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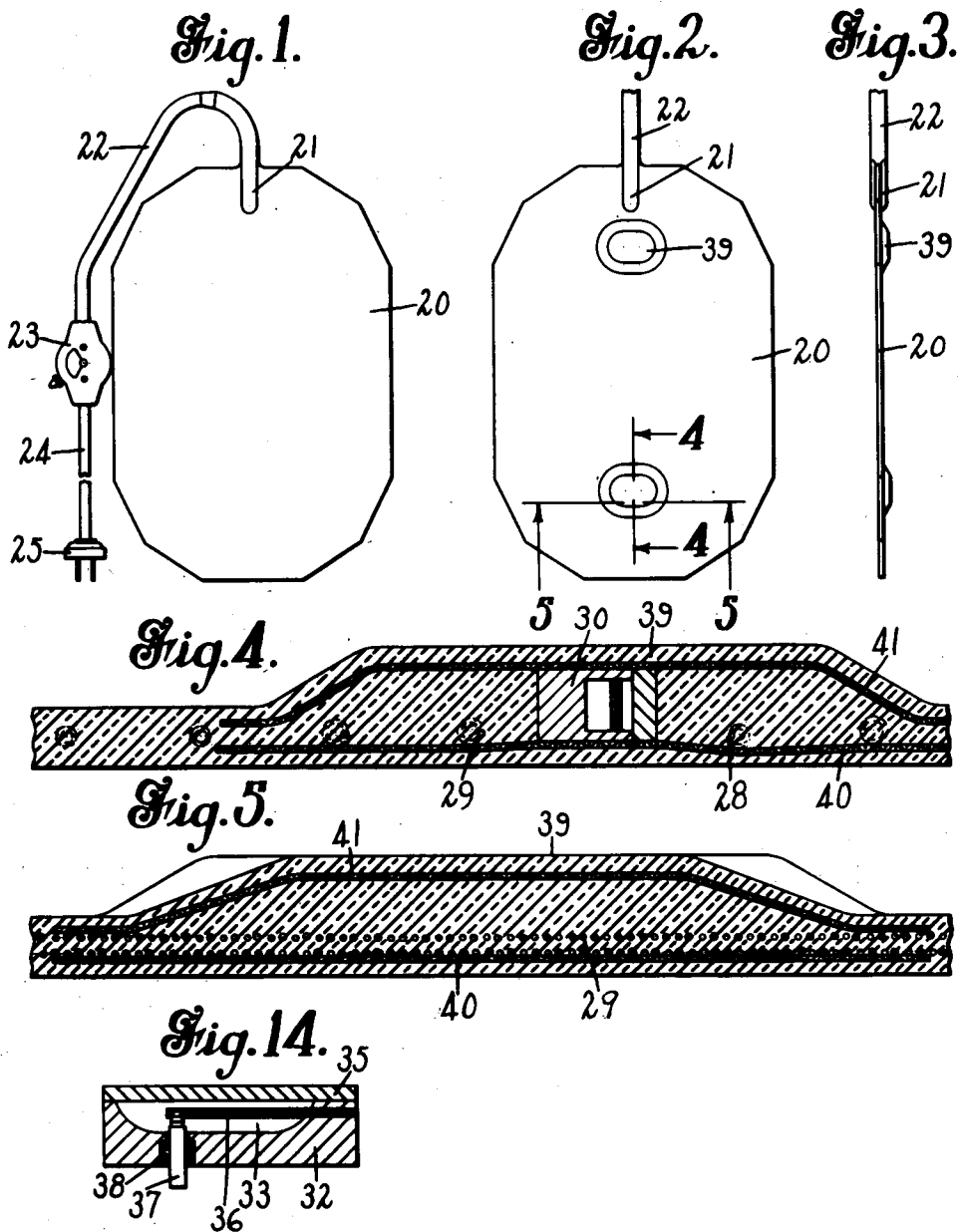
W. W. DE LANEY ET AL

2,018,512

ELECTRIC HEATING PAD

Filed June 30, 1931

3 Sheets-Sheet 1



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Fig. 6.

