

Aug. 14, 1945.

G. C. HEINRICH

2,382,312

ELECTRIC HEATING PAD

Filed July 8, 1944

Fig. 1.

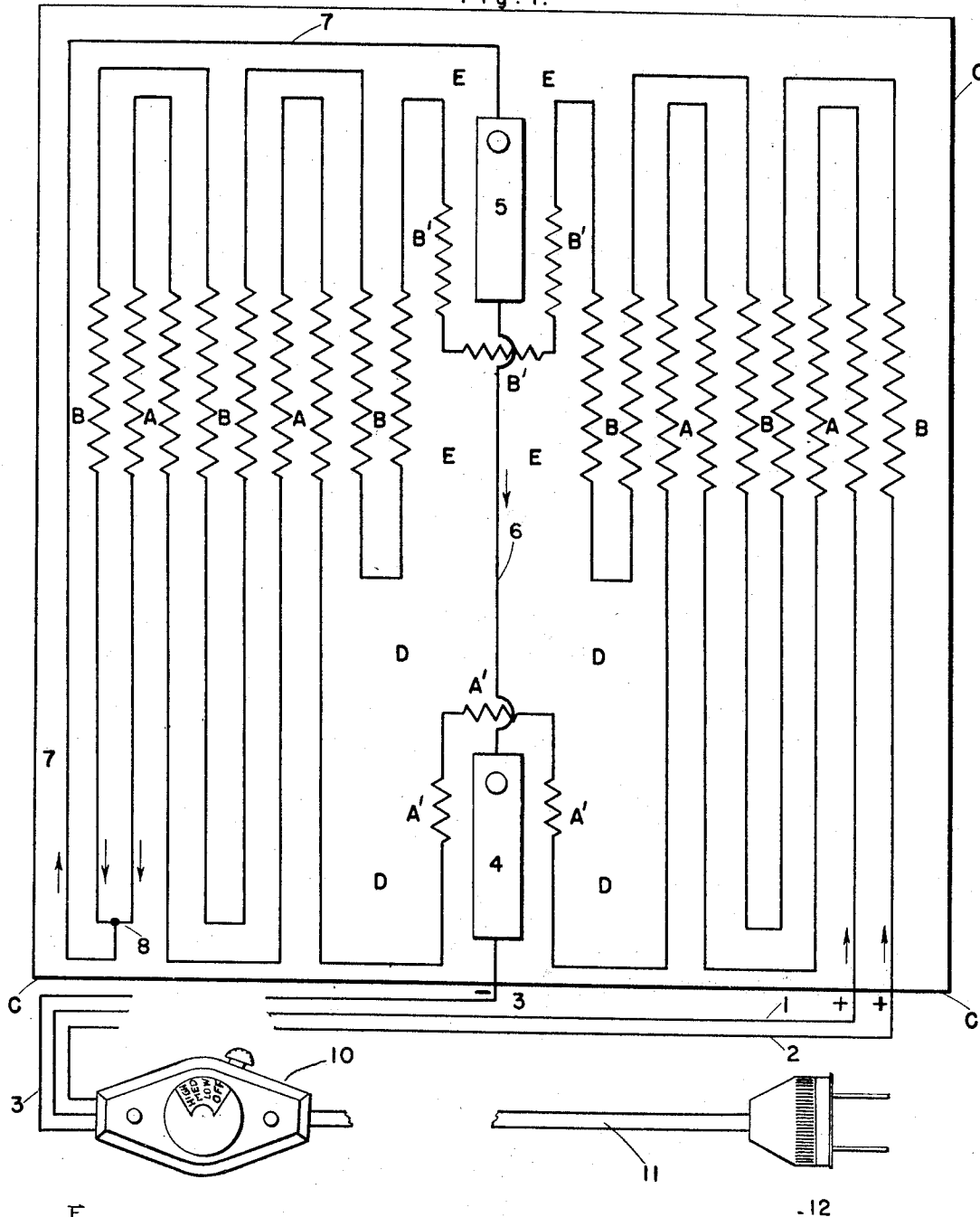
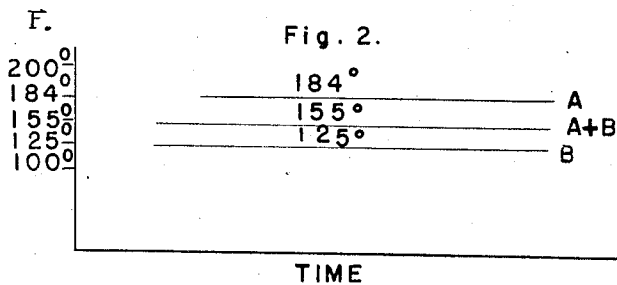


Fig. 2.



