June 11, 1940. C. A. RUDOLPH 2,204,231

COMBINATION THERMOSTATIC SWITCH

Filed April 29, 1938

Fig.1

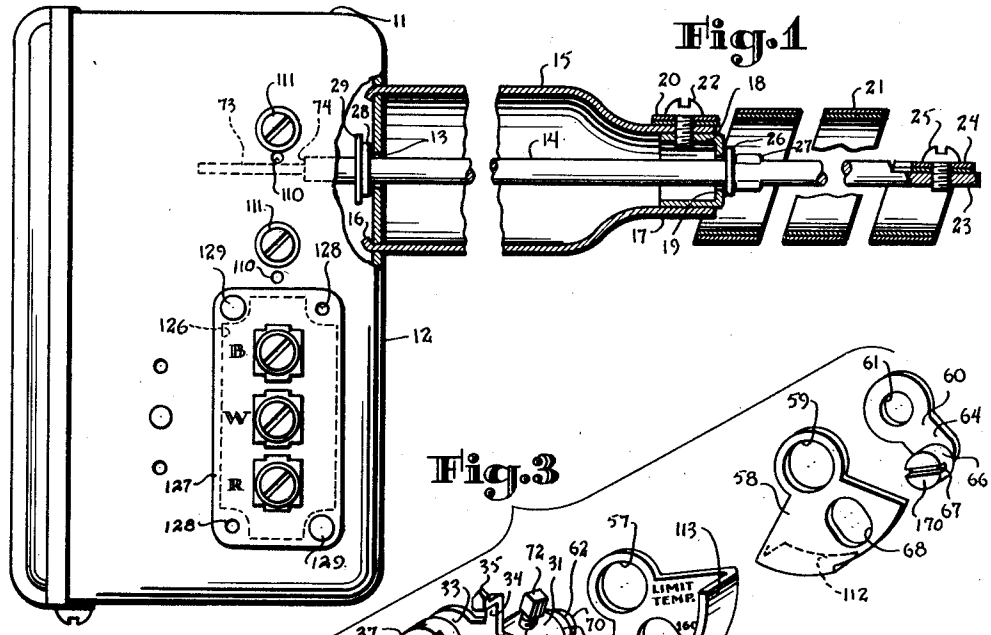


Fig.3

Fig.2

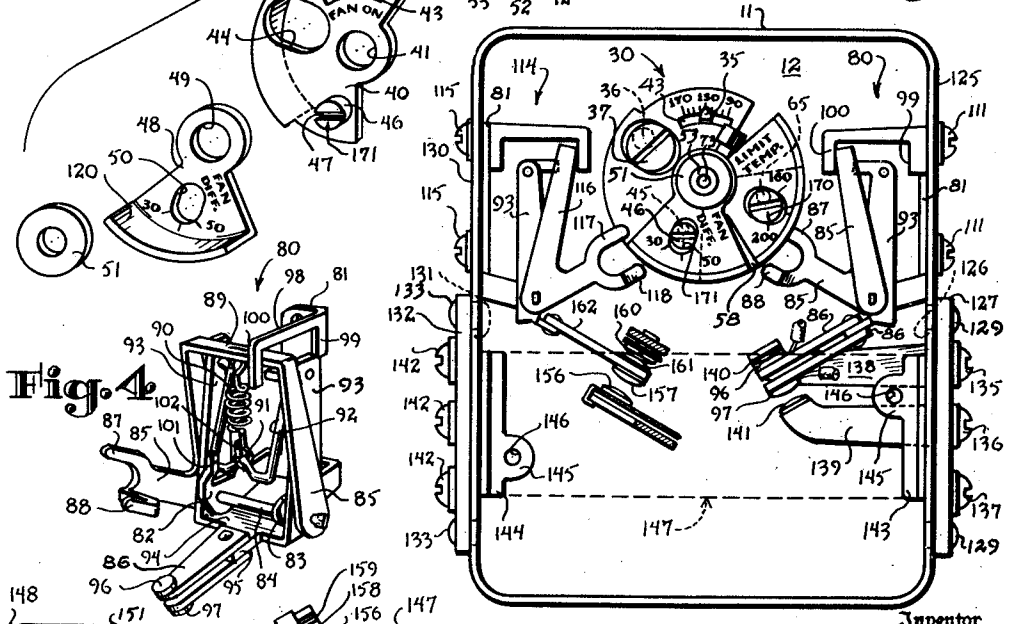


Fig.4

Fig.5

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Patented June 11, 1940 2,204,231