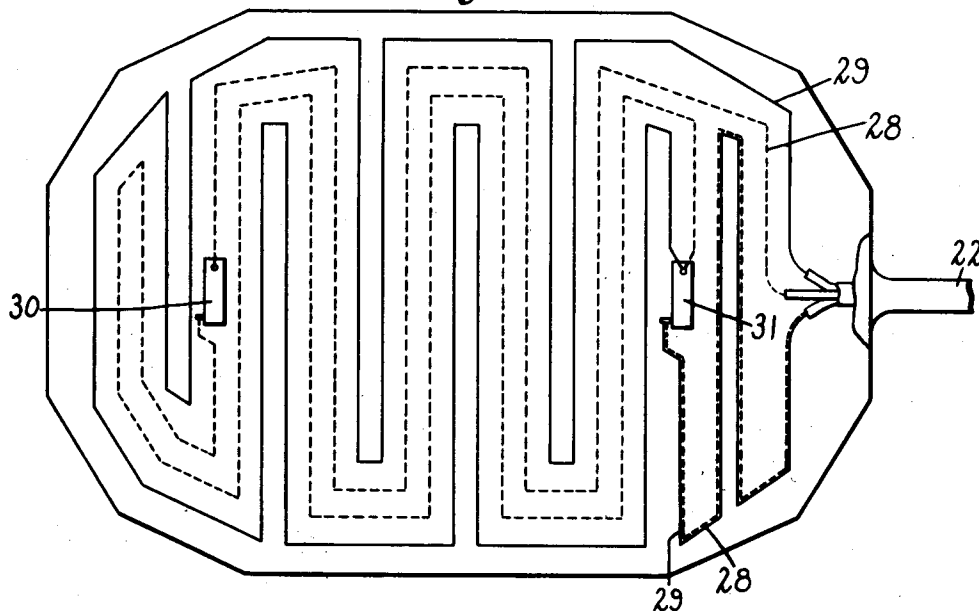


Fig. 15.

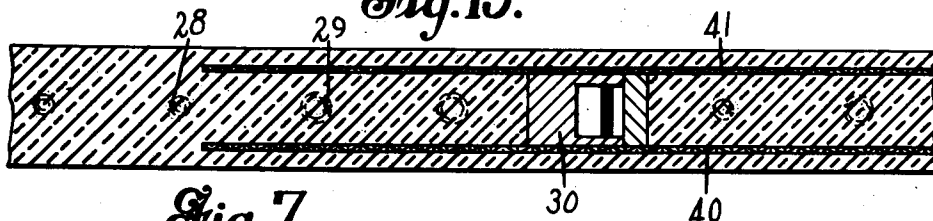
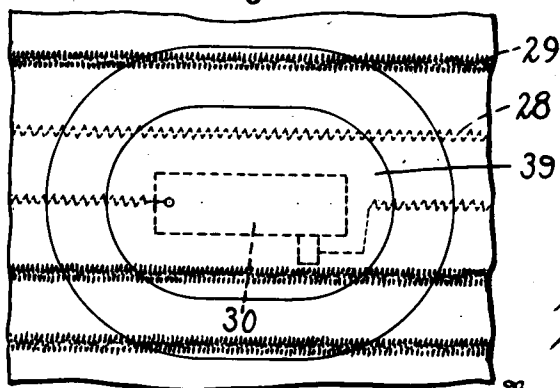


Fig. 7.



