My invention relates broadly to thermostatic devices and more particularly to an improved electrical circuit controller operated under control of a thermostatic device.

One of the objects of my invention is to provide a construction of a thermostatically controlled electrical circuit closer which is quick acting and highly sensitive to changes in temperature conditions.

Another object of my invention is to provide a construction of an adjustable thermostatic electrical switch which is responsive to temperature changes over a relatively wide range of temperatures.

Another object of my invention is to provide an arrangement of a spring actuated snap switch which is controllable by variations in position of a bi-metallic element operated in accordance with changes in temperature conditions.

Still another object of my invention is to provide an arrangement of an adjustable temperature-sensitive element for controlling the operation of a knife switch at predetermined temperatures.

Other and further objects of my invention reside in the simplified construction of the temperature controlled electrical circuit controller set forth more fully in the specification hereinafter following by reference to the appended drawings, in which—

Figure 1 is a front elevational view of the adjustable temperature controlled circuit closer of my invention with the circuit closer shown in circuit open position;

Figure 2 is a side elevational view of the circuit controller illustrated in Figure 1;

Figure 3 is a top plan view of the circuit controller shown in Figures 1 and 2;

Figure 4 is a vertical sectional view taken substantially on the line 4—4 of Figure 1;

Figure 5 is a vertical sectional view taken substantially on the line 5—5 of Figure 7;

Figure 6 is a transverse sectional view taken substantially on the line 6—6 of Figure 1; and

Figure 7 is a front elevational view of the circuit controller of my invention illustrated in circuit closing position.

My invention is directed to a circuit closer operating under control of a thermostat and arranged for selective actuation over an adjustable range of temperatures. The structure of the device of my invention is very simple, inexpensive in manufacture and production and yet performs a circuit closing operation with a high degree of accuracy. I provide a pivotally mounted adjustable arm pivotally supported with respect to an insulated structure and adjustable over a calibrated scale graduated according to temperature. The adjustable arm is connected to a lever member which may be selectively set in a predetermined position. The lever member insulatingly carries a bi-metallic expansible and contractible member. A knife switch, operative under control of a spring actuator, is arranged to contact with the bi-metallic member and operates in association with contact means to close an electrical circuit under control of the displacement of the bi-metallic member. The angular adjustment of the bi-metallic member determines the position at which displacement of the bi-metallic member permits actuation of the knife switch for corresponding control of the associated electrical circuit.

The simplicity of the design of the construction of my invention renders the device reliable for quick response to changes in temperature above or below a selected point with minimum danger of failure due to corrosion, dirt or exposure to the elements. By reason of the ruggedness of the mechanism of the device of my invention I have found the construction particularly adapted for use in the control of warning devices in fire alarm systems. Only a small rise in temperature is required to operate the knife switch device in the mechanism embodied in the structure of my invention so that heat flames in the general area of the device of my invention is sufficient to trigger off the thermostatic device, operate the knife switch and control a circuit to a warning system or independently operated sprinkler system. I have designed the device for installations in the home, factories, and places of business where the device must function over a period of years with minimum maintenance while subject to conditions of dust, dirt and fumes.

Referring to the drawings in detail, reference character 1 designates a supporting base structure of insulation material at the top of which there is mounted a scale member 2 carrying graduations 3 thereon calibrated in accordance with the temperature range over which the device operates. An adjustable arm 4 is pivotally mounted on member 5 which passes through the base 1. A spacing washer 6 is interposed between the under surface of the adjustable arm 4 and the surface of base 1 to permit the adjustable arm 4 to be angularly adjustable over the scale member 2. The upper end of the adjustable arm 4 is provided with an indicator pointer 4c having
a sighting edge extending longitudinally along the center line of the adjustable arm 4 and adapted to be selectively aligned with the graduations 3 on scale member 2. The opposite end of the adjustable arm 4 is bifurcated, as indicated at 4b, for embracing the headed stud 7 carried by lever member 8. The headed stud 7 is spaced from lever member 8 sufficiently to allow the bifurcated end 4b of adjustable arm 4 to be readily adjusted beneath the headed end of stud 7 so that, as the adjustable arm 4 is angularly shifted over to lever member 2, an angular adjustment in position of lever member 8 about the pivot 9 is effected. The member 8 is pivoted at 9 on support 1, enabling plate 8 to be located about 9 as a center as the adjustable arm is angularly adjusted. The lever 8 carries a block of insulation material 10 thereon with the sides of the block disposed in off-center with respect to pivot 9. The block 10 serves as a mounting means for the bi-metallic strip 11 which is secured by fastening means 12 to block 16. The plane of the bi-metallic strip 11 is displaced from the center 9, about which lever member 8 pivots, for such a distance that the upper end of the bi-metallic strip 11 moves through a relatively wide angular distance for relatively small angular displacement of the lever member 8. The upper end of the bi-metallic strip 11 is bifurcated, as represented at 11a, and serves as a journaling means for a shaft member 14 carrying roller member 15. The roller member 15 is displaceable in a transverse path, with respect to the support 1, under control of the movement of adjustable arm 4 and roller member 15 is also displaceable transversely of support 1 under conditions of expansion or contraction of the components of the bi-metallic strip 11.

