Dec. 24, 1935. C. I. HALL 2,025,586

ELECTRICALLY HEATED RUG

Filed Aug. 28, 1934

Fig. 1.

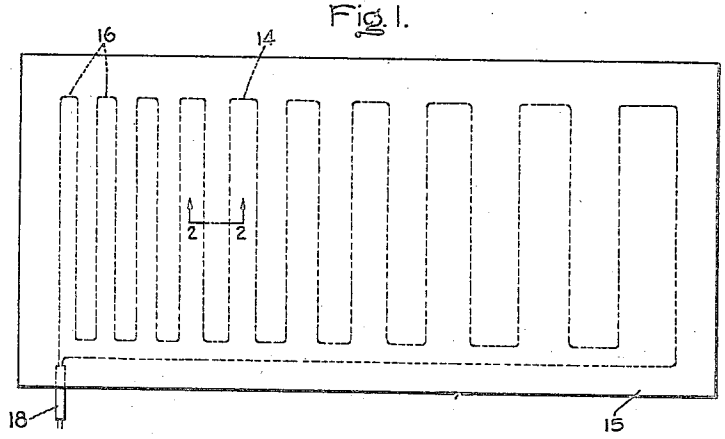


Fig. 2.

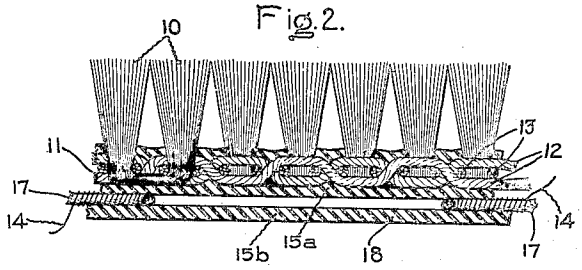


Fig. 3.

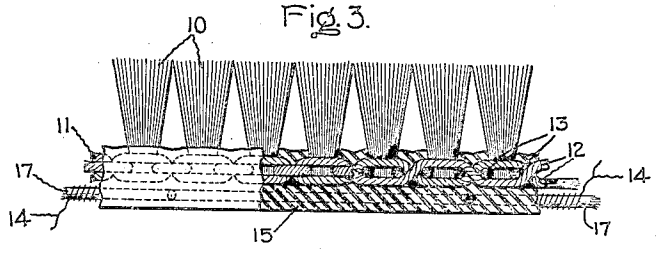
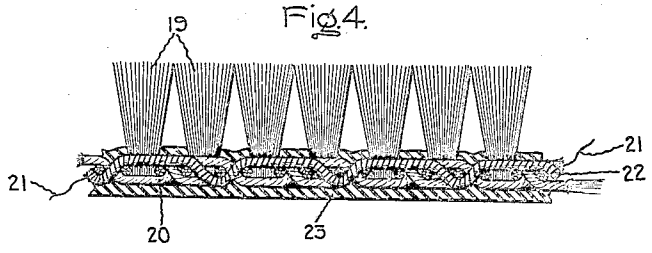


Fig. 4.



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ELECTRICALLY HEATED RUG

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10 Claims. (Cl. 219—46)

This invention relates to electrically heated rugs, and it has for its object the provision of an improved device of this character, and the method of making it.

More specifically, this invention relates to improved means for heating a rug provided with fabric surface piles and a backing for the piles formed of threads interwoven with each other and with the piles.

Electrically heated rugs of this character are quite desirable for the use of persons having restricted circulation in the feet and legs, such as the aged, invalids, convalescents and those suffering from anemia. In the homes of such people a great wastage of heat results when the temperature of the room is elevated to provide the relatively high temperature at the floor necessary to keep the feet and legs comfortable. This wastage of heat is considerable in the average home where the temperature gradient from the floor to the ceiling is about 1° F. rise per foot.

This invention contemplates the provision of an electrically heated rug which is both a comfort to the user and which is efficient and economical in its operation.

This invention further contemplates the provision of improved means for varying the temperature in different portions of the surface area of the rug so that the user can select the most comfortable temperature by shifting the feet from one position to another.

This invention also contemplates the provision of an electrically heated rug which is simple and durable in construction, and which is arranged to obviate short circuits within the rug, and danger of shocks to the user.

