

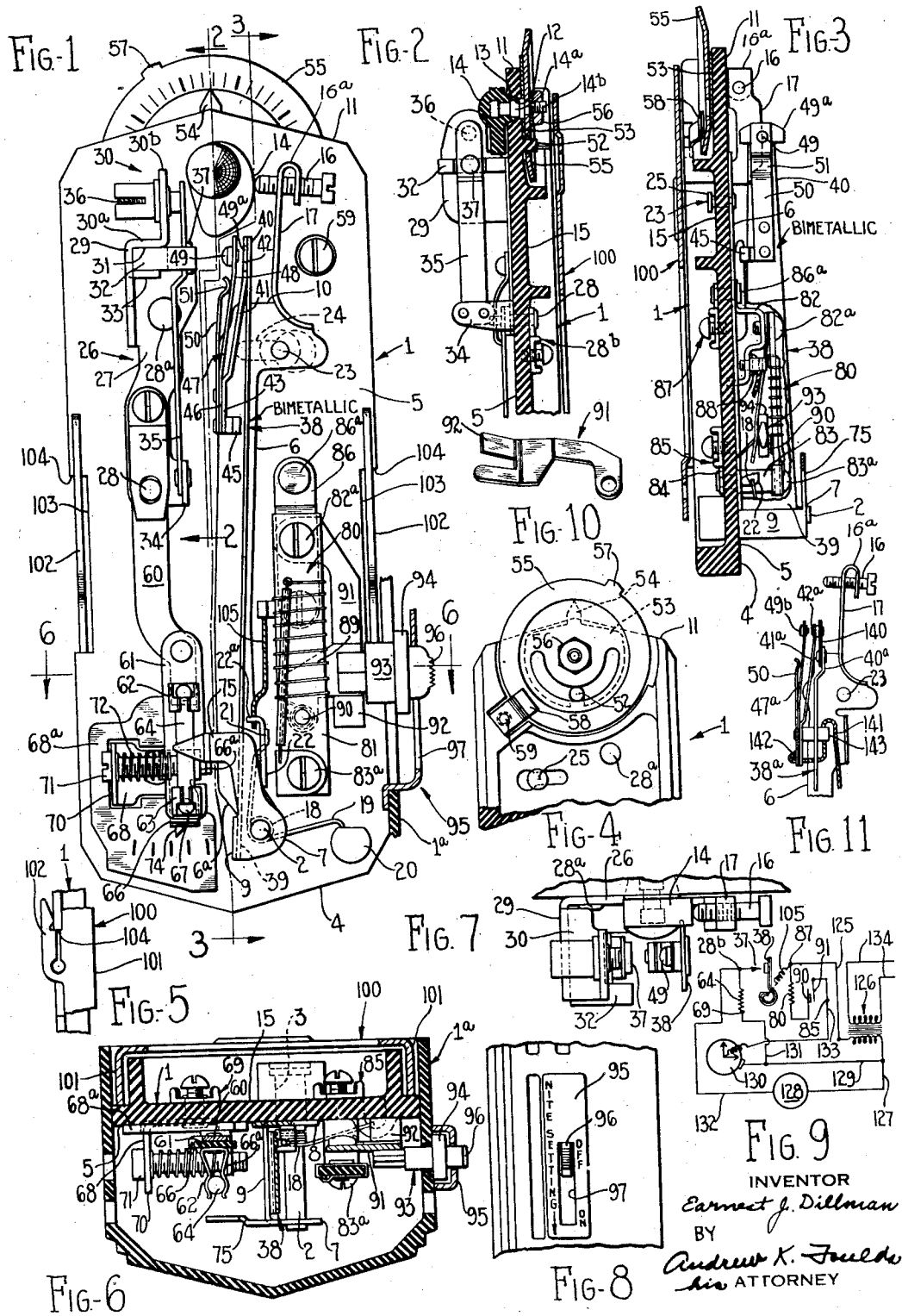
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HEATING SYSTEMS AND CONTROL MEANS THEREFOR

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HEATING SYSTEM AND CONTROL MEANS THEREFOR

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25 Claims. (Cl. 200—122)

My invention relates generally to control devices and more particularly to a room thermostat for controlling the temperature of an enclosed space.

One of the objects of my invention is to provide means for controlling a heating apparatus thereby to maintain a predetermined temperature within an enclosed space.

Another object is to provide means for changing the setting of the apparatus for maintaining a predetermined lower space temperature.

Another object is to provide a manually operable means for rendering the setting changing apparatus ineffective.

Another object is to provide means for supplying additional heat to the thermostatic blade to compensate for overrun of the heating apparatus, which would unduly raise the temperature of an enclosed space.

A further object of the invention is to provide a new and novel temperature controlling apparatus which is simple in operation and economical to manufacture.

The invention consists in the improved system and the construction and combination of parts comprising the same, all as will be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated my invention, in which drawing—

Figure 1 is a view in front elevation of the thermostat with a portion of the cover broken away;

Fig. 2 is a view substantially along the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a view substantially along the line 3—3 of Fig. 1 and looking in the direction of the arrows;

Fig. 4 is a partial view in rear elevation showing the adjusting mechanism;

Fig. 5 is a partial view in side elevation showing the means for securing the thermostat base to the mounting bracket;

Fig. 6 is a view substantially along the line 6—5 of Fig. 1 and looking in the direction of the arrows;

Fig. 7 is a partial view in top elevation showing certain of the elements of the thermostat;

Fig. 8 is a partial view in side elevation showing the night turn-down switch;

Fig. 9 is a diagrammatic view of the apparatus connected to a heating system;

Fig. 10 is a view of the heater switch blade, and

Fig. 11 is a partial view of a modified form of the thermostatic blade and the carried contact member.

