April 7, 1953 J. L. REYNOLDS 2,634,361

PICTURE FRAME HEATING PANEL

Filed Nov. 9, 1950

2 SHEETS--SHEET 1

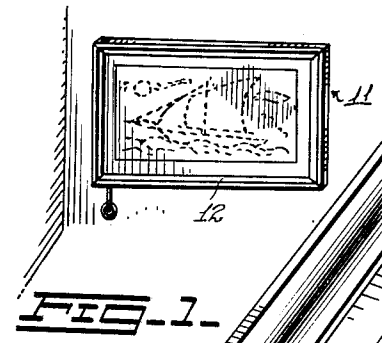


FIG. 1.

FIG. 2.

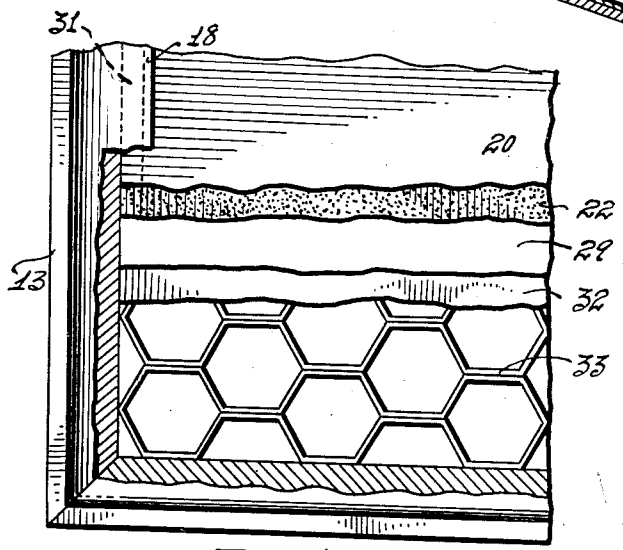


FIG. 3.

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PICTURE FRAME HEATING PANEL

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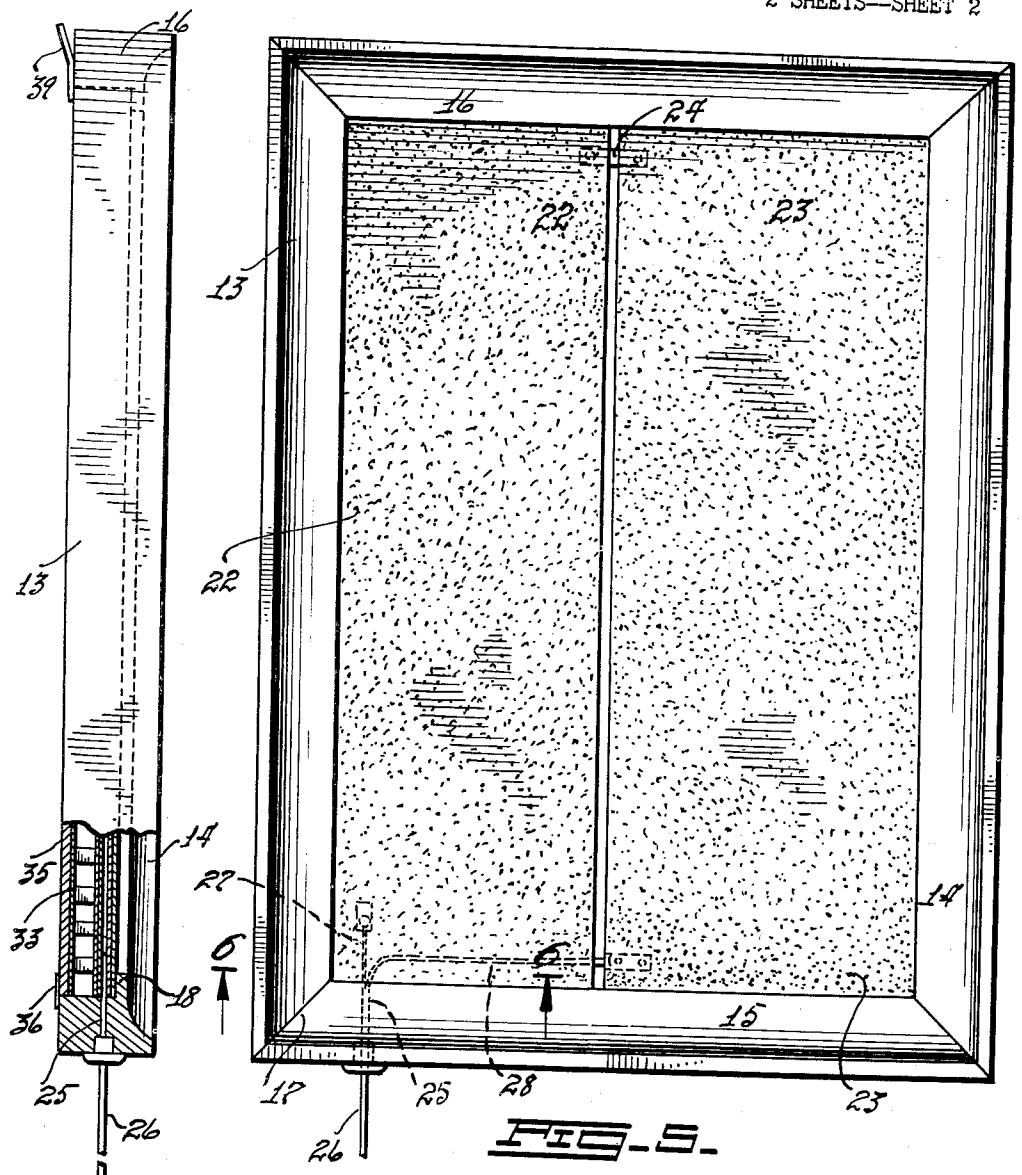


