Feb. 27, 1923. 1,447,031.

G. T. NEWELL, JR.

ELECTRICALLY HEATED WARMING PAD.

FILED JAN. 30, 1920.

Fig. 1.

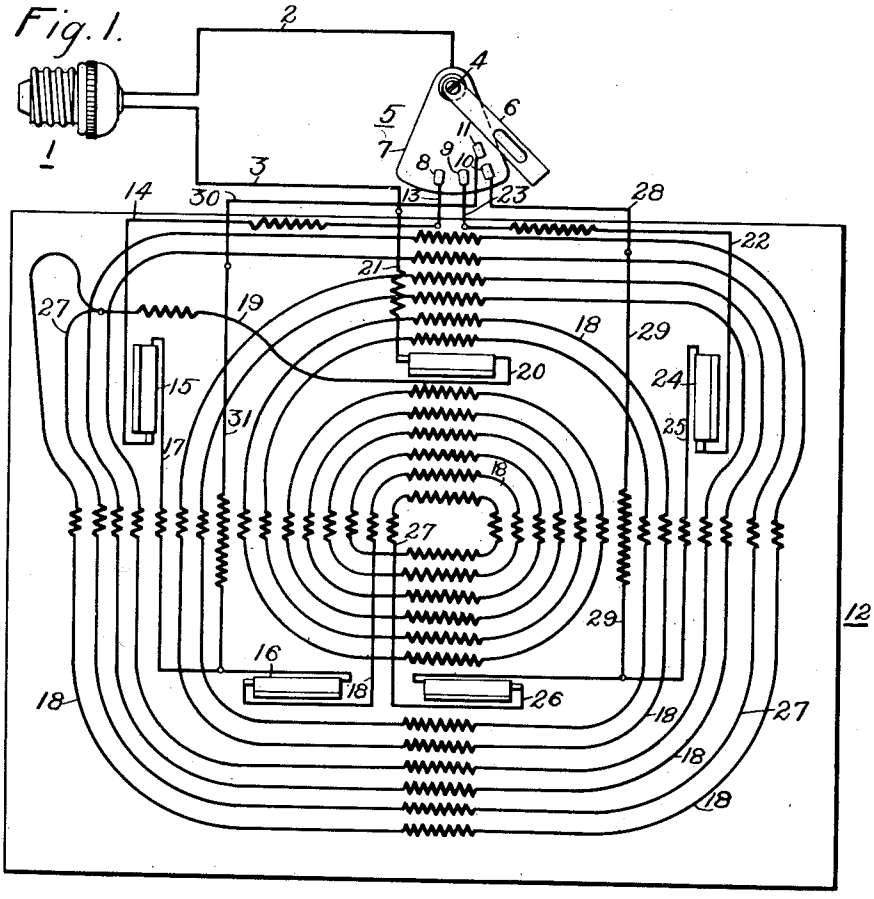


Fig. 2.

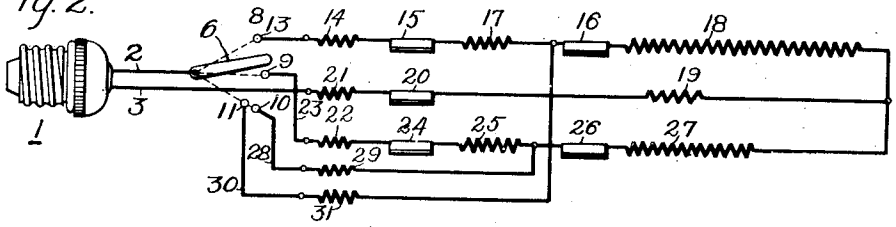
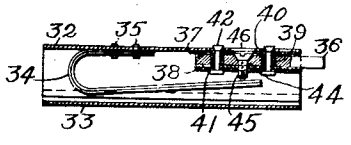


Fig. 3.



WITNESSES:

J. A. Helsel

H. M. Bebel

INVENTOR

George T. Newell, Jr.

BY

Wesley G. Carr

ATTORNEY

Patented Feb. 27, 1923.

1,447,031

UNITED STATES PATENT OFFICE.

GEORGE T. NEWELL, JR., OF BEVERLY, NEW JERSEY, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRICALLY-HEATED WARMING PAD.

