

[54] **METHOD OF MAKING AN ELECTRIC RADIANT HEATING PANEL**

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[58] Field of Search 219/213, 345, 347, 219/528, 529, 544, 549; 338/219; 29/611

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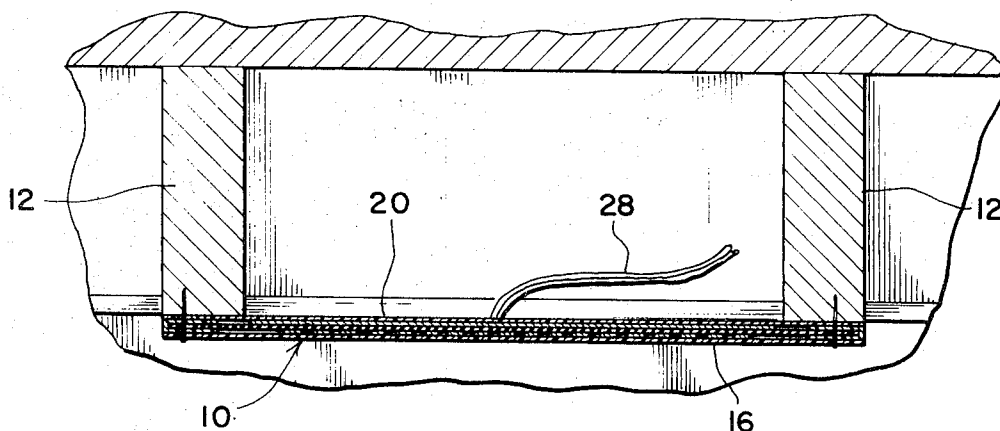
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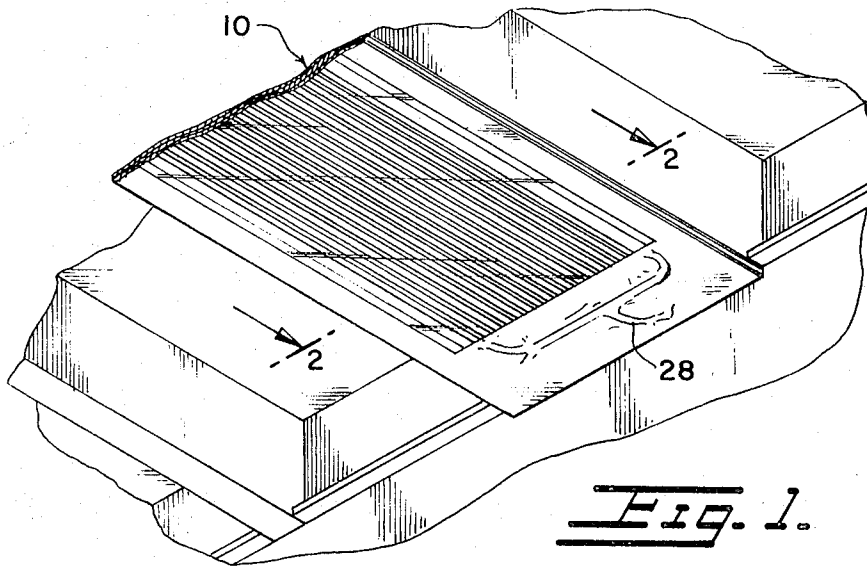
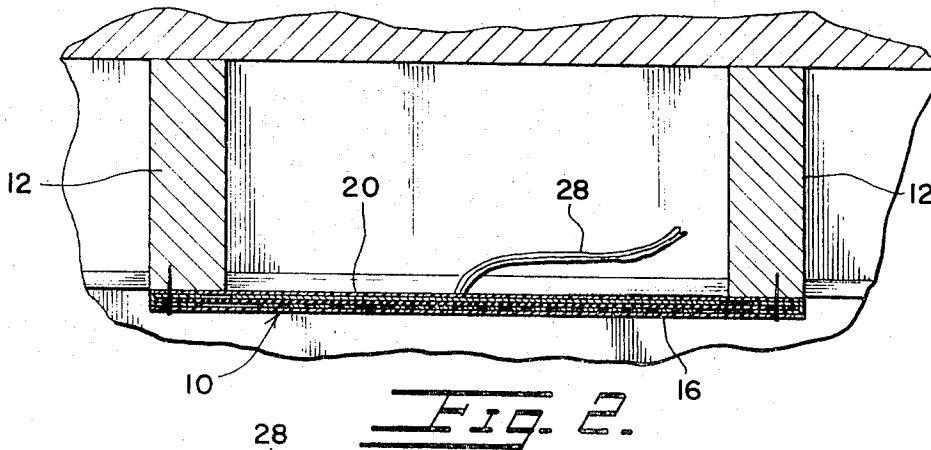
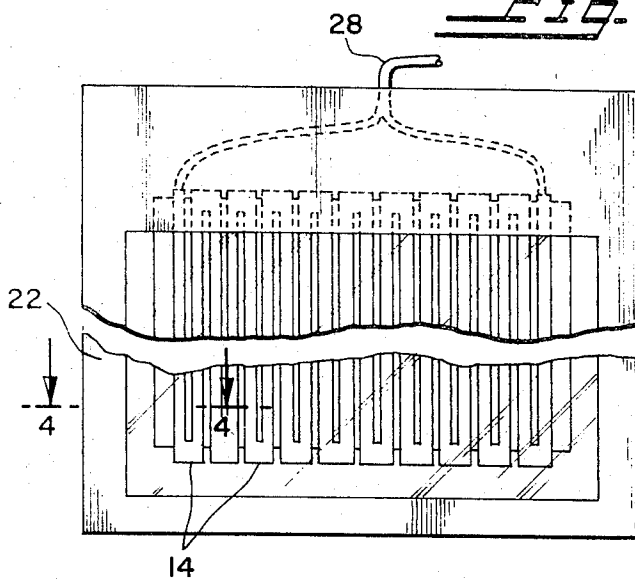
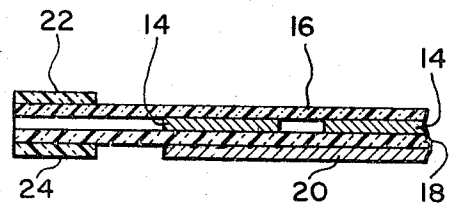
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[57] **ABSTRACT**

