Nov. 23, 1965 C. S. ODSON 3,219,783

MANUAL RESET THERMOSTATIC CONTROL

Filed July 12, 1963

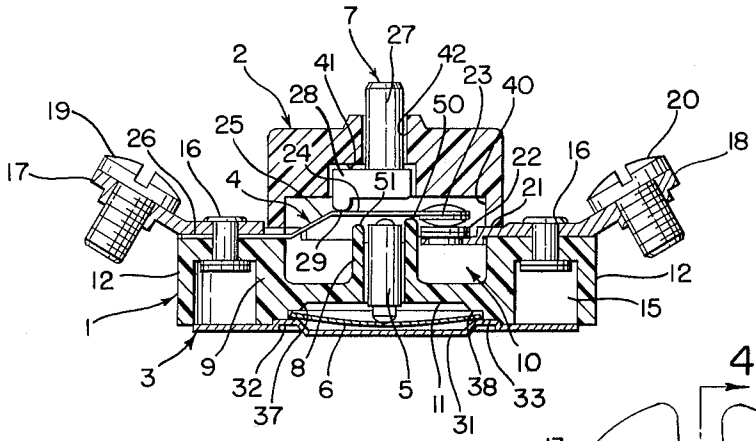

FIG. 1

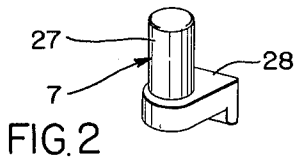

FIG. 2

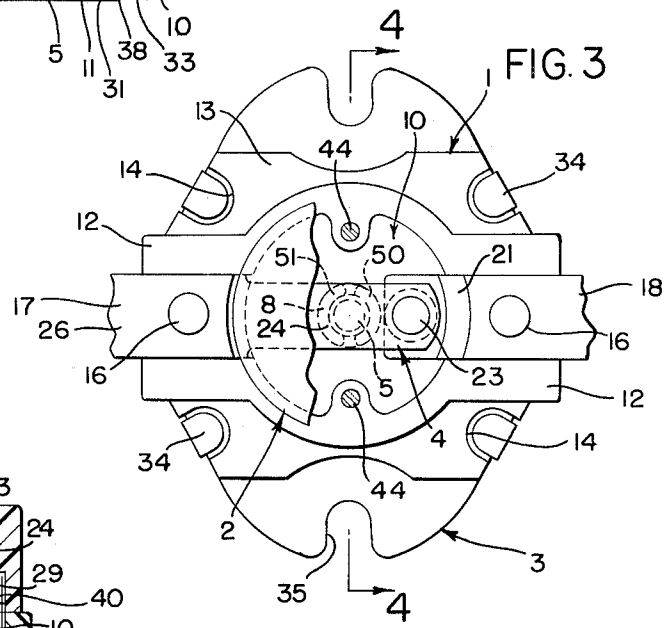

FIG. 3

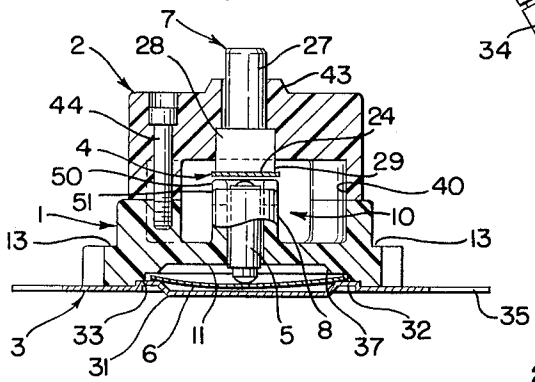

FIG. 4

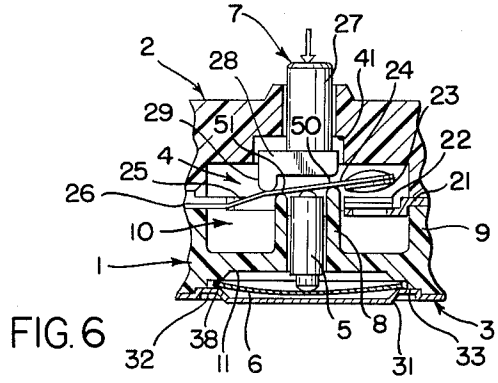

FIG. 6

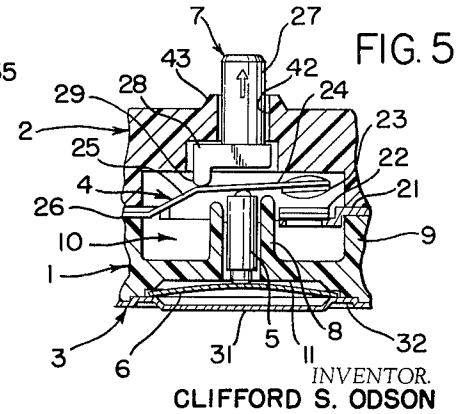

FIG. 5

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MANUAL RESET THERMOSTATIC CONTROL

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The present invention relates to a new and improved thermostatic control of the manually reset type and more particularly to such a control wherein the reset button is inoperative to hold the switch in closed position.