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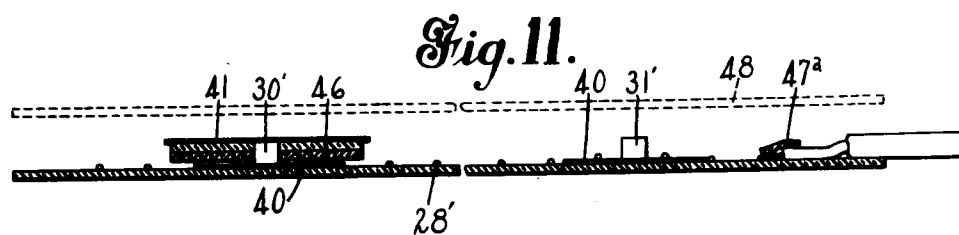
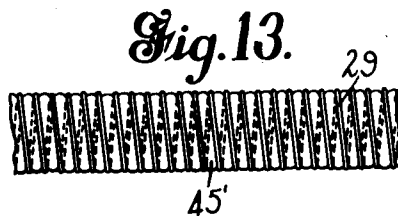
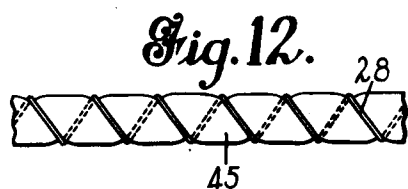
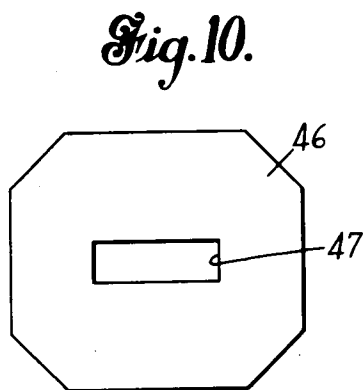
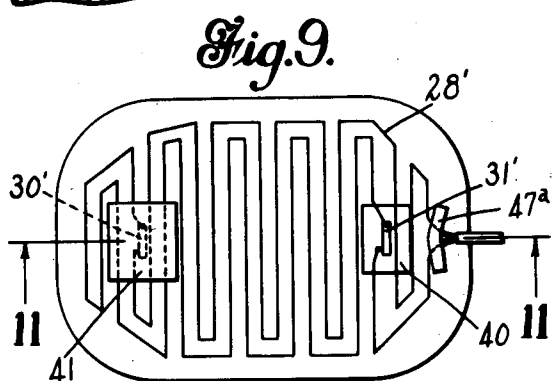
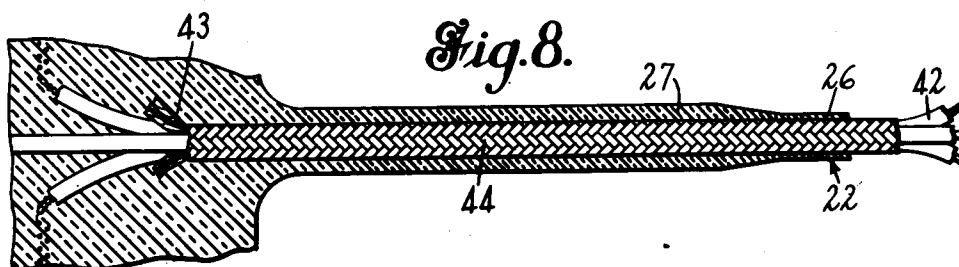
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ELECTRIC HEATING PAD

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,018,512

ELECTRIC HEATING PAD

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Application June 30, 1931, Serial No. 547,910

25 Claims. (Cl. 219—46)

This invention relates to electric heating pads such as used in homes and hospitals.

One of the objects of our invention is to provide a pad having a casing of rubber or like plastic insulating material so that it is moisture proof and can be used with damp cloths for providing a moist heat and can be easily cleansed and kept in a sanitary condition, and which is in the form of a sheet which is very thin and has maximum flexibility so that it may be readily conformed, if desired, to the body, head or limbs of the user in order to obtain the most efficient results. Notwithstanding the provision of these advantages we aim to furnish, in addition, a pad having sufficient heating capacity for the purposes in view, in which the heating coil or coils are under proper thermostat control so that the appliance will be entirely safe to use, and to embody these features in a structure which can be manufactured readily and at comparatively low cost.

To these and other ends, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a face view of a heating pad constructed in accordance with our invention;

Fig. 2 is a view of the opposite face of the pad with the conductor cord broken away;

Fig. 3 is an edge view;

Fig. 4 is a section enlarged beyond actual size and taken on line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 2;

Fig. 6 is a diagrammatic view of the electrical circuits which may be used;

Fig. 7 is a fragmentary plan view of the pad, showing some of the parts illustrated in Fig. 4;

Fig. 8 is a fragmentary sectional view of the cord-attached end of the pad;

Fig. 9 is a plan view of a partially completed pad having a somewhat different arrangement of heating circuit;

Fig. 10 is a detail of one of the rubber fillers used in building up the thermostat enclosing structures;

Fig. 11 is an enlarged section on line 11—11 of Fig. 9, illustrating the process of making the pad;

Figs. 12 and 13 are detail views of the cored resistance elements such as used in the form illustrated in Figs. 1, 2 and 3;

Fig. 14 is a sectional view of a thermostat, and

Fig. 15 is a fragmentary longitudinal section,

similar to Fig. 4, but showing a modified construction.