Application filed January 30, 1920. Serial No. 355,266.

To all whom it may concern:

Be it known that I, GEORGE T. NEWELL, Jr., a citizen of the United States, and a resident of Beverly, in the county of Burlington and State of New Jersey, have invented a new and useful Improvement in Electrically-Heated Warming Pads, of which the following is a specification.

My invention relates to electrically-heated apparatus and particularly to electrically-heated warming pads and it has for its object to provide a warming pad with which it is possible to obtain three different degrees of heat by simple and easily operated means.

A further object of my invention is to provide a warming pad which shall have a plurality of theremostats of novel design to limit the temperature of each heat, which thermostats are located in spaced relation on the surface of the pad and are so connected that certain thermostats act as master thermostats to the other thermostats.

Heretofore, pads have been manufactured in which the temperature obtained at their surfaces depended upon the joint effect of the amount of energy transformed into heat in the pad bodies and the amount of covering provided for such bodies. Other pads have been provided individually with a single resistor circuit and a plurality of thermostats set to operate at different temperatures, and also provided with a manually operable means for connecting the desired thermostat in circuit with the resistor and the supply circuit. Still other warming pads have been individually provided with a plurality of circuits of different resistances and with a thermostat connected in the common return conductor to limit the temperature of the pad.

More specifically, my invention embodies a plurality of resistor circuits located between several layers of cloth forming the pad proper, a plurality of thermostats for each of said circuits, the thermostats being located in spaced relation in the pad, a master thermostat for all of said circuits and a manually operable switching means for connecting one resistor circuit or parallel-connected portions of a plurality of such circuits to the supply circuit.

Figure 1 of the single sheet of drawings shows a schematic diagram of the various parts of the device embodying my invention, with particular reference to the location of the circuits, and of the thermostats on the surface of the pad; Fig. 2 is a diagrammatic representation of the circuits used therewith, and Fig. 3 is a view in cross-section, of a thermostat used on the pad.

A contact plug 1 has two conductors 2 and 3 connected to its contact terminals. The conductor 2 is connected to a contact terminal 4 of a manually operable switch 5. A switch blade 6 is pivotally mounted on the contact terminal 4, which is, in turn, mounted on a plate 7 of insulating material. A plurality of contact terminals 8, 9, 10 and 11 are mounted in spaced relation on the plate 7 and are connected to a plurality of resistor circuits, in a manner to be hereinafter set forth.

A pad 12 comprises a plurality of layers of cloth sewed together, and has mounted on its surface a plurality of resistor leads, circuits and thermostats to be hereinafter described. In actual construction, the switch 5 may be located relatively close to the pad 12 so that a conductor 13, which connects the contact terminal 8 to a resistance lead 14 on the pad 12, is of relatively short length. The other end of the resistance lead 14 is connected to one terminal of a thermostat 15 which is located near the upper left-hand corner of the pad 12 (as viewed in the drawing). The other terminal of the thermostat 15 is connected to one terminal of a second thermostat 16, located near the lower left-hand corner of the pad 12, by means of a resistance lead 17.

A resistor wire 18, of relatively high resistance, is connected to the other terminal of the thermostat 16 and is arranged in a series of substantially concentric convolutions over the surface of the pad and has its other end connected, by means of a short resistor lead 19, to a master thermostat 20 which is located in the upper central part of the pad 12. A short resistance lead 21 con-

nects the other terminal of the thermostat 20 to the conductor 3.

The contact terminal 9 is connected to a short resistor lead 22 by means of a conductor 23, the other end of the lead 22 being connected to one terminal of a thermostat 24 located near the upper right-hand corner of the pad 12. A resistance lead 25 connects the other terminal of the thermostat 24 to one terminal of a thermostat 26 which is located near the lower right-hand corner of the pad 12. The other terminal of the thermostat 26 is connected to one end of a resistor wire 27 having a lower resistance than the resistor wire 18 and arranged in convolutions substantially parallel to those of the resistor 18 and alternating therewith over the surface of the pad. The other end of the resistor wire 27 is connected to the junction of the resistor wire 18 and the resistance lead 19.

