Aug. 4, 1964 R. A. WISE 3,143,641

WATERPROOF HEATING PAD

Filed Sept. 25, 1962

Fig. 1.

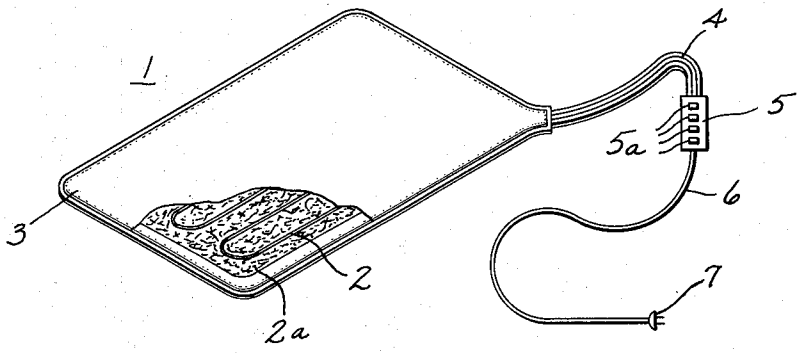


Fig. 2

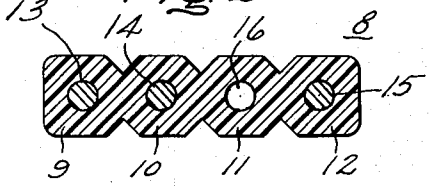


Fig. 3.

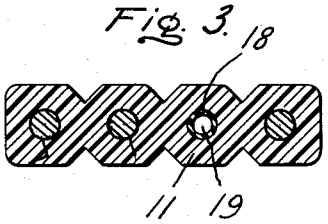


Fig. 4.

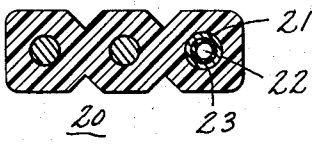
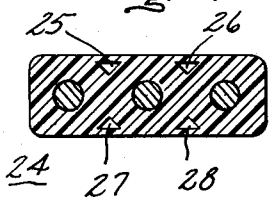


Fig. 5.



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WATERPROOF HEATING PAD

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This invention relates to waterproof, flexible electric heating devices, such as heating pads, and more particularly to means for controlling the amount of air within such a sealed device.

An electric heating pad typically includes a flexible heating element arranged in a suitable pattern and hermetically sealed within a flexible cover material of plastic or rubber. A watertight heating pad is desirable so that the device can be used with complete safety with wet packs or where moisture is present without danger of electrical shock. However, manufacture of such a sealed heating device presents the problem of control of the volume of air within the sealed enclosure. If too much air is entrapped in the pad when the enclosure is sealed, this air will expand when the heating element is energized, causing the pad to blow up like a balloon. Also, the air tends to insulate the heater from the user making the pad somewhat ineffective. On the other hand, if the enclosure is evacuated before sealing, the pad will operate normally, but will feel harsh and flat when applied to the body of the user. Since a heating pad is usually applied directly against the skin of the user, smooth, comfortable flexibility is very desirable.

Accordingly, it is a primary object of this invention to provide a waterproof electric heating pad which feels soft and flexible at all times.

It is a further object of this invention to provide a waterproof electric heating pad with an inexpensive arrangement to equalize the interior pad air pressure with the exterior pressure throughout the entire temperature range to which the pad may be subjected.

In accordance with this invention, an electric heating pad is provided with an air passage which permits air to flow freely into or out of the pad to maintain the pad in a soft and flexible condition. The pad itself is provided with a waterproof, airtight cover which will permit it to be totally immersed in liquid or used with any type of wet pack. The control unit for the heating pad which is remote from the pad itself is not hermetically sealed in that it is not expected to be immersed in water. Pressure relief is obtained by forming an air passage within the electrical power cord connecting the control unit to the pad. With this unique and inexpensive arrangement, the pad will not feel hard and flat when cold and will not become inflated when hot, but yet the pad itself may be totally immersed without liquid entering the pad interior or contacting any of the electrical wires. Furthermore, manufacture is facilitated, since precise control of air content of the envelope at the time of sealing is unnecessary.