UNITED STATES PATENT OFFICE

2,204,231

COMBINATION THERMOSTATIC SWITCH

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Application April 29, 1938, Serial No. 205,056

11 Claims. (Cl. 200—138)

This invention is directed broadly to an automatic switching device, and more specifically to a pair of switches which are operated by a condition responsive element and wherein various adjustments are provided to vary the condition values at which the switches are operated in each direction.

One of the uses to which this switching unit may be put is the control of a hot air heating system having a fan for forcing the air through the heating chamber surrounding the furnace and up into the rooms. In such a system it is desirable that, on starting, the fan be kept deenergized until the furnace has raised the air temperature in the heating chamber above a predetermined degree, after which the fan is energized to cause the air to pass from the heating chamber into the rooms to be heated. The purpose of this arrangement is to prevent cold air from being forced into the rooms before the furnace has had an opportunity to properly warm it.

It is also desirable in systems of the above type to provide a limit control so that if the air temperature in the heating chamber should rise too high the heat produced by the furnace will be decreased.

It is therefore one of the objects of this invention to provide a thermostatic switching device which may be used in a hot air heating system to control the fan and also act as a high limit control for the furnace. This is accomplished by inserting the thermostat in the bonnet of the furnace or in the hot air duct so as to respond to the temperature of the air heated by the furnace, and to provide two single throw switches for actuation by the thermostat, one of which controls the fan and the other of which acts as a limit control for the furnace.

In some instances it may be desirable to have a combination fan and high limit control wherein a two-speed fan is used. In this case the fan switch would be a double throw switch instead of a single throw. In some instances also it may be desirable to operate a limit control wherein one circuit must be closed in order to decrease the heat generated in the furnace, and a second circuit closed to increase the heat generated in the furnace. In such a case a double throw switch must be used as a limit control instead of the usual single throw switch. It might also be desirable in some cases to have only a limit control and no fan switch, or possibly a fan switch and no limit control.

Another important object of this invention is therefore to provide a switching device which will meet all of the requirements as set forth in the preceding paragraph.

Another object is to provide a switch casing in which are located two switching mechanisms each having a movable contact and two stationary contacts, and a condition responsive element for operating said switching mechanisms, each of said switching mechanisms and stationary contacts being readily removable from said casing whereby the unit may be made to meet any one of a number of different requirements in the control field.

Another object of the invention is to provide a combination fan and limit control switching mechanism wherein the temperature at which the limit control is actuated is readily adjustable as well as the temperature at which the fan control is actuated.

Still another object is the provision of means for adjusting the differential of operation of the fan control.

Another object is to operate the switching mechanisms by means of rotating cams and to accomplish the various adjustments by means of manually rotatable pins having eccentrically mounted heads.

Another object is to provide means for indicating the various adjustments of the cams.

When the two switching mechanisms are used to control low voltage circuits, it is easier to connect the lead wires to panels located on the outside of the casing, the stationary contacts being mounted on the panels. In the case of high voltage circuits all exposed connections must be enclosed in the casing.

It is therefore a further object of this invention to provide a panel mounted inside of said casing for carrying the stationary contacts and terminal connections where high voltage is used, and panels mounted outside of said casing for carrying the stationary contacts and terminals when low voltage is used.

