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ELECTRICAL HEATING PAD FOR FLOORS

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8 Claims. (Cl. 219—528)

This invention relates broadly to electrically heated pads, and more particularly to electrically heated pads which may be installed beneath a carpet or rug on a floor.

It is believed to be recognized that the area adjacent the floor portion of a room is usually the lowest temperature of a room and that a constant heat of relatively low temperature spread over a very large area at the floor of a room provides a very efficient and economical means of heating. It is also a very prevalent idea that if the feet of a person are kept warm, the body will be more comfortable all over, hence the desirability of maintaining the floor warm. And in this connection it is not to be overlooked that babies and very young children frequently play, crawl or sleep on the floor of a room, and it is therefore important to maintain the floor at a moderately warm and uniform temperature throughout its area.

It is broadly an object of the present invention to provide a flexible electrically heated floor pad which may be installed on a floor of hard heat-insulating material and under a carpet or rug. More specifically it is an object to provide such a pad having a flexible envelope covering of electrical insulating material, providing an outer layer of waterproof material built on an inner fabric layer of woven textile base in which the warp and woof are designed to reinforce against uneven shrinking and expanding; to provide in such a flexible pad a flexible electrical heating element which is fusible at a relatively low temperature; to provide in such a flexible pad a flat flexible electrical heating element, depending for electrical insulation on the structure of the pad body, and strong back and forth across the pad between the waterproof flexible electrical insulation sheets of the enclosing envelope, and secured thereto by adhesive strips lengthwise of the heating elements.

With the foregoing and other objects in view, as will be more fully apparent from this specification, a preferred form in which the invention may be exemplified is described herein and illustrated in the accompanying drawing in which:

FIG. 1 is a fragmentary plan view of one corner portion of the pad of the invention, a portion of outer cover being removed to show inner structure.

FIG. 2 is a fragmentary plan view of another corner portion of the pad of the invention, a part of an outer cover being folded back to show inner structure and relation of outer cover sheets.

FIG. 3 is a fragmentary plan view of another corner portion of the pad of the invention, having portions broken away to show structure.

FIG. 4 is a fragmentary plan view of another corner portion of the pad of the invention partly broken away to show structure.

FIG. 5 is a fragmentary sectional view of layers and elements comprising the pad of the invention, enlarged with relation to the other views, to diagrammatically show structural layers of material.

Referring to the drawing in which like reference characters indicate corresponding parts in the several views, 10 indicates generally the floor pad of the invention in which there are provided congruently overlapping exterior flexible cover sheet members indicated generally 11 and 12 having inner faces relatively opposed and substantially in facial contact, save and except for an electrical heating element 13 and its securing means therebetween, as will be further described.

Each of the cover sheet members 11, 12 is a suitable thin waterproof flexible electrical insulation material preferably comprising a vinyl-plastic coated fabric, which is a product well known in ordinary commerce for many years and having an exterior layer of 14 of a electrically-insulating vinyl-plastic which is intimately intimately interbonded to an inner layer of reticulated woven fabric 15, the respective warp 16 and weft 17, or longitudinal and lateral strands, of such inner layer preferably being woven normal to the side edges of the pad and normal to each other as distinguished from diagonal relative alignment, such normal weave being resistant to stretch and pull against the electrical heating element 13. While a "thin" cover material may be relatively commercially obtainable vinyl coated fabric material having a thickness between 3/64 and 3/32 inch is satisfactory and efficient. In the completed pad these cover sheet members have congruently overlapping registered edge relation, and when so arranged, are bound together with a flexible waterproof binding edge strip 18 of electrical insulation material around the perimeter of the pad, providing a flat closed envelope of flexible waterproof electrical insulating cover sheet material.