Further features, objects and advantages will become apparent with reference to the following drawing in which:

FIG. 1 is a perspective view of an electric heating pad including a cord set and a control unit; and

FIGS. 2–5 are cross-sectional views of various cord set embodiments having an air passage therethrough.

Referring to FIG. 1 there is shown a typical electric heating pad 1 having a resistance heating element 2 arranged on a suitable carrier 2*a* of felt or the like to distribute heat uniformly throughout the pad. The heating element is enclosed within a cover or surface material 3 which is flexible, waterproof, and washable. Rubberized fabric and sheet plastic films are commonly used for this purpose, such materials being impervious to air and water. The cover 3 is hermetically sealed around its outer periphery in any suitable manner; for example, by heat sealing a plastic or vulcanization of rubber.

Heating element 2 is connected by means of a conventional, multiconductor cord set 4 to a conventional control unit 5 having a plurality of pushbuttons 5*a* or other manually movable members to control the operation and temperature of the pad. Cord set 4 is, in turn, connected to power cord 6 terminating in a conventional electrical plug 7 for connecting the heating pad to a conventional electrical outlet or other power source. Cord set 4 is preferably made of flexible, waterproof, electrically insulating material, such as plastic or rubber, and is hermetically sealed to the heating pad cover 3. The control unit 5 is not designed to be immersed in water, and is accordingly not air or watertight. Thus, the heating pad may be immersed in water or used with wet towels, and the cord set 4 may also be exposed to liquid up to its connection to the control unit 5.

If the heating pad cover 3 is completely sealed, a problem arises as to the amount of air to be sealed within the cover at the time of manufacture. When the pad is in use, it should be flexible and pliable, so that it will conform to the contour of the user's body. Also, the pad surface should not provide an unpleasant sensation to the user when in contact with the skin. Consequently, it is desirable to have a small amount of air entrapped within the cover to obtain a soft, pleasant effect. However, the amount of air employed must be limited, in that an excess amount of air would materially reduce the efficiency of the heater by acting as an insulator between the user and the heating element 2. In other words, if too much air is sealed within the cover 3, such air will expand responsive to heat, and the cover will tend to inflate like a balloon.

On the other hand, if only sufficient air is sealed within the pad to provide the proper effect when the pad is in use, the pad tends to feel harsh and flat to the touch at lower temperatures. If a partial vacuum exists within the sealed envelope 3, the fabric or felt carrier is compressed, and the pattern of heating wire 2 is clearly apparent on the outside of the pad. Under these circumstances, the pad is not conducive to the comfort which the user seeks by heat therapy.

In accordance with the present invention, the air pressure problem is solved by a unique and simple arrangement wherein an air pressure relief means is formed within the cord set for the heating pad without sacrifice of the waterproof qualities. This is accomplished by providing an air passage in the cord set between the interior of the pad and the interior of the control unit. Since the control unit is not sealed, the interior of the heating pad is in effect kept at atmospheric pressure. Such an arrangement gives the desired feel to the heating pad throughout the entire temperature range to which the pad is normally to be subjected.

The air passage within the cord set may be provided in a variety of ways. In FIG. 2, there is shown the cross-section of a conventional "rip" type cord set 8 composed of juxtaposed sections 9, 10, 11, and 12, all but one provided with a conducting wire 13, 14, and 15, respectively. Section 11 is formed with an air passage 16 extending from the pad to the control unit, so that air may flow to and from the heating pad. A cord set 8 having such an air passage may be easily and inexpensively fabricated by using known extrusion techniques. FIG. 3 shows a cord set which is identical to FIG. 2 except that a noncollapsible tube 18 is positioned within section 11 of the cord set. The tube 18, being noncollapsible, will prevent the air passage 19 from being inadvertently pinched or squeezed closed. Such an arrangement is slightly more expensive than the arrange-

ment shown in FIG. 2, but has the advantage of being more reliable, trouble free, and easier to heat seal to the waterproof cover.