In accordance with this invention, the woven backing of the rug together with a suitable resistance conductor are embedded within a sheet-like body formed of a suitable flexible electrically insulating and heat conducting material, such as rubber. The resistance conductor is formed into a plurality of convolutions extending over an area substantially equal to the surface area of the rug and arranged to provide varying temperatures in different surface areas of the rug.

In one form of this invention, the convolutions are positioned in a plane substantially close to and parallel with the backing of the rug, while in another form, the resistance conductor is interwoven directly with the threads forming the backing of the rug.

In the first form, the electrically heated rug is made by impregnating the woven backing of the rug with rubber latex which is permitted to harden. This operation forms a flexible sheet of rubber in which the backing is embedded. Then the resistance conductor formed into convolutions of the desired shape and spacing is secured to the sheet of rubber that is thus formed. The convolutions are then covered by a sheet of rubber that is subsequently vulcanized to the sheet embedding the threads so that a homogeneous rubber sheet is formed embedding the threads and the resistance conductor. In the second form, after the rug has been made with the resistance conductor interwoven with the backing, the backing is impregnated with rubber latex, which is subsequently allowed to harden to form a sheet of flexible rubber embedding the woven backing and the resistance conductor.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a diagrammatic plan view of an electrically heated rug embodying this invention; Fig. 2 is an enlarged fragmentary elevation in section taken through the line 2—2 of Fig. 1 and looking in the direction of the arrows, but illustrating the rug in one stage of its construction before the rug is completed; Fig. 3 is a view similar to Fig. 2, but illustrating the rug in its finished form; and Fig. 4 is a vertical sectional view of a modified form of this invention.

Referring more particularly to Figs. 1, 2 and 3, this invention has been shown as applied to an electrically heated rug having a plurality of fabric piles 10 which are secured to a backing 11 formed of threads 12 and 13. These threads are interwoven with each other and with the piles so as to support the piles in a substantially upright position to provide a fabric surface for the rug, as shown in Fig. 1. It is to be understood that the threads 12 and 13 may be interwoven with each other and with the piles 10 in any suitable manner, and upon any suitable well-known weaving machine. It is also to be understood that it is not necessary that any particular weave be imparted to the threads 12 and 13, the important feature being that the piles be interwoven with the threads in such a manner that a relatively strong and durable backing is provided for the piles.

The backing of the rug 11 is embedded with a resistance conductor 14 in a sheet-like body 15 (Figs. 1 and 3) formed of a suitable flexible, heat conducting and electrically insulating material, such as rubber.

In the form of the invention shown in Figs. 1, 2 and 3, the resistance conductor 14 is arranged

into a plurality of convolutions 16 lying in a plane substantially close to the backing 11 and substantially parallel with it, as shown in Fig. 3. The convolutions, as shown in Fig. 1, have a length substantially equal to the width of the rug, and extend at spaced intervals substantially throughout the length of the rug. In other words, the convolutions are so arranged as to supply heat to substantially the entire surface area of the rug.

The convolutions 16, however, are not evenly spaced from one end of the rug to the other, but are so arranged that the spaces between succeeding convolutions increase from one end to the other of the rug,—from the left-hand to the right-hand end, as shown in Fig. 1. This arrangement of the convolutions provides for a temperature gradient from the left to the right-hand end of the rug, the spacing depending upon the gradient desired. In the particular example shown in Figs. 1, 2 and 3, the convolutions are spaced so as to provide a gradient from substantially 150° F. at the left-hand end to substantially 108° F. at the right-hand end.

This arrangement of the convolutions to provide varying temperatures in different portions of the surface area of the rug is a very important feature of this invention, because it provides substantially any temperature lying between the limits of the temperature gradient. The user can obtain the most comfortable temperature merely by shifting the rug relative to the feet. In addition, it obviates the use of auxiliary temperature controlling devices. The disadvantage of attempting to control an electrically heated rug with a thermostat, or like controlling device, resides in the fact that the thermostat controls the heating circuit in accordance with the temperature in the locality of the thermostat, but is not sensitive to the temperature in those portions considerably removed from the thermostat. It, therefore, does not accurately control the temperature in different portions of the rug. Moreover, the thermostat must be attached to the structure of the rug, and, therefore, is subject to damage by persons stepping on it. My temperature control also is a distinct improvement over those controls which comprise a plurality of heating resistances, together with switching means arranged to provide various connections between the resistances and their source of supply to provide different rates of heat generation, such as series and parallel connections. These arrangements are considerably more complex and expensive than my heat control, and besides, provide a very limited number of heats—oftentimes, three at the most.

