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K. L. WOODMAN

2,392,712

WARMING PAD

Filed Sept. 6, 1943

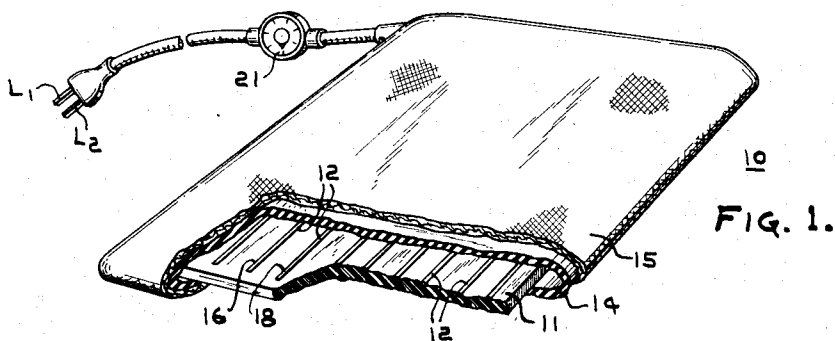


FIG. 1.

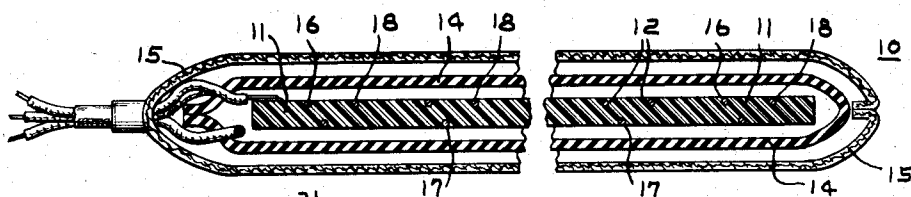


FIG. 2.

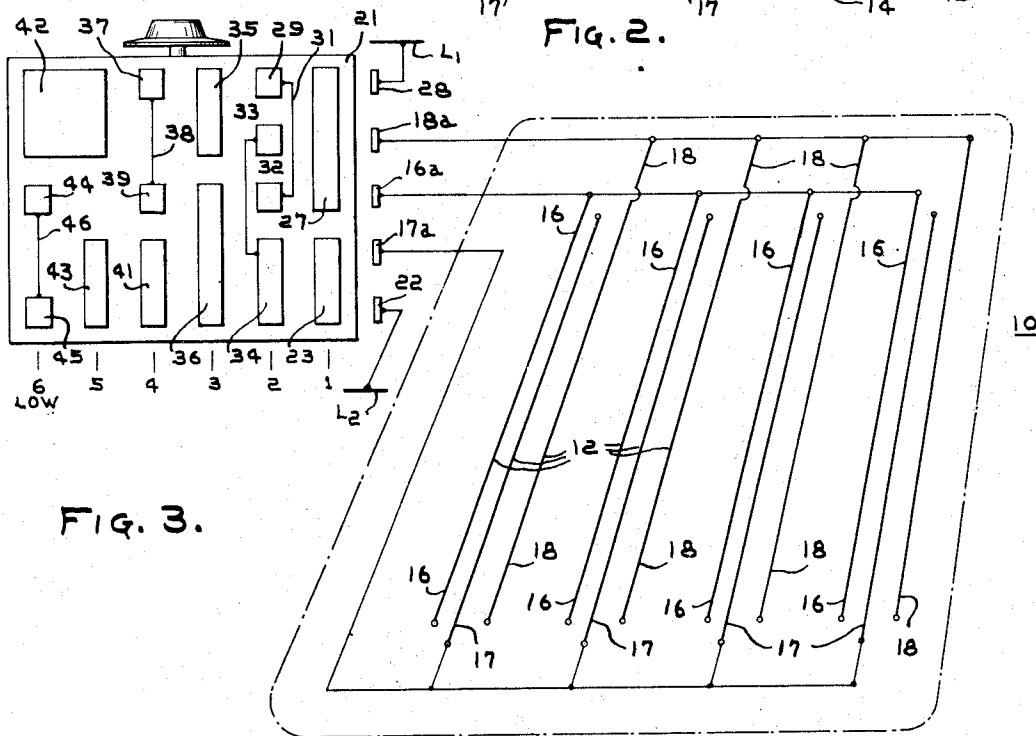


FIG. 3.

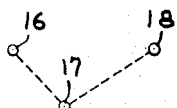


FIG. 4.
WITNESSES:

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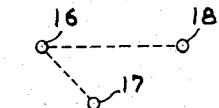


FIG. 5.

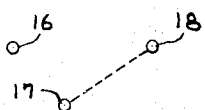


FIG. 6.

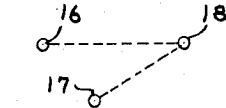


FIG. 7.

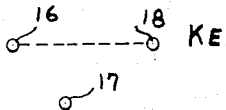


FIG. 8.

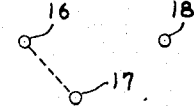


FIG. 9.