An electric radiant heating device is self contained and is mounted on a surface of a room, such as on the studs or joists of a building and has an electrical resistance strip element of predetermined wattage spaced from the edges of and sandwiched between two thin pliable mylar sheets, with colored strengthening strips mounted along each edge of the panel, and a reflective surface mounted on the rear surface overlying the resistance strip.

4 Claims, 4 Drawing Figures





METHOD OF MAKING AN ELECTRIC RADIANT HEATING PANEL

BACKGROUND OF THE INVENTION

The present invention relates generally to electric heating apparatus for buildings and more particularly to a panel, which utilizes relatively low temperature radiant electric heat, which uniformly heats a body within the room.

The advantages accruing to the use of radiant heating of rooms, especially large rooms with high ceilings, has been known. It is clean, comfortable, quiet and space saving. With the many advantages, this heating system has not been widely used because of many difficulties encountered in producing a workable, low cost, dependable unit. It has heretofore been proposed to incorporate electrical resistance heating elements in panels adapted to be mounted on a ceiling surface of a building. In one such U. S. Pat., No. 3,095,491, the panel is provided with serpentine grooves in which the insulated resistance wire is laid and covered with a conductive cement or plaster. Also, high density electric panels provide radiant heat but concentrate the heat in relatively small areas and often scorch the surrounding area and provide localized heating effects, i.e., hot and cold areas. Heretofore panels utilizing radiant heat required strong supports for the panels and the resistance elements. Formerly to utilize this type of heating unit required special tools for assembling, and special procedures for mounting the panel either on the ceiling or on the walls. Further, much of the heat of the resistance element escaped through the rear of the panel itself, which was wasteful with respect to the heat required to heat a body in the room. Many forms of radiant heating panels and heating elements have been employed and proposed, but these were complex, heavy, inefficient, relatively unreliable and possessed numerous drawbacks and disadvantages.

SUMMARY OF THE INVENTION

It is the principal object of the present invention to provide an improved electric radiant heating panel.

Another object of the present invention is to provide an electric radiant heating panel which can be quickly and easily mounted on joists, studs and the like, and safely covered with conventional construction materials to provide a uniform and even heating effect in the interior of a room in which this panel is mounted.

A further object of the present invention is to provide an electric heating panel that can be used on various surfaces such as walls, ceilings or seats to provide a generally uniform and even heating within the interior of the room.

Still another object of the present invention is to provide an electrical radiant heating panel which is pliable, can be rolled up during production and shipping, safe and light and can be mounted safely and quickly and uniformly over the studs of a floor or wall in new construction.

An additional object of the present invention is to provide an efficient method of continuously making an electric radiant heating panel.

