132 of the reset arm 130 is provided with an upstanding block 139 which has a retaining lug 140 formed on the forward face thereof. The end 133 is provided with an elliptical opening 141 and elongated arm 142 which is adapted to be engaged manually to move the reset member to the right as viewed in FIGURE 8 against the bias of the spring 138. As shown in FIGURE 8, the mobile contact-carrying arm 125 extends over the upper surface of the base 131 of the reset member 130 and normally engages in front of the lug 140 when the contacts 127 and 119 are in engagement by reason of the normal bias of the cantilever mounted contact-carrying arm 125. In such position the edge of the mobile arm engaging the lug 140 maintains the reset member in its retracted position as viewed in FIGURE 8 against the pressure of spring 138. When the bumper member 99 is actuated in response to movement of the bi-metal disc 103 into the position shown in FIGURE 9, the contact-carrying arm is moved above the upper surface of the lug 140 which slides thereunder and the contacts 127 and 119 are maintained open. Upon movement of the reset member manually to the right as viewed in FIGURES 8 and 9 the bias of the arm 125 moves the contacts into engagement with each other and the edge of the arm below the top surface of the lug 140.

A substantially cup-shaped closure member 143 comprising a bottom wall 144 and a side wall 145 is provided to close the chamber 96 of the housing 89. The side wall 145 of the member is provided with a plurality of depending lugs 146 which seat within the cavity 96 against the inner surface of the side wall 90 to maintain the closure member in position on the housing 89. The side wall 145 is provided with an opening 148 through which the manually actuated arm 142 is adapted to project. For securing the closure member 143 on the housing there is provided a pin 149 which engages within the elliptical slot 141 and is formed with a knurled end 150 which engages in the wall portion of an opening 151 formed in the boss 128.

Having thus described my invention so that persons skilled in the art may understand and practice the same, what I desire to obtain by Letters Patent is embodied in the appended claims.

I claim:

1. A thermostatic control device comprising a housing defining a switch chamber, a switch mounted within said chamber and including a stationary contact and a cantilever mounted arm carrying a mobile contact, a snap-acting thermostatic disc peripherally mounted on said housing remote from said switch chamber and having two positions of stability, a member slidably mounted in said housing for translating the movement of said disc to said mobile contact-carrying arm, means for maintaining said movable contact in switch open position upon movement of said disc from its first position of stability to its second position, said means including a member mounted in said switch chamber and movable transversely intermediate the ends of said mobile contact carrying arm, an upstanding lug mounted on the upper surface of said member and engageable below said contact-carrying arm and serving to maintain the mobile arm in switch open position and actuating means engageable with said movable member for releasing said mobile arm from its switch open position.

2. A thermostatic control device comprising a housing defining a switch chamber, a switch mounted within said chamber and including a stationary contact and a cantilever mounted arm carrying a mobile contact, a snap-acting thermostatic disc peripherally mounted on said housing remote from said switch chamber and having two positions of stability, a member slidably mounted in said housing for translating the movement of said disc to said mobile contact-carrying arm, means for maintaining said movable contact in switch open position upon movement of said disc from its first position of stability to its second position, said means including a member movable transversely with respect to and intermediate the ends of said mobile contact-carrying arm, an upstanding lug mounted on the upper surface of said member and adapted to engage below said arm and hold the arm in switch open position irrespective of the movement of the snap-acting thermostatic disc and the slidable member actuated thereby and actuating means engageable with said movable member for releasing said mobile arm from its switch open position.

3. A thermostatic control device comprising a housing defining a switch chamber, a switch mounted within said chamber and including a stationary contact and a cantilever mounted arm carrying a mobile contact, a snap-acting thermostatic disc peripherally mounted on said housing remote from said switch chamber and having two positions of stability, a member slidably mounted in said housing for translating the movement of said disc to said mobile contact-carrying arm, means for maintaining said movable contact in switch open position upon movement of said disc from its first position of stability

to its second position including a member having an upstanding lug thereon movable transversely of the longitudinal axis of the contact carrying arm and engageable thereunder and means for retracting said movable member including a camming surface formed on said member and a cam follower engageable with said camming surface and having a portion thereof projecting through said housing and adapted to be manually actuated.

4. A thermostatic control device comprising a housing defining a switch chamber, a switch mounted within said chamber and including a stationary contact and a cantilever mounted arm carrying a mobile contact, a snap-acting thermostatic disc peripherally mounted on said housing remote from said switch chamber and having two positions of stability, a member slidably mounted in said housing for moving said mobile contact-carrying arm to open switch position upon movement of said disc from its first position of stability to its second position,

a member adapted to move transversely of and engageable below the mobile contact-carrying arm intermediate the ends thereof and serving to prevent the closing of the switch contacts and means for retracting said movable member including a camming surface formed on said member and a cam follower engageable with said camming surface and having a portion thereof projecting through said housing and adapted to be manually actuated.

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