The electric circuit control, which coacts with the bi-metallic strip 11, is mounted upon a panel of insulation material designated at 16 secured by fastening means 17 to support 1. The panel 16 has a conductive plate 18 supported at the upper end thereof, which plate serves as a bearing surface for the knife switch blade 19 which is eccentrically pivoted by means of screw member 20 which passes through plate 18 and into the panel 16. The knife blade 19 has one end thereof turned inwardly toward the edge of panel 15, as represented at 19a, the said edge being tapered from a relatively narrow width of width in a substantially wider width at the other end and displaceable within the recess 16a formed in the side of panel 16. The widest edge of the tapered portion 19a is apertured at 19b to receive one end of the coil spring 21, the other end of which is fixed at 22 to the support 1.

The knife blade 19 eccentrically pivoted at 20 projects transversely of the support 1 and in spaced relation thereto offset from the coil spring 21 and the adjustable arm 4. The terminus of the knife blade 19 is cut away to provide a straight edge 23 extending in a substantially radial line through the pivot 20. The cut away portion 23 thus provides a step-like cut-out or recess 24 in the end of the knife blade 19. The roller member 15, associated with the bi-metallic strip 11, is displaceable along the straight edge 23 in the cut-out or recess 24. The portion of the switch blade 19, indicated at 25, immediately adjacent the recess 24, serves as a contacting means for establishing electrical connection with the switch jaws 26 mounted on insulated panel 16 when the switch blade 19 is released from the obstruction offered by roller 15. The switch jaws 26 are constituted by a pair of spaced plate members 26a and 26b normally insulated from each other by means of insulation material 27 and secured by means of screws 28 passing through spaced plate members 26a and 26b, but insulatingly spaced to prevent electrical contact between the same, as illustrated at Figures 26c and 26d. This is accomplished by enlarging the cut-out apertures in plate 26b and extending the separator of insulation material 27 to form a bushing around fastening screws 28 for preventing electrical contact between fastening screws 28 and plate members 26a and 26b. The plate member 26a has the end 26a' cantilevered forwardly at the upper corner thereof to guide the entry of the switch blade 19 into position between plate members 26a and 26b for bridging the electrical circuit therebetween. Plate members 26a and 26b have connecting lugs 26b' and 26a' extending therefrom and serving as terminal connections for the leads 29 and 30 respectively. Leads 29 and 30 pass through apertures 25a and 30a in support 1 and extend to the circuit which is to be controlled.

