United States Patent [19]

Manecke

[11] **3,885,222**

[45] **May 20, 1975**

[54] **THERMOSTAT CONSTRUCTION**

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[73] Assignee: **Robertshaw Controls Company**, Richmond, Va.

[22] Filed: **Oct. 23, 1973**

[21] Appl. No.: **408,678**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 260,107, June 6, 1972.

[52] **U.S. Cl.** **337/338**; 337/348; 337/367

[51] **Int. Cl.** **H01h 37/52**

[58] **Field of Search** 337/91, 95, 335, 338, 348, 337/358, 367, 370, 354

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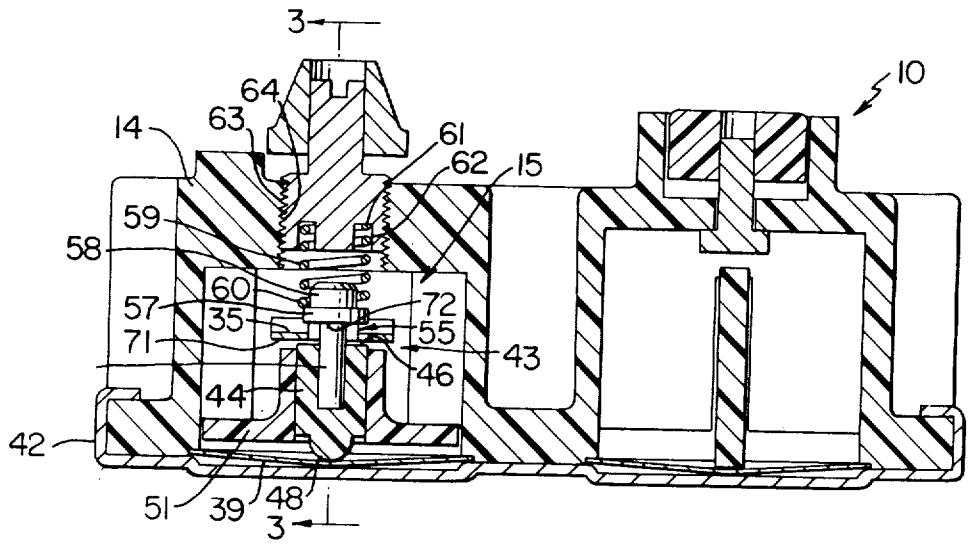
Primary Examiner—J. D. Miller
Assistant Examiner—Fred E. Bell
Attorney, Agent, or Firm—Candor, Candor & Tassone

[57] **ABSTRACT**

A control device having a housing provided with a pair of thermostatically operated electrical switches therein. A rigid lead is disposed internally in the housing and electrically interconnects the pair of switches in series. One of the switches is operated by a bimetal member which opens the switch when the bimetal member senses a certain condition. A reset member is provided for resetting the bimetal member and has a shaft portion passing through an opening in a wall of the housing which abutments being disposed on opposite sides of the wall. One of the abutments is adapted to engage a plunger disposed between a movable contact of the switch and the bimetal member and thereby move the plunger and bimetal member back to a resetting position of the bimetal member. The other abutment of the reset membet is adapted to engage the wall when the reset member is moved in a reset direction to limit resetting movement thereof so that the bimetal member cannot be reset unless the same is at a reset temperature.

20 Claims, 15 Drawing Figures



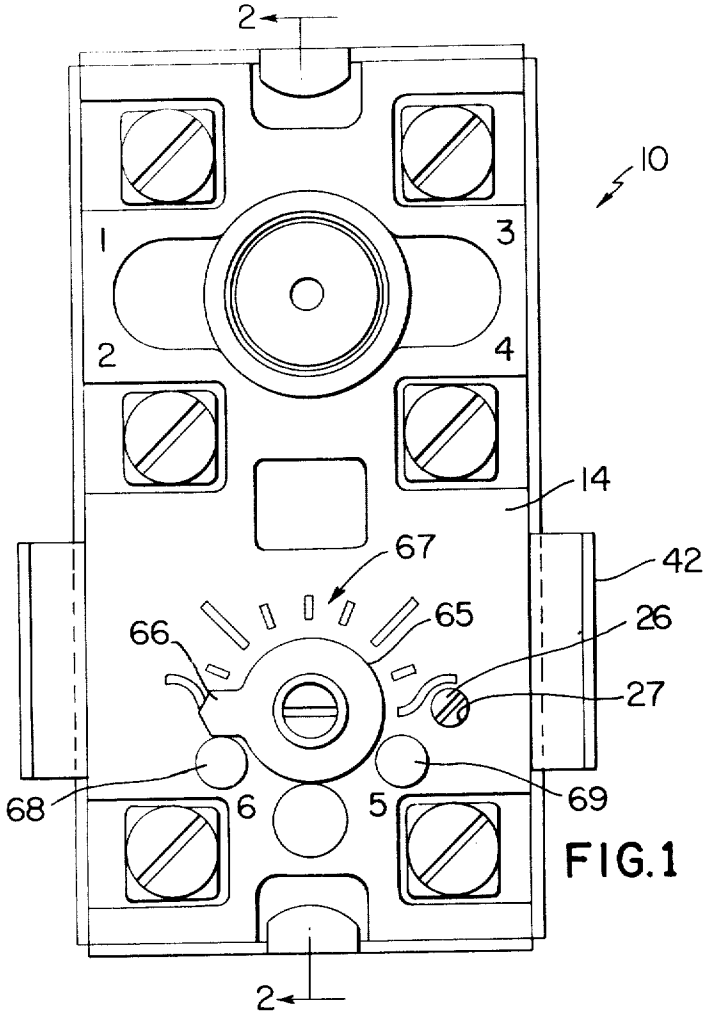

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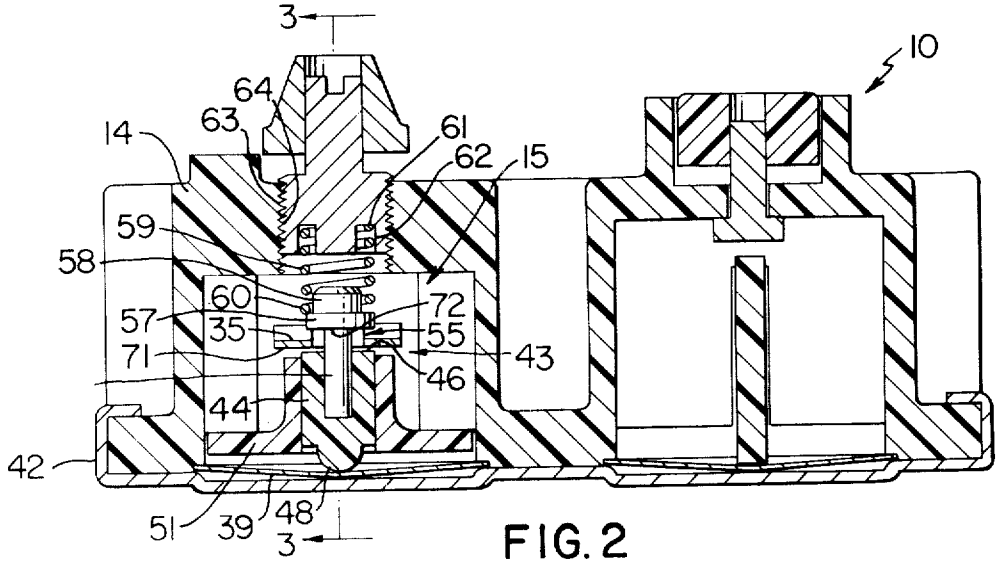
FIG. 1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48
3