INVENTOR
George C. Heinrich

BY

Barth & Lyne *Keel & Montgomery*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,382,312

ELECTRIC HEATING PAD

George C. Heinrich, Meriden, Conn., assignor to
Manning, Bowman & Co., Meriden, Conn., a
corporation of Delaware

Application July 8, 1944, Serial No. 544,027

12 Claims. (Cl. 219—46)

This invention relates to electric heating pads and the like.

Electric heating pads have heretofore been proposed for giving and maintaining multiple definite ultimate heats as distinguished from mere speed in heating up but the prior structures with which I am familiar either fall short of the desired object or are not entirely satisfactory for other reasons or both.

One object of the invention is a novel and improved electric heating pad which is capable of maintaining a plurality of different definite ultimate heats and which is further characterized by the simplicity of its structure and design and the economy with which it may be manufactured.

Further objects of the invention will hereinafter appear.

For a better understanding of the invention reference may be had to the accompanying drawing forming a part of this application wherein,

Fig. 1 is a diagrammatic view of an electric heating pad embodying the invention; and

Fig. 2 is a graph illustrating the three ultimate heats obtainable with this embodiment of the invention.

Referring to the drawing, I have illustrated my invention as embodied in a conventional heating pad or the like C, the pad being rectangular in this particular embodiment. The pad is provided with a multiplicity of heating coils or resistance elements and in the particular embodiment shown there are two such heating elements A and B. The heating elements A and B comprise branches or loops running pretty nearly the full length of the pad C on either side thereof and alternating with each other. The heater A comprises on each side of the pad four elongated branches in two pairs and the heater element B has on either side three elongated branches extending approximately the full length of the pad and two shorter branches extending down to approximately midway the length of the pad, the latter half-length branches being disposed inwardly with respect to the other branches of the heating elements.

The heating elements A and B are adapted to be energized either individually and separately or simultaneously through a manual control 10, the latter being connected through a cord 11 with a plug connector 12 and controlling a pair of wires 1 and 2 leading respectively to one side of the heater elements A and B and a third or common wire 3 leading to a thermostat 4. The thermostat 4 is connected by a conductor 6 with

another thermostat 5 and the latter is connected by conductor 7 to the common connection 8 for the corresponding ends of the heater elements A and B. By this arrangement either of the heating elements A and B may be connected in circuit alone or both of them may be connected in parallel across the circuit.

The arrangement of the branches or sections of the heater elements A and B shown in Fig. 1 leaves a comparatively large space D which is unoccupied by the main branches or sections of the heater elements A and B, this unoccupied space being located centrally of the pad and at the lower end thereof. The thermostatic element 4 is disposed midway of the width of this unoccupied space D and in the lower part thereof. It is therefore not quickly responsive to the heating of the elongated branches or loops of the heater elements A and B on the sides of the pads but is provided with a short length of heater winding A' which forms a part of the heater element A and is in close heat exchange relation with this thermostat. This thermostat 4 is therefore sensitive to and quickly responsive to this short section A' of the heater element A.

The arrangement of the main branches or loops of the heater elements A and B also leaves a space in the upper half of the heating pad and midway thereof which is unoccupied by the main heater branches. This unoccupied space is denoted by the letter E and is of narrower lateral dimensions than the unoccupied space D due to the presence of the half-length branches or loops of the heater element B disposed between the innermost branches or loops of the heater element A and the center line of the pad. The thermostat 5 is located in this space E near the upper end of the pad and is disposed midway the width thereof. This thermostat 5 is disposed more closely to the inner half length of the heater element B than the thermostat 4 is to the main branches of the heater element A and is therefore more sensitive to the heat of the main branches B than the thermostat 4 is to the main branches A but the thermostat 5 is none the less still spaced some distance from the main branches of the heater B and accordingly is not immediately responsive to the heating thereof. The heater element B however is provided with a comparatively short length or section B' which is closely disposed to the thermostat 5 so as to be in quick heat exchange relation therewith and this thermostat is therefore sensitive to and quickly responsive to this section B' of the heater B. Also in the particular embodiment shown

the heater section B' which is disposed closely adjacent or about the thermostat 5 is substantially longer than the section A' of the heater A which is disposed about or closely adjacent the thermostat 4. In the particular embodiment shown the section B' is roughly twice the length of the section A' and the heater B is of greater wattage capacity than that of heater A.