Referring to the drawing by characters of reference, the numeral 1 designates generally a base or supporting member which is preferably substantially rectangular in form and molded from an insulating material such as Bakelite and the numeral 1^a designates generally a cover member cooperable therewith. A fulcrum or bearing post 2 has one end secured within an aperture 3 extending through and located adjacent the lower end 4 of the base member 1, and has its other end extending outward from the front face 5 of the base member 1 and into the space enclosed by the cover member 1^a. An elongated, plate-like member 6 extends adjacent to and parallel to the face 5 and has at one end portion 6^a a pair of spaced ears or flanges 7, 8 connected by a vertical portion 9. The ears 7, 8 have aligned apertures which receive and journal about the post 2 to secure the member 6 for rotational movement in a plane parallel to the face 5. The member 6 extends longitudinally of the member 1 and the other end 10 of the member 6 terminates adjacent the upper end 11 of and preferably to the right of the longitudinal centerline of the member 1. Journaled within a tapered aperture 12 adjacent the end 11, and substantially on the longitudinal centerline of member 1, is a tapered portion 13 of a cam 14 which substantially fits the aperture 12. The cam 14 is positioned adjacent the front face 5 of the base member 1, and has a metallic insert or shaft 14^a molded therein to which extends through the portion 13 and outwardly from the rear face 15 of the base member 1 and is threaded as at 14^b. A range adjusting or calibrating screw 16 is screw-threaded through the side arms of a hook-shaped portion 16^a of an upturned flange 17 positioned at the end 10 of the member 6, and engages the face of the cam 14. The side arms of the hook-shaped portion 16^a are preferably held under a slight tension by the screw 16 so that the screw is frictionally held in adjusted position. A helically coiled spring member 18 is positioned concentric with the post 2 intermediate the spaced ears 7, 8 and has one end portion 19 positioned within an aperture in an outwardly projecting boss 20 of the base face 5 and has its other end portion 21 extending longitudinally of and engaging an upturned flange portion 22 of the member 6. The spring member 18 acts to urge the plate-like member 6 in a counterclockwise direction (see Fig. 1) to maintain the screw 16 in constant engagement with the face of the cam 14 so that rotational movement of the shaft 14^a can act through the cam 14 to move the member 6 in accordance with the setting of the shaft 14^a. The portion 22 has a lead wire receiving lug 22^a, the function of which will be set forth hereinafter.

The member 6 has intermediate its ends 6^a and 10, a rearwardly projecting lug 23 which ex-

tends through a slot 24 in the base member 1 so that a head portion 25 which is normally spaced slightly rearwardly of the rear face 15 cooperates with the face 15 to prevent accidental movement of the member 6 away from the front face. A metallic supporting member 26 is positioned to the left of the longitudinal centerline of the member 1 and has a horizontal portion 27 extending longitudinally of and held to the base member 1 by means of rivets 28, 28^a. The rivet 28 acts to electrically connect the member 26 to a binding post or screw 28^b secured to the face 15. The member 26 has an upturned flange portion 29 having an L-shaped, offset extending portion 30 having its short leg 30^a perpendicular to the portion 29 and its longer leg 30^b parallel to the portion 29. A shoulder 31 is formed at the intersection of the leg 30^a with the portion 29, and a U-shaped permanent magnet 32, which is preferably Alnico for high magnetism, is held with its poles spaced in a plane normal to the face 5 and facing toward the longitudinal centerline of the member 1. An inturned lug 33 of the vertical portion 29 rigidly clamps the magnet 32 against the leg 30^a.

Spaced from the shoulder 31 and toward the end 4 of the base member 1, the supporting member 26 has an upstanding ear or lug 34 to which is secured one end portion of a flexible spring contact carrying blade 35, which blade extends longitudinally of the base member 1 and between poles of the magnet 32, with the other end portion parallel to and laterally spaced from the leg 30^b. The blade 35 in its inert state flexes toward the leg 30^b and away from the member 6, and is positioned or flexed toward the member 6 by means of an adjustment screw member 36 which in this instance is screw-threadedly secured to the leg 30^b and has one end thereof engaging the blade 35. A contact member 37 is rigidly secured to the blade 35 and is positioned intermediate the poles of magnet 32, its position relative to the pole end faces being determined by the member 36 which thereby acts to determine the temperature differential at which the apparatus operates.

A bimetallic strip or blade 38, which may be slightly tapered, has its wider end portion 39 secured to the vertical portion 9 of the plate-like member 6 and the other or narrower end portion 40 of the bimetallic strip 38 terminates substantially in the plane of the magnet 32. A substantially rigid metallic strip 41, which in this instance is about one-third the length of the strip 38, has one end portion 42 secured to the bimetallic end portion 40 and has its other end portion 43 extending toward the lower end 4 of the base member 1, the portion 43 being spaced from the strip 38 toward the blade 35. The strip end portion 43 has a lug or terminal 45 extending downward therefrom and toward the strip 38 to serve as a terminal for a flexible lead wire. One end portion 46 of a flexible contact carrying blade 47 is secured to the portion 43, as by means of rivets. The other end portion 48 of the blade 47 is located intermediate the portion 40 and the contact member 37 and has secured thereto as by riveting, a contact member 49 which is cooperable to engage with the contact member 37 to control an electrical circuit. A pair of projections or ears extend outward from the strip end portion 42 to form an armature 49^a which cooperates with the magnet 32 to cause the contact members 37, 49 to make and break the electrical circuit controlled thereby with a quick action. This quick