FIG. 2

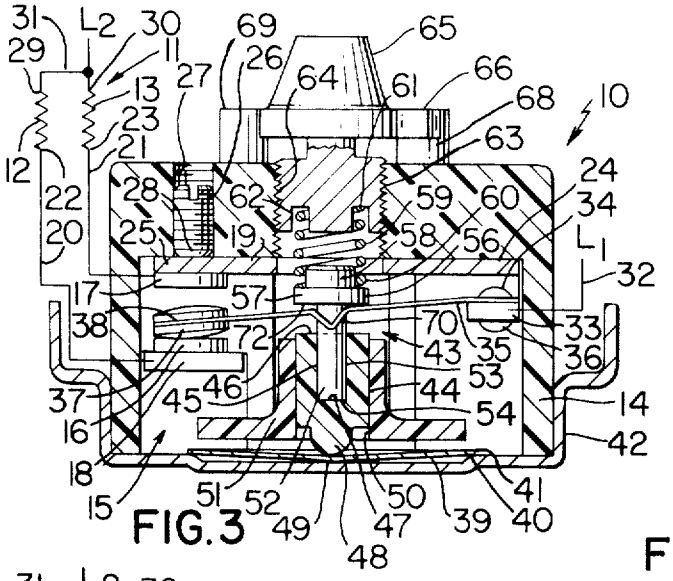


FIG. 3

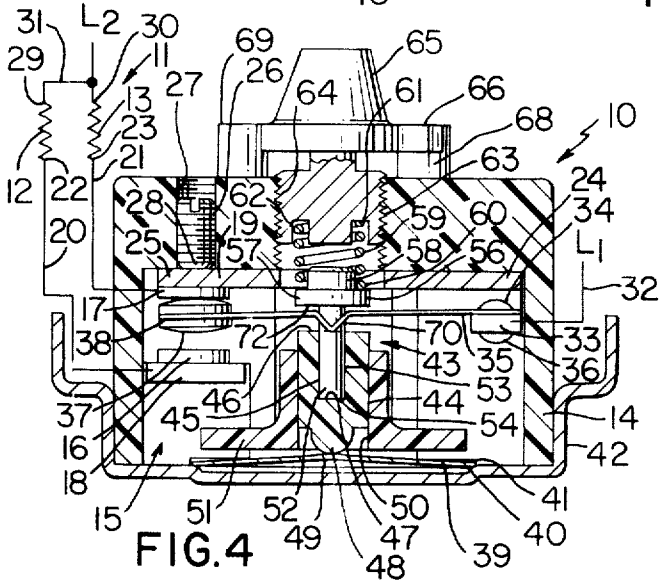


FIG. 4

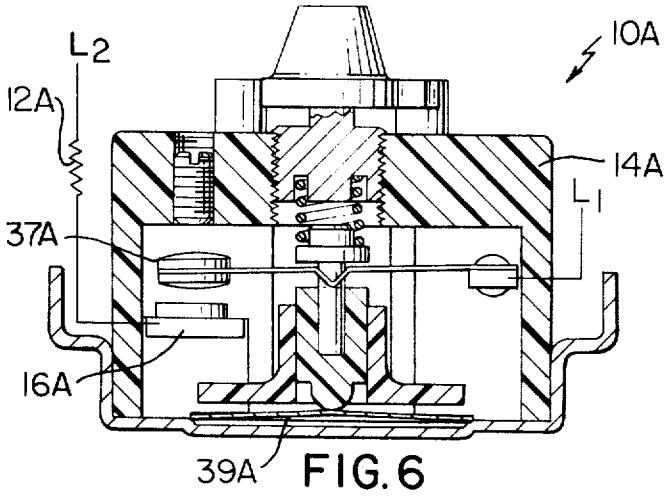


FIG. 6

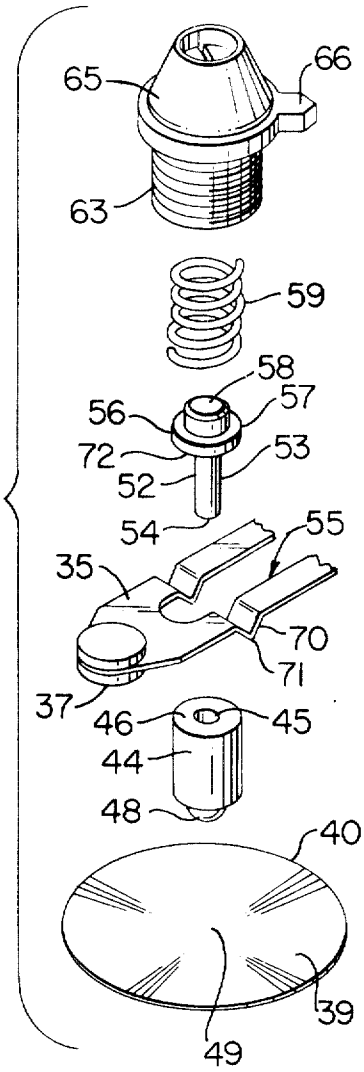


FIG. 5

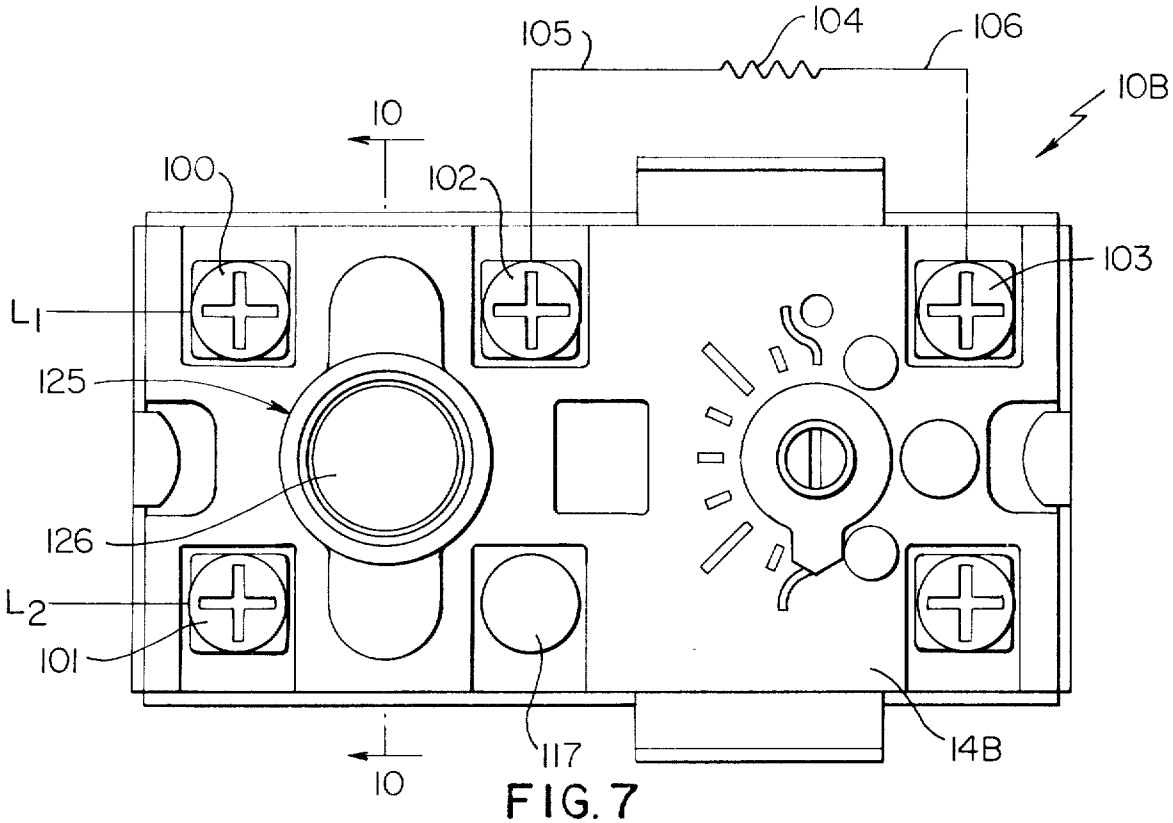
