April 2, 1940. H. W. UHLRIG 2,195,947

HEAT CONTROL DEVICE

Original Filed March 31, 1937 2 Sheets-Sheet 1

Fig. 1.

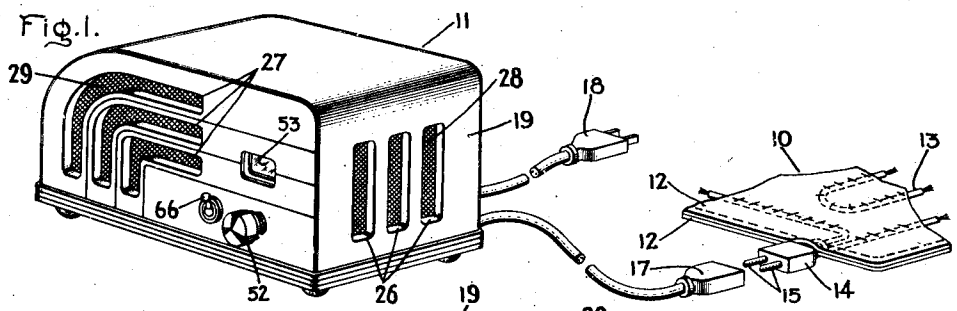


Fig. 2.

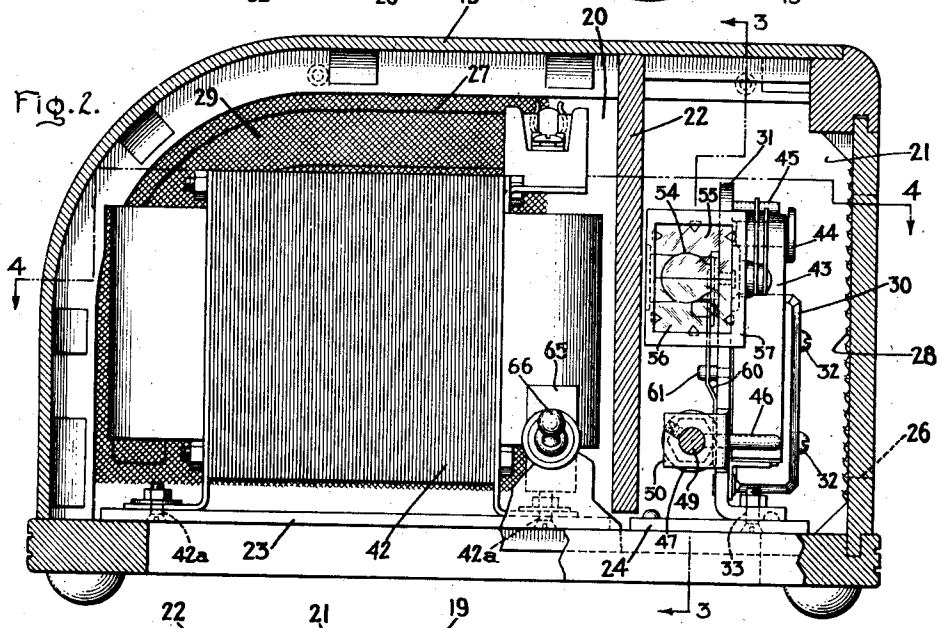
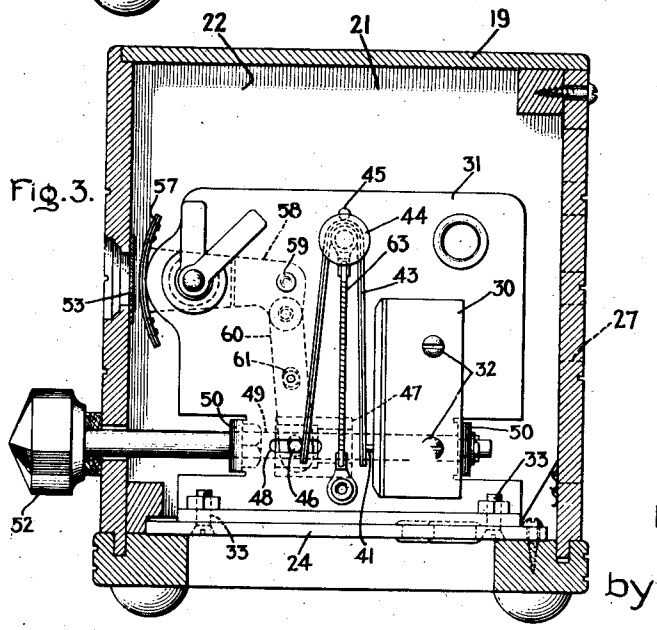


Fig. 3.