Any suitable resistance conductor 14 may be used. It is generally preferable, however, to protect the resistance conductor from deterioration by action of the rubber. For this purpose, the conductor is provided with a coating of enamel. It is also preferable to use a conductor of very fine wire and to wind it upon a suitable core 17 formed of any suitable material, such as asbestos, or cotton.

The ends of the conductor 14 may be electrically connected with any suitable electrical supply source by means of a supply conductor 18, which preferably will be of the twin type.

In making the rug shown in Figs. 1, 2 and 3, after the piles 10 have been interwoven with the threads of the backing 11, the backing will be impregnated with rubber. This may be accomplished by forcing the rubber in liquid form through the interwoven backing in any suitable manner, as by means of a nozzle, so that the backing is embedded in a sheet of rubber 15a, as shown in Fig. 2. This sheet is then allowed to harden.

To this sheet of rubber 15a is attached the resistance element 14 arranged into the convolutions 16 of the desired shape and number. Then a sheet of rubber 15b (Fig. 2) is placed over the convolutions. This sheet is then vulcanized to the sheet 15a of rubber embedding the backing 11. As a result, the backing 11 and the resistance conductor 14 are embedded in a common flexible homogeneous sheet of rubber 15.

It is preferable that while the sheet 15b is being assembled with the sheet 15a and before it is vulcanized to it that some suitable means be provided for securing the convolutions 16 to the latter sheet. For this purpose, the resistance conductor may be wound about pins (not shown) which are passed through the sheet 15a and properly positioned to form the convolutions 16. The entire sheet and resistance conductor is then covered with a suitable rubber adhesive which when it is allowed to harden secures the resistance conductor to the sheet.

The form of the invention shown in Fig. 4 differs from the form shown in Figs. 1, 2 and 3 in that the resistance conductor in Fig. 4 is interwoven with the backing of the rug, rather than being separated from the backing, as shown in Figs. 1, 2 and 3. The rug of Fig. 4, as shown, comprises piles 19 which are secured to a backing 20 similar to the backing 11 of the first form. Interwoven with this backing, is a resistance conductor 21 which preferably will be of the same construction as the resistance conductor 14 of the first form; that is, the conductor 21 will be helically wound upon a suitable cord 22 formed of asbestos. It will be understood that in the form of the invention shown in Fig. 4, the convolutions will be distributed through the rug substantially as are the convolutions shown in the first form, that is, they will be distributed so as to provide the desired temperature distribution over the surface area of the rug.

It is also to be understood that the resistance conductor 21 may be added as a separate element to the weave of the backing 20, or may be substituted for certain of the woof or warp threads, the choice, of course, depending upon the particular form of weaving that is used and the particular arrangement of convolutions of the heating element that is desired. If desired, the resistance conductor 21 may be woven into the backing 20 so as to take the place of certain of the filler threads that are commonly found in rugs.

The backing 20, together with resistance element 21 interwoven with it, is embedded in a flexible sheet-like body 23 which will be formed of a suitable flexible heat conducting and electrically insulating material, such as rubber.

In making the rug shown in Fig. 4, it will be understood that the resistance conductor 21 on its reenforcing cord 22 will be interwoven with the backing 20 at the time the rug is made. The backing 20 together with the resistance conductor 21 interwoven with it will then be impregnated with rubber in a manner similar to the impregnation of the backing 11 of the first form. This rubber is then allowed to harden to a sheet form, as clearly shown in Fig. 4.

A very important feature of this invention is the provision of the rubber heat conducting

sheet embedding both the backing of the rug and the resistance heating conductor. It will be observed that by reason of this arrangement the upper surface of the sheet of rubber lies above the backing in thermal relation with the surface piles 10 between their lower ends attached to the backing and their upper free ends, with the result that heat is conducted directly to the piles where it is wanted. The upper surface of the rubber sheet should be as near the top of the piles as is practicable.

The conduction of heat to the piles is enhanced by the interweaving of the heating element in the backing itself, as in the form shown in Fig. 4. It will be observed that by this arrangement, a considerable portion of the length of the heating element 21 is positioned relatively close to the upper surface of the rubber sheet 23.