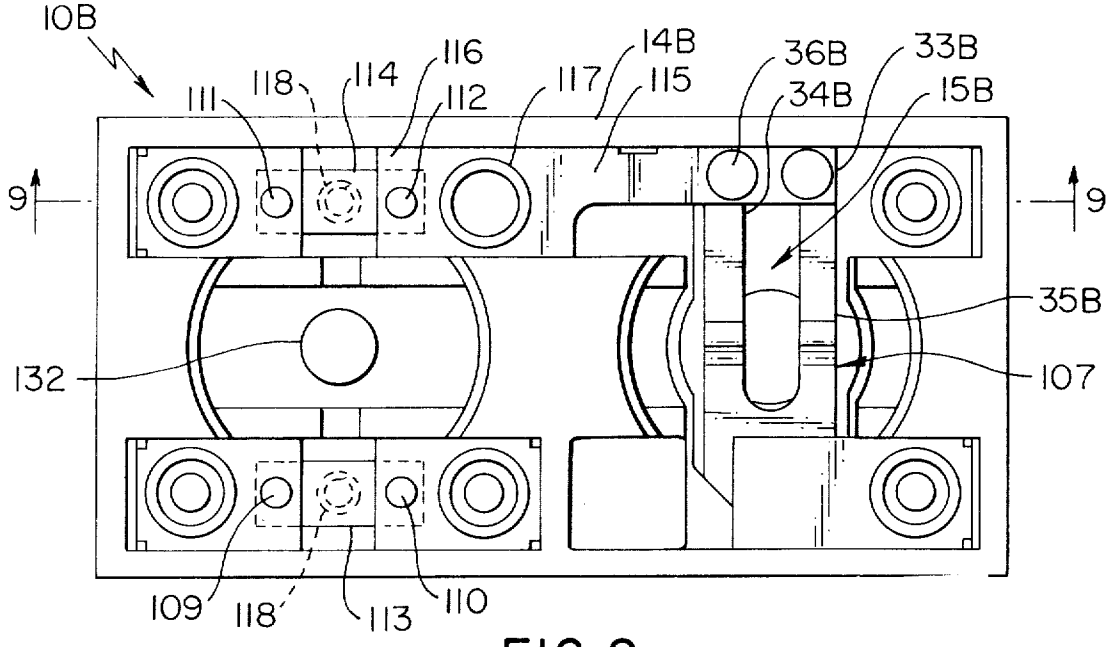

105
104
106
10B
10
100
102
103
L1
125
126
L2
101
117
14B
10

FIG. 7


10B
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116
112
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9
9
35B
132
107
109
118
113
110

