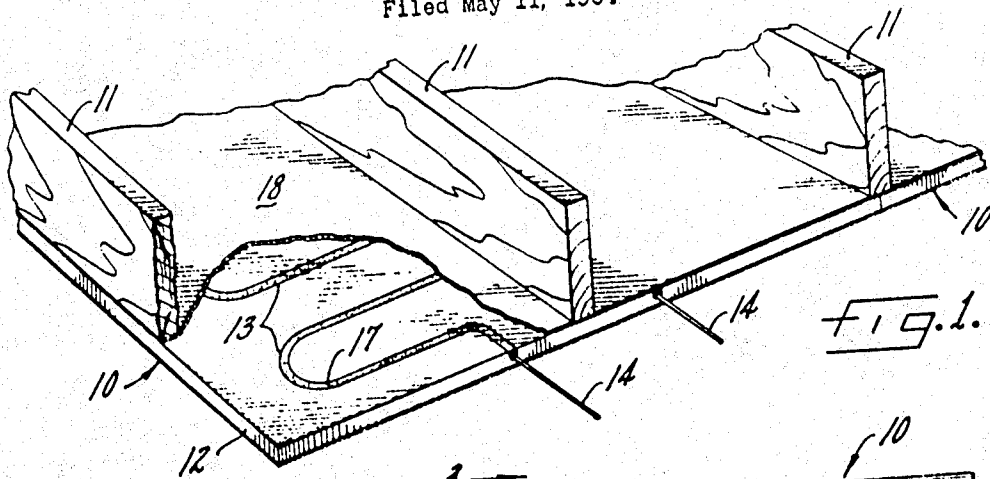
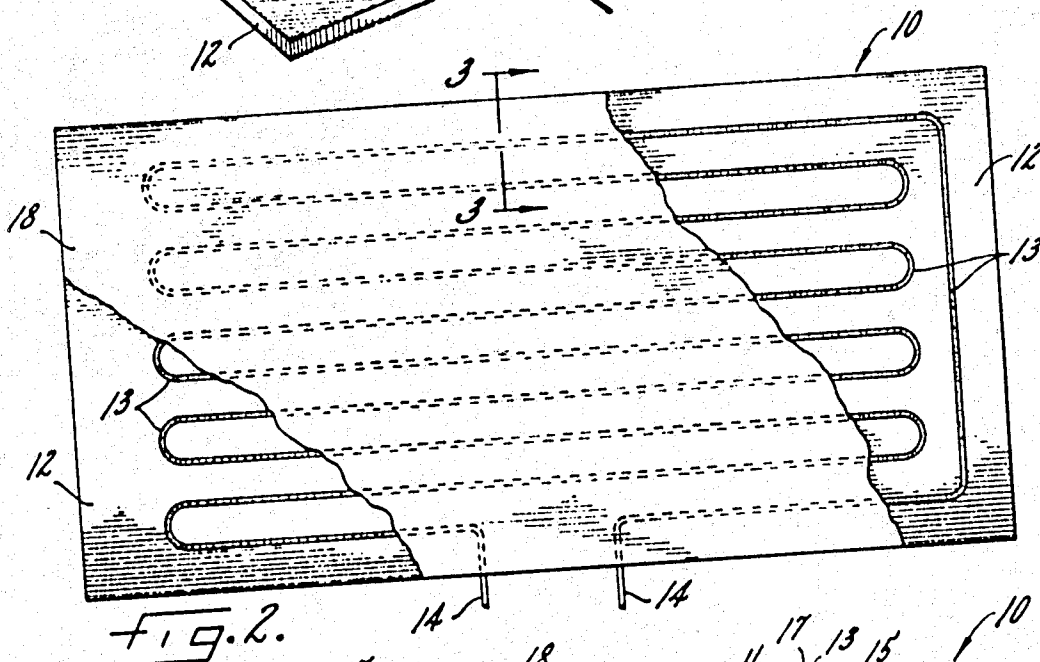
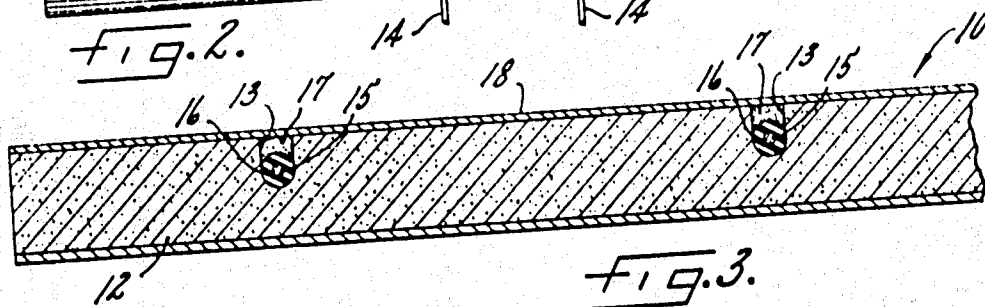
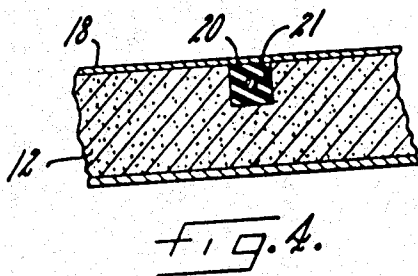