FIG-5-

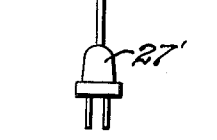


FIG-4-

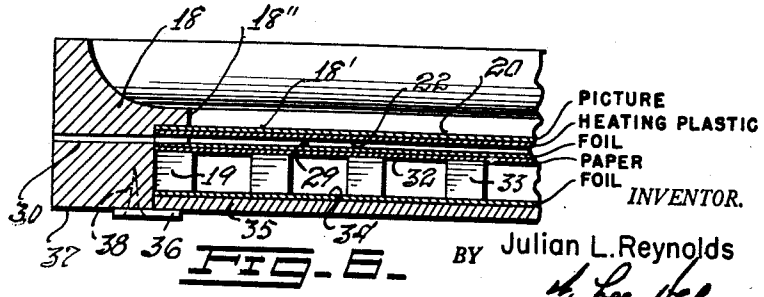


FIG-6-

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UNITED STATES PATENT OFFICE

2,634,361

PICTURE FRAME HEATING PANEL

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Application November 9, 1950, Serial No. 194,820

4 Claims. (Cl. 219—34)

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This invention relates to a radiant heating unit, and more particularly to a unit comprising a picture frame having mounted therein a radiant heating panel. The latter has a construction somewhat similar to that of my prior Patent No. 2,512,875 issued June 27, 1950, but involves several novel features not disclosed in said patent.

The radiant heating panel of said prior patent is in the form of sheets of construction material adapted either to be used as wall surfaces in new structures or to be applied to existing wall surfaces so as to cover substantially the entire area thereof. The present invention resides in the utilization of a radiant heating panel in a picture frame so as to produce a portable unit having considerable advantages in utilization, marketability, and installation over the construction material sheets of said patent. The present invention further resides in the improved construction of the heating panel itself.