The thermostats 4 and 5 are thus differentially affected by and responsive to the energization of the heater elements A and B, this differential action being due to the larger capacity of heater B, the section B' being longer than A', and to the closer physical relationship between thermostat 5 and sections of heater B. The thermostats 4 and 5 are connected in series with each other and the pad at all times, namely the full line current flows through each thermostat whether A or B is in circuit alone, or whether both A and B are in circuit.

With a pad of this structure I have found that three different definite, ultimate and substantially constant heats may be maintained in this pad, one definite ultimate heat being maintained by the energization of the heater element A alone, another definite and ultimate heat being maintained by the energization of the heater element B alone and a third and different ultimate heat being maintained by the energization of the elements A and B in parallel and simultaneously. For example, with the physical relationships shown between the thermostats, the main branches of the heater elements A and B and the heater sections A' and B', and with the section B' being roughly twice the over-all length of the section A' the pad can be designed and the thermostats adjusted to maintain an ultimate substantially constant heat temperature of around 180° to 190° F. with the energization of the heater element A alone, an ultimate heat temperature of around 120° to 130° F., with the energization of the heater element B alone, and around 150° to 160° F. with the energization of the heater elements A and B simultaneously in parallel across the circuit.

It is understood however that the pad may be designed to give different temperatures and different temperature ranges than those specified. The temperature maintained by either coil A or B alone varies generally inversely with the number of the heating coils about the corresponding thermostat and the proximity of the heating sections A' and B' to the thermostats also affects the temperature maintained. For example, increasing the length of the heating section A' or the positioning of the section more closely to the thermostat 4 would result in a decreased temperature maintained by the heater section A, A', and similarly with respect to the thermostat 5, the heater section B' and the heater B, B'. The inverse proportion between the number of turns of sections A' and B' and their proximity to their corresponding thermostats and the temperatures maintained is of course not in exact mathematical proportion but this rule applies generally. Putting it another way, for any given setting of the thermostats 4 and 5 the more coils B' there are placed near the thermostat 5 the lower the low heat would become for the whole heating pad, and assuming at the same time no change is made in the number of coils A' adjacent the thermostat 4, the high heat of the pad would remain the same but the medium heat for the pad, namely the heat obtained with both coils energized would be lower due to the increase of the coils of section

B' or to closer proximity thereof to the thermostat 5. Increasing of the number of coils A' or the positioning of these coils closer to the thermostat 4 would lower the high heat maintained, etc.

The temperatures maintained can be adjusted within limits by adjusting the thermostats 4 and 5. For example, all three heats would be subject to variation if both thermostats had a change of adjustment. Two heats would be affected if only one thermostat were changed in its adjustment.

The temperatures described above are average over-all temperatures of the pad and these temperatures of course would be affected if the pad were folded. The thermostat 4 is purposely placed at the central position where there are no elongated coils A so as to render this thermostat responsive or sensitive mainly to the few turns of coils A' which are closely associated with it. The same applies to the thermostat 5 although the thermostat 5 is not only surrounded by more turns (B') of the coil B but is actually disposed more closely to the principal coils B than is the thermostat 4 to the principal coils A. Generally the thermostat 4 is disposed at the coolest part of the pad while the thermostat 5 is disposed at the next coolest part of the pad except of course at the edges of the pad which may be expected to be as cool or even cooler than the points locations of the thermostats 4 and 5.

Fig. 2 shows a chart of the heats which I have actually obtained and maintained, namely the heats of 125°, 155° and 184° and this was effected with heater elements A and B having wattage capacities of 29 and 37, respectively, with the A element alone providing the 184° heat and the B element alone providing the 125° heat.

The pad temperatures here shown are the averages of temperatures taken at six different points distributed about the pad, and the thermostat 5 was set to operate at a lower temperature than thermostat 4.

The thermostats 4 and 5 function as regulating or "master" thermostats and may be of any conventional type, as for example, of the bimetal type, and they may be adjusted to give the desired heats in the pad. For the heats indicated in Fig. 2 the thermostats 4 and 5 were adjusted to operate at roughly 187° F. and 173° F. respectively.

As above described the heater element B is preferably of larger capacity than the heater element A although certain features of the invention are useful with no differential in capacity between the heating elements A and B. The invention is shown in a conventional heating pad where the sections or branches of the heaters A and B are arranged in elongated branches in one dimension with comparatively short sections connecting the elongated loops at the bottom and top of the pad. The invention of course is equally applicable to other conventional arrangements of heating coils, as for example where the multiple coils are arranged generally spirally of the pad with the spaces D and E reserved for the positioning of the thermostats 4 and 5 so as to render them mainly responsive to their particular sections A' and B'. In one such conventional heater pad the coils are arranged parallel to the sides of the pad, each heater coil following around the pad in a generally spirally direction. Also as above indicated, the differential effect of the heater sections A' and B' disposed about the thermostats 4 and 5 may be effected by disposing one section closer to its thermostat than the other

or by the difference in length of the sections, or by providing one of a higher wattage per inch of winding than the other, or by combination of two or more of these features. In the particular embodiment illustrated, the section B' is both longer than the section A' and has a higher wattage per inch of winding.