The contact terminals 10 and 11 are so radially alined on the surface of the plate 7 that the switch arm 6 may operatively engage both of them simultaneously.

The contact terminal 10 is connected to a conductor 28 which is, in turn, connected to one end of a resistance lead 29, the other end of which is connected to that terminal of the thermostat 26 to which the resistance lead 25 is connected. The contact terminal 11 is connected to a conductor 30, which is, in turn, connected to one end of a resistance lead 31, the other end of which is connected to that terminal of the thermostat 16 to which the resistance lead 17 is connected.

Fig. 2 shows a diagram of connection of the various resistor leads and resistor wires, without reference to their actual location on the pad.

Fig. 3 is a view, in cross-section, of a thermostat used on the heating pad and comprising two metal members 32 and 33, of channel section, which are so soldered together as to form an elongated tubular member of rectangular cross-section. A bimetallic strip 34, of substantially U-shape, is suitably secured to the inside of the members 32, near one end thereof, as by rivets 35. A terminal member 36 is mounted on the inside of the member 32 at the other end thereof and projects beyond the end of the member 32. A layer 37 of mica is placed between the member 36 and the member 32, and a similar layer 38 of mica is placed on the other side of the member 36. Two openings 39 are provided in the member 36 which register with openings 40 in the member 32 and with openings 41 in the mica plates 37 and 38. Rivets 42, extending through openings 39 in the member 36, serve to hold the mica plates 37 and 38 and the member 36 in their proper relative positions against the member 32, it being noted that the body of the rivets 42 is less in diameter than the openings 39 so that the member 36 is securely held against, and effectively insulated from, the member 32. A screw-threaded circular opening 44 is provided in the member 36 and a short contact screw 45 is placed therein, through an opening 46 in the member 32, and co-operates with the bi-metallic strip 34 to close or interrupt a circuit, the position of the screw 45 relative to the member 36 determining the temperature at which operative engagement will be made or interrupted.

While no specific mention has been made as to the construction of the resistor leads and wires, I may use a metallic conductor of relatively small diameter, having a relatively high resistance per unit of length and apply a relatively thick covering of braided asbestos thereto, so as to obtain an insulated resistor which shall have relatively great flexibility and be thoroughly insulated from the cloth of the pad. After the resistor leads and resistor wires and the thermostats have been placed in their proper relative location on one or more layers of cloth, they are covered by a similar set of layers and the two sets of layers are so sewed together between alternate convolutions that the resistors will not be shifted when the pad is being used and handled. Suitable cloth coverings (not shown) may be used to cover the body of the pad. The conductors 3, 13, 23, 28 and 30 may be united into a five conductor cable of any desired length between the switch 5 and the pad 12.

The operation of the device is as follows: The thermostat 15 is adjusted to interrupt a circuit at 130° F., the thermostat 24 is adjusted to interrupt a circuit at 160° F. and the thermostats 16, 26 and 20 are adjusted to interrupt a circuit at 190° F. These temperatures are illustrative any may be changed if desired, but these values represent approximately low, medium and high heats for this kind of appliance. To obtain low heat, the switch lever 6 is so moved as to engage the contact terminal 8, when the following circuit will be energized, it being understood that the contact plug 1 is in engagement with a contact socket connected to a suitable source of electrical energy: conductor 2, switch blade 6, conductor 13, resistor lead 14, thermostat 15, resistor lead 17, thermostat 16, high-resistance-resistor wire 18, resistor lead 19, thermostat 20 and resistor lead 21 to conductor 3. In case the temperature of the pad reaches or exceeds 130° F., the thermostat 15, which is adjusted to interrupt the circuit at that temperature, will operate to interrupt the circuit and hold it open until the temperature again falls to approximately 130° F.

To obtain a medium heat, the switch arm 6 is so moved as to engage the contact terminal 9 when the following circuit is established: conductor 2, switch arm 6, contact terminal 9, conductor 23, resistor lead 22, thermostate 24, resistor lead 25, thermostat 26, resistor wire 27, resistor lead 19, thermostat 20 and resistor lead 21 to conductor 3. If the temperature of the pad reaches or exceeds 160° F., the thermostat 24 operates to interrupt the circuit, the circuit being again closed when the temperature falls to or below 160° F. No mention has been made of the thermostat 16 in the high-resistance circuit or of the thermostat 26 in the medium resistance circuit but the function of each is to act as master thermostat to the other thermostat connected in the circuit. Thus, if thermostat 15, which is adjusted to interrupt the circuit at 130° F., fails to operate, for any reason whatever, thermostat 16, which is adjusted to operate at 190° F, operates as soon as the temperature reaches that value and thus prevents overheating of the pad.