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ELECTRIC RADIANT HEATING PANEL  
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3,277,273



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This invention relates to electric heating apparatus for buildings, and more particularly to a panel which can be secured to the building-frame and which will contain an electrical resistance heating element.

It has heretofore been proposed to incorporate electrical resistance heating elements in panels adapted to provide the wall or ceiling surfaces in a building. In one such panel, shown in the Deacon Patent No. 3,095,491, the rear face of the panel is provided with a serpentine groove in which an insulated resistance wire is laid and covered with a heat-conductive cement or plaster, the rear face of the panel being then covered with a sheet of paper or metal foil. It is an object of this invention to improve panels of that general type, particularly with regard to their ability to radiate the heat generated in the resistance wire.

A preferred form of heating panel embodying my invention comprises a sheet of plaster board or gypsum board of conventional type provided in its rear face with a serpentine groove, the ends of which extend into one edge of the sheet. In its cross-sectional shape, such groove is coordinated with the cross-sectional shape of the insulation with which the resistance wire is covered. If that insulation is circular in cross-section, the groove has a semi-circular bottom and a width desirably slightly less than the diameter of the insulation, so that the insulated wire, when forced into the groove, will have good heat-transmitting contact with the side walls and bottom of the groove. After the wire has been seated in the groove, the groove is filled with a heat-transmitting cement to a level flush with the rear face of the panel, and such rear face is then covered with one or more sheets of material such as paper or metal foil secured to the panel face. Metal foil is preferred for this purpose because of its heat-reflective properties. The ends of the resistance wire are brought out of the panel through the ends of the wire-receiving groove to extend from the edge of the panel for connection to appropriate leads.

Instead of employing an insulated resistance wire in which the insulation is circular in cross-section, I may employ a wire having insulation which is square or rectangular in cross-section. With such a wire, the cross-sectional shape of the panel groove would conform to that of the insulation, so that when the resistance wire is forced into the groove its exposed face will be substantially flush with the rear face of the panel, thus eliminating the necessity for the application of heat-conductive cement to remove air gaps which would retard transmission to the panel of heat generated in the wire.

Further objects and features of the invention will become apparent from the following more detailed description and from the accompanying drawing in which:

FIG. 1 is a perspective view of a ceiling construction showing heating panels secured to the lower faces of ceiling joists;

FIG. 2 is a plan view of the rear face of a heating panel;

FIG. 3 is a fragmental vertical section on an enlarged scale taken on the line 3-3 of FIG. 2; and

FIG. 4 is a vertical section similar to FIG. 3 but illustrating a modified construction.

In the construction shown in FIG. 1, a plurality of heating panels 10 are secured to the lower faces of a series of ceiling joists 11. As more fully shown in FIGS. 2 and 3, each of the panels 10 comprises a rectangular sheet 12 of gypsum board, plaster board, or like fire-resistant material the upper surface of which is provided with

a continuous serpentine groove 13 for the reception of an insulated resistance wire. The end portions of the groove 13 are located adjacent each other and extend into a side face of the sheet 12 whereby the ends of the resistance wire in the groove can be brought out through the side face of the panel, as indicated at 14, for connection to appropriate leads. The resistance wire, which is designated by the reference numeral 15 in FIG. 3, has a sheath or covering 16 of flexible insulating material. Preferably, although the covering 16 is electrically insulating, it is relatively heat-conductive in order to promote transfer to the sheet 12 of the heat generated by passage of current through the wire. Such coverings are known and form no part of the present invention.