FIG. 8

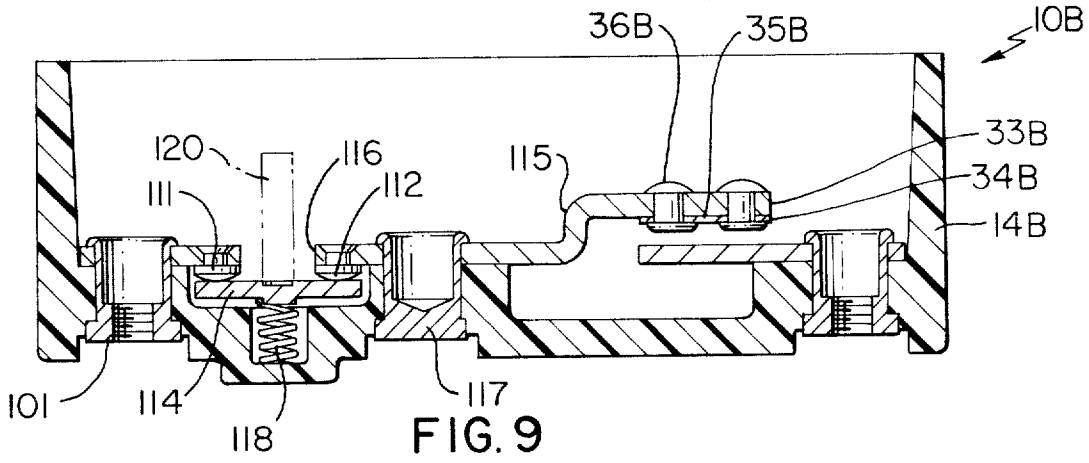

FIG. 9

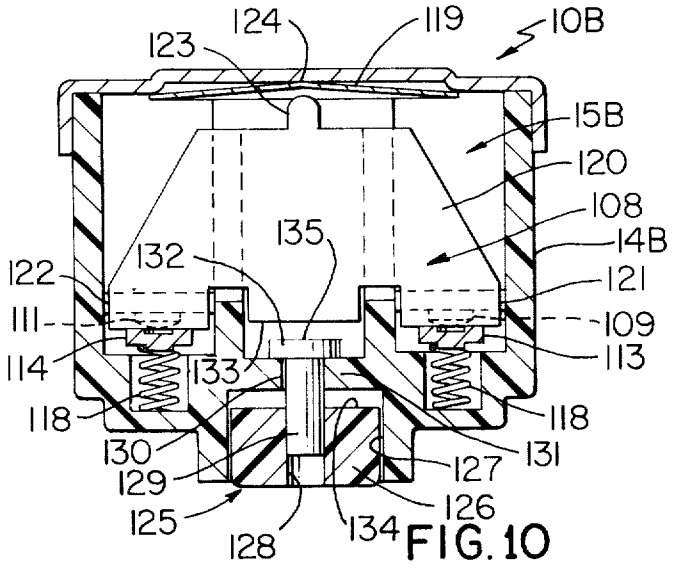

FIG. 10

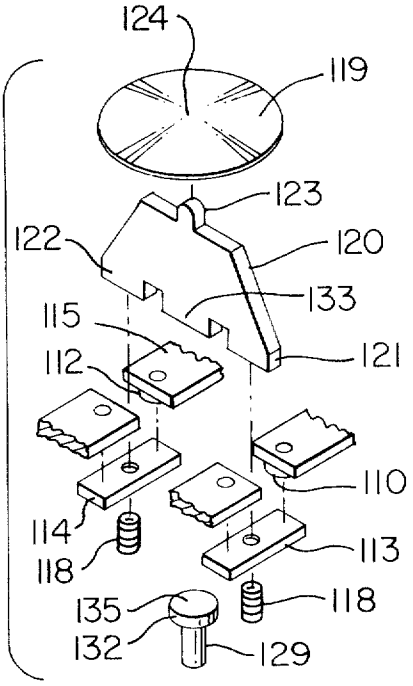

FIG. 11

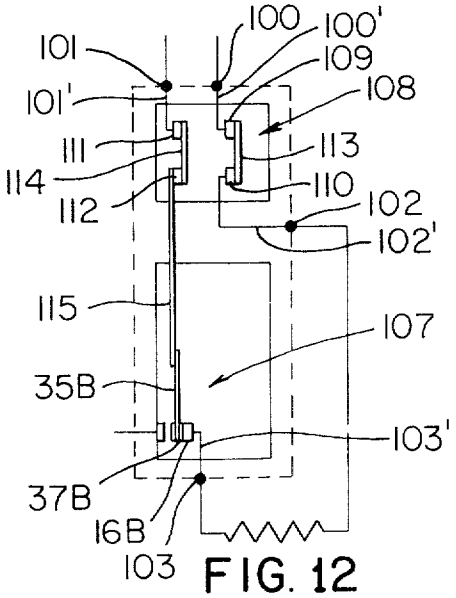

FIG. 12

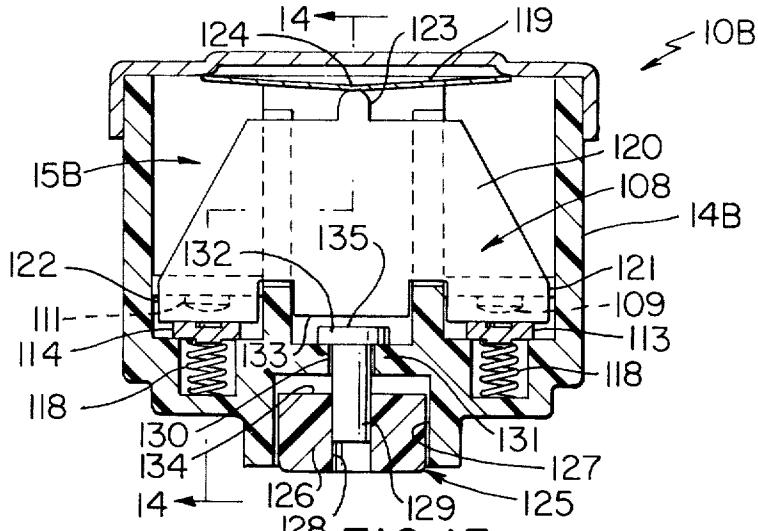

FIG. 13

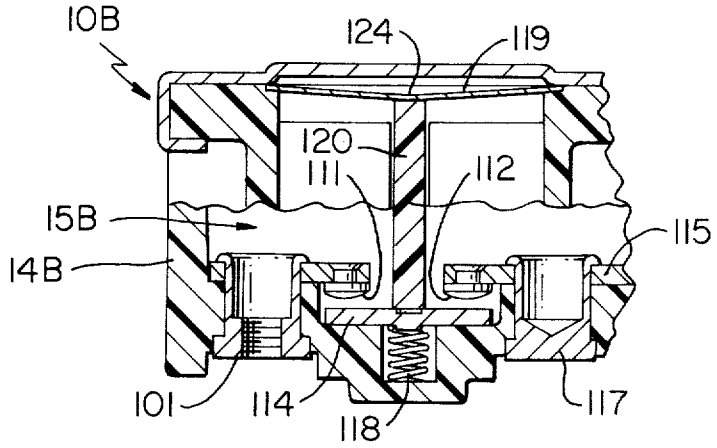

FIG. 14

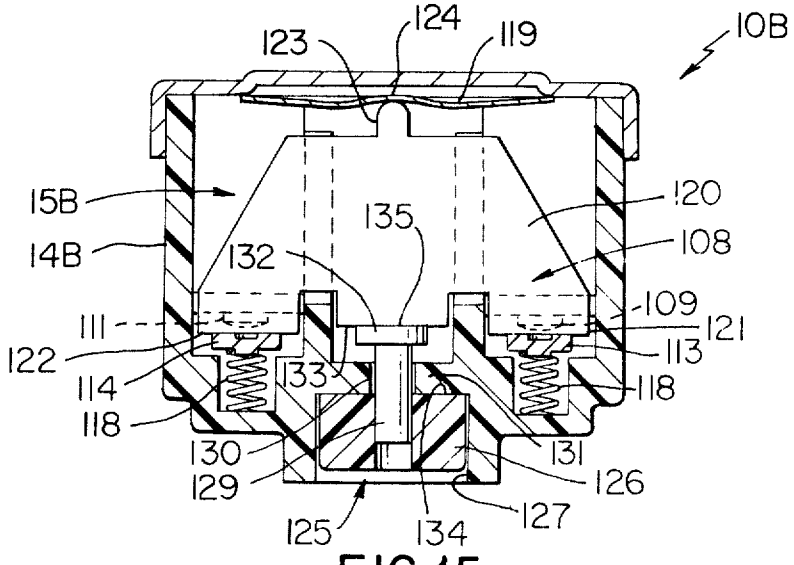

FIG. 15

THERMOSTAT CONSTRUCTION

This application is a continuation-in-part application of Ser. No. 260,107, filed June 6, 1972, and is assigned to the same assignee to whom the parent application is assigned.

This invention relates to an improved thermostat construction as well as to improve parts of such thermostat construction or the like.

It is well known to provide a thermostat arrangement wherein a low limit thermostatically operated switch construction is utilized to control a heater means or the like according to the setting of that particular thermostatically operated switch construction. A high limit thermostatically operated switch construction is also provided to terminate the flow of electrical current to the low limit thermostatically operated switch construction when the high limit thermostatically operated switch construction senses an unsafe high temperature. This safety thermostatically operated switch construction normally remains open after the same has been operated by the sensed high temperature and requires the operator to manually actuate a reset member before the high limit safety switch can be returned to its normal operating condition for supplying electrical current to the low limit thermostatically operated switch construction.

It is a feature of this invention to provide such a thermostat arrangement wherein both thermostatically operated switch constructions can be carried out in a single housing.

Another feature of this invention is to provide an improved high limit thermostatically operated switch construction for such a thermostat arrangement or the like.

In particular, one embodiment of this invention provides a control device having a housing provided with a pair of thermostatically operated electricl switch means disposed therein. The housing has external terminals respectively for the pair of switch means. A rigid lead means is carried internally in the housing and electrically interconnects the pair of switch means in series whereby prior used external interconnections between the two thermostatically operated switch means are eliminated.