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Fig. 4.

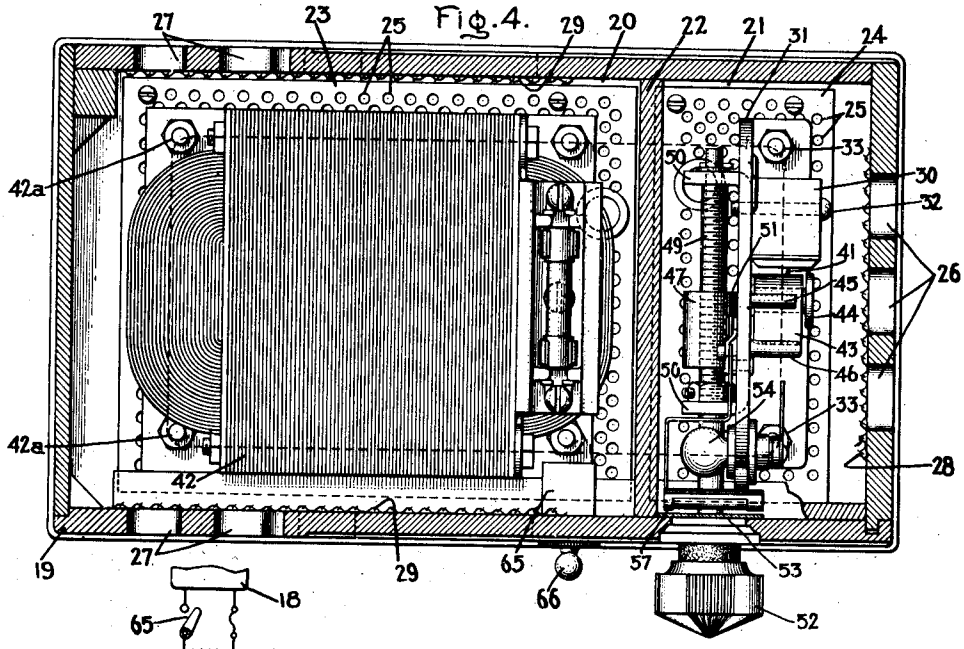
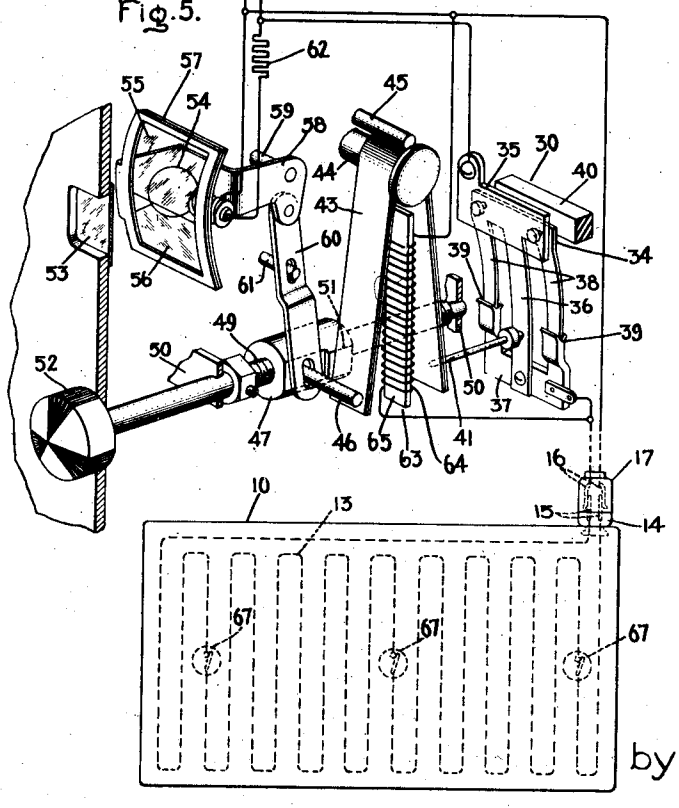


Fig. 5.