In accordance with one feature of my invention, the groove 13 has a width somewhat less than the diameter of the insulating covering 16 on the wire 15 with the result that the covered wire has to be forced into the groove with some accompanying elastic distortion or compression of the covering 16. Such compression or distortion of the covering 16 increases both the area and firmness of contact between it and the side walls of the groove, thus promoting the transfer of heat from the wire 15 through the covering to the sheet 12. Further to promote such heat transfer, at least the bottom of the groove conforms to the cross-sectional shape of the covering 16. That is, if the covering 16 is circular in cross-section, the bottom of the groove is semi-circular in section. The groove may be either formed in the sheet 12 in the molding thereof or cut in the sheet after the sheet is otherwise finished.

In the arrangement shown in FIG. 3, after the insulated wire is forced to the bottom of the groove 13, the groove is filled to a level flush with the upper face of the sheet 12 with a settable cement or plaster 17. Such plaster eliminates all air gaps between the surface of the wire-covering 16 and the walls of the groove 13, and hence promotes heat transfer to the sheet 12. To that end, the cement 17, is preferably of a type which possesses relatively good heat-transmitting properties.

After the upper portion of the groove 14 has been filled with cement, the upper face of the sheet 12 is covered with a sheet 18 of paper or metal foil adhesively secured to the sheet. Metal foil is preferred as a material for the sheet 18 because of its heat-reflective properties.

Prepared as just described, the panel is in condition for application to the frame-work of a building. As shown in FIG. 1, the panel is applied to ceiling joists 11; but, if desired, it could be disposed in a vertical plane and applied to studding. After application to the building frame-work, the projecting wire-ends 14 are bent, upwardly in the construction shown in FIG. 1, out of the plane of the panel for connection to appropriate leads, not shown. The panels may be secured to the building frame-work by nails driven through them at points spaced from the wire-receiving grooves 13.

Instead of employing a covering 16 of the conventional circular cross-section for the wire 15, I may provide such wire with a covering 20 (FIG. 4) which is square or rectangular in cross-section. When such a wire-covering is employed, the groove 21 in the sheet 12 is shaped in cross-section to conform to that of the covering; but again, the width of the groove is desirably slightly less than the width of the covering so that the latter will undergo some compression as it is forced into the groove. If the depth of the groove 21 is equal to the vertical dimension of the covering 20, the upper surface of the covering will lie flush with the upper face of the sheet 12 and there would be no necessity for the cement 17 shown in FIG. 3.

A panel constructed in accordance with my invention is very effective in its utilization of the heat generated in the resistance wire. This is due in large part to the fact that the insulating covering on the wire is compressed

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when in position and is held in firm and direct contact with the walls of the groove for at least the lower half of its circumference. In the arrangement shown in FIG. 4, the covering is in contact with the groove walls for three-fourths of its circumference; and, since the covering completely fills the groove, the application of plaster or cement to eliminate air gaps is not necessary.

I claim:

1. A radiant heating panel for application to building frame-work, comprising a sheet of fire resistant material having substantially plane front and rear faces and provided in its rear face with a serpentine groove having opposed side walls, and an electrical resistance wire provided with a flexible, compressible electrically-resistive covering seated in said groove, the width of the groove being less than the width of the covering, whereby the covering will be compressed between the opposed side walls of the groove and in intimate, heat-transferring contact with the side walls and bottom of the groove, said covering substantially filling the groove and having an outer face substantially coplanar with the rear face of said sheet.

2. A radiant heating panel for application to building frame-work, comprising a sheet of fire-resistant material provided in its rear face with a serpentine groove, an elec-

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trical resistance wire provided with a flexible electrically-resistive covering laid in said groove, said covering and groove having substantially identical rectangular cross-sections whereby the covering is in intimate, heat-transmitting contact with the sides and bottom of the groove, and a sheet of heat-reflective material covering and adhesively secured to the rear face of said first named sheet and in contact with the otherwise exposed face of said covering.

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