These and other objects will become readily apparent to those skilled in the art as the following specification is read in the light of the accompanying drawing, in which

Figure 1 is a side elevation of the device, parts being shown in section in order to illustrate more clearly certain features of the thermostat mounting;

Figure 2 is a front view of the switch casing with the cover removed showing the two switching mechanisms, the panel being shown in dotted lines to more clearly illustrate the switch contacts;

Figure 3 is an exploded view illustrating the various operating cams along with their adjusting means and the hub on which they are mounted;

Figure 4 is a detail view of one of the switching mechanisms, and

Figure 5 is a rear view of the panel which is mounted inside of the switch casing.

This instrument has been designed for use primarily as a combination fan and high limit control but it is obvious that there are many other varied uses to which it may be put in the automatic control field.

A switch casing is provided as shown at 11 having a back 12 and a hole 13 through the back and through which is inserted an operating shaft 14. A tubular supporting member 15 surrounds a portion of the shaft 14 and at one end is provided with four ears 16 which are inserted through slots in the back 12 of the casing 11 and bent over as shown in Figure 1 in order to securely fasten the support 15 to the casing 11. The opposite end 17 of the supporting member 15 is of much smaller diameter than the rest and surrounds a bearing member 18 in which there is a hole 19 through which the operating shaft 14 is inserted and which acts as a bearing surface therefor. One end 20 of a bimetallic coil 21 is fastened to the end 17 of the tubular support 15 by means of a screw 22 which passes through aligned holes in the bimetallic member 21, end 17 of the tubular support 15, and the bearing member 18 to hold them in assembled relation. The outer end 23 of the operating shaft 14 is flattened as shown in Figure 1 and the other end 24 of the bimetallic coil 21 is fastened thereto by means of screw 25. A washer 26 is placed on the shaft 14 between the bearing member 18 and a crimped portion 27 of the operating shaft to limit the movement of the shaft to the left as viewed in Figure 1. A second washer 28 is placed around the shaft 14 inside of the casing 11 and adjacent the back 12 thereof and a spring clip 29 engages a circular cut-away portion in the shaft 14 to maintain the washer 28 adjacent the back 12 of the casing 11 to limit the motion of the shaft 14 to the right, as viewed in Figure 1. These two washers allow the shaft 14 a limited amount of play and do not interfere with its rotative movement as provided by the bimetallic coil 21 as it responds to variations in temperature.

The operating unit which is adapted to be mounted on the inner end of the shaft 14 and which is generally indicated at 30 comprises a hub 31 which is provided with a series of shoulders. Non-rotatably secured on the hub 31 and seated against the shoulder 32 is an adjusting member 33 having an extension 34 with an axially offset pointer 35. Rotatably mounted on the member 33 is a pin 36 (see Fig. 2) having an eccentrically mounted head 37 which is provided with a kerf 38 for engagement by a screw-driver or similar tool. A member 40 having a hole 41 therein is inserted over the hub adjacent the member 33 and seated against the shoulder 42. This member 40 has an arcuate slot therein 43 through which is inserted the extension 34, and it is also provided with an elongated slot 44 through which is inserted the head 37 of the pin 36. This member 40 is mounted on the hub so as to be freely rotatable thereon to any position determined by the rotation of the eccentric pin 36. A pin 45 (see Fig. 2) having an eccentrically mounted head 46 which has a kerf 47 therein is rotatably mounted in the member 40 and a member 48 having a hole 49 is adapted to be mounted over the hub and lie adjacent the member 40. Member 48 has an elongated hole 50 therein which receives the head 46 of the eccentric pin 45 which is mounted in the member 40. The member 48 is also adapted to rotate freely on the hub 31 to a position determined by the adjustment of the eccentric pin 45. Also placed over the hub 31 is a washer 51 which seats against shoulder 52. The reduced end 53 of the hub 31 is burred over to maintain the parts in assembled relation on the hub. On the other end of the hub is mounted a member 55 having a hole 57 which seats against shoulder 56 and is adapted to freely rotate on the hub. Another member 58 having a hole 59 is also mounted on this end of the hub 31 and lies adjacent the member 55. Member 58 is also adapted to rotate freely on the hub. Member 60 having a hole 61 is also mounted on the hub and seats against a shoulder 62. This member 60 is positioned in predetermined relationship with the member 33 and preferably so that the extension 64 thereon is diametrically opposed to the extension on the member 33 carrying the eccentric pin 36. This member 60 is then staked to the hub so that it will not rotate with respect thereto. The extension 64 rotatably carries a pin 65 (see Fig. 2) having an eccentric head 66 and a kerf 67. The head 66 is inserted through holes 68 in member 58 and 69 in the member 55. The end 70 of the hub 31 is then burred to maintain these parts in assembled relation. The central portion of the hub 31 is provided with a screw threaded hole 71 into which is screwed a member 72. After the hub and the various operating members have been assembled, they are placed on the reduced end 73 of the operating shaft 14 and seated against the shoulder 74. The hub may be rotated with respect to the shaft 14 until it is in the proper position with respect to the thermostat, at which time the screw 72 is turned down until it firmly engages the shaft 14 and fixes the hub with relation thereto.