In Figs. 1, 2 and 3 we have shown the preferred exterior shape or configuration of our heating pad, which is in the form of an elongated approximately elliptical sheet 20 of plastic electrical insulating material, preferably rubber. This sheet which may conveniently be about twelve or thirteen inches long, is characterized by its thinness and great flexibility. As a result of the improvements hereinafter described, we can successfully construct rubber pads having a thickness of one-eighth of an inch or thereabouts in most of their area, and this is a feature of considerable advantage because it provides a structure which can be readily flexed so as to conform the pad to the body or head of the user, or so as to wrap or fold it about an arm or leg.

At one end of the pad is attached at 21 a moisture proof conductor cord 22, leading to an ordinary temperature-controlling switch 23, and from the switch 23 the customary heater cord 24 leads to an attaching plug 25.

The covering 26 of the conductor 22, which is preferably made of rubber, is increased in thickness adjacent the end of the pad, as shown at 27 in Fig. 8. The thickened wall 27 of the conductor is integrally joined with the body or sheet portion of the pad.

In the form shown in Figs. 1, 2 and 3, the rubber body or sheet contains heating resistances which are in the form of wire helices embedded centrally in the sheet and extending across the same in spaced parallel relation substantially throughout the length of the sheet. The coils may be of round cross-section, as shown, or they may be of elliptical or other suitable cross-section. Fig. 6 shows diagrammatically the circuits which we prefer to employ in a pad whose switch is adjustable to give three different degrees of heat, namely, low, medium and high. In this view, the dotted line 28 indicates the "medium heat" resistor, which can be appropriately constituted by a wire having its turns of relatively small diameter and considerably spaced from each other, as shown in Fig. 12. In Fig. 6, 29 indicates a "low heat" resistor such as shown in Fig. 13, and it will be observed that in this case the turns of the wire are of a greater diameter and are more closely spaced so that when a given length of the wire is traversed by the current, less heat will be generated than in the case of the medium heat wire. It will be observed from Fig. 6 that the medium heat wire 28 passes from one of the three conductor terminals in a num-

ber of reaches or spaced parallel portions to a thermostat 30, located near the remote end of the pad, and continues on from this thermostat back to the thermostat 31, located near the opposite end of the pad. On the other hand, the low heat wire 29 leads from another terminal of the conductor, by a number of spaced parallel portions, to the opposite end of the pad, then back toward the first end, where it is connected to the thermostat 31. From the thermostat 31 the resistors 28 and 29 lead back in multiple connection to the third terminal of the conductor. The switch 23 is adapted to cut in either the low heat circuit or the medium heat circuit, or both, and in the latter case the adjustment is for high heat.

A suitable thermostat is shown in detail in Fig. 14. Such a thermostat has a steel body 32 in the form of a block having an inner cavity 33, covered by a steel lid or cap 35, which conforms closely to the body and may be conveniently soldered to the body. The cap 35 when placed in position effectively seals the hollow block against the entrance of any exterior substance, such as rubber. Anchored in the block 32 and projecting into the cavity 33 is an ordinary bi-metallic thermostat bar 36 adapted to cooperate in the usual way with a contact member 37, insulated from the block by insulation 38, and having a projecting portion to which a resistor element or wire may be readily connected as by soldering. These thermostats are embedded in our sheet rubber pad body, and in the form shown in Figs. 1, 2 and 3, where it is desired to use a minimum amount of rubber in the pad body consistent with satisfactory results, those portions of the body which contain the thermostats 30 and 31 are somewhat raised from the plane of the sheet on one side, so as to create projecting portions 39 in the nature of bosses, which securely enclose and protect the thermostat devices. These bosses are preferably of generally elliptical shape, as shown in the drawings, and have flat tops and gently sloping sides. In other words, this construction provides a thermostat-enclosing portion at one face of the sheet, which merges into the remainder of the sheet and so no abrupt shoulders or projections are presented. As shown in Fig. 4, the thermostat 30, which is of rectangular cross-section and somewhat elongated, lies on its side in a correspondingly shaped chamber in the body of the sheet between one of the medium heat resistors 28 and one of the low heat resistors 29 which in this particular case are embedded in the rubber in a plane approximately in line with the lower face of the thermostat body. Below the thermostat and underlying the resistors within the thermostat enclosing boss is a piece of rubberized fabric 40, embedded in the rubber and having its fabric face lowermost. This piece of fabric may be of substantially square shape but its shape is not particularly important. A similar rubberized fabric piece 41 overlies the thermostat in the boss or protuberance 39, being embedded in the rubber adjacent the upper face of the rubber sheet or body, as viewed in Fig. 4, and at its margins this fabric piece 41, which has its fabric face uppermost, is inclined downwardly so as to conform to and follow the inclined marginal portion of the boss.