One of the thermostatically operated switch means of the above control device includes a fixed contact and a movable contact cooperating therewith and normally being disposed in contact therewith. A bimetal member is carried by the housing and has a certain position when sensing a certain temperature. A plunger is movably carried by the housing and is disposed between the bimetal member and the movable contact to cause the movable contact to move away from the fixed contact when the bimetal member is sensing the certain temperature. A reset member is movably carried by the housing for engaging against the plunger to reset the bimetal member after the same has sensed the certain condition and opened the movable contact away from the fixed contact. The reset member has a shaft portion passing through an opening in a wall of the housing with the shaft portion having abutment means disposed on opposite sides of the wall. One of the abutment means is adapted to engage the plunger for resetting the bimetal member when the reset member is moved in one direction relative to the housing wall. The other abutment is adapted to engage the wall when the reset member is moved in that one direction to thereby limit resetting movement of the reset member whereby the bimetal member cannot be reset unless the same is at a resetting temperature thereof.

Accordingly, it is an object of this invention to provide an improved control device having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide improved parts for such a control device or the like.

Other objects, uses and advantages of this invention are apparent from a reading of the description which proceeds with reference to the accompanying drawings forming a part thereof and wherein;

FIG. 1 is a front view of one embodiment of the improved thermostat construction of this invention.

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 2 and schematically illustrates the electrical control system utilizing the thermostat construction of this invention.

FIG. 4 is a view similar to FIG. 3 and illustrates the snap disc in a different snapped condition thereof.

FIG. 5 is an exploded perspective view of certain parts of the temperature setting means of the thermostat construction of this invention.

FIG. 6 is a view similar to FIG. 4 and illustrates another embodiment of this invention.

FIG. 7 is a view similar to FIG. 1 and illustrates another embodiment of this invention.

FIG. is a bottom view of the control device illustrated in FIG. 7 with the bottom cover thereof removed.

FIG. 9 is a cross-sectional view taken on line 9—9 of FIG. 8.

FIG. 10 is a cross-sectional view taken on line 10—10 of FIG. 7.

FIG. 11 is an exploded, perspective view of certain parts of the high limit thermostatically operated switch construction of the control device of FIG. 7.

FIG. 12 is a schematic view illustrating a control system utilizing the control device of FIG. 7.

FIG. 13 is a view similar to construction 10 and illustrates the high limit thermostatically operated switch constructed when the same is sensing a high unsafe temperature.

FIG. 14 is s cross-sectional view taken on line 14—14 of FIG. 13.

FIG. 15 is a view similar to FIG. 13 and illustrates the high limit thermostatically operated switch construction when an attempt is being made to reset the same and the actuated bimetal member has not returned to a resetting temperature thereof.

While the various features of this invention are hereinafter described and illustrated as providing control devices for a particular electrical control system, it is to be understood that the control devices of this invention can be utilized with other electrical control systems as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of the uses of this invention.

Referring now to FIGS. 1–5, one embodiment of the improved thermostat construction or control device of this inention is generally indicated by the reference numeral 10 and is illustrated schematically in FIGS. 3 and 4 as being utilized in an electrical control system that

is generally indicated by the reference numeral 11, the electrical control system 11 comprising a pair of power source leads L1 and L2 adapted to be placed across an electrical heater means 12 when the thermostat construction 10 is disposed in the condition illustrated in FIG. 3 in a manner hereinafter set forth and for disconnecting the power source leads L1 and L2 from the electrical heater means 12 and placing the same across another electrical heater means 13 when the thermostat construction 10 is disposed in the condition illustrated in FIG. 4 in a manner hereinafter described.

The thermostat construction 10 comprises a frame means or housing 14 having a chamber 15 therein containing a pair of spaced fixed contacts 16 and 17 respectively interconnected to terminal means 18 and 19 adapted respectively to be interconnected to external leads 20 and 21 in any conventional manner so that the fixed contacts 16 and 17 are respectively electrically interconnected to one side 22 and 23 of the electrical heater means 13 and 12.

The terminal means 19 for the fixed contact 17 can have its right-hand end 24, FIGS. 3 and 4, fastened to the housing means 14 while its left-hand end 25 that carries the fixed contact 17 is free for movement relative to the housing means 14. However, the terminal 19 has a spring bias that normally holds the end 25 flat against the housing in the manner illustrated in FIG. 3. However, a threaded adjusting member 26 is disposed in a threaded bore 27 in the housing 14 to have its end 28 engageable against the free end 25 of the terminal 19 to position the terminal end 25, and, thus, the contact 17 downwardly toward the other fixed contact 16 depending upon the threaded relation between the threaded member 26 and the housing 14 so that the spacing between the contracts 16 and 17 can be adjusted for a purpose hereinafter described.

The other sides 29 and 30 of the electrical heater means 13 and 12 are respectively interconnected by lead means 31 to the power source lead L2.

The other power source lead L1 is interconnected by a lead 32 to a terminal means 33 of the housing 14 in any suitable manner with the terminal means 33 being electrically interconnected to the right-hand end 34 of a conductive switch blade 35 that is fastened thereto by suitable rivet means 36. The switch blade 35 carries contact means 37 on the left-hand free end 38 thereof with the contact means 37 being cooperable with the fixed contacts 16 and 17 in the manner illustrated in FIGS. 3 and 4. However, the natural bias of the spring blade 35 is to move the blade 35 downwardly in the manner illustrated in FIG. 3 to normally place the contact means 37 into good electrical contact with the fixed contact 16 as illustrated.

A bimetallic snap disc of substantially circular configuration 39 is carried by the housing means 14 and has its outer periphery 40 received within a recess 41 formed in the housing means 14 and being held in the recess 41 by a cover member 42 detachably carried by the housing 14 and closing the chamber 15 thereof as illustrated.

A plunger means 43 of this invention comprises a first plunger part 44 having an opening 45 interrupting one flat end 46 thereof to terminate within the part 44 at an end wall 47. The other end 48 of the plunger part 44 is formed wtih a hemispherical configuration and is adapted to engage against the central part 49 of the snap disc 39 as illustrated.

The plunger part 44 is disposed within a guide opening 50 passing through a guide part 51 secured in the chamber 15 of the housing 14 in any suitable manner to locate and guide the axial up and down movement of the plunger means 43 between the positions illustrated in FIGS. 3 and 4.

The plunger means 43 has another plunger part 52 that is substantially rivet-shaped so as to have a stem 53 thereof received within the opening 45 of the first plunger part 44 and have its free end 54 bottom out against the end wall 47 at the end of the opening 45 of the plunger part 44 as illustrated in FIGS. 3 and 4. The stem 53 of the plunger part 52 loosely through an opening 55 formed centrally through the switch blade 35 as illustrated in the drawings so that the stem 35 does not engage the blade 53 but permits axial movement therebetween.

However, the rivet-like part 52 of the plunger means 43 has a hat-shaped head 56 defined by a first disc-like part 57 adjacent the stem 52 and a smaller disc-like part 58 on top of the disc-like part 57 to act as a spring locating means. For example, a compression spring 59 is carried by the housing means 14 and has one end 60 telescopically disposed over the disc part 58 to rest against the lower disc part 57 as illustrated in FIG. 4 and has another end 61 received within an annular recess 62 of a threaded adjusting member 63 threadedly disposed in a threaded bore 64 formed in the housing 14 and leading from the exterior thereof to the chamber 15 as illustrated.