By arranging the bi-metallic strip 11 so that increases in temperature will displace the strip to the left, looking at the elevational views of Figures 1 and 7, increases in temperature will result in displacement of roller 15 out of the restraining position as illustrated in Figure 7, whereupon knife blade 19, which is normally restrained in the position illustrated in Figure 1 for maintaining the circuit controller in open circuit condition, is eccentrically moved about the center 14, as illustrated in Figure 7, electrically shunting plate members 26a and 26b and closing the circuit through the conductors 29 and 30. A warning device, such as an annunciator or buzzer, may be operated, a bell may be sounded, a horn actuated or, in the case of the application of the device of my invention to fire alarms, a sprinkler system may be set into operation. Similarly, if the device is to operate upon a decrease in temperature, the metallic components making up the bi-metallic element 11 may be so arranged as to cause a decrease in temperature roller member 15 will be moved to the left, thereby releasing the eccentrically mounted knife blade 19 and permitting the blade to make contact with plate members 26a and 26b. Adjustment of arm 4 and corresponding displacement of lever 8 so positions roller member 15 to close the circuit through the conductors 23 and 24 so that the straight edge 23 of knife blade 19, that the time of operation of the circuit controller may be accurately preset in accordance with temperature conditions. The straight edge 23 serves as a cam member in association with roller 15 where roller 15 normally rides along arm 23 continuously supporting the eccentrically mounted plate 19. Accordingly, in order that a proper setting may be had of roller 15 for a corresponding setting of adjustable arm 4 over the calibrations on the graduated scale 2, the range of the cam 23 is directly proportional to the temperature range over which the device is adjustable. However, when that temperature condition is reached at which bi-metallic member 11 shifts roller member 15 to a position no longer supporting blade 19, the circuit closing operation is effected. After each circuit closing operation the device must be reset for subsequent repeat operations.

I have found the construction of my invention very reliable and practical and, while I have disclosed my invention in one of its preferred embodiments, I realize that modifications in structure and arrangement may be made, and I de-
sire it to be understood that no limitations upon
my invention are intended other than may be im-
posed by the scope of the appended claims.

What I claim as new and desire to secure by
Letters Patent of the United States is as follows:

1. A thermostatically controlled switch com-
prising a base support of insulation material, a
panel of insulation material mounted thereon, a
pair of electrical contact members uninsulatingly
supported with respect to each other on said
panel, a switch blade pivoted mounted on said
panel for engagement and disengagement with
said contact members and extending in spaced re-
lation to said base support and terminating in a
cam-faced edge portion, spring means normally
engaging said switch blade into connection with said
contact members, a thermo-sensitive element
supported at one end with respect to said base
and engageable at the other end with the cam-

detached face portion of said switch blade for nor-
mal use in maintaining said switch blade out of

gagement with said contact members, a calibrated
scale carried by said base support means for ad-
justing the relative position of said thermo-sen-
titive element and the cam-faced edge portion
of said switch blade for determining the time of
connection of said switch blade with respect to
said contact members according to a selected
temperature, and an indicator movable by said
means with respect to said calibrated scale.

2. A thermostatically controlled switch com-
prising a base support of insulation material, a
panel of insulation material mounted thereon, a
pair of electrical contact members uninsulatingly
supported with respect to each other on said
panel, a switch blade pivoted mounted on said
panel for engagement and disengagement with
said contact members and extending in spaced re-
lation to said base support and terminating in a
cam-faced edge portion, spring means normally
engaging said switch blade into connection with said
contact members, a lever member pivoted
mounted on said base support, a thermo-sensi-
tive strip member carried by said lever member
and terminating in a supporting end normally
generating the cam-faced edge of said switch blade
and thereby engaging said switch blade in the
movement of said switch blade in connection with
said contact members, a calibrated scale carried by said base support means for adjusting the position of said lever
member for determining the time of connection of said switch blade with respect to said contact
members according to a selected temperature,
and an indicator movable by said means with re-
spect to said calibrated scale.

3. A thermostatically controlled switch com-
prising a base support of insulation material, a
panel of insulation material mounted thereon, a
pair of electrical contact members uninsulatingly
supported with respect to each other on said
panel, a switch blade pivoted mounted on said
panel for engagement and disengagement with
said contact members and extending in spaced re-
lation to said base support and terminating in a
cam-faced edge portion, spring means normally
engaging said switch blade into connection with said
contact members, a lever member pivoted
mounted at one end on said base support and
engaging a stud member on the opposite end, an
adjusting arm pivoted on said base support and
bifurcating at one end for engaging said stud
member and provided with an indicator on the
opposite end, a calibrated scale mounted on said
base support in a position beneath said indi-
cator, an insulation member carried by said lever
member, a thermo-sensitive element constituted
by a bi-metallic strip supported by said lever
member and extending in a plane substantially
normal to the plane of said lever member and

offset from a center line extending through the
pivotal mounting of said lever member and means
carried by the end of said bi-metallic strip and

normally engaging the cam-faced edge of said
switch blade obstructing the movement of said
switch blade into engagement with said contact
members whereby said adjusting arm operates
over said calibrated scale for determining the
time of connection of said switch blade with said
contact members according to a selected tem-
peratur