action is partly made possible by the flexibility of the bimetallic strip 38 and partly by the flexibility of the blade 47. A vibration dampening leaf spring 50 extends spaced from and longitudinally of the blade 47 and has one end secured to the end portion 46, and has an offset bent portion 51 at its other end which normally engages the blade 47 approximately one-third of the distance between the contact member 49 and the blade end portion 46. While the contact members 37, 49 are in engagement, the spring bent portion 51 is separated from the blade 47 and the riveted portion of the contact member 49 is in engagement with the strip end portion 42. Upon disengagement of the contact members 37, 49 the blade 47 will flex outwardly away from the end portion 42 and into engagement with the bent portion 51 of the spring 50. Engagement of the portion 51 by blade 47 acts to dampen vibration of the contact member 49 thereby to prevent any accidental engagement upon opening of the contact members 37, 49.

Projecting rearwardly from the base member face 15 and adjacent the end portion 11 and the shaft threaded portion 14^b is a lug 52 which is preferably molded integral with the base member 1. A plate member 53, which is positioned against the face 15 and concentric with the shaft 13, has a plurality of apertures therethrough, one of which receives the lug 52 to secure the member 53 against rotation and another of which loosely receives the shaft 14^a. The plate member 53 is preferably located back of the base member 1 and so that it can not be seen when viewing the front face 5, with the exception of a finger or pointer 54 which projects upward beyond the base member end 11 and which serves as an indicator. A disc-shaped dial plate 55 is positioned against the member 53 concentric with the shaft 14^a which is received within a central aperture extending through the dial plate 55. The dial plate 55 is rigidly held against a shoulder on the shaft 14^a by means of a nut 56 threaded on the shaft portion 14^b. An arc-shaped slot in the dial plate 55 which may be of 180° as shown receives the lug 52, and cooperates therewith to limit rotation of the dial plate 55. Projecting radially outward from the circumference of the dial plate 55 is an extending portion or knob 57 which is preferably so positioned that the pointer 54 and knob 57 are in radial alignment when the instrument is set for normal operation. Suitable indicia inscribed on the plate 55 cooperates with the pointer 54 to indicate the temperature at which the contact members 37, 49 will engage to complete an electrical circuit therethrough. The dial plate 55 is frictionally held against unwanted rotation by a leaf spring 58 having one end portion held against the base member face 15 by means of a screw 59 having its head positioned against the base member face 5 and extending through the base member 1 so that the other or threaded screw portion will screw-threadedly engage and hold the spring 58.

Pivoted to the rivet 28 is one end of a plate-like lever member 60 which has secured to its other end portion a heater carrying member 61, preferably made of a strip of Bakelite. A pair of clips 62, 63 are riveted one at each end portion of the member 61 and to the outer face thereof for receiving the end portions of a cartridge type cylindrical heater 64. The clip 62 is electrically connected to the member 60 through the rivet which secures the clip 62 and members 60, 61 together. The clip 63 is secured to the mem-

ber 61 and electrically connected by means of a rivet 67 to a plate-like member 66 which underlies one end portion of the member 61. The plate-like member 66 has an upturned flange or ear 66^a which extends perpendicular to the member 61 and beyond the outer face thereof. A plate-like member 68 is rigidly secured against the base member face 5 and within a conforming recess of an embossed surface 68^a by a rivet which also serves to connect electrically the plate member 68 to a binding screw or post 69 secured to the base member face 15. The plate member 68 has a portion 70 bent upward into a position substantially perpendicular to the face 5 and parallel to the ear 66^a. A screw 71 extends through an aperture in the portion 70 and has its head end abutting the face of the portion 70 away from the ear 66^a. The threaded portion of the screw 71 is screw-threaded into a threaded aperture within the ear 66^a aligned with the aperture in portion 70. A helical coil compression spring 72 arranged concentric with the screw 71 has one end abutting the portion 70 and its other end abutting the ear 66^a so that the member 66 may be pivoted about the rivet 28 by the screw 71 and thereby positioned relative to the bimetallic strip 38. A pointer 74 which is integral with the member 66 cooperates with suitable indicia on the member 68^a to indicate the position of the heater 64 relative to the bimetallic strip 38.

Heat from the heater 64 is radiated directly to the strip 38 and is also transferred to the strip 38 through an arm or L-shaped portion 75 of the ear 7 and through the vertical portion 9 which serves as a heat conducting member. One leg of the L-shaped portion 75 is spaced from and overlies the heater 64 and is tapered so that as the heater 64 is moved away from the strip 38, less heat will be conducted through the portion 75 to the strip 38.

For purposes of night turn-down, so that the strip 38 will act to close the contact members 37, 49 at a predetermined lower surrounding temperature, there is provided a heater element 30 which is positioned adjacent to and to the right of the bimetallic strip 38, and is spaced from the front face 5. The heater 80 preferably comprises a strip of Bakelite 81, or other electrical insulating material, which is not affected by temperature and is clamped at either end to metallic spacer members 82, 83 by means of screws 82^a, 83^a.