The adjusting member 63 has a knob construction 65 secured thereto or formed integrally therewith, as desired, whereby rotation of the knob 65 varies the threaded relation of the threaded member 63 within the housing 14 and, thus, the force of the compression spring 59 urging the plunger means 43 into engagement with the central part 49 of the snap disc 39. If desired, the knob 65 can have a suitable pointer means 66 extending therefrom to be movable adjacent a scale 67 on the housing 14 as illustrated in FIG. 1 to indicate the temperature setting position of the knob 65 and, thus, the temperature setting of the temperature setting means for the thermostat construction 10. If desired, outwardly extending stops or abutments 68 and 69 can be provided on the housing 14 to limit rotational movement of the knob 65 to the right and left as illustrated in FIG. 1 as the pointer part 66 of the knob 65 will abut against the stops 68 and 69 when at the opposed limits of its temperature setting positions.

Thus, by varying the threaded relation of the threaded member 63 with the housing 14, the force of the compression spring 59 urging the plunger means 43 into engagement with the central part 49 of the snap disc 39 varies the temperature required for the snap disc 39 to snap from the condition illstrated in FIG. 3 to the condition illustrated in FIG. 4 upon the principles fully set forth in the patent to Spencer, U.S. Pat. No. 2,239,540, whereby the theory and operation of the change in the spring force being imposed on the snap disc 39 to change the temperature required to snap the disc 39 over center in either direction need not be further described.

The switch blade 35 is provided with V-shaped, bent projections 70 on both sides of the opening 55 passing therethrough so that the apex portions 71 of the V-shaped projections 70 are adapted to be engaged by the annular shoulder or wall 46 of the plunger part 44 as

the plunger part **44** is being moved upwardly from the position illustrated in FIG. 3 to the position illustrated in FIG. 4 whereby the take-up of the lost motion provided between the annular shoulder **46** and the projections **70** of the blade **35** before the plunger part **44** engages the blade **35** causes the plunger part **44** to abruptly engage the switch blade **35** and move the same upwardly from the position illustrated in FIG. 3 to the position illustrated in FIG. **4** as the snap disc **39** is snapping over center so that any contact weld that might exist between the movable contact **37** and the fixed contact **16** will be broken by such lost motion take-up movement of the plunger part **44.**

The snap distance of the snap disc **39** is so constructed and arranged that when the disc **39** is fully snapped over center in the manner illustrated in FIG. **4,** the plunger part **44** will place and hold the movable contact **37** into contact with the fixed contact **17** in opposition to the force of the normal bias of the spring blade **36** tending to return the movable contact **37** to its down position as illustrated in FIG. **3.** However, it can be seen that the other side **72** of the head **56** of the plunger part **52** is now spaced from the blade **35** when the blade **35** has been moved to its up position as illustrated in FIG. **4** so that when the snap disc **39** subsequently snaps back over center from the position illustrated in FIG. **4** to the position illustrated in FIG. **3,** the plunger means **43** will follow such movement of the disc **39** because of the downward force of the compression spring **59.** Thus, because of the spacing between the under surface **72** and the blade **35,** any contact welding of the movable contact **37** to the fixed contact **17** will be broken by the under surface **72** of the plunger part **52** abruptly engaging against the blade **35** after the take-up of lost motion therebetween to overcome such welded condition and permit the blade **35** to move downwardly until the movable contact **37** is placed in contact with the contact **16.** Such movement of the blade **35** takes place with substantially a snap motion because the compression spring **59** causes the plunger part **52** to follow the snap movement of the disc **39.**

Thus, it can be seen that in the operation of the electrical control system **11,** when the temperature sensing condition of the snap disc **39** causes the snap disc **39** to be in the position illustrated in FIG. **3,** only the heating element **12** is being placed across the power source leads L1 and L2 and is, thus, being operated by the thermostat **10.** However, when the temperature being sensed by the snap disc **39** changes in such a manner that the same reaches the temperature for which the control knob **65** has been set, the snap disc **39** snaps over center and through the plunger means **44** in the manner previously described snaps the switch blade **35** from the position illustrated in FIG. **3** to the position illustrated in FIG. **4** whereby the heater means **12** is effectively disconnected from the power source leads L1 and L2 and the heater means **13** is now placed across the power source leads L1 and L2 as illustrated in FIG. **4** to be operated by the thermostat **10.** Conversely, when the temperature being sensed by the snap disc **39** returns to the condition that will cause the snap disc **39** to snap back to the position illustrated in FIG. **3,** the snap disc **39** snaps back over center from the position illustrated in FIG. **4** to the position illustrated in FIG. **3** to switch the power source leads L1 and L2 from the heater means **13** back to the heater means **12.**

Therefore, it can be seen that the thermostat construction **10** of this invention is readily adapted to control a switching operation by the plunger means **43** that serves the dual purpose of setting the operating temperature for the thermostat disc **39** as well as providing opposed abutment means **46** and **72** to move the switch blade **35** between its two positions in a lost motion take-up manner to overcome any welding between the movable contact **37** and the fixed contacts **16** and **17** in the manner as previously set forth.

Further, by having the plunger means **43** pass through the opening **55** in the blade **35,** the blade **35** is not utilized in any manner to translate the motion or force of the compression spring **59** to the central part **49** of the snap disc **39** as provided in the aforementioned patent to Spencer, U.S. Pat. No. 2,239,540, and all of the parts, **44, 52, 63,** and **65** for the temperature setting means of the thermostat **10** are in direct alignment with each other and with the snap disc **39** to provide for accurate temperature setting control for the snap disc **39.**

While the thermostat **10** previously described has been provided with a switching function in both snapped conditions of the snap disc **39,** it is to be understood that the various features of this invention can be utilized to merely make or break one switch without incluiding the breaking and making of another switch in combination therewith.

For example, reference is now made to FIG. **6** wherein another thermostat construction of this invention is generally indicated by the reference numeral **10A** and parts thereof similar to the thermostat **10** previously described as indicated by like reference numerals followed by the reference letter "A."

As illustrated in FIG. **6,** the snap disc **39A** is illustrated as having been snapped over center from the normal condition of FIG. **3** to the position of FIG. **4** to thereby move the movable contact **37A** away from the fixed contact **16A** in the manner previously described. However, because the thermostat construction **10A** does not include a fixed contact **17** or the terminal **19** thereof, the snap disc **39A** merely maintains the movable contact **37A** out of contact with the fixed contact **16A** as illustrated in FIG. **6** so that no current is passing through the thermostat construction **10A** when the snap disc **39A** is in its up position as illustrated in FIG. **6.** However, when the snap disc **39A** snaps downwardly to place the same in position illustrated in FIG. **3,** it can be seen that the movable contact **37A** will be in engagement with the fixed contact **16A** so that power source leads L1 and L2 will place the heater means **13A** in operation.

While the control devices or thermostat constructions **10** and **10A** have been previously described as having just the manually settable, thermostatically operated switch construction for controlling the operation of the heater means **12, 13** or **13A,** it is to be understood that control devices **10** and **10A** can include a high limit thermostatically operated switch construction which, when sensing an unsafe high temperature, will terminate the flow of current to the low limit switch constructions thereof that comprise the movable contact means **37** or **37A.**

In particular, while another embodiment of the control device or thermostat construction of this invention is generally indicated by the reference numeral **10B** in FIG. **7–5** and parts thereof similar to the control de-

vices **10** and **10A** previously described are indicated by like reference numerals followed by the reference letter "B" and will be hereinafter described in connection with a high limit thermostatically operated switch construction thereof, it is to be understood that such high limit thermostatically operated switch construction can be utilized in the control devices **10** and **10A** in a like manner and for a like purpose.