The conductor cord 22 is, in this form, provided with three separate conductors and each conductor is enclosed in a rubber covering 42, as shown in Fig. 8. If desired, each conductor

may be covered with an asbestos covering in addition to the rubber covering 42. Between these conductors a filler 43 of cotton or the like is placed. Over this filler is a suitable braid 44, such as a cotton braid. The rubber covering or neck 27, which is of considerable thickness as above described, extends substantially beyond one end of the pad body and to this portion the thinner rubber wall portion 26 of the conductor cord is integrally joined. As a result, it is possible with the particular pad illustrated, to project the pad body into water and also that portion of the conductor extending up to the switch, without any moisture getting into the pad or the conductor cord leading thereto.

In Fig. 9 we have shown a modified form of heating pad in which the body is constructed substantially in the manner previously described but in which a single resistor is employed. This resistor may, for example, be of the kind shown in Fig. 12, that is, it may be constituted by a resistor 28' similar to the resistor 28 previously described. In this case, the resistor is led back and forth in reaches or stretches which are fairly close to each other and extend substantially from one end of the pad to the other. Thermostats 30' and 31' similar to those previously described are used in this case, one of these being interposed in the circuit near one end of the pad and the other being interposed in the circuit near the other end. It will be understood that in this case the two thermostats are used in series so that one constitutes a check upon the other. It will further be understood that various alternative circuit arrangements may be employed as desired, those shown herein being merely by way of example. It will be obvious, of course, that in the example shown in Fig. 9, the cord or cable attached to the pad is a two-conductor cord. It is, however, connected to the pad in substantially the same manner as the cord or cable 22.

In manufacturing a pad such as we have described, the procedure is substantially as follows. Two sheets of unvulcanized rubber conforming generally to the desired final contour, which may have a thickness of, say, one-sixteenth of an inch, are provided. Upon the face of one of these sheets, resistor and thermostat parts are assembled in the manner generally indicated in Fig. 9. Where the single resistor circuit is to be employed, the wire is placed upon the upper surface of the sheet in parallel lines or reaches substantially as shown in Fig. 9. First, however, the pieces 40 of rubberized fabric are placed in position and the resistor wire has certain of its reaches placed across these pieces. When the resistor wire is placed in position upon the sheet it is provided with a core. We prefer to make the core of rubber, either uncured or only partially cured, the fine resistor wire being wound helically upon the rubber core. In practice, the rubber core for the resistor 28', which core is indicated at 45 in Fig. 12, may have a diameter of, say, three sixty-fourths of an inch. The resistor 29 used in the form of pad shown in Fig. 1 has a similar rubber core 45' (Fig. 13), which may have a diameter of, say, one-sixteenth of an inch. The wire itself may be No. 32 B & S gauge in each case. The helically wound wire having its interior rubber core may be arranged in proper formation upon a suitable board or the like, and may have naphtha applied to it so that upon pressing the rubber sheet down upon the wire the sheet will pick up the wire and there-

after the wire-covered face of the sheet can be arranged uppermost, as shown in Fig. 9. The thermostats are then interpolated in the circuit and placed on the fabric pieces 40, and around each of the thermostats two rubber pieces or fillers 46 are placed, these fillers having rectangular openings 47, shaped to conform closely to the thermostat body. Then, upon each uppermost rubber piece 46 is laid a fabric piece 41, with its fabric face uppermost. The conducting cord, which at this time is already supplied with a rubber covering extending substantially to its inner end, is laid upon the upper surface of the sheet near one end and its terminals spread apart and connected with the resistor or resistors, as the case may be, and the cord is temporarily held in place by means such as a rubber strip 47^a extending over its rubber cover and cemented to the upper face of the sheet.