The switching unit which is generally indicated at 80 is of the double snap action type which does not have a vanishing contact pressure. This mechanism is shown in detail in Figure 4 and comprises a stationary bracket 81 having two forwardly extending legs 82 and 83. These legs carry at their extremity an axle 84 on which is mounted a generally U-shaped member 85 having an extension on which are mounted two fingers 87 and 88 which are laterally and longitudinally displaced with respect to each other. The connecting portion 89 of the member 85 carries one end of a tension spring 90, the other end 91 of which is connected to the connecting portion of a U-shaped bail 92. The legs of bail 92 are pivotally connected to the opposite legs 93 of a U-shaped contact arm 94 having an extension 95 carrying at its free end two contacts 96 and 97 mounted on insulating arms 86. The bracket 81 has an extending portion 98 which has two spaced downwardly extending arms 99 and 100 which may act as stops for the U-shaped member 85 and one of the legs 93 of the U-shaped contact arm 94.

Assuming the mechanism to be in the position shown in Figure 4, it will be noted that the spring 90 is tending to rotate the bail 92 in a clockwise direction and as a result the bail is tending to rotate the contact arm 94 in a clockwise direction. On clockwise movement of the

member 85 the upper end 90 of the spring will be moved to the right as seen in Figure 4 until it passes over-center with respect to the bail 92, at which time the lower end of the bail will snap from engagement with a stop 101 which is formed on the leg 82 of the bracket 81 into engagement with the stop 102, also formed on the extension 82. This causes the bail to pass over-center with respect to the contact arm 94 thereby causing it to snap in a counter-clockwise direction. It will be noted that two distinct snap actions occur. The bail 92 snaps and passes over-center with respect to contact arm 94 causing it to snap. Hence there can be no stable position of the mechanism at which the contact pressure exerted by the arm 94 is zero.

If the member 85 is rotated in a counter-clockwise direction, the reverse action will take place. The spring 90 will first move toward the left and pass over-center with respect to the bail 92 which will then snap in a clockwise direction from engagement with the stop 102 into engagement with the stop 101. This movement of the bail 92 causes it to pass over-center with respect to the contact arm 94 which will then snap in a clockwise direction to the position shown in Figure 4. The arms 99 and 100 will act as stops for the U-shaped member 85 and the arm 100 will also act as a stop for the upper portion of the contact arm 94.

The switching mechanism 80 is mounted on the side of the casing 11 as shown in Figure 2. The side of the casing 11 is provided with indentations 110 which cooperate with holes in the bracket 81 in order to center it with respect to the holes through which are inserted the screws 111 which securely fasten the switch mechanism 80 to the side of the casing 11. This switch mechanism is so positioned that at times the finger 87 will be in the path of movement of the flange 112 on the member 58 as it is rotated by means of the operating shaft 14. At times the finger 88 will be in the path of the flange 113 on the member 55.

The switching unit indicated generally at 114 is identical with the switching unit 80 and is mounted on the opposite side of the casing 11 by means of the screws 115. The switch operating mechanism of the unit 114 being the same as that of unit 80, it will not be described. The operating arm 116 of this unit 114 is provided with two laterally and longitudinally displaced fingers 117 and 118. The finger 117 is positioned so that at times it will be in the path of movement of the flange 120 on member 48, and the finger 118 is positioned so that at times it will be in the path of movement of the flange 121 on the member 40.