As illustrated in FIGS. **7** oand **12**, the control device **10B** has four external terminal means **100, 101, 102** and **103** carried by the housing **14B** therof, the terminals **100** and **101** being respectively interconnected to external power source leads L1 and L2 by suitable threaded fasteners as illustrated while the terminals **102** and **103** are respectively adapted to be interconnected to the heater element **104** by external leads **105** and **106.**

The housing **14B** contains the low limit thermostatically operated switch construction that is generally indicated by the reference numeral **107** and comprises the previously described fixed contact **16B** and movable contact **37B** that is carried by the switch blade **35B** and which is operated by the same parts in the manner previously described to control the on-off operation of the heater means **104** so that the same will tend to have an output temperature effect as selected by the temperature setting of the low limit thermostatically operated switch construction **107.** Because the thermostatically operated switch construction **107** has been fully described in connection with FIGS. **1–6,** no further discussion thereof is deemed necessary in connection with the control device **10B.**

However, the control device **10B** includes another thermostatically operated switch means that is generally indicated by the reference numeral **108** in FIG. **12** and comprises two pairs of spaced apart fixed contacts **109, 110** and **111, 112** each being adapted to be bridged by movable contacts or members **113** and **114** in the manner illustrated in FIG. **12** and hereinafter described.

It can be seen in FIGS. **8** and **12** that the terminal **101** is electrically interconnected to the contact **11** while the terminal **100** is electrically connected to the contact **109** respectively by the internal terminal parts **100'** and **101'** of the terminals **101** and **100.**

Similarly, it can be seen in FIGS. **8** and **12** that the terminal **102** is interconnected to the fixed contact **110** by the terminal part **102'** thereof and the terminal **103** is interconnectd to the fixed contact by the terminal part **103'**.

As illustrated in FIG. **8, 9** and **12,** the fixed contact **112** is interconnected to the switch blade **35B** of the low limit thermostatically operated switch construction **107** by the rigid lead means or conductive buss bar **115** that carries the fixed contact **112** on the end **116** thereof, the end **34B** of the switch blade **35B** being fastened by the rivets **36B** to the other end **33B** thereof as illustrated. he rigid lead means or members **115** is fastened inside the chamber **15B** of the housing **14B** by a single fastening member **117** as illustrated, the single fastening member **117** being rivet shaped and having a part thereof disposed externally of the housing **14B** as illustrated in FIGS. **7** and **9.**

By providing the rigid lead means **115** inside the housing **14B,** no external connections are required between the high limit thermostatic switch construction **108** and the low thermostatic switch construction **107** so that the same can be disposed in the same housing **14B** and not be provided as two separate parts as disclosed in the U.S. patent to Manecke, U.S. Pat. no. 3,435,189.

As illustrated in FIGS. **9, 10, 13** and **15,** each contact member **113** and **114** of the high limt thermostatically operated switch construction **108** is urged toward its respective pair of fixed contacts **109, 110** and **111, 112** by a compression spring **118** whereby the contact members **113** and **114** normally bridge the contacts **109, 110** and **111, 112** so that the power source leads L1 and L2 can respectively complete an electrical circuit through the heater element **104** to operate the same whenever the movable contact **37B** of low limit thermostatic switch construction **107** is in contact with the fixed contact **16B** as illustrated in FIG. **12.** As previously stated, when the output temperature effect of the heating element **104** exceeds the setting of the low limit thermostatically operated switch construction **107,** the movable contact **37B** is moved away from the fixed contact **16B** to terminate the operation of the heater element **104** by breaking the electrical circuit therethrough until the output temperature effect thereof falls below the set temperature whereby the movable contact **37B** is again moved against the contact **16B** to again operate the heating element **104** in the above manner.

However, should an unsafe output temperature effect be provided by the operating heating element **104,** such as might occur during a malfunction of the low limit thermostatically operated switch construction **107** when it has its contact **37B** closed against the contact **16B,** the high limit thermostatic switch construction **108** will operate to open the movable contacts **113** and **114** away from their respective pair of fixed contacts **109, 110** and **111, 112** in a manner illustrated in FIG. **13** to disconnect the power source leads L1 and L2 from the heater element **104** and thereby terminate the operation therof.

In particular, the thermostatically operated switch construction **108** includes another bimetal disc or member **119** similar to the disc **39** previously described but adapted to snap over center from the condition illustrated in FIG. **10** to the condition illustrated in FIG. **13** only when the disc **119** senses a high unsafe temperature as fully described in the aforementioned patent to Manecke, U.S. Pat. No. 3,435,189.

A plunger member **120** of insulative material is disposed in the chamber **15B** of the housing **14B** and has a pair of projections **121** and **122** adapted to respectively engage against the movable contact members **113** and **114** as illustrated in FIG. **10.** The plunger **120** also has a central projection **123** adapted to be engaged by the center portion **124** of the bimetal disc **119** when the same is snapping over center from the position illustrated in FIG. **10** to the position illustrated in FIG. **13** whereby the snapping distance of the disc **119** is such that the same pushes the plunger member **120** downwardly in FIG. **13** in opposition to the force of the compression springs **118** to hold the movable contact members **113** and **114** against the housing **14B** as illustrated in FIG. **13** so that the electrical circuits, through the electrical switch construction **108** are completely opened, until the disc **119** is manually reset from the actuated condition illustrated in FIG. **13** back to the reset condition illustrated in FIG. **10.**

This resetting of thermostatic bimetal disc **119** is accomplished by the manual actuation of a reset member of the control device **10B** which is generally indicated by the reference numeral **125** and comprises a button member **126** movable in a circular cutout **127** formed in the housing **14B** and having a central opening **128** passng therethrough and carrying a shaftlike part **129** press fitted therein. The shaftlike part **129** passes through an opening **130** formed in a wall **131** of the housing **14B** and is provided with a rivet like enlarged end **132** which is disposed inside the housing **14B** and is engageable with a center projection **133** of the plunger member **120.**

Therefore, it can be seen that the reset member **125** includes an abutment surface **134** on the button **126** for engagement against the wall **131** of the housing **14B** to limit movement of the reset member **125** in its resetting direction toward the housing member **14B** as will be apparent hereinafter whereas the part **132** of the reset member **125** has an abutting surface **135** for abutting against the plunger member **120** to move the same in a resetting direction when the reset member **125** is moved toward the housing **14B** by the operator or the like.

The operation of the thermostatically operated switch construction **108** will now be described.

As previously stated, when the disc **119** is in the condition illustrated in FIG **10,** the plunger member **120** is so sized that the same is adapted to be disposed between the bimetal disc **119** and the contact members **113** and **114** in such a manner that the compression springs **118** are adapted to maintain the contact members **113** and **114** in their bridging condition against the fixed contacts **109, 110** and **111, 112** so that electrical current from the power source leads L1 and L2 can be utilized to operate the heater means **104** under the control of the low level thermostatically operated switch construction **107** as previously described.