The lower sheet structure having been thus prepared and carrying on its upper face the various parts as shown, for example, in Figs. 9 and 11, the upper rubber sheet, which is indicated by the dotted lines at 48 in Fig. 11, is laid upon the lower sheet. The article is then placed in a metal mold, such as required to form a body of the shape shown, an additional amount of rubber being placed on a portion of the conductor cord which projects out, say, a few inches beyond the end of the sheet. The mold and its contents are then heated in the usual manner and the two plates of the mold pressed together under very heavy pressure so as to produce the completed wire-containing sheet having a neck portion enclosing and integrally joined to the rubber-covered conductor cord. By molding rubber around the rubber-covered conductor the pad is provided with a relatively thick neck portion which gives great strength to the connection between the cord and the pad and enables it to withstand the twisting and bending strains to which it is subjected.

In the molding operation the material of the sheets and the material of the resistor core or cores are flowed together into an integral structure and the cores extend between the turns of the coils and are joined in one piece with the surrounding body of rubber.

In molding the body of the pad, a very high pressure is used, for example, 2000 pounds to the square inch. It is, therefore, of the utmost importance that this pressure be prevented from destroying or injuring any of the metallic parts used in the construction of the pad. We have been able to meet the requirements by providing a rugged thermostat block which is constructed of steel so as to withstand this high pressure, and which additionally is so constructed as to prevent the rubber from entering the interior of the thermostat during the molding operation. Ordinarily, the molding pressure would be sufficient to flow the rubber into the interior thermostat chamber and thereby render the thermostat inoperative, but in our construction the thermostat block is sealed against the entrance of the rubber and the greater the pressure exerted in the molding operation the closer will be the fit between the cap portion of the thermostat and the body thereof.

In some cases we find it desirable in assembling the parts to place one of the rubber pieces 46 in position on each underlying piece of rubberized fabric before the resistance wires are placed in position on the lower sheet, and to run the wires over the upper surface of the piece 46 instead of

between this piece and the piece 40, as shown in Fig. 11. The thermostat will then be connected to the wires and laid in its recess or pocket in the piece 40, and the remaining steps will be as previously described. It will be understood that if we proceed in this manner some or all of the reaches of coiled wire in the thickened portion of the pad adjacent each thermostat will be located approximately centrally of the thickened portion instead of to one side of the center, as shown in Fig. 4.

In Fig. 15 we have shown a modified form of pad having a similar resistor and thermostat arrangement to that described in connection with the form of Fig. 1, but wherein the body of the pad is of increased thickness. This particular form of pad is suitable for hospital use, where a somewhat more rugged type of construction is desirable, and in this case the thermostats are located substantially in the median plane of the body instead of being offset from such plane, as in the form first described.

During the molding of the parts as described, vulcanization takes place in the usual manner.

It will be observed that in our heating pad as herein described the resistor structure comprises a plurality of fine coils of helical formation, which coils are of substantially round cross-section, preferably with their longest reaches or stretches disposed transversely to the lengthwise axis of the pad body and running substantially parallel to each other. These coils are not only embedded in the body of the pad, but in the completed pad are provided with interior rubber cores which give them effective internal support and properly space the turns for insulation purposes, such rubber cores in the completed article being integral with the outer body of rubber which encloses the coils.

Various changes may be made in the details of the construction and in the process of making the pad without departing from the scope of our invention as defined in the claims.

What we claim is:

1. A heating pad comprising a plastic sheet, a resistor structure embedded in the sheet and comprising a hollow coil, and a plastic core within the coil, said coil being of helical formation and said plastic core being integrally joined with the body of the sheet.
2. An electric heating pad comprising a rubber sheet and a plurality of hollow resistor coils embedded in the sheet and having rubber in the interior thereof integrally joined with the surrounding rubber of the sheet, said coils being of substantially round cross-section.
3. A heating pad comprising a thin elongated rubber sheet, heating coils disposed substantially parallel to each other transversely to the longitudinal axis of the sheet and embedded in the sheet, each coil being of substantially round cross-section and formed as a helix and having its axis disposed substantially in the plane of the sheet, and rubber cores in said coils extending out of the same between the turns and integrally joined with the surrounding material of the sheet.
4. A heating pad comprising a thin elongated rubber sheet, heating coils disposed substantially parallel to each other transversely to the longitudinal axis of the sheet and embedded in the sheet, each coil being of substantially round cross-section and formed as a helix and having its axis disposed substantially in the plane of the sheet, rubber cores in said coils extending out of the same between the turns and integrally joined

with the surrounding material of the sheet, and a thermostat embedded in the sheet and connected with one of said coils.