Heretofore, thermostatically controlled switches have been employed extensively to protect clothes driers, electric motors, hot water heaters, and other equipment against damage due to overheating, but such devices were not entirely satisfactory particularly because of the tendency for irresponsible operators to secure the manually reset button in such position as to maintain the contacts of the switch in closed position. Thus, the operator would use the reset button to bypass the function of the switch and continue operation of the equipment when it was subject to overheating.

During the last decade, various thermostatic controls have been designed in an attempt to solve this problem, but they have not been completely satisfactory for many reasons. Thus, they were complicated in structure, expensive to manufacture, and unreliable or lacking in durability or versatility. Some did not work properly when subject to vibration.

The apparatus of the present invention provides a solution to the foregoing problems in a simple manner and materially advances the art. The bimetallic actuating element which moves the contact arm between the open and closed position may be of the conventional type and a reset button is used to return such element to its original position. Novel means are provided to engage the contact arm when the reset button is depressed to cause such arm to pivot in a direction to open the switch, whereby the switch cannot be held in closed position by the reset button when the latter is maintained in such depressed position. The novel arrangement overcomes vibration problems and permits a very wide range of applications using many different bimetallic elements.

It is therefore among the objects of the present invention to provide a new and novel thermally controlled electrical switch which serves to interrupt or open an electric circuit automatically upon a rise in temperature to a predetermined degree and which requires manual actuation to close the circuit thereafter.

Another object of the invention is to provide a thermostatic control for an electric circuit having a switch therein and embodying manual reset means operable to close the contacts of the switch upon initial movement thereof and to thereafter open the contacts upon further movement of the manual reset means.

A further object of the invention is to provide a thermostatic switch having manually actuated means for closing the contacts of the switch after having been opened upon being subjected to a predetermined temperature, which reset means when maintained in its extreme depressed position holds the contacts of the switch open.

A still further object of the invention is to provide a new and novel manual reset thermostatic control wherein

the switch mechanism is trip free of the manual reset means.

Another object of the invention is to provide a simple, inexpensive, thermostatic control which will protect valuable equipment against damage from overheating regardless of any attempts on the part of the operator to continue operation of such equipment.

A further object of the invention is to provide a simple, reliable thermostatic control which requires a substantial force to effect resetting and which is not affected by vibration or improper positioning of the reset button.

Another object of the invention is to provide a thermostatic control which may be used with bimetallic discs having widely varying temperature characteristics and which is suitable for many different types of applications.

These and other objects and advantageous features of the invention will become more apparent from the following detailed description of the invention taken in conjunction with the claims and with the accompanying drawings wherein like reference characters denote corresponding parts and wherein:

FIGURE 1 is a transverse medial sectional view of a thermostatic control embodying the present invention;

FIGURE 2 is a perspective view of the reset button;

FIGURE 3 is a top plan view of the thermostatic device with parts broken away;

FIGURE 4 is a longitudinal vertical sectional view taken on the line 4—4 of FIGURE 3 showing the parts when the contacts of the switch are in the normally closed positions as in FIGURE 1;

FIGURE 5 is a fragmentary transverse vertical sectional view showing the position of the parts when the contacts of the switch are open; and

FIGURE 6 is a fragmentary transverse vertical sectional view similar to FIGURE 5 but showing the position of the parts when the reset button is in its maximum depressed position.

Referring more particularly to the drawings, there is illustrated a preferred form of my thermostatic control assembly which comprises a one-piece base 1, a one-piece cover 2 rigidly mounted on said base, a sheet metal mounting plate 3, rigidly mounted on the bottom face of said base, a movable contact arm 4 mounted in cantilever fashion on the top face of said base, a cylindrical bumper or pin 5 slidably mounted at the center of the base, a bimetallic disc 6 peripherally mounted between said base and said mounting plate for moving said bumper axially toward and away from said contact arm to open the normally closed contact when it is heated above a predetermined temperature, and a reset button 7 mounted for axial movement in the cover 2 coaxial with the bumper 5. Since the general construction of the assembly is quite similar to that disclosed in United States Patent No. 3,081,388 granted March 12, 1963, the construction of the parts will become readily apparent to those skilled in the art. The base 1, the cover 2 and the reset button 7 are made of a suitable electrical insulating material having a substantial resistance to heat. Such material may be a phenolic condensation product or any other suitable material commonly used for thermostatic controls of this general type. The bumper 5 may also be formed of such a material.