The side 125 of the casing 11 is provided with a hole 126 shown in dotted lines in Figures 1 and 2, and on the outside of the casing 11 an insulated panel 127 is provided for closing the hole 126. The panel 127 is properly centered by means of indentations 128 and is secured to the casing by any suitable means such as the rivets 129. The opposite side 130 of casing 11 is provided with a similar hole 131 which is closed by means of an insulated panel 132 which is secured to the casing by means of rivets 133. Three terminals are secured to the panel 127 by means of screws 135, 136 and 137. The screws 135 and 136 also secure brackets 138 and 139 to the inside of the panel 127, these brackets carrying at their opposite ends stationary contacts 140 and 141. These contacts are positioned on opposite sides of the contact arm 94 so as to engage alternately the movable contacts 96 and 97 as the switching mechanism 80 is snapped from one position to another. Panel 132 is also provided with three screws 142 for securing electric terminals to the panel. Mounted in the inside of the casing 11 and slightly forwardly of the panels 127 and 132 is a pair of brackets 143 and 144. Each of these brackets is provided with an ear 145 having a hole 146 therein. An insulated panel 147 is provided with slots 148 in opposite ends thereof which are adapted to coincide with the holes 146 in the ears 145 when the panel 147 is properly positioned. The panel 147 is maintained in position by means of screws engaging the slots 148 and the holes 146. The reverse side of the panel 147, as shown in Figure 5, is provided with a series of screw-threaded holes 150 and having diametrically opposed upstanding lugs 151 adjacent thereto. A metallic bracket 152 having cut-away portions cooperating with the lugs 151 to properly center the bracket about one of the holes is fastened thereto by means of a screw 153. Mounted with the bracket 152 is a thin piece of flexible metal 154 having an end 155 looped around the end of the bracket 152. The strip 154 carries an electrical contact near its end and is biased away from the bracket 152, its movement in this direction being limited by the looped end 155. The purpose of this flexible strip is to provide a press-back for the stationary contact 156 as it is engaged by the movable contact 157 operated by the switching mechanism 114. A similar bracket 158 is mounted by means of a screw engaging another of the screw holes 150 in the panel 147 which bracket also carries a piece of flexible metal 159 on which is mounted a stationary contact 160. Contact 160 is positioned to cooperate with a movable contact 161. The movable contacts 157 and 161 are mounted on the insulating contact arm 162 which is snapped back and forth by the mechanism 114 in such a manner as to cause engagement of the contacts 161 and 160 in one position thereof and 157 and 156 in another position.

Assume for the purposes of illustration that this control instrument is used as a combination fan and high limit control and that the thermostat 21 is positioned to respond to the temperature of the air in the bonnet of a furnace. Assume also that a two-speed fan is used which means that the fan will be running at high speed when the air temperature is above a predetermined degree and at low speed when the air is below a predetermined degree. Assume also that a limit control is used of the type which requires that one circuit be closed to operate the limit control in one direction and another circuit closed to operate the limit control in the opposite direction. Such a device is shown in Figure 2 and with the parts in the positions as shown, the switches 160 and 161 will be closed and the fan running at high speed as the air temperature is above a predetermined point. Also the air temperature is below the point at which the limit control will function to decrease the heat generated in the furnace so that under these conditions if the room thermostat should call for heat the air will be immediately delivered to the room at high speed by the fan, and the burner for the furnace will be turned on. If the burner should remain on for a long time, the air temperature would increase and cause the thermostat 21 to rotate the hub 31 in a counterclockwise direction until the finger 87 is engaged by the