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2,392,712

WARMING PAD

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4 Claims. (Cl. 219—46)

This invention relates to electric heating or warming pads and more particularly to a warming pad having a flexible sheet-like heating element, and it has for an object to provide an improved device of the character set forth.

The present invention is an improvement over the invention disclosed and claimed in my Patent No. 2,340,097, issued January 25, 1944, and assigned to the assignee of the present invention.

In the mentioned prior patent, there is disclosed a warming pad comprising a flexible sheet-like, light-weight heating element made of an electrically-conducting rubber sheet member having conductors of opposite polarity mounted on opposite sides of the sheet member. Electrical energy flowing from one set of conductors on one side of the sheet to the other set of conductors on the opposite side of the sheet traverses the thin sheet rubber member and provides substantially uniform heating of the rubber sheet. In accordance with the teaching of my said patent, it is proposed to control the temperature of the warming pad by means of a thermostat which may be positioned adjacent to the heating element to control the flow of current through the conductors and the sheet rubber heating element in accordance with the heat demand required.

It is an object of the present invention to provide a heating or warming pad of relatively simple manufacture in which the heat output of the pad is varied by a simple selector switch.

In accordance with my present invention, it is proposed to provide three or more sets of electrical conductors which may be selectively connected to vary the resistance of the paths of flow of current traversing the sheet rubber body, and thereby vary the heat output of the pad.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a perspective view of a warming pad in which my invention is incorporated, a portion of the pad being broken away to better illustrate the details of construction;

Fig. 2 is a sectional transverse view of the pad illustrated in Fig. 1;

Fig. 3 is a diagrammatic view showing a preferred arrangement of the conductors in the pad, together with a schematic illustration of a switch that may be used to selectively connect the conductors to the supply source of electricity; and,

Figs. 4 to 9, inclusive, are diagrammatic illustrations of a group of three conductors, illustrat-

ing by dotted lines the paths of current flow through the rubber sheet heating element obtainable by the selector switch shown in Fig. 2.

Referring to the drawing, there is shown a warming pad, generally indicated 10, which comprises a relatively thin, flexible, sheet-like, electrically-conducting rubber heating element 11 having sufficient electrical resistance to provide heating and a plurality of conductors 12 mounted on or imbedded in the opposite surfaces of the heating element. These conductors are preferably made of strips or strands of tinfoil or the like, or any suitable low-resistance, electrically-conducting material which is flexible enough to provide the flexibility required of the heating pad.

The heating element 11 preferably comprises a rubber composition which embodies acetylene carbon black or other electrical-conducting blacks in the order of approximately 85 parts to 100 parts of rubber in accordance with the teachings of Bull et al., Patent No. 2,255,376. However, the heating element may be formed of any other suitable material and in any desired manner.

In the embodiment illustrated in the drawing, the flexible conductors 12 are arranged in the form of definitely spaced grids at the opposite surfaces of the rectangular-shaped heating element 11 and are preferably imbedded therein, as shown particularly in Fig. 2. This arrangement has the advantage of reducing the hazard of shock through accidental shorting of a conductor through the protective casing surrounding the heating element. The protective casing comprises a moisture-resistant, electrically-insulating bag-like cover 14 enclosing the heating element, and an outer covering of heavy cloth or fabric 15, enclosing the heating element 11 and insulating bag 14, and which provides a pleasing appearance and permits the warming pad to be used in direct contact with the human body in keeping with established practice.

While more may be used, three grids or sets of conductors 16, 17 and 18 are shown, two sets of conductors being secured to or imbedded in one surface of the heating element, and the third set attached to the other surface, with the conductors of the sets in substantially parallel relation. The conductors are preferably arranged as shown, so that a conductor of each set together with a conductor of each of the other sets forms a group, as illustrated in Figs. 2 and 4 to 9, inclusive. The conductors of each group are spaced so that the length of the path of the current flow through the heating element 11 be-

tween the conductors is different, whereby the resistance of the path of flow through the rubber body heating element is different. Thus, by connecting the different sets of conductors to supply conductors of opposite polarity, different degrees of heating of the warming pad are obtained. While the invention is not limited thereto in the arrangement of the groups shown in the drawing, the ratio of the distance between conductors 16—17, 17—18, and 16—18 is 2 to 3 to 4, respectively.

While three sets of conductors have been shown, it is to be understood that any desired number may be employed, depending on the number of heats desired. However, it is believed that three conductors which may be connected, as will hereinafter be explained, to provide at least six different heats, will be sufficient since in general practice probably three or four heats only will be required.

Referring now to Fig. 3, the three sets of conductors arranged with their conductors in individual groups are shown together with a drum switch 21. The drum switch 21, shown schematically in developed form, is adapted to connect the conductors selectively to opposite sides of a supply source indicated L₁ and L₂.

In Fig. 3, the switch 21 is set at "off," all three of the conductors being disconnected from the supply line conductors L₁ and L₂. The different positions of the switch providing six heats are identified by characters 1 to 6, inclusive, immediately below the switching segments associated with these positions to provide the proper circuit connections to give the desired heat.