The spacer member 83 has a reduced portion extending through an aperture in the base member 1 and has a shoulder formed at the intersection of the reduced portion with the normal diameter portion which abuts the face 5 and positions the spacer member 83 relative to the member 1. The reduced diameter portion extends beyond the face 5 and extends through an aperture in a plate 84 and the end portion is peened or riveted over to secure the member 83 within the base member aperture and the plate 84 to the face 15. The plate 84 has a binding screw or post 85 for securing the thermostat lead wire. The spacer member 82 is substantially a U-shaped member having one of its leg portions turned outwardly, as at 86, and apertured to receive a rivet 86^a which extends through an aperture in the base member 1 and an aperture in a binding post or plate 87. The rivet is peened over to rigidly secure plate 87 and member 82 to the base member 1. The end of the other leg portion of the member 82 is received within an indent in the face 5 and is so positioned therein that when the screw securing the strip 81 to the spacer mem-

ber 82 is rotated, the spacer member is held against rotation.

The leg portion which is received within the indent has a horizontal offsetting portion which is apertured to receive a binding screw 88. A coil of resistance wire 89 is wound around the strip 81 and has one end thereof secured to a clip which is positioned beneath the screw 83^a and the other end of the wire 89 is secured to contact member 90 which is carried by the strip 81 intermediate the coil of wire and the member 83, and on the under surface thereof facing the face 5 of the member 1. A switch blade 91, which may be a piece of flexible, resilient, current conducting metal, has one end secured intermediate the strip 81 and the spacer member 82 by the screw 82^a. The blade 91 extends substantially parallel to and beneath the strip 81 so that it underlies the contact member 90 and cooperates therewith to control an electrical circuit. The blade 91 has an offset portion 92 which is bent downwardly toward the base member face 5 and cooperates therewith to limit the movement of the blade 91 in its opening direction and also serves as a cam face for cooperating with a slide member 93 carried by the cover member 1^a. The member 93 is slidable longitudinally of the member 1^a parallel to the face 5 and along the cam face 92 to open and close the circuit to the heater element 80. A flange portion 94 of the member 93 is located intermediate the outside surface of the cover member 1^a and the under surface of a cap 95 carried by the member 1^a. A serrated external portion 96 extends externally of the cap 95 through a slot 97 so that the switch may be operated manually externally of the apparatus. The cap 95 preferably contains suitable legendary matter so that the setting of the switch is clearly evident to persons operating the apparatus.

A mounting bracket 100 is preferably formed from a piece of plate stock having flanged, longitudinal edge portions 101 and hook-like portions 102 which extend outwardly and upwardly from each flange portion 101. The base member 1 has a pair of oppositely disposed side wall recesses 103 which form shoulders 104. The recesses 103 receive the hook-like portions 102 and the shoulders 104 cooperate therewith to removably secure the member 1 to the bracket 100. With this construction, the thermostat lead wires may be connected to the apparatus, and the bracket 100 secured to the room wall, prior to the securing of the base member 1 to the bracket 100 so that a completely concealed mounting is obtained, and one in which the cover member 1^a need not be removed during the installation of the apparatus. This is particularly advantageous because it eliminates the danger of accidental damage to the delicate operating parts of the thermostatic apparatus.

There is but one lead wire 105 within the instrument, and this connects the binding screw 88 to either the lug 22^a or the lug 45, depending upon the operating characteristics desired. If the instrument is to be used on low amperage equipment which is generally the case in low voltage circuits, it is preferable to secure the lead wire 105 to the lug 22^a to minimize the resistance to movement of strip 38 and use the strip 38 as a current conducting member. However, if the instrument is to be used on relatively high amperage equipment, which is generally the case in higher voltage circuits, the lead wire is connected to the lug 45 so that the heating effect of the

current flowing through the strip 38 is eliminated.

The apparatus is connected into a control system by means of suitable lead wires. The binding post 87 is connected by the lead wire 125 to one side of the secondary of a transformer 126. The other side of the secondary is connected by a lead wire 127 to an electrically operated heat supplying means 128 and by a lead wire 129 to one contact of a time switch 130. A lead wire 131 connects the lead wire 129 with a binding post 69 so that the transformer secondary is connected directly to the means 128, time switch 130, and anticipatory heater 64. The other side of the means 128 is connected by a lead wire 132 to binding post 28^b and the other side of the time switch 130 is connected by a lead wire 133 to the binding post 85. The primary of the transformer 126 is supplied with electrical energy through lead wires 134.

Fig. 11 shows a modification of my apparatus. The thermostatic blade 38^a has an offset end portion 40^a which carries one edge portion of a non-heat-conducting, non-electrical-conducting plate-like member 140 which may be a piece of Bakelite. The end portion 42^a of the rigid strip 41^a is secured to the opposite edge portion of the member 140. A flexible lead wire 141 has one end (not shown) connected to the binding screw 88. The other end of the wire 141 is connected, as at 142, so that it makes good circuit with the blade 47^a and therethrough to the contact member 49^b. The wire 141 is clamped, as at 143, so that the wire is rigidly supported for movement with the blade 38^a without mechanical strain at the connection 142. With this construction no current flows through the bimetallic blade 38^a and therefore the blade is not affected by any internal heating effects due to the innate resistance of the blade to current flow. Furthermore, by electrically isolating the blade 38^a and plate-like member 6 any capacity effect at open circuit condition between the parts electrically connected with the contact member 37 and the blade 38^a and member 6 is eliminated.