flange 112 which will cause the arm 85 to be rotated in a clockwise direction and actuate the switch mechanism 80 to break the contact between the contacts 96 and 140 and establish contact between the contacts 97 and 141. This will operate the limit control to cause a decrease in the heat generated in the furnace which in turn will cause the temperature of the air to decrease. As the mechanism 80 is actuated, the arm 85 will snap to a position where the finger 87 rides free of the path of movement of the flange 112 to permit a temperature overrun without putting any strain on the switch mechanism 80. This movement of the arm 85 also swings finger 88 to a position where it is in the path of movement of the flange 113 when the hub 31 is rotated in a clockwise direction due to a reduction in the air temperature. As the flange 113 engages the finger 88, it swings the arm 85 in a counterclockwise direction and snaps the mechanism 80 to its original position where the contacts 96 and 140 will again be closed. The arm 85 will snap to the position disclosed in Figure 2 so that the finger 88 will be free of the flange 113 so as not to hinder the further clockwise rotation of the hub 31. If the room thermostat should be satisfied and the burner for the furnace remain deenergized for a long period of time, the air temperature will continue to decrease and the hub 31 will be rotated in a clockwise direction until the flange 120 engages the finger 117 and snaps the mechanism 114 to break contact between the contacts 160 and 161 and make contact between the contacts 156 and 157. This will cause the fan to operate at low speed until the air again reaches a predetermined temperature. Snapping of the mechanism 114 causes the finger 117 to move out of the path of movement of the flange 120 and the finger 118 to move into the path of movement of the flange 121. If the room thermostat now calls for heat, the burner for the furnace will be energized and the air temperature will increase causing the thermostat 21 to rotate the hub 31 in a counterclockwise direction until the flange 121 engages the finger 118, snaps the mechanism 114 and returns the parts to the position shown in Figure 2.

As the member 60 is fixed with respect to the hub 31, which in turn is fixed to the operating shaft 14, a marker 170 may be provided on the head 66 of the eccentric pin 65 to cooperate with a scale as shown on the member 55 to indicate the temperature at which the mechanism 80 will be operated to cause the limit control to function to cut off the burner of the furnace. The differential of operation of the mechanism 80 is determined by the circumferential spacing of the flanges 112 and 113 and as these members are adjusted simultaneously by the pin 65, this differential will remain constant although as set for the the limit temperature may be adjusted.

The member 33 is also fixed with respect to the hub 31 and therefore the pointer 35 may cooperate with a scale as shown on the member 40 for indicating the temperature at which the fan is turned on by the switch mechanism 114. The differential of operation of this mechanism depends upon the circumferential spacing of the flanges 120 and 121. This spacing is adjustable by means of the eccentric pin 45, and for this reason a marker 171 on the head 46 of this pin may cooperate with a scale as shown on the member 48 to indicate in degrees this differential.

When this control mechanism is being used to control low voltages, it is easier to mount the electric terminals and the stationary contacts on the panels 127 and 132 because there will be no danger in exposing these terminals when the voltage between them is low. When high voltages are used, it is essential that the terminals be enclosed within the switch casing 11 and in such case the terminals as well as the stationary contacts for the switch must be mounted on the panel 147. In the illustrated embodiment, the switching mechanism 80 is used to control low voltage and therefore the contacts and terminals are mounted on the panel 127. However, the fan which is controlled by the mechanism 114 is connected to a high voltage and therefore the contacts and terminals are mounted on the panel 147. It will be readily understood, however, that the terminals and switch contacts for both mechanisms may be mounted either on the panel 147 or the panels 127 and 132.

If instead of a two-speed fan it is desired to control an on and off fan, it is necessary only to remove the bracket 152 by means of the screw 153 along with the associated contact 156. Also if it is desired to operate a limit control where it is necessary only to open a single circuit to actuate the control, the bracket 139 with its contact 141 may be readily removed by means of the screw 136. It can also be appreciated that the bracket 158 might be removed instead of bracket 152 or the bracket 138 instead of bracket 139 if the opposite switch action were desired. Further, either the switch mechanism 114 or 80 may be removed from the casing merely by removing the supporting screws if it should be desired to have an instrument with only a limit control or only a fan switch. It will thus be seen that a number of different combinations may be obtained by the present instrument.