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HEAT CONTROL DEVICE

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Application March 31, 1937, Serial No. 134,055
Renewed August 22, 1939

7 Claims. (Cl. 200—122)

This invention relates to heat control devices, more particulary to devices of this character for controlling electrically heated blankets and the like, and it has for its object the provision of improved means for controlling the temperature of the blanket.

More specifically, this invention relates to improvements in the heat control device for controlling electrically heated blankets described and claimed in the copending application of William K. Kearsley, Serial No. 99,459, filed September 4, 1936 and assigned to the same assignee as this invention.

For a more complete understanding of this invention, reference should be had to the accompanying drawings in which Fig. 1 is a perspective view illustrating a portion of an electrically heated blanket, and a control therefor arranged in accordance with this invention; Fig. 2 is an enlarged vertical sectional view taken through the control device of Fig. 1; Fig. 3 is a vertical sectional view taken through the line 3—3 of Fig. 2 and looking in the direction of the arrows; Fig. 4 is a horizontal sectional view taken through the line 4—4 of Fig. 2 and looking in the direction of the arrows; and Fig. 5 is a diagrammatic representation of the control device of Figs. 1–4 and of the blanket which it controls.

Referring to the drawings, this invention has been shown in one form as applied to an electrically heated blanket 10 which it controlls by means of a heat control device 11 arranged in accordance with this invention. As shown in Fig. 1, the blanket comprises a pair of sheets 12 arranged in superimposed relation and receiving between them a resistance conductor 13.

A suitable electrical terminal plug 14 is attached to the blanket having a pair of terminal pins 15 connected to the ends of the resistance conductor and adapted to engage a pair of contacts 16 provided in a supply plug 17. The plug 17 is connected to a supply plug 18 through the control device 11.

This control device 11 comprises a housing 19 divided into two compartments 20 and 21. These compartments are separated by a vertical wall 22. The bottoms of the two compartments 20 and 21 are closed by means of floor plates 23 and 24 respectively. These plates preferably will be formed of a suitable metal, such as pressed steel, and each of the plates is provided with a large number of relatively small apertures 25. The right-hand end of the housing 19, as viewed in Figs. 1, 2 and 4, is provided with a series of spaced windows 26, while the front and back walls of the housing are provided with a series of elongated spaced apertures 27. The apertures 26 and 27 are covered respectively by means of screens 28 and 29. The walls forming the casing 19 outside of the bottom wall plates 23 and 24 may be formed of any suitable material such as wood, while the partition 22 also may be formed of any suitable material, but preferably will be formed of a material having a low heat conductivity such as wood.

Mounted within the compartment 21 is a suitable switch 30 adapted to be connected in the heating circuit of the blanket 10. The switch 30 may have any suitable construction, but preferably will be of the snap-action type. The switch 30 is rigidly secured to a supporting plate or panel 31 by means of screws 32. The panel 31 is arranged in an upright position in the compartment, as clearly shown in Figs. 2 and 4, and is secured to the bottom plate 24 by means of screw-fastening means 33. The switch as shown comprises a housing within which is mounted a movable contact 34 (Fig. 5) arranged to cooperate with a fixed contact 35. Contact 34 is carried by a suitable flexible switch arm 36 formed of electrically conducting material. The switch arm is rigidly secured at one end to a fixed support 37 mounted in the switch housing and has its other end rigidly secured to the contact 34. Arranged on opposite sides of the flexible switch arm 36 are a pair of springs 38 secured to the movable contact 34 at one end and at their opposite end are received in knife edge bearings 39. The members 38 are in longitudinal compression and are arranged to normally bias the movable contact 34 into engagement with the fixed contact 35. A suitable stop 40 is provided to limit the movement of the contact away from the fixed contact 35. The movable contact is moved away from the fixed contact and against the stop 40 by means of a plunger pin 41, which when moved inwardly of the housing moves the switch from its closed to its open position against the stop 40. When the plunger 41 is released the springs 38 will snap the switch to its closed position.

As shown diagrammatically in Fig. 5, one side of the resistance conductor 13 is connected to one side of the electrical supply plug 18 while the other side of the resistance conductor is connected to the plate 37 and thence through the switch arm 36 to the movable contact 34, the cooperating fixed contact 35 being connected to the other side of the supply plug 18. As shown, a transformer 42 is inserted in the connections between the blanket 10 and the supply source. The

function of this transformer will be described in greater detail hereinafter. This transformer is mounted in the chamber 20, and, as shown, is secured to the floor plate 23 by means of screw fastening means 42a.