The base 1 is quite similar to the plastic base of the thermostatic control shown in the aforesaid patent but

has a central boss 8 which cooperates with the contact arm 4 in a novel manner so that the parts function in a manner quite different from those shown in said patent. The central boss 8 is generally cylindrical and coaxial with the cover 2, the bumper 5 and the annular wall portion 9 located below the margin of said cover. The central boss 8 and the wall portion 9 of the base 1 define an annular chamber 10 in the top portion of the base, and said base is provided with a bottom circular disc-receiving recess 11 below and coaxial with said chamber to permit movement of the disc 6 to the position shown in FIGURE 5.

The base 1 has rectangular portions 12 at opposite sides thereof and flat horizontal flanges 13 with a series of tab-receiving recesses 14 substantially as shown in said patent. The rivet openings 15 of the rectangular portions 12 are necessary to permit use of the rivets 16 to mount the terminal members 17 and 18. Said terminal members are rigidly mounted on the flat upper surface of the base 1 and are bent upwardly at the ends to provide means for mounting the conventional terminal screws 19 and 20. The member 18 has a horizontal contact-carrying portion 21 within the chamber 10 which carries a fixed contact button 22, and the arm 4 has a contact button 23 rigidly mounted on its free end for movement into and out of engagement with the fixed contact. The arm 4, in its normal unstressed condition, has a flat horizontal portion 24, a substantially flat inclined portion 25 and a flat horizontal end portion 26, the latter end portion being clamped between the terminal member 17 and the base 1 to provide a rigid cantilever support for the arm 4 as is best shown in FIGURE 1.

The reset button 7 has a cylindrical portion 27 which is preferably, but not necessarily, coaxial with the base 1 and an enlarged portion 28 perpendicular to the axis of the portion 27 and having an offset projection 29 as best shown in FIGURE 2. It will be seen that the portion 29 is straight and perpendicular to the contact arm 4 and has a semi-cylindrical bottom surface which engages the contact arm 4 along a straight line perpendicular to said arm and extending substantially the full width of said arm as shown in FIGURE 4. The reset button 7 normally rests on the contact arm under the action of gravity and does not interfere with opening or closing of the contacts by the bimetallic disc 6.

The central circular portion 31 of the sheet metal mounting plate 3 is concentric with the disc 6 and the bumper 5 and is dished out to provide room for movement of the disc 6 to its lowermost position shown in FIGURE 1. The plate 3 has an annular recessed portion 32 concentric to the portion 31 and the disc 6 which provides a ring-like seat for the marginal portion of said disc. Said recessed portion 32 fits in a recess 33 of the base 1 to locate the mounting plate on the base, and said plate has four tabs 34 which are bent around the flanges 13 into the recesses 14 to rigidly hold the mounting plate on the base. The opposite end portions of the mounting plate project beyond the flanges 13 as shown in FIGURES 3 and 4 and have conventional mounting holes 35 therein.

The disc-shaped composite thermal plate 6 may be a conventional bimetallic snap-acting thermostatic element which moves from one position of stable equilibrium when cold as shown in FIGURES 1, 4 and 6 to another relatively stable position of equilibrium when hot as shown in FIGURE 5. Such bimetallic disc is conventional and the manner of mounting the disc forms no part of this invention. Thus, the recess 11 has a marginal frustroconical surface 37 which joins the flat annular surface 38 of the base 1 to provide a knife-like circular edge concentric to the disc. The marginal portion only of the disc 6 is mounted in the annular space between the flat surface 38 and the portion 32 of the mounting plate, and the disc will snap from its lowermost to its uppermost position when heated above a predetermined temperature.

The thermostatic control of this invention is particularly well suited for use with a bimetallic disc 6 which requires a very large temperature change to effect snapping of the disc. By using a disc 6 with a top temperature up to 200° F. and a bottom temperature of not in excess of 0° F., it is possible to use the control of this invention for many different purposes. All that is necessary is to substitute for the disc 6 another disc having the desired range of temperatures without modifying the construction of the other parts.

Thus, the thermostatic control of this invention could be employed to protect a clothes drier against overheating even when it is necessary to cool the disc 6 below 0° F. to cause it to snap from its uppermost position shown in FIGURE 5 to its lowermost position shown in FIGURE 6 since such snapping may be effected manually by the reset button 7 without waiting for such cooling to occur.