I claim:

1. In an electric heating pad, a pair of heater elements distributed about the heater pad so as to leave a zone unoccupied by the main sections of the heater elements, a pair of thermostats connected in series and displaced from each other centrally of the unoccupied zone of the pad, one of the said heater elements having a short section thereof which is in close heat exchange relation with one of said thermostats, a short section of the other heating element being in close heat exchange relation with the other of said thermostats, each of said heater elements being independently and individually connectible across a heating supply circuit and said heater elements being connectible in parallel across a heating supply circuit and said thermostats being in series with the circuit in all three alternative connections.

2. In an electric heating pad a pair of heater elements distributed about the heater pad so as to leave a zone unoccupied by the main sections of the heater elements, a pair of thermostats connected in series and displaced from each other centrally of the unoccupied zone of the pad, one of said heater elements having a short section thereof which is in close heat exchange relation with one of said thermostats, a short section of the other heating element being in close heat exchange relation with the other of said thermostats, each of said heater elements being independently and individually connectible across a heating supply circuit and said heater elements being connectible in parallel across a heating supply circuit and said thermostats being in series with the circuit in all three alternative connections, one of said thermostats having a greater length of its corresponding heater section in close heat exchange relation therewith than the other thermostat.

3. In an electric heating pad at least two heating elements distributed about the pad with means for connecting said heater elements individually in circuit or in parallel in circuit and a pair of thermostats spaced from each other so that each is substantially unaffected by temperature changes in the immediate vicinity of the other thermostat and one thermostat having a section of one heater element in close heat exchange relation therewith and the other thermostat having a section of the other heater in close heat exchange relation therewith and said thermostats being connected in series with each other and with the heating elements in each of the alternative connections of the heater elements.

4. In an electric heating pad a pair of heating elements having branches thereof which alternate with each other, said heating elements being distributed and concentrated along the side areas of the pad and being energized individually or in parallel, a thermostat disposed near the bottom of the pad midway between the concentrated branches of the heater elements on the sides of the pad so as to be only slowly responsive to the said branches of the heater elements, a second thermostat spaced from the first thermostat and disposed near the opposite end of the pad at a point midway between the said areas containing

the branches of the heater elements so as to be only slowly responsive to the heating of said side branches, said thermostats being connected in series with each other and with said heating elements, one of said thermostats having a portion of one of the heating elements closely disposed thereto so as to render the same quickly responsive to the heating current of said element, the other of said thermostats having a section of the other heater element closely disposed thereto so as to render said thermostat quickly responsive to the heating current flowing therein.

5. In an electric heating pad a pair of heating elements having branches thereof which alternate with each other, said heating elements being distributed and concentrated along the side areas of the pad and being energized individually or in parallel, a thermostat disposed near the bottom of the pad midway between the concentrated branches of the heat elements on the sides of the pad so as to be only slowly responsive to the said branches of the heater elements, a second thermostat spaced from the first thermostat and disposed near the opposite end of the pad at a point midway between the said areas containing the branches of the heater elements so as to be only slowly responsive to the heating of said side branches, said thermostats being connected in series with each other and with said heating elements, one of said thermostats having a portion of one of the heating elements closely disposed thereto so as to render the same quickly responsive to the heating current of said element, the other of said thermostats having a section of the other heater element closely disposed thereto so as to render said thermostat quickly responsive to the heating current flowing therein, one of said heater elements being of greater wattage capacity than the other and having a greater portion of the heater element disposed in close heat exchange relation with its thermostat than the section of the other heater which is disposed in close heat exchange relation with its thermostat.

6. In an electric heating pad a pair of heating elements having branches thereof which alternate with each other, said heating elements being distributed and concentrated along the side areas of the pad and being energized individually or in parallel, a thermostat disposed near the bottom of the pad midway between the concentrated branches of the heater elements on the sides of the pad so as to be only slowly responsive to the said branches of the heater elements, a second thermostat spaced from the first thermostat and disposed near the opposite end of the pad at a point midway between the said areas containing the branches of the heater elements so as to be only slowly responsive to the heating of said side branches, said thermostats being connected in series with each other and with said heating elements, one of said thermostats having a portion of one of the heating elements closely disposed thereto so as to render the same quickly responsive to the heating current of said element, the other of said thermostats having a section of the other heater element closely disposed thereto so as to render said thermostat quickly responsive to the heating current flowing therein, one of said heater elements being of greater wattage capacity than the other and having around two times the length of the section of the heater element disposed in close heat exchange relation with the thermostat than the section of the other heater which is disposed in close heat exchange relation with its thermostat.