By turning the switch to bring the switch segments of position 1 into engagement with the fixed switch contacts shown to the right of the drum 21, a circuit is completed from supply line conductor L₂, contact 22, segment 23 to contact 17a and conductor set 17. From the conductor set 17, the current branches and traverses the rubber sheet to conductor sets 16 and 18, as shown in Fig. 4, providing the highest degree of heat in the rubber sheet. From the conductor sets 16 and 18, the current flows to contacts 16a and 18a, respectively, to segment 27, contact 28 to the other side L₁ of the supply line.

Position 2 of the switch completes a circuit from supply line conductor L₁, contact 28, segment 29, bridging conductor 31, segment 32 to contact 16a of conductor set 16. The current divides at the conductor set 16 and flows through the rubber sheet along the paths shown by dotted lines in Fig. 5, to conductor sets 17 and 18. From the conductor sets 17 and 18, the current flows to contacts 17a and 18a, respectively, which engage electrically-connected segments 33 and 34, respectively, and from segment 34 to contact 22, completing the circuit to the other side L₂ of the supply line.

Position 3 of the switch completes a circuit from supply line conductor L₁, contact 28, segment 35, contact 18a of the conductor set 18. The current divides, as shown by the dotted lines in Fig. 6, and flows from conductor set 18 through the rubber sheet to conductor sets 16 and 17, and from these two sets of conductors flows through contacts 16a and 17a to segment 36, contact 22 to the other side L₂ of the supply line.

On turning the switch to position 4, a circuit is completed from supply conductor L₁ to fixed contact 28, conducting segment 37, which is electrically connected by wire 38 with conducting segment 39, in engagement with contact 16a of

conductor set 16. The current from conductor set 16 traverses the rubber heating element to the conductor set 17, contact 17a to the switch segment 41 in engagement with contact 22 to supply line conductor L₂. In position 4 of the switch, a circuit is completed in which the current traverses the rubber sheet from conductor 16 to conductor 17, as shown by the dotted line in Fig. 7.

On turning the switch to position 5, a circuit is completed from supply line conductor L₁, contact 28, segment 42, contact 18a of conductor set 18 through the rubber body to conductor set 17, contact 17a, segment 43, contact 22 to supply line conductor L₂. The path between conductor set 18 and conductor set 17 is shown by a dotted line in Fig. 8.

On turning the switch to position 6, a circuit is completed from supply line conductor L₁, contact 28, segment 42, contact 18a, conductor set 18, contact 16a, switch segment 44 to segment 45 through the conductor 46, contact 22 to the other side L₂ of the supply line. The current flows along a path represented by the dotted line in Fig. 9 between conductor sets 18 and 16 providing the lowest degree of heat in the rubber sheet.

From the above description, it will be understood that any one of six heat outputs may be obtained by setting the switch at any one of the positions from 1 to 6, and that no thermostat is required to control the heat output of the warming pad.

While not necessary, it may be desirable as a safety measure or requirement to employ a temperature-limiting thermostatic switch responsive to the temperature of the pad, and which may be inserted in either or both of the supply line conductors L₁ and L₂ to open the supply circuit in the event the pad exceeds a maximum safe temperature.

While but one arrangement of the conductors has been shown, other arrangements will occur to those skilled in the art and the invention is not to be construed as limited to the arrangements shown.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. A warming pad comprising a single flexible sheet-like heating element made of electrical resistance material, at least three conducting members embedded in said heating element and spaced relative to each other, the spacing between at least one of said conducting members and the other two conducting members being different to provide paths of flow of current through said heating element of different lengths, and means for selectively connecting said conducting members to opposite sides of a supply line to provide different degrees of heating in said heating element by selection of a path or paths of flow of current through said heating element between said conducting members.

2. A warming pad comprising a flexible sheet-like heating element made of electrical resistance material, a pair of spaced electrical conductors attached to one surface of said heating element,

a third electrical conductor spaced from said pair of conductors and attached to the opposite surface of said heating element, the spacing of said third conductor from each conductor of said pair being different to provide paths of flow of current through said heating element of different resistance, and means for selectively connecting said conductors to opposite sides of a supply line to provide different degrees of heating in said heating element by selection of a path of flow of current through said heating element between said third conductor and a conductor of said pair.

3. A warming pad comprising a flexible sheet-like heating element made of electrical resistance material, a pair of spaced electrical conductors imbedded in said sheet-like heating element adjacent one surface thereof, a third electrical conductor imbedded in said heating element adjacent the opposite surface thereof, each conductor

being spaced different distances from the other two conductors to provide paths of flow of current of different lengths through said heating element, and switch means connectible to a source of electricity, said switch means being adapted to selectively connect two of said conductors to opposite sides of said source, or a pair of said conductors to one side and another of said conductors to the other side of said source of electricity to provide different degrees of heating in said heating element.

4. The structure recited in claim 3 in which said switch and said conductors are so constructed and arranged that said switch may connect any one of said conductors to one side of the source of electrical energy and either one or both of the remaining conductors to the other side of said source.

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