Between the opposed fabric inner faces 15 of the cover sheets 11, 12, and preferably secured to the inner fabric face of one of the cover sheets, there is mounted an electrical heating element or strip which has been generally indicated 13. This heating element has the quality of relatively low electrical resistance, so that while it becomes sufficiently warm for mild heating purposes, it is not characterized by a high resistance which will cause it to glow, as in the exposed elements of radiant electrical heaters. The heating element 13 is of easily pliable composite metallic composition of low fusing character, having the quality of fusing at temperature insufficient to superficially burn readily inflammable material such as wood, paper, or cloth, to an appreciable damaging burning or combustion extent. As an example, a metallic composition of equal quantities of tin and lead are adaptable for the heating element, without being a composition readily obtained as wire or strip in the commercial market. Because of the low fusing temperature of the heating element, and the electrical insulation characteristics of the body of the pad the heating element may be strong bare between the cover sheets without other insulation wrapping. The range of fusibility of the heating element 13 may vary quite widely, but for practical purposes an electrical resistance element that will fuse within the range of 200 degrees and 400 degrees (F.) is efficiently satisfactory. The heating element 13 is preferably a grill formed of a relatively thin, flat flexible, narrow ribbon strip 19 of electrically conductive resistance material, arranged in any suitable back-and-forth pattern, preferably in relatively spaced parallel strips 20 elongated transversely of the major central portion of the pad, each of said strips preferably being angularly retroverted upon itself at each of its opposite ends in form of an acute angle which may form a V-shaped overlap at the ends of the conductive strips as at 21. Due to the relative pliable character of this conductive heating element, the relatively parallel strips thereof may be readily bent toward each other as at 21a in adjacent spaced relation to the opposite ends thereof to form the converging V-shaped ends of the strips, without planar parallel relationship nor the facility for overlapping the ends of the strip at the converging end of the V-shaped overlap. This overlap in an acute angle at the opposite ends of said strips provides a greater facility in laying the strips parallel and returning them back and forth to form the heating element grid, since only one.
angular overlap is required at the end of each pair of strips of the conducting element. The relative spacing of these strips may be varied, such as a spacing of one-half inch to three-inch centers, and the width of the strips and the total footage thereof in a pad are also variable according to the size of pad, the heat capacity of the pad, and the water amperes, and voltage of electric current being employed.

The electrical heating element 13 is a continuous strip for carrying an electric circuit and manifestly such circuit is broken by the fusing at any point of the heating element. Preferably the element is a flat and relatively narrow strip in a planar sense and relatively thin in thickness, a dimensional example being stated for illustrative purposes and not by way of limitation.

Example

For an overlying rug 4 feet by 7 feet, a suggested underlying pad of substantially:

- **Length:** 6 ft. 8 inches
- **Width:** 3 ft. 8 inches
- **Square area of pad, approximately:** 25 sq. ft.

**Heating element indicated 13—**

- **Width:** .076 inch
- **Thickness:** .014 inch
- **Length:** 400 feet

Strips 19 of heating element parallelly spaced: 75-inch centers

Manifestly the opposite terminal ends of the heater element are connectible in an electric circuit for which reason it is preferred that the opposite terminal ends or terminal legs 22 and 23 of the heating element shall be positioned in relatively closely spaced proximity adjacent a peripheral edge of the covers of the pads, whereby the ends of said terminal legs may be brought closely together at one corner of the pad and connected to an electric circuit lead line 24. The strips or reaches 19 of the heating element with the acutely angular end portions 21 extend transversely across substantially the entire transverse dimension of the interior fabric face of a cover member except for allowance of the marginal space 25 preferably substantially one inch to three inches wide around the peripheral portion of the pad, which may accommodate the terminal legs 22, 23, and also provide a marginal operative protective space for the edge of the pad.

The flat thin elongated ribbon strips 19 of the heating element 13, including the strips of angularly disposed end portions 21, are suitably secured to the inner fabric face 15 of one of the cover sheets preferably by overlying strips of non-conducting pressure-sensitive adhesive paper tape 26 which may be of a type generally known as masking tape. The tape 26 is spread longitudinally along and overlying the length of the strips of the heating element, the said tape strips being substantially wider than the width of the strips of heating element 13 so that there is a substantial margin of the adhesive tape on each side of the strips of the heating element for securely fastening the heating element to the inner face of the cover sheet. Where the strips of heating element 13 are parallelly spaced relatively closely, such as exemplified in the drawing, a single strip of pressure sensitive adhesive tape may be of sufficient width to cover two adjacent strips of the heating element and including the angular retroverted end portions thereof as shown in FIG. 1. It has been found from experimentation that the anchoring of the strips of heating element by longitudinally overlying strips of pressure sensitive adhesive non-conducting paper tape not only stabilizes the heating element against displacement due to strain of people walking on the carpet overlying the pad, but the longitudinally overlying strips of adhesive material 27 also exert sufficient binding stabilizing effect along the longitudinal face of the strips of the heating element to substantially eliminate longitudinal thermal expansion of the heating element, and thus distributes that expansion laterally transversely of the element, such lateral expansion being a very minor amount of movement from thermal expansion as compared with the normal longitudinal thermal expansion if such longitudinal thermal expansion is not resisted.

Having anchored the heating element to the inner planar face of a first of the covers, it is preferred to provide intermittent patches of adhesive 29 across the said inner face of said first cover sheet in lines approximately six inches apart; and while said adhesive 29 is moist and sticky, the other or second cover sheet may be placed over the said first cover sheet in planar form with peripheral edges in congruent overlying register, whereby the two cover sheets are adhesively secured together, whereas the water amperes, expansion of the element, and thus distributes that expansion laterally transversely of the element, such lateral expansion being a very minor amount of movement from thermal expansion as compared with the normal longitudinal thermal expansion if such longitudinal thermal expansion is not resisted.