7. In an electric heating pad a pair of heating elements having branches thereof which alternate with each other, said heating elements being distributed and concentrated along the side areas of the pad and being energized individually or in parallel, a thermostat disposed near the bottom of the pad midway between the concentrated branches of the heater elements on the sides of the pad so as to be only slowly responsive to the said branches of the heater elements, a second thermostat spaced from the first thermostat and disposed near the opposite end of the pad at a point midway between the said areas containing the branches of the heater elements so as to be only slowly responsive to the heating of said side branches, said thermostats being connected in series with each other and with said heating elements, one of said thermostats having a portion of one of the heating elements closely disposed thereto so as to render the same quickly responsive to the heating current of said element, the other of said thermostats having a section of the other heater element closely disposed thereto so as to render said thermostat quickly responsive to the heating current flowing therein, one of said heater elements being of greater wattage capacity than the other and having a greater portion of the heater element disposed in close heat exchange relation with the thermostat than the section of the other heater which is disposed in close heat exchange relation with its thermostat and also having inner branches extending approximately halfway the length of the pad.

8. An electric heating pad having two side zones and a central zone spacing the two side zones, at least two heater elements having sections thereof distributed throughout the two side zones, a thermostat for each of said heater elements disposed in said central zone, said thermostats being spaced both from each other to render each of them substantially non-responsive to the temperature immediately surrounding the other thermostat, said thermostats having sections of the heaters in close proximity thereto and each of the thermostats having a section of only one of the heaters in close juxtaposition thereto, said heater elements having internal connections providing for the series connection of the thermostats with each other and said heater elements, the latter being connectible either in parallel or individually in circuit.

9. An electric heating pad having two side zones and a central zone spacing the two side zones, at least two heater elements having sections thereof distributed throughout the two side zones, a thermostat for each of said heater elements disposed in said central zone, said thermostats being spaced both from each other to render each of them substantially non-responsive to the temperature immediately surrounding the other thermostat, said thermostats having sections of the heaters in close proximity thereto and each of the thermostats having a section of only one of the heaters in close juxtaposition thereto, said heater elements having internal connections providing for the series connection of the thermostats with each

other and said heater elements, the latter being connectible either in parallel or individually in circuit, the section of one heater element which is juxtaposed to its corresponding thermostat being of a different length from that in juxtaposition to the other thermostat.

10. In an electric heating pad at least two heating elements distributed about the pad with means for connecting said heater elements individually in circuit or in parallel in circuit and not more than two regulating thermostats spaced from each other so that each is substantially unaffected by temperature changes in the immediate vicinity of the other thermostat and one thermostat having a section of one heater element in close heat exchange relation therewith and the other thermostat having a section of the other heater in close heat exchange relation therewith and said thermostats being connected in series with the line and one of said thermostats having a substantially greater length of its corresponding heater in close heat exchange relation therewith than with respect to the other thermostat.

11. In an electric heating pad at least two heating elements distributed about the pad with means for connecting said heater elements individually in circuit or in parallel in circuit and not more than two regulating thermostats spaced from each other so that each is substantially unaffected by temperature changes in the immediate vicinity of the other thermostat and one thermostat having a section of one heater element in close heat exchange relation therewith and the other thermostat having a section of the other heater in close heat exchange relation therewith and said thermostats being connected in series with the heating elements in each of the alternative connections of the heater elements and one of said thermostats having a substantially greater length of its corresponding heater in close heat exchange relation therewith than with respect to the other thermostat, and said heater elements being of different wattage capacities with the larger capacity heater element having a longer section of its heater in close heat exchange relation with its corresponding thermostat than with respect to the smaller heater.

12. In a three-heat electric heating pad, two heating elements distributed about the pad and means for connecting said heating elements individually in circuit or in parallel in circuit, not more than two regulating thermostats spaced from each other, one thermostat having a section of one of said two heating elements in close heat exchange relation therewith, the other thermostat having a section of the other heating element in close heat exchange relation therewith, one of said two heating elements providing for the low heat with the other element out of circuit and the other of said heating elements providing for the high heat with the first-named heating element out of circuit and both said heating elements when connected in parallel providing for the medium heat.

GEORGE C. HEINRICH.