To obtain high heat, the switch arm 6 is so moved as to simultaneously engage contact terminals 10 and 11. Referring to Fig. 2, it will be noted that a resistor lead 29 is connected in series-circuit relation to the high-resistance wire 18, a resistor lead 31 is connected in series-circuit relation to the medium-resistance wire 27 and that these two circuits are connected in parallel-circuit relation. It will also be noted that thermostat 16 is connected in one of the circuits, the thermostat 26 is connected in the other circuit and thermostat 20 now is traversed by the combined current flowing in the two circuits. If a local hot-spot develops, for example, in the medium-resistance circuit near the thermostat 26, this thermostat will operate to interrupt the circuit which reduces the amount of heat generated, thus insuring safety of operation.

It may also be pointed out that, in each case, there are three thermostats connected in circuit and so located in spaced relation on the surface of the pad that, even if substantially one half of the surface of the pad be unprotected by additional coverings, each circuit will still have a thermostat connected therein which is in proximity to, if not directly under, such covered part and which therefore will operate to interrupt the circuit if the temperature in such covered part reaches a predetermined maximum value.

The thermostat disclosed is particularly applicable to warming pads, as it is relatively small and of light weight and, therefore, responds quickly to changes of temperature and thoroughly protects the engaging contact terminals.

I thus provide a three-heat warming pad having a plurality of resistor circuits thoroughly protected against excessive temperatures by a plurality of thermostats in each circuit, the thermostats being so located, in spaced relation on the surface of the pad, that injuriously high temperature in any part of the pad will be effectively prevented.

Various modifications may be made in the device without departing from the spirit and scope of my invention and I desire that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

I claim as my invention:

1. In an electrically-heated pad, heating means comprising a plurality of resistor circuits, a temperature-responsive circuit-interrupter connected in each circuit, another temperature-responsive circuit-interrupter connected in common to all of said circuits, and means for selectively energizing said resistor circuits and said first circuit-interrupters.

2. In an electrically-heated pad, the combination with a plurality of resistor circuits, each circuit being distributed substantially uniformly over the surface of the pad, and means for selectively energizing said resistor circuits, of an individual thermostat in each resistor circuit, and another thermostat connected in common with all of said resistor circuits, said common thermostat being located in spaced relation to said individual thermostats on the surface of said pad.

3. In a heating pad, the combination with electric terminals, a circuit comprising a plurality of resistance conductors and a high-resistance coil in series-circuit relation with a plurality of thermal cutouts, and a second circuit comprising a plurality of resistance conductors and an intermediate resistance coil in series-circuit relation with a plurality of thermal cutouts, of a master thermal cutout, and means for selectively connecting said circuits, through said master cutout, to said terminals.

4. In a heating pad, the combination with electric terminals, a circuit comprising a plurality of resistance conductors and a high-resistance coil in series-circuit relation with a plurality of thermal cutouts, and a second circuit comprising a plurality of resistance conductors and an intermediate resistance coil in series-circuit relation with a plurality of thermal cutouts, of a master thermal cutout, all of said thermal cutouts being located in spaced relation on the surface of said pad, and means for selectively connecting said circuits, through said master cutout, to said terminals.

5. In a heating pad, the combination with electric terminals, a plurality of resistance circuits and a plurality of thermostats in each of said circuits, of a master thermostat and means for selectively connecting

said circuits to said master thermostat and said electric terminals.

6. In a heating pad, the combination with electric terminals, a resistance coil distributed substantially uniformly over the surface of the pad, and manually operable means for connecting said resistance coil to said electric terminals, of a plurality of thermostats located at opposite ends of the surface of said pad and connected in series-circuit relation to said resistance coil.