In more detail, by mounting the radiant heating structure within a picture frame, there is produced as easily marketable home appliance unit instead of merely a raw construction material. The picture frame unit may be mounted or suspended on a wall surface in the same manner as a conventional framed picture so as to obviate the expensive installation by skilled technicians required with the construction material panels or sheets of said prior patent. Possible difficulties and inconveniences caused by building code requirements wtih respect to wall specifications may be obviated. The units of the present invention provide a more flexible and adaptable heating source in that one or more units may be turned on and off so as to adjust to varying heat load requirements. Furthermore, the units are easily positioned and relocated whereby they may be moved from room to room or to different parts of the same room. It will thus be seen that one or a few units may be moved about so as to accommodate a larger interior without prohibitive cost. The units are also capable of supplying a localized heating in accordance with the particular requirements of local areas or regions of the interior. Existing structures are more easily adapted for radiant heating installation since the latter involves merely the hanging of a picture frame on a wall in the conventional manner. The units also perform a dual function in that they act both as framed pictures for decorating the walls and also as heating units. A further advantage of the present invention is that the units are quickly and easily removable

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and easily manipulated for washing, replacement, or repair.

Furthermore, the improved novel construction of the heating panel of the present invention is simpler, more efficient and more economical to manufacture, and provides a more uniform heating throughout its area, than the panel of said prior Patent No. 2,512,875.

Other objects and advantages of the present invention are inherent in the structure as claimed and as disclosed in the specification and in the drawings wherein:

Fig. 1 is an elevational view showing a radiant heating picture frame unit in accordance with the present invention and shown mounted on a wall surface;

Fig. 2 is a perspective view of the device with parts broken away to show the interior construction;

Fig. 3 is a front elevational view of the unit partially broken away for purposes of clarity and illustration;

Fig. 4 is a side elevational view partially sectioned to show the interior construction of the unit;

Fig. 5 is a front elevational view with the decorative panel removed so as to show the sheet-like electrical heating members and the electrical connections therefor; and

Fig. 6 is a transverse sectional view taken substantially on the line 6—6 of Fig. 5.

Referring now to the drawings, the reference numeral 11 indicates generally the radiant heating unit embodying the present invention. The unit 11 comprises a conventional picture frame indicated at 12 and formed by a pair of horizontal members 13, 14, and a pair of vertical members 15, 16 joined thereto. As best seen in Fig. 5, the adjacent abutting ends of the members 13, 14, 15, 16 are bevelled as at 17 so as to interfit in the conventional manner.

Each of the frame members is provided along its inner longitudinal edge with a flange 18 projecting inwardly therefrom. The flanges 18 of the frame members define the marginal edges of the picture frame opening. As best seen in Fig. 6, each of the flanges 18 is provided with a rear surface 18' forming a flat shoulder and defining the forward wall of a recess extending peripherally about the rear portion of the frame 12. The recess is further defined by a side wall 19 of each of the frame members off-set outwardly from the respective inner edges 18'' and located rearwardly of and adjacent the flanges 18.

A decorative panel 20 is mounted in the frame

12 at the front thereof and is provided with a forward heat radiating surface 21 facing through the opening of the frame 12 and having any suitable decorative design or picture thereon. The marginal edges of the decorative panel 20 extend within the recess formed by the side walls 19 and flanges 18 and are in abutting contact with the rear surfaces or flat shoulders 18'.

Adjacent the rear face of the decorative panel 20 and in direct heat conducting relationship thereto are a plurality of sheet-like electrical heating members 22, 23 lying in a common plane.

Although only two such heating members are disclosed in the drawing, it will be obvious that any number may be employed. Each of the sheet-like members 22, 23 is formed of an electrically non-conductive material, preferably plastic, and has dispersed therein an aggregation of minute electrically-conductive particles such as carbon, aluminum, copper or other conductive metal.