A still further object of the present invention is to provide a method of making a radiant heating device, including positioning a reflective layer directly on an insulating layer for the resistance element, and with the electric resistance element having a predetermined

heating effect and the heat from the panel can be easily determined by the general dimensions of the panel.

Another object of the present invention is to provide a radiant heating panel of the above nature, characterized by its reliability, simplicity, ruggedness, ease of operation, efficient utilization of electric power, versatility and adaptability.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawings which illustrate a preferred embodiment thereof.

In a sense the present invention contemplates the provision of an electric radiant heating panel which can be mounted on the surface of a ceiling such as the studs of a building and include a serpentine electrical resistance strip spaced from the edges of and sandwiched between a pair of thin, pliable plastic mylar sheets with strengthening strips on each edge of the resistance strip and a reflective surface mounted on the rear surface overlying the resistance strip. An alternate construction uses a conventional panel for hung type ceilings, in which an electric resistance strip element is mounted. The panel contains the insulating and reflector surfaces to focus the heat interiorly into the room and does not depend on separate insulation or other surfaces. This self-contained heating unit is safe, reliable, simple but rugged, requires no additional support elements, can be readily handled even while operating without fear of shock, and is completely enclosed in its own insulating cocoon.

Since the resistance element is sandwiched between two pliable continuous strips, with supporting strips along each edge, it lends itself to efficient mass production techniques, and can be made in continuous lengths or the desired lengths or widths as required for a particular job.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a prospective view of a ceiling construction showing a heating panel made in accordance with the present invention, secured to adjoining studs;

FIG. 2 is a cross-sectional view taken along line 2 — 2 of FIG. 1;

FIG. 3 is a fragmented plan view of one embodiment of a panel partially broken away and illustrating the resistance element; and

FIG. 4 is a cross-sectional view taken along line 4 — 4 of FIG. 3.

DESCRIPTION OF A PREFERRED EMBODIMENT

Heretofore, with radiant heating devices, it has been found that where the radiant heat impinges directly upon the body at a uniform rate, it causes discomfort, so that the quantity of heat either must be reduced or the person moves to another area and hence becomes cool. With the present invention, the radiant heat, while being directed into the interior of the room is non-uniform and hence provides a more uniform heating comfort, since concentration of heat on the body is avoided. Essentially, the heating panel diffuses the radiant heat to provide more comfort.

Panels made in accordance with the present invention may be made in varying widths and thicknesses. If desired, the panels can overlie several joists with the heating elements mounted between the insulating inner and outer layers at predetermined portions so as to fall

between adjacent joists and thereby allow easy mounting of the panel to the joists without fear of contacting a resistance element. The panels can be made in continuous sheets from flexible, pliable material so they can be rolled during the fabricating process and unrolled during use.

Referring now to the drawing which illustrates a preferred embodiment of the present invention, the reference numeral 10 generally designates an electric heat radiating panel secured to the lower surfaces of a series of ceiling joists 12.

Referring particularly now to FIG. 4, there is shown panel 10 which has an electrical resistance element 14 sandwiched between two pliable layers 16 and 18. Element 14 is serpentine in shape to provide maximum heat for a given surface. The ends are enlarged to provide good conductivity. Element 14 is advantageously made of a lead tin combination to allow the material to fuse if overheated. Mounted on the outer surface of bottom layer 18 is a reflective surface 20 which may be metallic foil, bright colored plastic, or the like, either carried on one surface or formed therein. Pliable layers 16 and 18 are electrically insulated. Mounted along the outer longitudinal edges of layers 16 and 18 are reinforcing strips 22 and 24 respectively, which advantageously are of a bright color and contrast with insulating layers 16 and 18 respectively, so as to be readily seen by the user or worker. Strips 22 and 24 do not overlie any electrical connectors or resistance elements and can be used to mount the panel directly to the joints or floor or wallboard quickly and easily. The panel 10 is mounted to joists 12 by stapling through strips 22 and 24 to joists 12. The use of strips 22 and 24 allow very thin and essentially weak structural materials to be used as the insulating layers 16 and 18, since the strengthening strips 22 and 24 provide the holding power of the panels. Since all of the layers are pliable and flexible, the finished panel illustrated in FIGS. 1 and 2 can be rolled for storage and transportation and predetermined heating size. Layers 14 and 18 are so fabricated and positioned to overlie the electrical heating resistance elements 14, to fabricate the entire panel 10 into a unitary article and the outer layers 16 and 18 are fastened together in any suitable manner, such as by adhesive, heat sealing, or the like. When panels 16 and 18 are attached, they fix resistance element 14 with respect to the panels 16 and 18 and prevent unwanted movement. Similarly, reflector panel 20 and strengthening strips 24 and 26 are adhered to layers 16 and 18 respectively by any suitable means.