In operation, the heating element 13 is connected in an electrical circuit by means of the lead-in line 24 which may be of 110 v. or 220 v. Further, in operation it has been established as highly desirable that the heating pad be employed upon a relatively hard unpadded underlying heat-insulating floor rather than upon an underlying soft pad, since the underlying hard surface prevents stretching and deformation of the heating element from constant foot pressure thereon.

It will be noted that it is preferred that the strips 19 of heating element 13 shall be strung in parallelly disposed lengths of the heating element, whereby the pad may be readily rolled for shipment or storage. Assuming that the roll would normally be with the strips of heating element lengthwise of the roll, the axis of such roll would be parallel to the strips of pressure sensitive tape 26, whereby creeping or bulging of such tape would be eliminated.

Other well-known conveniences of conventional type may be employed in connection with the use of the heating pad in the same manner as with other electrical heating utilities such as room thermostats, time clocks, and other well-known accessories.

Having described the invention, I claim:

1. An electrically heated floor pad which includes a pair of relatively opposed flexible waterproof exterior sheets of electrical insulation material, a pair of flexible flat electric heating elements of electrical heating element of material fusible at a temperature lower than combustion temperature of readily combustible products, said strip of heating element being strung back and forth transversely across and between opposed faces of said flexible exterior sheets, said strip of heating element being retroverted upon itself at the ends of such transversely strung strips and providing at the opposite ends of the strung strips a single acutely angular overlap, and an electrical insulating tape adhesively bonded to a face of one of the said sheets of waterproof electrical insulation material in lengthwise overlying relation to the said strips of heating element.

2. An electrical heating floor pad of the character described, as set forth in claim 1, and in which said tape is a pressure-sensitive-adhesive tape of electrical insulating material.

3. An electrically heated floor pad as set forth in claim 1, the said flexible opposed sheets of insulating material having an exterior waterproof surface intimately bonded to an inner surface of reticulated cloth, and in which the length of flexible strip of electrical heating element including the retroverted overlapped ends thereof is attached by said tape to the cloth face of said sheets.

4. In an electrically heated floor pad as set forth in claim 3, and in which there is a waterproof electrical insulation binding means around the perimeter edges of said sheets binding said sheets together in congruent over-
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lying relation enveloping the heating element therebetween in a waterproof enclosure.

5. An electrically heated floor pad comprising an exterior pair of congruent overlying flexible sheets of waterproof electrical insulating material, and a waterproof binding strip around the peripheral edges binding them together and providing a waterproof enclosure, a flexible flat strip of electrical heating element in a grid of elongated strips strung back and forth between said flexible sheets and having the ends of the strips retroverted upon themselves acutely angularly, and strips of pressure sensitive electrically insulated adhesive tape lengthwise overlying said strips of electrical heating element and including said retroverted ends thereof, said tape securing said heating element lengthwise along its length to an inner surface of one of said sheets of insulation material.

6. An electrically heated floor pad as set forth in claim 5, in which each of said sheets of electrical insulating material has an exterior waterproof surface material intimately bonded to an inner surface of reticulated cloth, and said electrical insulating tape is adhered to one of said inner cloth surfaces in lengthwise overlying relation to the heating element.

7. In an electrically heated floor pad as set forth in claim 5, in which the inner surface of the reticulated cloth of the exterior sheets has the respective warp and woof thereof woven relatively normal to each other, and normal to the side edges of the sheet, said strip of electrical heating element being in facial contact with and adhered to one of the reticulated faces of the cloth, and the said pressure sensitive electrical insulation tape is adhered lengthwise overlying the heating element and securing the heating element lengthwise on said cloth.

8. A floor pad for electrical heating, including a first flexible exterior sheet of electrical insulation material having an exterior waterproof surface intimately bonded to an inner surface of reticulated cloth having warp and woof relatively normal, and normal to the edges of said insulating sheets, a flat, flexible strip of electrical heating element which is fusible at temperatures between 200 and 400 degrees F., said heating element being strung in relatively parallel spaced strips back and forth across the central portion of said cloth surface of said first flexible sheet, said strip of electrical heating elements being acutely angularly retroverted upon itself at the opposite ends of said strips, an electrical insulating pressure-sensitive adhesive tape adhering lengthwise overlying the strips of heating element including the retroverted ends thereof, a second exterior flexible sheet of electrical insulating material similar to said first mentioned exterior sheet of insulating material, congruently overlying the area of said first sheet of flexible material which has the electrical heating element secured thereon, and a waterproof binding means around the perimetral edges of said sheets binding them together.

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