When the contact members 37 and 49^b are in engagement and current is flowing therethrough a certain amount of heat is generated due to contact resistance. At circuit closed position the contact member 49^b is in engagement with the rivets securing the portion 42^a to the member 140, but the member 140, due to its resistance to heat flow, acts to prevent any appreciable conduction therethrough to the sensitive bimetallic blade 38^a. The blade 38^a therefore remains responsive to the temperature of the surrounding air. With this construction, the apparatus may be utilized to control circuits of relatively high currents and/or high voltages without a detrimental effect on the accuracy of the blade 38^a. It is seen that the modification has certain advantages over the construction shown in the other figures.

The operation of my apparatus is as follows: Suitable lead wires are connected as hereinbefore described to the binding screws 28^b, 69, 85 and 87. When the slide member 93 is moved to "off" position or the time switch 130 is in open circuit position, the apparatus then acts to control an electrical circuit from the transformer 126, lead wire 125, binding post 87, its associated rivet, spacer member 82, lead wire 105 to lug 22^a then through strips 38 and 41, blade 47, contact members 49, 37, blade 35, binding post 28^b through its associated rivet, lead wire 132, means 128, and lead wire 127. A circuit from the transformer

126 through the same path to blade 35 is also controlled by the contact members 49, 37, but then the latter circuit goes through lever member 60, clip 62 and its associated rivet, heater 64, clip 63 and its associated rivet, screw 71, member 68, binding post 69 through its associated rivet, lead wire 131, and lead wire 129 to the transformer 126. In this manner the heater 64 is energized each time the contact members 37, 49 are closed so that the heater may "anticipate" the increased room temperature in the well known manner, and its heat output is independent of the current flowing through the means 128. Upon movement of the slide member 93 downward or to "on" position, the blade 91 engages contact member 90 and a circuit is completed from the transformer 126, through lead wire 125, binding post 87, its associated rivet, spacer member 82, blade 91, contact member 90, wire 89, spacer member 83, binding post 85 through its associated rivet and to the time switch 130. Upon closure of the time switch 130 the circuit is completed through the lead wire 129 to the transformer 126. The heater element 80 so energized acts to heat the strip 38 so that it is maintained for example at 9° F. above ambient temperature, thereby acting to temporarily maintain the room temperature 9° F. below the setting of the dial plate 55. Upon movement of the slide member 93 to "off" position, the heater element 80 is deenergized and the strip 38 acts to control the contact members 37, 49 normally irrespective of the switch 130.

It is to be noted that the disclosed construction is simple and economical for quantity manufacture, eliminates all inserts which heretofore were molded within the base member thereby greatly decreasing the manufacturing costs thereof. The disclosed construction also eliminates the need for an extra night temperature sensitive blade, or for a mechanical means to alter the normal daytime setting of the day temperature sensitive blade. It may furthermore be noted that the switch blade 91 may be omitted and the terminals of the coiled heater wire 89 connected directly one to each of the spacer members 82, 83 and the time switch 130 act to control the energization of the heater 80 thereby rendering the "night turn-down" entirely automatic without any means to provide for abnormal operation.

The preferred embodiment of the device, however, is to have the time switch 130 energize the heater 80 at a regular predetermined time each evening, and to deenergize the heater each morning at a regular predetermined time. The manually operable slide member 90 is then utilized as a means for preventing operation of the heater 80 upon those occasions when it is desirable to maintain normal operation of the thermostat during the periods when the heater 80 would normally be energized by the time switch 130. The member 90 thus enables the operator to readily and simply render the time switch 130 ineffective to set the thermostat for night operation, upon certain occasions, without interfering with the normal operation of the time switch per se or changing the setting of the dial plate 55 to compensate for the effect of the heater 80.

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

1. In an apparatus of the character described, a base member, a movable supporting member pivotally supported at one end thereof to one face of said base member, a bimetallic element secured at one end portion to said supporting

member, a rigid member secured to the other end portion of said bimetallic element and having its free end extending toward said element one end, a flexible carrying member secured to the free end of said rigid member and having a portion extending toward said element other end portion, a contact member carried by said flexible member at said flexible member portion, said flexible member being operable to allow relative movement between said contact member and said element, and adjusting means on said base member on the face opposite to said one face, said adjusting means having a portion extending through said base member and operable to vary the temperature at which said contact member will complete an electric circuit.

2. In an apparatus of the character described, a base member, a movable supporting member pivotally supported at one end thereof to one face of said base member, a bimetallic element secured at one end portion to said supporting member, a fixed contact member carried by said base member on said one face, a rigid member carried by the other end portion of said bimetallic element, a flexible contact carrying member carried by said rigid member and having a portion adjacent said element other end portion, a movable contact member carried by said flexible member at said flexible member portion, said flexible member being operable to allow relative movement between said movable contact member and said element, adjusting means on said base member on the face opposite to said one face, said adjusting means having a portion extending through said base member, said extending portion having a cam operable upon movement of said adjusting means to engage and to move said supporting member to vary the temperature at which said movable contact member will engage said fixed contact member, and means tending to follow said movable contact member to dampen vibration of said movable contact member subsequent to disengagement of said contact members.

3. In an apparatus of the character described, a base member, a movable supporting member pivotally supported at one end thereof to one face of said base member, a bimetallic element secured at one end portion to said supporting member, a fixed contact member carried by said base member on said one face, a rigid member carried by the other end portion of said bimetallic element, a flexible contact carrying member carried by said rigid member and having a portion adjacent said element other end portion, a movable contact member carried by said flexible member at said flexible member portion, said flexible member being operable to allow relative movement between said movable contact member and said element, adjusting means on said base member on the face opposite to said one face, said adjusting means having a portion extending through said base member and operable to vary the temperature at which said movable contact member will engage said fixed contact member, means to dampen vibration of said movable contact member subsequent to disengagement of said contact members, a horse-shoe type permanent magnet having its poles embracing said fixed contact member and carried by said base member, and armature means carried by said rigid member and cooperable with said magnetic means to cause said movable contact member to move with a quick action.