Although this control device has been described in connection with a combination fan and high limit control, it will be appreciated that it is also adaptable for many other uses. Other changes and modifications in this instrument may occur to those who are skilled in the art, and I therefore wish it to be clearly understood that I am to be limited, not by the specific embodiment disclosed herein, but rather by the scope of the appended claims.

I claim as my invention:

1. In a device of the class described comprising in combination, a first switch, a second switch, a condition responsive device, a first operating means operatively associated with said condition responsive device for operating said first switch in one direction at one condition value and in the other direction at a second condition value, a second operating means operatively associated with said condition responsive device for operating said second switch in one direction at a third condition value and in the other direction at a fourth condition value, means for simultaneously adjusting the condition values at which said first operating means operates said first switch in each direction without affecting the operation of said second switch, and means associated with said second operating means for adjusting said third condition value at which said second operating means operates said second switch without substantially affecting the operation of said first switch or said fourth condition value.

2. In a device of the class described comprising in combination, a first switch, a second

switch, a condition responsive device, a first operating means operatively associated with said condition responsive device for operating said first switch in one direction at one condition value and in the other direction at a second condition value, a second operating means operatively associated with said condition responsive device for operating said second switch in one direction at a third condition value and in the other direction at a fourth condition value, means for simultaneously adjusting the condition values at which said first operating means operates said first switch in each direction without affecting the operation of said second switch, and means associated with said second operating means for adjusting the condition values at which said second operating means operates said second switch in each direction without affecting the operation of said first switch and for also adjusting the difference between said last mentioned condition values.

3. In a device of the class described comprising in combination, a first switch, a second switch, a shaft, a hub mounted in a predetermined position on said shaft, a condition responsive device for rotating said shaft, a first member on said hub for operating said first switch in one direction, a second member on said hub for operating said first switch in the opposite direction, means for simultaneously adjusting said members about said hub for varying the condition values at which said switch is operated, a third member on said hub for operating said second switch in one direction, a fourth member on said hub for operating said second switch in the opposite direction, means for simultaneously adjusting said third and fourth members on said hub for varying the condition values at which said second switch is operated, and means for individually adjusting said fourth member relatively to said third member for varying the differential of operation of said second switch.

4. In a device of the class described comprising in combination, a first switch, a second switch, a shaft, a hub mounted in a predetermined position on said shaft, a condition responsive device for rotating said shaft, a first member on said hub for operating said first switch in one direction, a second member on said hub for operating said first switch in the opposite direction, means for simultaneously adjusting said members about said hub for varying the condition values at which said switch is operated, a third member on said hub for operating said second switch in one direction, a fourth member on said hub for operating said second switch in the opposite direction, means for simultaneously adjusting said third and fourth members on said hub for varying the condition values at which said second switch is operated, means for individually adjusting said fourth member relatively to said third member for varying the differential of operation of said second switch, means for indicating the value of the condition at which said first switch is actuated in one direction, means for indicating the value of the condition at which the second switch is operated in one direction, and means for indicating the difference between said last condition value and the condition value at which the second switch is operated in the opposite direction.

5. In a device of the class described comprising in combination, a first switch, a second switch, a shaft, a hub mounted in a predetermined position on said shaft, a condition responsive device for rotating said shaft, a first member on said hub for operating said first switch in one direction, a second member on said hub for operating said first switch in the opposite direction, means for simultaneously adjusting said members about said hub for varying the condition values at which said switch is operated, a third member on said hub for operating said second switch in one direction, a fourth member on said hub for operating said second switch in the opposite direction, means for simultaneously adjusting said third and fourth members on said hub for varying the condition values at which said second switch is operated, and means for individually adjusting said fourth member relatively to said third member for varying the differential of operation of said second switch, said adjusting means comprising pins having eccentrically mounted heads, said heads having tool engaging means by which they may be turned.