It is also to be noted that the rug of this invention is mechanically strong, durable and efficient. The convolutions of the resistance conductor are firmly anchored in the sheet of rubber with reference to each other so that it is practically impossible for these elements to come in contact with each other, or to get out of position. Thus, it is practically impossible for a short circuit to occur, or for the user to come in contact with the live conductor.

Moreover, the rubber body provides a waterproof and air-tight casing around the backing of the rug and its resistance conductor.

While I have shown particular embodiments of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrically heated rug comprising a plurality of piles constituting a surface for said rug, a backing for said piles comprising a flexible, electrically insulating and heat conducting substantially homogeneous sheet-like body, and an electrical resistance conductor embedded in said body, said body functioning to transfer and distribute heat from said resistance conductor to said piles, whereby a heated surface is provided for said rug.

2. An electrically heated rug comprising a backing of woven thread, a plurality of fabric piles secured to said backing, an electrical resistance conductor arranged in convolutions in a plane substantially parallel with said backing out of direct contact with said piles, and a flexible, electrically insulating heat conducting body of rubber embedding said backing and said resistance conductor so as to secure said resistance conductor in thermal relation with said piles.

3. An electrically heated rug comprising a plurality of fabric piles, threads interwoven with each other and with said piles so as to form a backing to which said piles are secured in an upright position, said piles forming a fabric surface for said rug, a flexible relatively thin sheet of rubber embedding said interwoven threads and the lower ends of said upright piles, and a resistance conductor embedded in said sheet of rubber beneath said backing out of direct contact therewith and formed into a plurality of convolutions spaced at intervals in substantially the same plane and covering an area substantially coextensive to that of said backing, said thin rubber sheet functioning to transfer heat from said conductor to said piles, whereby a heated fabric surface is provided.

4. In a device of the class described, a sheet-like heating body and a resistance heating element in thermal relation with said body distributed over the area of said body so as to establish a substantially uniform temperature gradient between the ends of said body.

5. An electrically heated rug comprising a fabric surface, a backing supporting said surface, a flexible, heat conducting, electrically insulating, sheet-like body embedding said backing, and a resistance element embedded in said sheet-like body in thermal relation with said backing formed into a plurality of convolutions extending from substantially one end to the other of said rug and arranged to provide temperatures of varying magnitude in different surface areas of said rug.

6. An electrically heated rug comprising a fabric surface formed of fabric piles, a woven backing interwoven with said piles, a flexible sheet of rubber embedded in said woven backing, a resistance conductor embedded in said sheet of rubber in thermal relation with said backing formed into a plurality of convolutions extending crosswise substantially the width of said rug and spaced at intervals throughout substantially the length of said rug, said intervals increasing in magnitude from one end to the other of said rug so as to establish a substantially uniform temperature gradient between the ends of said rug.

7. An electrically heated rug comprising a plurality of surface piles, a backing of threads interwoven with each other and with said piles, a resistance conductor interwoven with said threads and a sheet of rubber embedding said interwoven threads and said conductor.

8. The method of making an electrically heated rug which comprises interweaving surface piles with threads so as to form a surface for said rug and a backing for said surface, embedding said backing in a sheet-like mass of rubber, attaching a resistance conductor to the side of said sheet-like mass opposite said surface, placing a sheet of rubber over said side with said resistance conductor attached to it and then uniting said sheet of rubber to said sheet-like mass so as to form a homogeneous mass of rubber embedding said backing and said resistance conductor.

9. The method of making an electrically heated rug which comprises interweaving fabric piles and threads so as to form a fabric surface for said rug and a backing therefor, impregnating said backing with liquid rubber, allowing said rubber to harden, attaching to the back of said hardened rubber a resistance element, placing over said resistance element a sheet of rubber and then vulcanizing said sheet to said rubber embedding said backing so as to embed said backing and said resistance element into a flexible homogeneous body of rubber.

10. The method of making an electrically heated rug which consists in weaving a plurality of fabric piles together with threads so as to form a fabric surface and a backing therefor, interweaving with said threads a resistance conductor and embedding said backing together with the interwoven resistance conductor in a sheet-like body of rubber.

CHESTER I. HALL.