4. In an apparatus of the character described,

a base member, a contact member carried by said base member, a thermostatic element carried by said base member, a contact member carried by said element, a heat supplying means, a heat conducting member secured in heat conducting relationship to said element for conducting heat supplied by said heat means to said element and having a portion positioned adjacent said heat means, and means for varying the rate of heat transfer to said element from said heat supplying means.

5. In an apparatus of the character described, a base member, a contact member carried by said base member, a thermostatic element carried by said base member, a contact member carried by said element, a heat supplying means, a heat conducting member for conducting heat supplied by said heat supplying means to said element and having a portion positioned adjacent said heat means, and means for moving said heat supplying means relative to said conducting member portion thereby to vary the rate of heat transfer therethrough from said heat supplying means to said element.

6. In an apparatus of the character described, a base member, a contact member carried by said base member, a thermostatic element carried by said base member, a contact member carried by said element, a heat supplying means, heat conducting means for transferring heat from said heat supplying means to said element, said conducting means having a V-shaped portion adjacent said heat supplying means, and means for moving said heat supplying means with respect to said V-shaped portion thereby to vary the rate of heat transfer from said heat supplying means to said element.

7. In an apparatus of the character described, a casing, a thermostatic element carried by said casing, a contact member carried by said element and cooperable with said first-named contact member to control an electrical circuit, electrical heater means within said casing and disposed in heat exchange relation with said element, a fixed contact member, a movable contact member, flexible means having a portion thereof rigid with said casing and carrying said movable contact member and operable to urge said movable contact member in one direction, said fixed and said movable contact members being operable to control an electrical circuit to said heater means, and means slidably secured to a wall of said casing and manually movable from external of said casing for flexing said carrying means in a direction opposite to said one direction thereby to control the operation of said heater means.

8. In an apparatus of the character described, a casing comprising a base member and a cover member, a thermostatic element carried by said base member, a contact member carried by said base member, a contact member carried by said element and cooperable with said first-named contact member to control an electrical circuit, electrical heater means disposed in heat exchange relation with said element and carried by said base member, a fixed contact member carried by said heater means, a longitudinally extending plate-like member underlying said heater means and having a portion cooperable with said fixed contact member and operable to control an electrical circuit to said heater means, said cover member being cooperable with said base member to enclose said element and said

heater means, and means carried by said cover member, said last-named means having a portion extending through said cover member and being cooperable with said plate-like member to move said plate-like member in one direction and having a portion extending external of said cover member so that said plate-like member may be moved from externally of said casing.

9. In an apparatus of the character described, a casing comprising a base member and a cover member, a carrying member spaced from and secured to said base member within said casing, a contact member carried by said carrying member within said casing, electrical resistance means carried by said carrying member within said casing and having one terminal thereof secured to said contact member, a movable member within said casing and extending adjacent to said carrying member and having a portion thereof cooperable with said contact member to control an electric circuit to said resistance means, and means carried by said cover member for moving said movable member.

10. In an apparatus of the character described, a casing comprising a base member and a cover member, a carrying member spaced from and secured to said base member within said casing, a contact member carried by said carrying member within said casing, electrical resistance means carried by said carrying member within said casing and having one terminal thereof secured to said contact member, a movable member within said casing and extending adjacent to said contact member to control an electric circuit to said resistance means, said movable member having one end portion secured intermediate said base member and said carrying member, and means carried by said cover member and movable substantially parallel to said carrying member for moving said movable member.

11. In an apparatus of the character described, a casing comprising a base member and a cover member, a strip insulating member spaced from and secured to said base member within said casing, a contact member carried by said strip member within said casing, electrical resistance means carried by said strip member within said casing and having one terminal thereof secured to said contact member, a resilient plate-like current conducting member within said casing and extending adjacent to said strip member and having a portion thereof cooperable with said contact member to control an electric circuit to said resistance means, said plate-like member having one end portion secured intermediate said base member and said strip member, said plate-like member having an offset stop portion at its other end portion, said stop portion being engageable with said base member to limit movement of said plate-like member away from said contact member, and means carried by said cover member portion and movable substantially parallel to said strip member for moving said plate-like member.

12. In an apparatus of the character described, a base member, an adjustable temperature sensitive element carried by said base member and movable in a plane substantially parallel to said base member, a rotatable member carried by said base member, cam means having a cam face in a plane substantially parallel to said base member and operable by said rotatable member and cooperable with and to regulate the adjustment of said element, said rotatable member extending through said base member, and a manually op-

erable member rigidly secured to said rotatable member and operable to actuate said cam means, said base member having a portion interposed between said manual member and said cam means.

13. In an apparatus of the character described, a base member having an aperture therethrough, a temperature sensitive element carried on one face of said base member through which said aperture extends, a member rotatable in said aperture and having a portion extending beyond said one face and having a portion extending beyond a second face of said base member through which said aperture extends, a cam member secured to said rotatable member first-named portion and cooperable with said element upon rotation to adjust the operation of said element, a wheel-like member secured to said rotatable member second-named portion and having a portion viewable upon viewing said one face, said wheel-like member having suitable indicia on said viewable portion, a pointer member co-operable with said indicia for determining the setting of said element, and means carried by said wheel-like member and extending radially therefrom, said extending means being constructed and arranged relative to said pointer member so as to indicate the normal setting of said wheel-like member when said extending means is in alignment with said pointer member.