However, when the bimetal disc **119** senses a high unsafe temperature, the same automatically snaps over center in the manner illustrated in FIG. **13** and engages against the projection **123** of the plunger **120** to drive the plunger **120** downwardly in FIG. **13** in opposition to the force of the compression springs **118** to hold the contact members **113** and **114** respectively away from their respective pairs of contacts **109, 110** and **111, 112** so that all electrical current flow to the heater **104** is terminated. The bimetal member **119** will remain in the actuated condition illustrated in FIG. **13** until the operator resets the same by pushing inwardly on the reset member **125.**

As the reset member **125** is moved inwardly by the pushing inwardly on the same, the abutting surface **135** engages against the projection **133** of the plunger **120** and moves the plunger **120** therewith until the abutting surface **134** on the button **126** engages against the wall **131** to terminate inward movement of the reset member **125.**

If the bimetal member **119** has cooled sufficiently to a resetting temperature thereof, such upward movement of the plunger **120** against the central portion **124** of the bimetal member **119** is sufficient to cause the bimetal member **119** to snap back over center from the actuated condition illustrated in FIG. **13** to the actuated position illustrated in FIG. **11** and thereby permit the contact members **113** and **114** to again bridge the fixed contacts **109, 110** and **111, 112** in the manner previously discussed.

However, if the bimetal member **119** has not cooled sufficiently to be reset and is thereby still sensing an unsafe temperature condition, the reset member **125** can be pushed inwardly its full distance as illustrated in FIG. **15** wherein the surface **134** of the button **126** bottoms out against the wall **131** and the bimetal member **119** will not be flexed sufficiently by the plunger **120** to be snapped overcenter and the plunger **120** will not have been moved sufficiently to permit the contact members **113** and **114** to close against the fixed contacts **109, 110** and **111, 112** whereby current cannot be supplied to the heating means **104** through the thermostatically operated switch construction **108** during an attempt to reset the same as long as the disc **119** is sensing a unsafe condition or has not cooled sufficiently for the reasons fully set forth in the aforementioned patent to Manecke, U.S. Pat. No. 3,425,189.

Therefore, the bimetal member **119** of the switch construction **108** must sense a safe condition or be sufficiently cooled before the same can be reset from the position illustrated in FIG. **13** to the position illustrated in FIG. **10.**

The plunger **120** is guided in its above described movements relative to the housing **14B** by suitable guide parts of the housing **14B** as illustrated.

Accordingly, it can be seen that this invention not only provides an improved control device having a unique thermostatically operated switch construction and resetting means thereon, but also this invention provides a control device havng two thermostatically operated switch constructions being electrically interconnected together in series by rigid lead means disposed internally in the housing means of the control device.

While the forms of the invention now preferred have been described and illustrated as required by the Patent Statute, it is to be understood that other forms can be utilized and still come within the scope of the appended claims.

What is claimed is:

1. A control device having a housing, a pair of thermostatically operated electrical switch means carried by said housing in spaced apart side-by-side relation, said housing having external terminals respectively for said pair of switch means, and a rigid lead means carried internally in said housing and electrically interconnecting said pair of switch means in series, said rigid lead means having opposed ends and being secured to said housing intermediate said ends thereof to dispose said ends in cantilever fashion with said ends respectively forming part of said switch means.

2. A control device as set forth in claim **1** wherein each of said thermostatically operated electrical switch means has a bimetal disc for operating the same.

3. A control device as set forth in claim **1** wherein one of said switch means has a pair of spaced apart fixed contacts carried by said housing and a movable contact member for bridging said fixed contacts to complete the circuit through said one switch means, one of said terminals being electrically interconnected to one of said fixed contacts, and said rigid lead means having one end thereof carrying the other of said fixed contacts.

4. A control device as set forth in claim **3** wherein said rigid lead means comprises a single rigid conduc-

tive member, and a single fastening member securing said rigid conductive member inside said housing.

5. A control device as set forth in claim 3 wherein the other of said switch means has a movable contact and a fixed contact cooperable therewith and carried by said housing, said rigid lead means having the other end thereof electrically interconnected to said movable contact, another of said terminals being electrically interconnected to said fixed contact of said other switch means.

6. A control device as set forth in claim 5 wherein said other switch means has a flexible switch blade carrying said movable contact thereof, said switch blade being carried by the other end of said rigid lead means.

7. A control device as set forth in claim 6 wherein said one switch means includes another pair of spaced apart fixed contacts carried by said housing and a movable contact member for bridging said other pair of fixed contacts to complete an electrical circuit between said other pair of fixed contacts.

8. A control device as set forth in claim 7 wherein a pair of said terminals are respectively electrically interconnected to said other pair of fixed contacts.

9. A control device as set forth in claim 8 wherein said one switch means includes a bimetal member carried by said housing and a plunger movably carried by said housing and being disposed between said bimetal member and said movable contact members to operate the same to open conditions thereof when said bimetal member senses a certain temperature condition.

10. A control device as set forth in claim 9 wherein said housing carries a reset member for operating on said plunger to reset said bimetal member after the same has sensed said certain temperature condition.

11. A control device having a housing, an electrical switch carried by said housing and including a fixed contact and a movable contact cooperable therewith and normally disposed in contact therewith, a bimetal member carried by said housing and having a certain position when sensing a certain temperature, a plunger movably carried by said housing and being disposed between said bimetal member and said movable contact to cause said movable contact to move away from said fixed contact when said bimetal member is sensing said certain temperatures, and a reset member movably carried by said housing for engaging against said plunger to reset said bimetal member after the same has sensed said certain temperature and opened said movable contact away from said fixed contact, said housing having a wall with an opening therethrough, said reset member having a shaft portion passing through said opening and having abutment means on opposite sides of said wall, one of said abutment means adapted to engage said plunger for resetting said bimetal member when said reset member is moved in one direction relative to said wall, the other of said abutments being adapted to engage said wall when said reset member is moved in said one direction to thereby limit resetting movement of said reset member.

12. A control device as set forth in claim 11 wherein said other abutment means abuts said wall before said reset member can reset said bimetal member if said bimetal member is not at a reset temperature thereof.

13. A control device as set forth in claim 11 wherein said other abutment means comprises a push button.

14. A control device as set forth in claim 13 wherein said push button has an opening passing therethrough, said shaft being disposed in said opening to be carried by said push button.

15. A control device as set forth in claim 14 wherein said shaft terminates in a rivet-like end thereof remote from said push button and on the other side of said wall from said push button, said rivet-like end defining said one abutment means.

16. A control device as set forth in claim 11 wherein a spring means is carried by said housing and is disposed between said housing and said movable contact to urge said movable contact into contact with said fixed contact.

17. A control device as set forth in claim 16 wherein said housing carries another fixed contact spaced from the first mentioned fixed contact, said movable contact being adapted to bridge said fixed contacts under the force of said spring means as long as said bimetal member is in a reset condition thereof.

18. A control device as set forth in claim 17 wherein another pair of spaced fixed contacts is carried by said housing and another spring urged movable contact is carried by said housing bridging said other pair of fixed contacts, said plunger also being disposed between said bimetal member and said other movable contact to cause said other movable contact to move away from said other pair of fixed contacts when said bimetal member is sensing said certain temperature.

19. A control device as set forth in claim 18 wherein said bimetal member comprises a snap disc bimetal member.

20. A control device as set forth in claim 19 wherein said plunger has a part thereof engageable with the center of said disc to be moved thereby.

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