The switch arm 36 is controlled by means of a bimetallic thermostat bar 43 mounted within the compartment 21. The bar 43, as shown, is of hair-pin or U-shape, and it is supported from the panel 31 by means of a pin 44 over which the bar is draped, as clearly shown in Figs. 3 and 5. The pin 44 as shown is provided with a head to prevent movement of the thermostat from the pin axially of the pin; the thermostat is secured against vertical movement with reference to the pin by means of a second pin 45 also secured to the panel 31. The bimetallic bar 43 is so arranged that when its temperature is elevated, its two legs spread apart, whereas when the temperature is reduced the two legs move together. The right hand leg, as viewed in Figs. 3 and 5, is arranged to bear on the plunger 41, while the left hand leg bears against an abutment or stop 46. It will be observed in view of this that when the temperature of the bar rises to a predetermined maximum value it will move the plunger 41 inwardly sufficiently to move the switch to its open position, while when the temperature of the bar is reduced to a predetermined low value the two legs will move inwardly sufficiently to permit the switch to close.

The temperature setting of the device to control the temperatures at which the switch is opened and closed is effected by means of adjusting the position of the stop 46 which, of course, adjusts the position of the bimetallic bar 43 with relation to the switch plunger 41. When the bar 46 is moved toward the left, as viewed in Figs. 3 and 5, it increases the temperature setting of the device, whereas when it is moved in the opposite direction it reduces the temperature setting of the device.

The stop 46 is mounted on a carriage 47 which is mounted to move in a longitudinal direction on the opposite side of the panel 31 from the switch and thermostat, the pin 46 extending through an elongated aperture 48 provided for it in the panel. The carriage 47 is mounted on an elongated screw 49 which in turn is mounted for rotation in supporting brackets 50. It will be observed that when the screw 49 is rotated it will move the carriage 47 longitudinally of the panel. The carriage 47 is prevented from rotating on the screw when it is adjusted by means of a flattened surface 51 provided on the carriage and bearing against the side wall of the panel. The screw extends forwardly through an aperture provided for it in the front wall of the housing where an adjusting knob 52 is secured to it.

A suitable indicating device is provided to assist in adjusting the temperature of the control device. This indicating device comprises a window 53 in the front wall of the housing adjacent the adjusting knob 52, as clearly shown in Figs. 1, 3 and 5. Arranged back of the window is a suitable source of light 54 shown as an incandescent lamp. This lamp, as shown, is supported on the panel 31. Interposed between the lamp and the window are a pair of transparent sheet-like members 55 and 56 mounted in a frame 57, one sheet covering substantially half the area of the frame, while the other sheet covers the remaining area of the frame. The two sheets preferably will have different colors. Thus, the sheet 55 may be red, whereas the sheet 56 may be green. The frame 57 is mounted upon a bracket 58 which is pivotally mounted on a pin 59 secured to the panel 31. A lever 60 fulcrumed on a pin 61 mounted on the panel 31 has its upper end pivotally secured to the bracket 58 and its lower end pivotally secured to the pin 46, as clearly shown in Fig. 5. In view of the foregoing arrangement, it will be observed that when the knob 52 is adjusted to vary the position of the carriage 47, the lever 60 will be rotated in one direction or the other, depending upon the direction of adjustment of the rod, so as to move the frame 57 carrying the transparent colored members 55 and 56 up or down back of the window. Thus, when the temperature is adjusted, the colored fields of vision back of the window will change in accordance with the temperature change. Preferably, these fields will be so arranged that when the setting of the thermostat is changed to increase the temperature of the blanket, the area of red color will increase in the field of vision, whereas when the temperature setting is lowered more and more of the green color will appear in the field of vision. The lamp 54, as shown, is connected to the two sides of the secondary of the transformer 42, and hence, is continuously energized while the device is operating. A resistance 62 is inserted in the lamp circuit.