FIG. 4 shows a three sectioned or stranded cord set **20**, in which one of the conductor groups **21** is given a tubular shape rather than the conventional solid cross-section. To prevent the air passage **22** formed within the conductor **21** from being inadvertently closed, there is provided a noncollapsible tube **23** positioned within conductor **21**. The ends of the conductor **21** and tube **23** must, of course, be left open within the pad and within the control unit to permit air flow. The embodiment of FIG. 4, requiring only a three-stranded cord set, has the advantage of being more compact than those of FIGS. 2 and 3.

In FIG. 5, there is shown an embodiment of a cord set wherein the grooves formed between the strands of a conventional cord set **24** of the type shown in FIGS. 2–3 have been enclosed to form a plurality of air passages **25–28**. Cord set **24** presents a flat rectangular cross-section which has the advantage of being easily sealable to the heating pad cover. Although the number of passages formed within cord set **24** is entirely optional, forming a plurality of passages provides reliability to the heating pad in the event one or more of the passages should become clogged in any manner.

It will be appreciated that an air passage may be inexpensively formed within the cord set in a variety of other arrangements which will readily come to mind. Accordingly, it should be understood that the invention is not limited to the particular cord set cross-sections shown, and it is intended in the appended claims to cover all such variations and modifications that fall within the true spirit and scope of this invention.

What I claim is:

1. An electric heating pad having a flexible cover which is impervious to air and water, a resistance heating element distributed within said cover, an unsealed heating pad control unit, a flexible, electrical cord set including a plurality of conductors and having a cover material which is impervious to air or water, said conductors being connected to said heating element said cord set having one end sealed to said heating pad and its opposite end connected to said control unit, a power cord connected to said cord set at one end and adapted for connection to a power source at the other end, and pad air pressure relief means formed within said cord set which equalizes the air pressure within and without the pad even though water cannot enter the pad when it is totally immersed in water.

2. An electric heating pad having a flexible, waterproof, airtight surface material, a resistance heating element distributed within said cover, an unsealed heating pad control unit, a flexible waterproof power cord sealed to said pad, at one end and connected to said control unit at its other end, said cord including an air passage

formed therein to provide air pressure relief means for the pad.

3. An electric heating pad having a flexible airtight cover material, a resistance heating element distributed within said cover, an unsealed control unit for the pad, a flexible airtight cord set having one end hermetically sealed to said pad and the other end connected to the control unit, means for connecting said cord set to a power source and pad air pressure release means formed within said cord set comprising an air passage extending between the pad and the control unit.

4. An electric heating pad having a surface material which is impervious to air and water, a resistance heating element distributed within the pad an unsealed heat control unit for the heating pad, a flexible airtight cord set connecting said pad to the control unit, said cord set including a plurality of conductors embedded in a cover of insulating material, said conductors being connected to said heating element, and a noncollapsible tube embedded within said cord set and extending between the pad and the control to provide air pressure relief means for the pad.

5. A flexible electric heating pad having a waterproof cover, a resistance heating element distributed within said cover, a heat control unit for said pad which permits air flow into and out of the control unit, a cord sealed to said pad and connected to the control unit, a stranded, tubular-shaped conducting wire included within said cord which provides an air passage between said pad and said control unit.

6. An electric heating pad having a flexible airtight surface material, a resistance heating element distributed within the pad, a control unit for the pad which permits air flow into and out of the control unit, a flexible airtight electrical cord set connecting said pad to the control unit, said cord set including a plurality of conductors embedded in insulated juxtaposed relation, in an airtight cover material, said conductors being connected to said heating element, a power cord connected to said cord set at one end and adapted for connection to the power source at the other end, and a plurality of air passages formed within said cover material adjacent said conductors extending between the pad and the control unit to provide air pressure relief means for the pad.

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