4. A thermostatically controlled switch com-
prising a base support of insulation material, a
panel of insulation material mounted thereon, a
pair of electrical contact members uninsulatingly
supported with respect to each other on said
panel, a switch blade eccentrically mounted on
said panel and swingable in an orbit for estab-
lishing connection with said contact members, an
angularly disposed extension on the eccentric-
ally mounted end of said switch blade directed
over one edge of said panel, a tension coil spring
connected at one end to said base support and
at the other end to the angularly disposed ex-
tension of said switch blade for normally urging
said switch blade in a direction establishing con-
nection with said contact members, said switch
blade terminating in a cam-faced edge portion,
a thermo-sensitive element supported at one end
with respect to said base and engageable at the
other end with said cam-faced edge portion of
said switch blade for normally obstructing the
movement of said switch blade in connection with
said contact members, and means for an-
gularly adjusting the position of said thermo-
sensitive element for effecting a release of the
cam-faced edge portion of said switch blade at
a predetermined temperature.

5. A thermostatically controlled switch com-
prising a base support of insulation material, a
panel of insulation material mounted thereon, a

pair of electrical contact members insulatingly supported at said panel, a switch blade pivotally mounted on said panel for engagement and disengagement with said contact members and extending in spaced relation to said base support and terminating in a cam-faced edge portion, spring means normally urging said switch blade into engagement with said contact members, a thermo-sensitive element supported at one end with respect to said base and carrying a roller member at the other end engageable with the cam-faced edge portion of said switch blade, for normally obstructing the movement of said switch blade toward said contact members, a calibrated scale carried by said base support means for adjusting the relative position of said thermo-sensitive element and the cam-faced edge portion of said switch blade, and an indicator movable by said means with respect to said calibrated scale.

7. A thermostatically controlled switch comprising a base support of insulation material, a panel of insulation material mounted thereon, a pair of electrical contact members insulatingly supported with respect to each other on said panel, a switch blade pivotally mounted on said panel for engagement and disengagement with said contact members and extending in spaced relation to said base support and terminating in a cam-faced edge portion, spring means normally urging said switch blade into connection with said contact members, a lever member pivotally mounted on said base support, a calibrated scale carried by said base support adjacent said lever member, a thermo-sensitive element supported at one end with respect to said lever member and terminating in a bifurcated portion engageable with the cam-faced edge portion of said switch blade for normally maintaining said switch blade out of engagement with said contact members, means for moving said lever member for adjusting the relative position of said thermo-sensitive element with respect to said base and with respect to said switch blade for predetermining the position of said roller member along the cam-faced edge portion of said switch blade and an indicator connected with said lever member and movable over said calibrated scale whereby displacement of said thermo-sensitive element under conditions of changes in temperature operates to release the support offered to the cam-faced edge portion of said switch blade by said roller member for effecting the closing of an electrical circuit between said switch blade and said contact members.

8. A thermostatically controlled switch comprising a base support of insulation material, a panel of insulation material mounted thereon, a pair of electrical contact members insulatingly supported with respect to each other on said panel, one of said electrical contact members having one corner thereof canted outwardly, a switch blade pivotally mounted on said panel and swingable in an orbit to a position guided by the outwardly canted contact member to a position shunting said contact members, spring means for normally urging said switch blade into said shunting position, a calibrated scale carried by said base support, a lever member pivotally mounted at one end on said base support, a thermo-sensitive element supported at one end with respect to said lever member and engageable at its other end with said switch blade for maintaining said switch blade out of contact relation with said contact members until displaced by changes in temperature to a position releasing said switch blade for operation under control of said spring means for shunting said contact members, means for adjusting the position of said lever member, and an indicator connected with said lever member and movable over said calibrated scale.

RUSSELL ANDREW GRADEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,069,551</td>
<td>Copeman</td>
<td>Aug. 5, 1913</td>
</tr>
<tr>
<td>1,997,604</td>
<td>Stewart</td>
<td>Apr. 16, 1935</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>716,147</td>
<td>France</td>
<td>Oct. 5, 1931</td>
</tr>
</tbody>
</table>