It will be observed that the bimetallic bar 43 mounted as it is in the compartment 21, which is open at the bottom through the apertures 25 in the bottom wall and at the end through the apertures 26 in the end wall, is subjected to a draft of air which flows in at the bottom of the compartment and out of the end wall. In other words, it is subjected to the temperature of the air of the room in which the control device and blanket are located. In addition to this, the thermostat bar is caused to respond to a local heat source which is obtained by means of an auxiliary heating element 63 comprising a resistance conductor 64 mounted on an insulating supporting member 65. The supporting member 65 is mounted in a vertical position on the panel 31 between the two legs of the bimetallic thermostat bar, as clearly shown in Figs. 3 and 5. The resistance conductor 64, as shown, is connected to one side of the transformer 42, while its other side is connected to the plate 37 of the switch. In view of these connections when the switch is closed the auxiliary heater 63 will be energized to apply heat to the thermostat, whereas when the switch is opened the auxiliary heater will be deenergized.

The electrical energy input to the blanket 10 is controlled by the proportion of time that the switch 30 is closed as to the time it is open. These times are controlled by the temperature of the thermostat bar which is jointly dependent upon the room temperature and upon the operation of the auxiliary heater 63. For a given unchanging room temperature, the thermostat controls the switch to deliver an invariable amount of energy to the blanket which therefore delivers a constant heat energy. The temperature of the blanket is constant under these conditions. When the room temperature varies, however, the energy input delivered by the blanket changes. Thus, if for a given setting of the thermostat, the room temperature should decrease, the heat that will be imparted to the thermostat bar from the room is reduced and it will require a longer period of time for the auxiliary heater 63 to heat the bimetallic bar to the temperature at which it opens the switch

than it did before; and after the switch has been opened and the auxiliary heater 63 is de-energized, the thermostatic bar will cool quicker to reclose the switch due to the increased cooling action of the room. These two actions in delaying the opening of the switch and in advancing its closing cooperate to increase the proportion of time that the switch is closed. The control, therefore, supplies more energy to the blanket to hold its temperature constant in spite of the decrease in room temperature. Conversely, when the room warms up, the proportion of the time that the switch is closed to the time that it is opened is reduced so as to reduce the energy input of the blanket sufficiently to hold a constant temperature. The transformer 42 functions to reduce the voltage of the supply line to a relatively low value and to insulate the blanket from the supply line in order to eliminate danger of shock. An important feature of this invention is the separation of the transformer 42 from the thermostat 43 in order to prevent the transformer heat from affecting the thermostat. This is accomplished, as has been previously described, by means of the insulating wall 22 separating the two compartments 20 and 21. Furthermore, the transformer compartment is thoroughly ventilated at all times by means of a draft which is induced to flow upwardly through the openings in the bottom wall 23 and outwardly through the side openings 27 in the housing.

Preferably, a suitable control switch 65 will be mounted in the compartment 20 and connected in the energizing circuit to the blanket to open and close this circuit, as desired. This switch preferably will be of the snap action type and will have a control member 66, as shown, accessible on the exterior of the casing for convenience of operation.

If desired, a suitable number of high temperature protective devices 67 may be incorporated in the blanket and connected in series with the heating circuit as shown in Fig. 5. These devices may be any suitable thermostats arranged to open the heating circuit in case of an abnormal high temperature condition, such as a temperature of 180°–200° F., and to reclose the circuit when the temperature falls to a safe value.

While I have shown and described a particular embodiment of my invention it will be understood that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

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

1. A heat control device for an electrically heated blanket and the like comprising a supporting panel, a pin on said panel, a U-shaped thermostat loosely draped over said pin so that the pin constitutes the sole support for the thermostat and the legs of the thermostat depend freely from the pin, a switch on one side of said thermostat having an operating member arranged to be actuated by the adjacent one of said legs and controlling the application of heat to and the shut off of heat from the blanket, means for applying heat to both of said legs when the switch is in position to apply heat to the blanket, and to remove the heat from the legs when the switch is in position to shut off heat from the blanket, a bar movably mounted in said panel arranged to engage the other of said legs, means for adjusting the position of said bar with relation to said leg so as to vary the temperature setting of said control device, and a housing enclosing said panel, thermostat, and switch having openings in its lower and upper walls providing for an air draft upwardly over and around said legs, the connections between said bar, said switch actuating means and said thermostat being freely detachable, and means for normally securing said thermostat against vertical movement whereby the said thermostat may be readily removed from said pin.