14. In a device of the character described, a base member, a carrying member pivotally supported on said base member, a contact member carried by said base member, a bimetallic blade having one end portion secured to said carrying member, a non-conducting member secured to the other end portion of said blade and positioned adjacent said contact member, a rigid member carried by said non-conducting member, and a resiliently mounted contact member carried by said rigid member and cooperable with said carried contact member to control an electric circuit.

15. In a device of the character described, a supporting member, a switch arm having one end portion carried by said member, an insulating member secured to said arm, a rigid metallic strip member carried by said insulating member, and a resiliently mounted contact member carried by said rigid member, said contact member being engageable with said rigid member to limit movement of said contact member in one direction relative to said rigid member.

16. In a switch mechanism, a pair of longitudinally extending substantially parallel metallic contact carrying members, a contact member carried by one of said members, a second contact member carried by the other of said parallel members and cooperable with said first-named contact member to control an electric circuit, and an insulating member carried by said other parallel member, said second contact member being electrically insulated from said other parallel member by said insulating member thereby to reduce the capacity effect between said parallel members when said contact members are in open circuit position.

17. In an apparatus of the character described, a base member, a temperature sensitive member, means having movement in a plane parallel to and carried by said base member on one face thereof and supporting said sensitive member for movement in a plane parallel to said one face, a fixed contact member, a U-shaped permanent magnet carried by said base member on

said one face, means having movement in a plane parallel to and carried by said base member on said one face and extending between the poles of said magnet, said last-named means being operable to position said fixed contact member between said magnet poles and adjustably position said fixed contact member relative to the faces of said magnet poles, a movable contact member carried by said sensitive member and cooperable with said fixed contact member to control an electric circuit, and adjusting means carried by said base member on the face opposite to said one face, said adjusting means having a portion extending through said base member, said extending portion having a cam surface operable upon rotation of said adjusting means to move said sensitive member supporting means parallel to said one face thereby to vary the temperature at which said movable contact member will engage said fixed contact member.

18. In an apparatus of the character described, a base member, a contact member carried by said base member, a thermostatic element carried by said base member and having a portion engageable with said contact member to complete an electric circuit, a heat supplying means, a heat conducting means extending into relatively close overlying relation to said supplying means and for transferring heat from said heat supplying means to said element, and means for moving one of said means relative to the other of said means so that the rate of transfer of heat to said heat conducting means from said heat supplying means may be varied.

19. In a device of the character described, a base member having an upper and a lower surface, a fulcrum pin carried by said base member at one end portion thereof and extending from and substantially perpendicular to said upper surface, a longitudinally extending lever member fulcrumed on said pin and extending toward the end portion of said base member opposite to said one end portion, said base member having an aperture therethrough opening through said surfaces, said lever member having a rebent portion adjacent said aperture, an adjustment member rotatable in said aperture and having a cam portion parallel to and adjacent to said upper surface, an adjustment pin screw-threadedly secured to said rebent portion and having an end surface portion engaging said cam portion for movement of said lever member in a plane parallel to said upper surface upon rotation of said adjustment member, an elongated bimetallic strip member secured at one end portion to said lever member and extending along said upper surface toward said opposite end portion, a first contact member carried by said bimetallic member at the end portion thereof opposite to said one end portion and having movement relative thereto, a U-shaped permanent magnet carried by said upper surface and having its poles aligned in a plane extending vertically to said upper surface, a second contact member, means positioning said second contact member intermediate said poles and in position for engagement by said first contact member thereby to complete an electric circuit, and an armature member carried by said bimetallic member and cooperable with said magnet to cause said contact members to engage with a quick action, means rigid with said first contact member and engageable with said armature member subsequent to engagement of said first contact member with said second contact member thereby to limit the movement of said arma-

ture member toward said magnet to prevent a positive engagement of said armature member with said poles.

20. In a device of the character described, a base member having an upper and a lower surface, a fulcrum pin carried by said base member at one end portion thereof and extending from and substantially perpendicular to said upper surface, a longitudinally extending lever member fulcrumed on said pin and extending toward the end portion of said base member opposite to said one end portion, said base member having an aperture therethrough opening through said surfaces, said lever member having a rebent portion adjacent said aperture, an adjustment member rotatable in said aperture and having a cam portion parallel to and adjacent to said upper surface, an adjustment pin screw-threadedly secured to said rebent portion and having an end surface portion engaging said cam portion for movement of said lever member in a plane parallel to said upper surface upon rotation of said adjustment member, an elongated bimetallic strip member secured at one end portion to said lever member and extending along said upper surface toward said opposite end portion, a first contact member carried by said bimetallic member at the end portion thereof opposite to said one end portion and having movement relative thereto, a U-shaped permanent magnet carried by said upper surface and having its poles aligned in a plane extending vertically to said upper surface, a second contact member, means positioning said second contact member intermediate said poles and in position for engagement by said first contact member thereby to complete an electric circuit, an armature member carried by said bimetallic member and cooperable with said magnet to cause said contact members to engage with a quick action, means rigid with said first contact member and engageable with said armature member subsequent to engagement of said first contact member with said second contact member thereby to limit the movement of said armature member toward said magnet to prevent a positive engagement of said armature member with said poles, and means for adjustably positioning relative to the face of said poles the face of said second contact member which is engaged by said first contact member thereby to determine the movement of said armature member toward said poles.