7. In an electric heating pad, the combination with electric terminals, a plurality of resistance circuits, and a plurality of thermostats in each of said resistance circuits, the thermostats in each resistance circuit being located at opposite ends of a surface of said pad, of a master thermostat and means for selectively connecting said resistance circuits to said master thermostat and said electric terminals.

8. In an electric heating pad, the combination with electric terminals, and a plurality of resistance circuits, each of said resistance circuits comprising a plurality of resistance units and a plurality of thermostats located at opposite ends of a surface of said pad, of a master thermostat and means for selectively connecting said resistance circuits to said master thermostat and to the electric terminals and for connecting a part of each of said resistance circuits to said master thermostat and to the electric terminals.

9. In an electric heating pad, the combination with electric terminals, and a plurality of resistance circuits, each of said resistance circuits comprising a plurality of resistance units and a plurality of thermostats located at opposite ends of a surface of said pad, of a master thermostat, and means for selectively connecting said resistance circuits to said master thermostat and to the electric terminals and for connecting portions of all of said resistance circuits simultaneously to said master thermostat and to the electric terminals.

10. In an electric heating pad, the combination with electric terminals, a high-resistance circuits comprising a plurality of resistance coils, a thermostat set to interrupt the circuit at a low degree of heat and a circuit master-thermostat, a low-resistance circuit comprising a plurality of resistance coils, a thermostat set to interrupt the circuit at an intermediate degree of heat and a circuit master-thermostat, of a master thermostat common to both of said resistance circuits and set to interrupt the circuits at a high temperature, and a switch for connecting either the high-resistance circuit or the low-resistance circuit or portions of both circuits, in parallel, to said common master-thermostat and to said electric terminals.

11. In an electric heating pad, the combination with electric terminals, a high-resistance circuit comprising a plurality of resistance coils, a thermostat set to interrupt the circuit at a low degree of heat and a circuit master-thermostat, a low-resistance circuit comprising a plurality of resistance coils, a thermostat set to interrupt the circuit at an intermediate degree of heat and a circuit master-thermostat, of a master thermostat common to both of said resistance circuits and set to interrupt the circuits at a high temperature, both of the circuit master-thermostats being located at one end of said pad and the common master thermostat being located at the other end of said pad and a switch for connecting either the high-resistance circuit or the low-resistance circuit or portions of both circuits, in parallel, to said common master-thermostat and to said electric terminals.

12. In an electric heating pad, the combination with electric terminals and a plurality of resistor circuits, each circuit comprising a plurality of resistors of different resistances, and a plurality of thermostats set to open the respective circuits at different temperatures, of a master thermostat, and means for connecting any one of said circuits or portions of all of said circuits simultaneously to said master thermostat and to the electric terminals.

13. In an electric heating pad, the combination with electric terminals, a high-resistance circuit comprising a plurality of resistance coils, a thermostat set to interrupt the circuit at a low degree of heat and a circuit master-thermostat, a low-resistance circuit comprising a plurality of resistance coils, a thermostat set to interrupt the circuit at an intermediate degree of heat and a circuit master-thermostat, the resistance coils of both of said resistance circuits being located substantially symmetrically over the surface of said pad in a series of convolutions, of a master-thermostat set to open the circuits at a high temperature, all of said master thermostats being located in heat-receiving relation to both circuits, and a switch adapted to connect either the high-resistance circuit or the low resistance circuit or portions of both of said circuits simultaneously to said high-temperature master-thermostat and to the electric terminals.

14. In an electric heating pad, the combination with electric terminals, a high resistance circuit distributed substantially uniformly over the surface of the pad in concentric convolutions, a low-resistance circuit distributed substantially uniformly over the surface of the pad in convolutions alternating with those of the high-resistance circuit, and manually operable means for

selectively connecting said circuits to the electric terminals, of a thermostat in each of said circuits, a master-thermostat in each of said circuits, and a master-thermostat common to both circuits, each thermostat comprising a metal tube, a bi-metallic strip of substantially U-shape secured within said tube at one end thereof and an adjustable contact member insulated from, and secured within, said tube at the other end thereof.

In testimony whereof, I have hereunto subscribed my name this 13 day of Jany 1920.

GEORGE T. NEWELL, JR.