To energize heating element 18, electrical current from a power source, not shown, can be conducted by means of wires such as indicated at 28. Wires or cable 28 are connected to the outer elements of resistance element 14 and provide uniform heating throughout the panel as seen best in FIGS. 1 and 3. The current from the power source flows through the entire resistance element 14 resulting in a generation of heat due to the resistance of the element. The heat generated from element 14 flows into the room directly through layer 16 and is also reflected by reflector layer 20 again through both layers 18 and 16 providing a non-concentrated diverse radiant heat into the interior of the room and essentially almost all of the heat into the room and little through the rearward surface of the reflective layer 20 to escape.

The panel shown in the drawing is extremely thin and flexible and can be fastened safely and quickly to wall joists and ceiling joists and the wall or ceiling panels and outer wall panels and ceilings can be mounted directly over the heating panels in new construction. The heating panels are completely self-contained and safe and resist moisture, mold, insects and the like. The multi-colored strips 22 and 24 provide the strength and quickly alert the user to where the panel can be mounted safely to the joist, such as by staples, nails, and the like. While a separate reflective panel 20 is shown, it can be combined with strip 18 by coating the outer surface of strip 18. This coating can be made by electro-disposition, painted or coated in a conventional manner, as shown in the art. Because of the relatively low concentration of heat from the panels, the ceiling panels mounted over the heating panels 10 act as a heat bank, which holds and maintains the heat and thus heat continually radiates into the room to distribute warmth throughout the entire room, even after the thermostat is satisfied. For example, $\frac{3}{8}$ inch plasterboard will radiate heat for approximately one-half hour after the heating units are turned off. The operating costs are low with panels mounted as described above, since the thermostatic controls react swiftly to changing conditions in the interior of the room and the heat generated is only on for a relatively small time, and the room is kept at the required temperature by reason of the heat bank characteristics. This type of heating is not restricted to a heat source being where a person stands or sits in the room but encompasses the entire room.

By reason of the panels being mounted behind the wall and ceiling panel, there is no lost space for radiators and the like. Further, the effectiveness of the heat transferred into the room is not influenced by the ceiling height.

One embodiment measures $33\frac{1}{2} \times 113$ inches and covers three normal conventional joists wide or runs across eight joists long. Two of these units are sufficient to heat an insulated 10×12 room and maintain the desired heat when the outside temperature is minus 10° F.

A further embodiment is designed for 2×4 feet tiles which fit a suspended ceiling and can be utilized in the conventional suspended or drop ceilings to provide specified heating areas. Panels of this type can be used with 300 watts and can go up to 600 watts if desired.

Advantageously, strips 16 and 18 are made from mylar plastic material and the heating unit cable is non-ferrous and non-magnetic, so as to provide a silent system with no hum. The desired heat obtainable can be quickly calculated from the heat emission from a predetermined length and width of the panel, and quickly be made to the desired size to provide the desired heat.

To produce the panel, the heating element is placed between two layers of mylar and the layers affixed to each other by an adhesive applied to the facing surfaces. The heating element is fixed between the layers. The strips can be made as long or as short or as wide or thin as desired. The reflective layers and strengthening strips can be affixed in the same manner. While various geometric configurations are illustrated, other shapes can be used.

While there has been described and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

What is claimed is:

1. The method of making a radiant heating panel comprising positioning a first thin pliable plastic panel to overlie a pair of narrow plastic strips, each on an opposite edge of said first panel, joining said edge strips to said first panel, positioning a serpentine electrical resistance element on said first panel on the surface opposite said edge strips and positioned between said edge strips, overlying said resistance element with a second thin pliable plastic panel, joining said second panel to said first panel to hold said resistance element in position therebetween, positioning edge strips along opposite side edges of the outer surface of said second panel, joining said edge strips to said second panel, electrically coupling a conductor to opposite ends of

said serpentine resistance element, and positioning a reflective surface on the outer surface of one of said outer panels and overlying said resistance element.

2. The method of claim 1 wherein said reflective surface is provided by superimposing a third panel on the outer surface of one of said first or second panels, and providing a reflective surface on said third panel.

3. The method of claim 1 further including forming the edge strip with a color different from said first and second panels.

4. The method of claim 1 wherein said heating panel is to be used in a structure containing joists and further including selecting the width of the resistance element to fall between consecutive joists.

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