As best seen in Fig. 5, an electrical conductor 24 contacts the upper portions of the sheets 22, 23 so as to connect the latter in series. The lower horizontal frame member 15 is provided with an opening 25 through which extends an electrical cable 26 having a lead 27 in contact with the lower portion of sheet 22 and a lead 28 in contact with the lower portion of sheet 23. The end of the cable 26 is provided with a conventional plug 27' adapted to be inserted into a conventional electrical wall socket. It will thus be seen that electrical current supplied through the cable 26 will flow upwardly through one of the members 22, 23, then through conductor 24, and then downwardly through the other of the members 22, 23, each of the latter being electrically insulated from the other by the spacing provided between their opposite adjacent edges.

The current flows only through the conductive particles and the electrical energy is transformed into heat which is then distributed uniformly and evenly throughout the entire areas of the members 22, 23 by means of the heat conducting characteristic of the plastic material. The uniformity and even distribution of the heat is further aided by the fact that the conductive particles are very minute and numerous and are distributed substantially uniformly throughout the areas of the members 22, 23.

Spaced rearwardly from the heating members 22, 23 is a layer of metallic foil 29, preferably aluminum, or other metal having a high heat reflective characteristic. The spacing between the foil 29 and the heating members 22, 23 provides an air space therebetween which serves as insulation preventing heat from the members 22, 23 from passing to the layer of foil 29 by means of direct conduction, it being understood that air has an extremely low coefficient of heat transfer.

The air space between the heating members 22, 23 and the layer of foil 29 also serves the purpose of ventilating the interior of the unit so as to prevent the rear portions of the latter from over-heating. In more detail, and referring to Figs. 2 and 6, the frame members 13, 14 are provided with channels or openings 30 each communicating at one end with the atmosphere and at the opposite inner end with the air space between the heating members 22, 23 and the layer of foil 29. It will thus be seen that relatively cool air from the interior of the room may flow through the channels 30 and the air space adjacent the foil layer 29 so as to ventilate the interior of the unit. The spacing between the foil layer 29 and the heating members 22, 23 may be provided by means of a plurality of spacer elements 31 extending adjacent and between the marginal edges of the foil 29 and heating members 22, 23 as best seen in Fig. 2.

A layer of paper 32 is preferably provided adjacent the foil 29 and forms the forward face of a planar heat insulating member 33. As best shown in Fig. 2, the heat insulating member 33 is provided with a cellular structure similar in appearance to a honeycomb so as to have air cells extending substantially from the rear to the forward faces, as described and disclosed in more detail in my prior Patent No. 2,512,875. The rear face of the heat insulating or planar body member 33 is provided with a second layer of heat reflective material such as metal foil 34.

A backing plate 35 abuts against the rear surface of the foil 34. A plurality of detachably mounted strips 36 are secured at their outer edges to the rear surfaces 37 of the frame members 13, 14, 15, 16 by any suitable means such as screws 38, as best seen in Fig. 6. The inner edges of the strips 36 abut against the rear surface of the backing plate 35 so as to urge the latter forwardly and thereby maintain the backing plate 35, layer of foil 34, heat insulating member 33, paper layer 32, foil layer 29, spacer elements 31, foil layer 22 and decorative panel 20 in compressed assembled relationship.

As shown in Fig. 4, the frame member 16 is provided with a conventional picture-hanging bracket 39 for suspending the entire unit on a wall surface in the same manner as a conventional picture frame. If it is desired to hang the unit horizontally as shown in Fig. 1 the bracket 39 may be provided on the frame member 13.

It will thus be seen that when electric current flows through the sheet-like members 22, 23 the latter becomes uniformly heated and the heat is transferred by direct conduction to the decorative panel 20. The high heat radiating character of the front surface 21 of the panel 20 will cause a high percentage of the heat generated to be radiated from the unit so as to heat the interior of the room. The layer of foil 29 is highly reflective and hence is also a poor absorber of heat radiation. Therefore the heat radiated from the heating members 22, 23 rearwardly will strike the foil 29 and be reflected forwardly, thereby preventing heat from being transmitted through the rear portions of the unit. The air space between the heating members 22, 23 and the foil 29, and also the air spaces within the honeycomb heat insulating member 23 prevents heat from being transmitted to the rear portions by conduction. The layer of foil 34 at the rear of the heat insulating member 23 further serves to reflect any rearwardly directed heat radiations back to the forward portion of the unit. It will thus be seen that the major portion of the heat generated in the heating members 22, 23 is transmitted forwardly from the heat radiating surface of the panel 20, thereby providing a radiant heating device having a high efficiency and also protecting the adjacent wall surfaces from the deleterious effects of over-heating.