5. A heating pad comprising a rubber sheet, a resistor embedded therein, and a thermostat embedded in the sheet and connected to the resistor, said sheet having a boss at one face forming a part of the enclosing structure of said thermostat, said thermostat being interposed between the outer face of said boss and the outer face of the sheet in that portion where the boss is located.

6. A heating pad comprising a thin rubber sheet, a resistor embedded therein comprising a plurality of helices of fine wire disposed substantially parallel to each other, a thermostat embedded in the sheet and connected to the resistor, a rubber neck integral with the sheet at one end thereof, a conductor extending inwardly through said neck and enclosed thereby and connected with said resistor, and a rubber covering for an external portion of said conductor integrally joined with said rubber neck, said neck having a wall of greater thickness than said covering and gradually merging with said covering.

7. An electric heating pad comprising a sheet of plastic electrical insulating material, a helical resistor coil embedded in the sheet, and a core of plastic electrical insulating material interiorly supporting the coil and integrally joined with the material of the sheet in the intervals between the turns of the coil.

8. A heating pad comprising a rubber sheet, a resistor wire embedded in the sheet, and a thermostat embedded in the sheet in the plane of the resistor wire and connected with the resistor wire, said thermostat comprising a small hollow rectangular block having a thermostat bar therein, and a cover plate extending along one side of the block and sealing the same against the inflow of rubber.

9. A heating pad comprising an elastic sheet, a resistor coil embedded in the sheet and having a plurality of convolutions, and a thermostat in one of said convolutions embedded in the sheet comprising a hollow rectangular block having a recess therein at one side thereof, a thermostat bar in said recess, and a cap plate at the side of the block closing said recess.

10. A heating pad comprising a rubber sheet, a resistor wire embedded in the sheet and thermostats embedded in the sheet and connected with the resistor wire, said sheet having bosses projecting from the face thereof in the regions where the thermostats are located.

11. A heating pad comprising a rubber sheet, a resistor wire arranged in convolutions extending transversely of the sheet, and thermostats connected with said resistor wire and embedded in the sheet at points located toward the respective ends of the sheet, said sheet being thickened in those regions where said thermostats are located.

12. A heating pad comprising a rubber sheet, a resistor embedded in said sheet in convolutions extending transversely thereof and comprising sections arranged to create different degrees of heat, and thermostats connected with the resistor and embedded in the sheet on opposite sides of the center thereof, said sheet having tapering bosses projecting from the face thereof in those locations where the thermostats are embedded.

13. A heating pad comprising a plastic sheet, a resistor wire embedded in the sheet and arranged in convolutions therein, and a thermostat

embedded in the sheet and connected with the resistor wire, said sheet having a boss projecting from one face thereof in the location in which said thermostat is embedded.

14. A heating pad comprising a plastic sheet, a resistor wire embedded in the sheet and arranged in convolutions therein, and a thermostat embedded in the sheet and connected with the resistor wire, said sheet having a boss projecting from one face thereof in the location in which said thermostat is embedded, said boss having a slanting side surface.

15. In a heating pad, the combination with a pad body of rubber, of a resistor embedded in the body and arranged in convolutions therein, and a pair of thermostats embedded in the body in different locations, one thermostat being located toward one end of the pad and the other toward the opposite end, said resistor comprising a heating section connected with one thermostat only, another heating section of different degree connected with both thermostats, and a duplex return section leading out of the pad from one of the thermostats.

16. A heating pad comprising a thin elastic sheet, a resistor embedded in said sheet and comprising resistor wires passing back and forth in convolutions arranged transversely of the sheet, and thermostats connected with the wires and embedded in the sheet and located respectively toward opposite ends of the sheet, said thermostats being substantially in the plane of said convolutions and located between certain convolutions and said sheet having bosses projecting from the face thereof in the regions where said thermostats are located.

17. A heating pad comprising a plastic sheet, a resistor wire embedded in the sheet and arranged in convolutions therein, and a thermostat embedded in the sheet and connected with the resistor wire, said sheet having a boss projecting from one face thereof and the thermostat being located partly in the boss and partly in that portion of the sheet from which the boss projects.