21. In a device of the character described, a base member having an upper and a lower surface, a fulcrum pin carried by said base member at one end portion thereof and extending from and substantially perpendicular to said upper surface, a longitudinally extending lever member fulcrumed on said pin and extending toward the end portion of said base member opposite to said one end portion, said base member having an aperture therethrough and extending through said surfaces, said lever member having a rebent portion adjacent said aperture, an adjustment member rotatable in said aperture and having a cam portion parallel to and adjacent to said upper surface, an adjustment pin screw-threadedly secured to said rebent portion and having an end surface portion engaging said cam portion for movement of said lever member in a plane parallel to said upper surface upon rotation of said adjustment member, an elongated bimetallic strip member secured at one end portion to said lever member and extending along said upper surface toward said opposite end portion, a first contact

member, means resiliently securing said first contact member to said bimetallic member and carried by said bimetallic member at the end portion thereof opposite to said one end portion, a U-shaped permanent magnet carried by said upper surface and having its poles aligned in a plane extending vertically to said upper surface, a second contact member, means positioning said second contact member intermediate said poles and in a position for engagement by said first contact member thereby to complete an electric circuit, an armature member carried by said bimetallic member and cooperable with said magnet to cause said contact members to engage with a quick action, said first contact member having a portion engageable with said armature member subsequent to engagement of said first contact member with said second contact member thereby to limit the movement of said armature member toward said magnet to prevent a positive engagement of said armature member with said poles, and means engageable with and movable with said resiliently securing means upon disengagement of said contact members to dampen vibration of said first contact member.

22. In an apparatus of the character described, a base member, a supporting member having a portion held against said base member and having an upturned flange, said flange having one portion and having a second portion bent to form a shoulder with said one portion and having a third portion extending beyond said second portion substantially parallel to said one portion, a U-shaped permanent magnet carried by said supporting member adjacent said shoulder with the poles of said magnet in vertical alignment relative to said base member, said supporting member having a second flange on the side of said magnet opposite to said third flange portion, a resilient blade member having one end portion secured to said second flange and extending between said magnet poles and overlying said third flange portion, a contact member carried by said blade member intermediate said poles, and means carried by said third flange portion for positioning the contact face of said contact member relative to the face of said poles.

23. In an apparatus of the character described, a base member, a supporting member having a portion held against said base member and having an upturned flange, said flange having one portion and having a second portion bent to form a shoulder with said one portion and having a third portion extending beyond said second portion substantially parallel to said one portion, a U-shaped permanent magnet positioned adjacent said shoulder with the poles of said magnet in vertical alignment relative to said base member, tab means extending from said first flange portion and locking said magnet in position against said shoulder, said supporting member having a second flange on the side of said magnet opposite to said third flange portion, a resilient blade member having one end portion secured to said second flange and extending between said magnet poles and overlying said third flange portion, a contact member carried by said blade member intermediate said poles, and means carried by said third flange portion for positioning the contact face of said contact member relative to the face of said poles.

24. In an apparatus of the character described, a plate-like base member, a plate-like supporting member secured in face to face relation with

said base member and having an upstanding flange, a U-shaped magnet held against said flange with its poles in vertical alignment relative to said base member, a blade member having one end portion secured to said plate-like supporting member and extending substantially parallel to the upper face of said base member and intermediate the poles of said magnet, a contact member carried by said blade member intermediate said poles, means carried by said flange and engageable with said blade member for positioning said contact member relative to the end surfaces of said poles, a plate-like elongated arm member having one end portion pivotally secured to said supporting member and extending therefrom toward one end portion of said base member, a bimetallic strip member carried by said base member and extending from said base member one end portion substantially parallel to said base member upper face, a contact member carried by said bimetallic member and cooperable with said first-named contact member to control an electric circuit, armature means carried by said bimetallic member and cooperable with said magnet to cause said contact members to break said circuit with a quick action, heater means having heat exchange relation with said bimetallic member and carried by said elongated arm member, and means carried by said base member and operable to pivot said elongated arm member thereby to position said heater means relative to said bimetallic member.

25. In an apparatus of the character described, a plate-like base member, a plate-like supporting member secured in face to face relation with said base member and having an upstanding flange, a U-shaped magnet held against said flange with its poles in vertical alignment relative to said base member, a blade member having one end portion secured to said plate-like supporting member and extending substantially parallel to the upper face of said base member and intermediate the poles of said magnet, a contact member carried by said blade member intermediate said poles, means carried by said flange and engageable with said blade member for positioning said contact member relative to the end surface of said poles, a plate-like elongated arm member having one end portion pivotally secured to said supporting member and extending therefrom toward one end portion of said base member, a bimetallic strip member carried by said base member and extending from said base member one end portion substantially parallel to said base member upper face, a contact member carried by said bimetallic member and cooperable with said first-named contact member to control an electric circuit, armature means carried by said bimetallic member and cooperable with said magnet to cause said contact member to break said circuit with a quick action, electrical heater means having heat exchange relation with said bimetallic member and carried by said elongated arm member, means carried by said base member and operable to pivot said elongated arm member thereby to position said heater means relative to said bimetallic member, said last named means acting as an electrical conductor for said heater means, and spring clip means holding said elongated arm member in good electrical contact with said supporting member.

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