The cover 2 provides the means for locating and guiding the reset button and has an internally cylindrical recess 40 which cooperates with the chamber 10 to provide a space for receiving the contacts and for permitting movement of the contact arm 4. The cover also has a recess 41 of a size to receive the offset portion 28 of the reset button and a cylindrical bore 42 for receiving the cylindrical portion 27 of the reset button. The cover may be provided with a projecting annular portion 43 whereby the bore 42 has an axial length no less than its diameter and substantially greater than the diameter of the button portion 27. The cover is rigidly and detachably connected to the base 1 by retaining screws 44 or other suitable means, the cover and the base forming a non-metallic housing.

If desired, the thermostatic control of this invention may be constructed as shown in the drawings which are drawn substantially to scale, but it will be apparent that the size, shape and arrangement of the parts may be varied considerably.

In order to prevent the operator from securing the reset button in a depressed position and thereby maintaining the switch closed so as to continue operation of the overheated equipment, fulcrum means are provided for causing the arm 4 to swing in a direction to open the switch when the reset button is depressed so that the switch remains open and prevents operation of the overheated equipment until the reset button is released. The preferred construction of this invention is shown in the drawings. As shown, the guide portion or boss 8 of the base 1 has a pivot portion 50 on the side of the bumper 5 adjacent the switch 22–23 and has a stop portion 51 on the opposite side of said bumper adjacent the offset portion 29 of the reset button. The portion 51 has a height less than that of the portion 50 as shown in FIGURES 5 and 6 so that the straight portion 24 of the arm 4 is held against the portions 50 and 51 when a downward force is applied to the reset button thereby limiting the movement of said button and protecting the disc 6 against damage due to excessive movement of the bumper 5. The portions 50 and 51 are located so that the disc 6 is moved to its normal lowermost position and the switch is held open when the reset button is depressed as shown in FIGURE 6. Since the stop portion 51 is closed to the offset portion 29 of the reset button it effectively stops said button when the button is in the lowermost position shown in FIGURE 6 and prevents damage to the arm 4. The stop portion 51 also protects the plate 3 by preventing the bumper 5 from forcing the disc 6 below its normal position shown in FIGURES 4 and 6.

As shown in FIGURE 1 the projecting portion 50 of the guide member 8 provides fulcrum means located adjacent the bottom surface of the arm 4 and adjacent the mobile contact 23 when the arm is in its normal switch-closing position and the reset button 7 is released. Said fulcrum means provides a pivot to swing the movable contact 23 out of engagement with the fixed contact 22 whenever the reset button 7 is depressed below its normal released position shown in FIGURE 1.

If the disc **6** is heated sufficiently to cause it to snap from its normal stable position shown in FIGURE 1 to a second stable position of opposite concavity as shown in FIGURE 5, the switch is opened to break the electrical circuit between terminals **17** and **18**. After the disc **6** has cooled somewhat, the reset button **7** is depressed to force the spring arm **4** against the bumper **5** and to snap the disc **6** back to its original position.

The downwardly moving button moves the straight portion **24** of the cantilever arm against the pivot portion **50** and causes it to swing the contact **23** away from the fixed contact **22** before the arm arrives at its lowermost position against the stop **51**. Thus, the button must be released before the switch can be closed. If the button is released the disc **6** will permit further operation with the switch closed as in FIGURE 1 only so long as its temperature is below a predetermined amount. The thermostatic control of FIGURES 1 to 6, therefore, provides at all times reliable protection against overheating.

It will be understood that the above description is by way of illustration rather than limitation and that, in accordance with the provisions of the patent laws, variations and modifications of the specific devices disclosed herein may be made without departing from the spirit of the invention.

Having described my invention, I claim:

1. A thermostatic control device comprising a housing, an electric switch mounted within said housing, a cantilever mounted contact arm for opening and closing said switch, a thermostatic element mounted on said housing remote from said contact arm and said switch and having two positions of stability, said element having means responsive to heat for moving the element from one position to the other position when the temperature is above a predetermined range and for returning said element to said one position when the temperature is below said range, said means resisting movement of said element between said positions when the temperature is within said range, bumper means responsive to movement of said thermostatic element to one of said positions for swinging said arm in one direction to open said switch, means for closing said switch and for moving said arm in the opposite direction when said thermostatic element is in the other of said positions, reset means including a manually operated button for moving said thermostatic element to said other of said positions while simultaneously causing movement of said arm in response to depressing of said button, and fulcrum means responsive to said last-named movement of said arm for opening said switch and for holding the switch open until said button is released.