18. A heating pad comprising a plastic sheet, a resistor wire embedded in the sheet, and a thermostat embedded in the sheet and connected with the resistor wire, said sheet having a boss projecting from one face thereof and disposed over the thermostat, said boss having a flat outer face with a curved margin and a slanting side surface.

19. In a heating pad, a pad body of plastic material in the form of a sheet, a resistor embedded in the sheet and arranged in convolutions therein, said resistor comprising sections adapted to create different degrees of heat, thermostats embedded in the sheet and connected with the resistor, said thermostats being located on opposite sides of the center of the longitudinal median line of the sheet, one being located toward but somewhat spaced from one end of the pad and the other being located toward but somewhat spaced from the opposite end of the pad, said sheet having bosses projecting from the face thereof in the regions in which said thermostats are embedded.

20. A heating pad comprising a thin sheet of flexible rubber, a resistor embedded in the sheet and arranged in convolutions extending transversely thereof, a thermostat connected with the resistor and embedded in the sheet within the lines thereof in a location intermediate the center of the sheet and one end thereof, a second thermostat connected to the resistor and embed-

ded in the sheet within the lines thereof at a point intermediate the opposite end of the sheet and the center thereof, said sheet having portions of increased thickness projecting from the face thereof in the locations in which said thermostats are situated.

21. In a heating pad, a body comprising a sheet of flexible rubber, a resistor embedded in said sheet and arranged in convolutions therein extending transversely of the sheet, said resistor comprising a low heat section, a heat section of greater heating effect and a common return for said sections, a thermostat connected to one of said sections and embedded in the sheet in the longitudinal median line thereof at a point between the center of the sheet and one end, and another thermostat connected to the other section and embedded in the sheet in the longitudinal median line thereof at a point between the center of the sheet and the opposite end thereof.

22. In a heating pad, a body comprising a thin sheet of elastic plastic material, a resistor embedded in said sheet and comprising a coil of heating wire arranged in convolutions extending across the sheet, said resistor comprising a low heat section, a heat section of greater heating effect, and a common return for said sections, a thermostat connected to one of said sections and embedded in the sheet in the longitudinal median line thereof at a point between the center of the sheet and one end, and another thermostat connected to the other section and embedded in the sheet in the longitudinal median line thereof at a point between the center of the sheet and the opposite end thereof, said sheet having shallow bosses with slanting side surfaces projecting from one face thereof and located over the embedded thermostats.

23. In a heating pad, a body comprising an elongated thin sheet of flexible rubber, a conductor cord connected with said sheet at one end thereof, a resistor embedded in said sheet and comprising helically coiled wire disposed in convolutions extending across the sheet transversely substantially from one end of the sheet to the other end, said resistor comprising a low heat

section extending substantially from the conductor-cord-connected end of the sheet substantially to the opposite end thereof, a heating section of greater heating effect extending substantially from said conductor-cord-connected end of the sheet substantially to the opposite end thereof, and a common return for said sections, a thermostat connected to one of said sections and embedded in the sheet in the longitudinal median line thereof at a point between the center of the sheet and the conductor-cord-connected end of the sheet, and another thermostat connected to the other section and embedded in the sheet in the longitudinal median line thereof at a point between the opposite end of the sheet and the center thereof.

24. In a heating pad, the combination with a pad body comprising a thin flexible sheet of rubber, of a resistor of helically coiled wire embedded in the body and arranged in transverse convolutions therein, a conductor cord connected to one end of the body, said resistor comprising a low heat section extending substantially from the conductor-cord-connected end of the sheet to the opposite end thereof, a heat section of greater heating effect extending from said conductor-cord-connected end of the sheet substantially to the opposite end thereof, a thermostat embedded in the sheet toward the end which is remote from the conductor cord, said thermostat being connected with one of said heat sections only, another thermostat embedded in the sheet toward the conductor-cord-connected end thereof, said second thermostat being connected with both heat sections, and a common return section leading out of the pad from the last-named thermostat to the conductor cord.

25. In a heating pad, a body comprising a thin flexible rubber sheet, and a resistor embedded in said sheet and comprising helically coiled wire, said resistor being divided into portions of different heating effect, the turns of the portion of higher heat effect being of less diameter and more widely spaced than those of the portion of less heating effect.

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