6. In a device of the class described, comprising in combination, a first switch, a second switch, a shaft, a hub mounted in a predetermined position on said shaft, a condition responsive device for rotating said shaft, a first member on said hub for operating said first switch in one direction, a second member on said hub for operating said first switch in the opposite direction, means for simultaneously adjusting said members about said hub for varying the condition values at which said switch is operated, a third member on said hub for operating said second switch in one direction, a fourth member on said hub for operating said second switch in the opposite direction, means for simultaneously adjusting said third and fourth members on said hub for varying the condition values at which said second switch is operated, and means for individually adjusting said fourth member relatively to said third member for varying the differential of operation of said second switch; said hub, operating members, and adjusting means being removable from and adjustable on said shaft as a unit.

7. In a device of the character described comprising in combination, a shaft, a condition responsive device for rotating said shaft, a hub fixed to said shaft, a first switch, a first member for operating said first switch in one direction rotatably mounted on said hub, a slot in said member, a plate fixed to said hub, a pin rotatably mounted in said plate and having an eccentrically mounted head located in said slot, a second member for operating said first switch in the opposite direction rotatably mounted on said hub, means causing said first and second members to rotate together about said hub when adjusted by said pin, a second switch, a third member rotatably mounted on said hub for operating said second switch in one direction, a slot in said third member, a second plate fixed to said hub, a pin rotatably mounted in said second plate and having an eccentrically mounted head located in the slot in said third member, a fourth member for operating said second switch in the opposite direction rotatably mounted on said hub, and means causing said third and fourth members to rotate together about said hub when adjusted by said pin.

8. In a device of the character described comprising in combination, a shaft, a condition responsive device for rotating said shaft, a hub fixed to said shaft, a first switch, a first member for operating said first switch in one direction rotatably mounted on said hub, a slot in said

member, a plate fixed to said hub, a pin rotatably mounted in said plate and having an eccentrically mounted head located in said slot, a second member for operating said first switch in the opposite direction rotatably mounted on said hub, means causing said first and second members to rotate together about said hub when adjusted by said pin, a second switch, a third member rotatably mounted on said hub for operating said second switch in one direction, a slot in said third member, a second plate fixed to said hub, a pin rotatably mounted in said second plate and having an eccentrically mounted head located in the slot in said third member, a fourth member for operating said second switch in the opposite direction rotatably mounted on said hub, means causing said third and fourth members to rotate together about said hub when adjusted by said pin, a slot in said fourth member, and a pin rotatably mounted in said third member, said pin having an eccentrically mounted head located in the slot in said fourth member.

9. In a device of the character described comprising in combination, a switch casing, a first switch assembly comprising a bracket, an arm, a snap action mechanism operated thereby, and a movable contact operated by said snap action mechanism, said assembly being removably mounted as a unit on one side of said casing, a second switch assembly essentially like the first removably mounted as a unit on another side of said casing, stationary contacts removably mounted in said casing for cooperation with said movable contacts, whereby either one of the two switches may be readily removed if not desired, and condition responsive means for actuating said switches by cooperating with said arms.

10. In a device of the character described comprising in combination, a switch casing, a first switch assembly comprising a bracket, an arm, a snap action mechanism operated thereby, and a movable contact operated by said snap action mechanism, said assembly being removably mounted as a unit on one side of said casing, a second switch assembly essentially like the first removably mounted as a unit on another side of said casing, a first pair of stationary contacts individually removably mounted one on each side of the first movable contact, a second pair of stationary contacts individually removably mounted one on each side of the second movable contact, whereby each switch may be made either single or double throw and either switch may be removed if desired, and condition responsive means for actuating said switches by cooperating with said arms.

11. In a device of the character described comprising in combination, a switch casing, two holes, one in each of two sides of said casing, two insulated panels, one closing each of said holes, a first switch mechanism, a movable contact operated thereby, a second switch mechanism, a movable contact operated thereby, means for mounting one of said mechanisms on one side of said casing and the other on another side, a third insulated panel, means for mounting said third panel within said casing, a plurality of stationary contacts cooperating with said movable contacts, electrical terminals for said stationary and movable contacts, and means for mounting said stationary contacts and said terminals on said third panel or said other two panels as desired.

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