It is to be understood that the specific embodiment of the invention disclosed in the specification and drawings is intended as merely illustrative of one of the many forms which the invention may take in practice, the scope of the invention being delineated in the appended claims. Many modifications and variations of

the disclosed embodiment will be readily apparent to those skilled in the art without departing from the scope of the invention. For instance, electrical resistance ribbons such as disclosed in my prior Patent No. 2,512,875, or other heating means, may be substituted for the sheet-like heating members 22, 23. The cellular insulating member 33 may be eliminated or other equivalent insulating means may be employed. Either or both of the heat reflective foil layers 29, 34 may be dispensed with. Furthermore, the specific disclosed manner of mounting the several elements of the radiant panel within the frame 12 may be modified if desired. Also, the front face of the decorative panel 20 may be provided with any well-known coating or surface layer having a high heat radiating characteristic.

What I claim and desire to secure by Letters Patent is as follows:

1. A radiant heating device comprising a frame having a central opening therethrough, an inwardly projecting flange formed on the frame and extending around the periphery of the opening so as to define the marginal edges thereof, the rear surface of the flange forming a flat shoulder and defining the forward wall of a recess extending peripherally about the rear portion of the frame, a decorative panel having a forward heat radiating surface facing through the opening and abutting said flat shoulder, a planar insulating body member spaced rearwardly from and parallel to said panel and having air cells therein extending substantially from its rear face to its forward face, heating means between said panel and said body member, a heat reflective layer at the rear face of said body member, a rigid backing plate at the rear surface of the heat reflective layer, said decorative panel, insulating member, heat reflective layer and backing plate having peripheral edges within said recess, means secured to said frame and pressing against the rear surface of the backing plate for urging the latter forwardly so as to maintain the shoulder, panel, heating means, insulating member and heat reflective layer in compressed assembled relationship, and a picture-hanging bracket secured to the frame for suspending the latter on a wall.

2. A radiant heating device comprising a picture frame, a decorative panel mounted in the frame and having a forwardly-facing heat radiating surface with a decorative design thereon, a planar body member spaced rearwardly from said panel and having air cells therein extending substantially from its rear face to its forward face, heating means between said panel and said body member, heat reflective layers of foil at the rear and front faces of said body member, means for maintaining the panel, heating means, body member and heat reflective layers in assembled relationship, and a picture-hanging bracket secured to the frame for suspending the latter on a wall.

3. A radiant heating device as set forth in claim 1 wherein said heating means comprises a plurality of sheet-like members, each of said last-recited members being formed of a non-conductive material having embedded therein and disposed substantially throughout the entire area thereof a plurality of minute electrically-conductive particles, and means for connecting said sheet-like members to a source of electrical power whereby current may flow through said sheet-like members.

4. A radiant heating device comprising a picture frame, a decorative panel mounted in the frame and having a forwardly-facing heat radiating surface with a decorative design thereon, a plurality of sheet-like members in direct heat conducting relation to the rear face of said panel, each of said members being formed of an electrically non-conductive plastic material having embedded therein a plurality of minute electrically-conductive particles, means for connecting said sheet-like members to a source of electrical supply whereby electrical current may flow through said members, a planar body member spaced rearwardly from said sheet-like members and having air cells therein extending substantially from its rear face to its forward face, heat reflective layers of foil at the rear and front faces of said body member, means for maintaining the panel, sheet-like members, body member and heat reflective layers in assembled relationship, and a picture-hanging bracket secured to the frame for suspending the laater on a wall.

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