2. A temperature control device for an electrically heated blanket and the like removed thermally from the blanket comprising a switch adapted to be connected in the energizing circuit of said blanket, a temperature responsive element connected to said switch to operate it between its closed and open positions to energize and deenergize said blanket, heating means operating to apply heat locally to said temperature responsive element when said switch is closed and to remove heat from it when said switch is opened, a housing for said temperature responsive element and switch having a floor and windows above the floor, the floor having a plurality of apertures through it so that the air in the room in which the blanket is located circulates freely through the housing, the heat imparted to the temperature responsive element from said air and heating means causing the switch to open and by the opening of said switch permitting said temperature responsive element to cool to reclose the switch, whereby the temperature responsive element operates jointly in response to the temperature of the heating means and of the room to vary the energy input to the blanket inversely with variations in the room temperature.

3. A heat control device comprising a panel, a switch rigidly secured to said panel having means normally biasing it to its closed position and an actuator arranged when operated in one direction to open the switch, an abutment, a carriage mounted behind said panel, said abutment extending through said panel and being carried by said carriage, said abutment being spaced from said actuator and substantially aligned with it, a pin on said panel, a U-shaped thermostat drapped over said pin so that the pin constitutes the sole support for said thermostat and the legs of said thermostat are freely suspended between said abutment and actuator, said carriage being mounted for movement toward and away from its associated leg, and a screw threaded in said carriage arranged by rotation to adjust the position of the carriage.

4. A heat control device comprising a panel, a switch rigidly secured to said panel having means normally biasing it to its closed position and an actuator arranged when operated in one direction to open the switch, a pin on said panel, a U-shaped bimetallic bar draped over said pin with its legs free to move together or apart as the temperature changes, an abutment acting as a stop for outward movement of one leg, and the other leg arranged to move said actuator to open the switch by movement of said legs away from each other, a carriage supporting said abutment for movement toward and away from its associated leg, a screw threaded in said carriage arranged by rotation to adjust the position of the carriage, an indicating device to denote the setting of said thermostat, means pivotally mounting said indicating device, and a lever connecting said carriage with said indicating de-

vice to rotate the indicating device to vary its position when the position of the carriage is changed.

5. A heat control device comprising a housing, a vertically arranged panel within said housing, a switch on said panel, a U-shaped thermostat mounted on said panel with its legs depending downwardly, one of said legs cooperating with said switch to control its operation between open and closed positions, a heating device positioned vertically on said panel between said legs arranged to apply heat locally to both of said legs and controlled by said switch to be deenergized when the switch is open and energized when the switch is closed, a perforated floor in the bottom of said housing upon which said panel rests, and windows in the upper walls of the housing providing for an air draft through the housing upwardly through the floor and over and around said legs.

6. A temperature control device for an electrically heated blanket and the like removed thermally from the blanket comprising a switch adapted to be connected in the energizing circuit of said blanket, a temperature responsive element connected to said switch to operate it between its closed and open positions to energize and deenergize said blanket, an auxiliary heating resistance element connected in said energizing circuit to be energized when said switch is closed and deenergized when said switch is opened and arranged to apply heat locally to said temperature responsive element, a housing for said temperature responsive element switch and auxiliary heating resistance element having a metallic floor and windows above the floor, the floor having a plurality of apertures through it so that the air in the room in which the blanket is located circulates freely through the housing, the heat imparted to the temperature responsive element from said air and the auxiliary heating resistance causing the switch to open and by the opening of said switch permitting said temperature responsive element to cool to reclose the switch, whereby the temperature responsive element operates jointly in response to the temperature of the auxiliary heating element and of the room to vary the energy input to the blanket inversely with variations in the room temperature.

7. A temperature control device for an electrically heated blanket comprising a housing having two compartments separated by a wall having poor heat conductivity, separate floors in the housing for the compartments respectively, each having apertures therethrough, and each compartment having windows above the floors so that air can freely flow through the two compartments, a thermostatic switch in one compartment movable between opened and closed positions responsively to temperature changes of predetermined magnitude, and responding to the temperature of the air flowing through the compartment, a heating element in the same compartment arranged to apply heat locally to said thermostatic switch only when said switch is closed, the heat imparted to said thermostatic switch from said heating element and air controlling the period of time said switch is closed and thereby the energy input to said blanket, said period varying in the inverse order with variations in the temperature of said air so that a substantially uniform temperature condition is maintained in said blanket irrespective of variations in the temperature of the room in which the blanket is placed, and a voltage reducing transformer in the other compartment arranged to be connected between the source of electrical supply and the blanket, the heat generated in said other compartment by said transformer being thermally insulated from said thermostatic switch by said wall of poor heat conductivity between said compartments and being dissipated by the flow of air through said other compartment.

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