2. A thermostatic control device comprising a housing, a switch mounted within said housing having a stationary contact and a mobile contact, a lever arm mounted to swing in said housing and to move said mobile contact, a snap-acting bimetallic disc peripherally mounted on said housing remote from said lever arm and said switch and having two positions of stability, said disc snapping from one of said positions to the other when its temperature is above a predetermined range and snapping back to its original position when its temperature is below said range, an elongated member slidably mounted in said housing between said disc and said arm for moving toward the arm to open said switch in response to movement of the disc to one of said positions and for moving away from said arm when the disc returns to the other of said positions, a reset button having means for moving said arm toward said elongated member and for causing said member to return the disc to said last-named position in response to depressing of said button, and fulcrum means for engaging said arm between said last-named means and said switch to swing the arm in a direction to open said switch when said button is depressed.

3. In 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 arm carrying a mobile contact, a snap-acting thermostatic element mounted on said housing remote from said switch chamber and having two positions of stability, means operably connected between said arm and said thermostatic element for opening the switch when said element is in one of said positions and for permitting closing of said switch when said element is in the other of said positions, and a reset button having means for moving said element from its switch-opening position to its switch-closing position when said button is depressed, the improvement which comprises fulcrum means carried by said housing and engageable with said cantilever arm to form a pivot, said reset button acting on said arm to move said thermostatic element from said switch-opening position to said switch-closing position when said button is depressed, said fulcrum means causing said arm to swing and open said switch in response to depressing of said button and permitting the arm to open and close said switch when said button is released.

4. A thermostatic control device comprising a housing defining a switch chamber, a pair of terminals on said housing, a normally closed switch mounted in said chamber and including a stationary contact connected to one of said terminals and a metal spring arm carrying a mobile contact, said arm extending across said chamber and having one end mounted on said housing and connected to the other of said terminals, a bimetallic thermostatic disc peripherally mounted on said housing below said arm and remote from said chamber and having two stable positions of opposite concavity, the central portion of said disc moving upwardly and downwardly between said stable positions in response to changes in the temperature of said disc, an upright bumper member slidably mounted in a guide portion of said housing for upward and downward movement and extending between an intermediate portion of said arm and the central portion of said disc to effect opening and closing of said switch by said arm, a reset button slidably mounted in the top portion of said housing above the intermediate portion of said arm and engaging the top of said arm to return the disc to its lowermost stable position, and fulcrum means carried by said housing at the top of said guide portion and forming a pivot which swings the free end of said arm away from said fixed contact when said reset button is depressed, said pivot being located below and adjacent the bottom surface of said arm when the reset button is released and the arm is in its normal switch-closing position.

5. In a thermostatic control device having a housing with two external electrical terminals and means for conducting an electric current between said terminals including a normally closed switch in said housing having a mobile contact mounted on the end of a cantilever spring arm and a stationary contact, said spring arm normally holding said mobile contact against said stationary contact to close the circuit between said terminals and a snap-acting thermostatic means for engaging an intermediate portion of said arm to move it in one direction to open said switch in response to an increase in temperature beyond a preselected range, the improvement which comprises a reset button having means for moving said intermediate portion of said arm in the opposite direction to reset said thermostatic means, and fulcrum means located adjacent the surface of said arm when the arm is in its normal switch-closing position and engaging said arm when said intermediate portion is moved in said opposite direction by said reset button to form a pivot to swing the mobile contact out of engagement with said fixed contact.

6. A thermostatic control device comprising a housing, an electric switch mounted in said housing including a stationary contact and a mobile contact, said mobile contact being mounted on the free end of a spring arm that is mounted on said housing to swing from a first position wherein the switch is closed to a second position wherein the switch is open, a snap-acting thermostatic disc peripherally mounted on said housing below said

arm and having two positions of stability, an upright member slidably mounted in a guide portion of said housing and extending between the top of said disc and intermediate portion of said arm to translate the movement of said disc to said arm and to effect opening and closing of said contacts, a manual reset button having means for engaging the top of said arm on the side of said upright member remote from said mobile contact to lower said upright member and reset said disc in response to depressing of said button, and fulcrum means at the top of said guide portion forming a pivot between said mobile contact and said upright element for engaging the bottom of said arm to open said switch in response to depressing of said button.

7. A control device as defined in claim 6 wherein stop means are provided at the top of said guide portion on the side thereof remote from said pivot to limit the downward movement of said reset button, said arm being held in a switch-opening position when forced against said stop means.

No references cited.

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