United States Patent [19]

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[45] **Oct. 16, 1973**

[54] **DECORATIVE ACOUSTICAL PANEL**

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[21] Appl. No.: **200,752**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 130,611, April 2, 1971, Pat. No. 3,706,171.

[52] **U.S. Cl.** **52/475,** 52/144, 52/484, 52/629

[51] **Int. Cl.** **E04b 5/52,** E04c 2/38

[58] **Field of Search** 52/475, 474, 484, 52/489, 627, 629, 624, 145, 144, 483, 488

[56] **References Cited**

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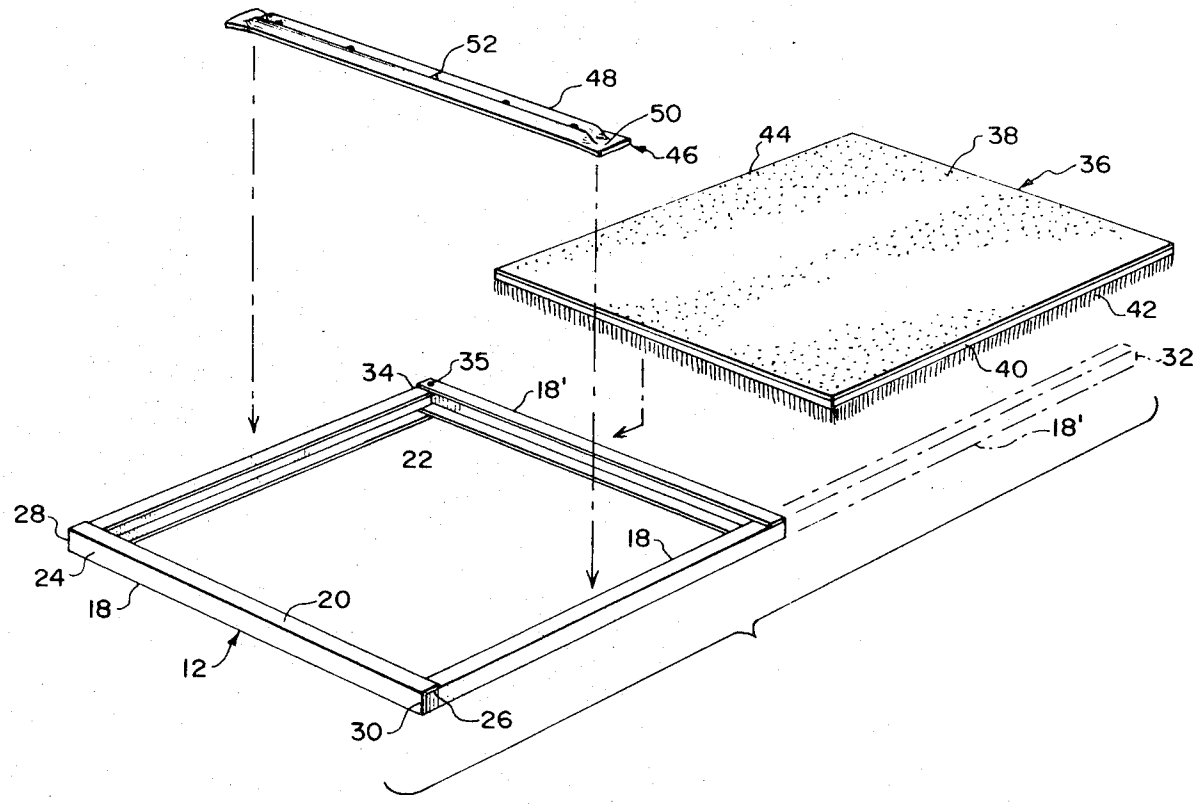
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[57] **ABSTRACT**

A decorative acoustical ceiling panel is disclosed comprising a rigid rectangular frame member having a rectangular layer of carpeting material held peripherally therein and provided with a backing of fire-resistant reinforcing composition including integral reinforcing members to provide a flat, sag-proof panel. The panels are adapted to be assembled with other like panels in edge-to-edge relationship in a suitable ceiling installation and provide the appearance of a blanket of carpeting covering the ceiling. Mounting means in the form of hook members comprising extensions of the reinforcing members extend from the upper edges of the frame member for mounting the panels on support members suspended from a ceiling. A method of fabricating the panels is also disclosed which imparts the desired rigidity without buckling and with the use of the least amount of reinforcing cement.

14 Claims, 8 Drawing Figures



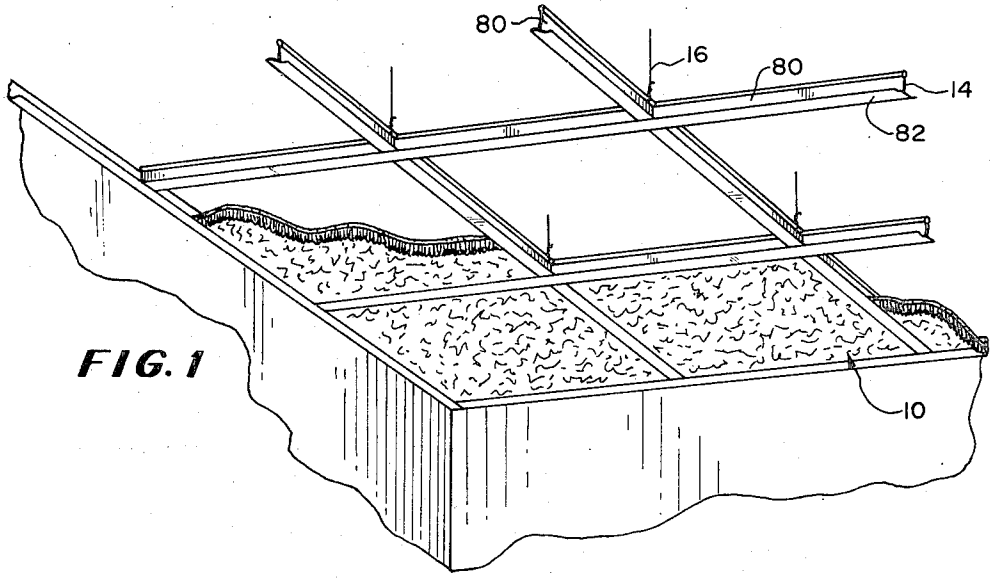


FIG. 1

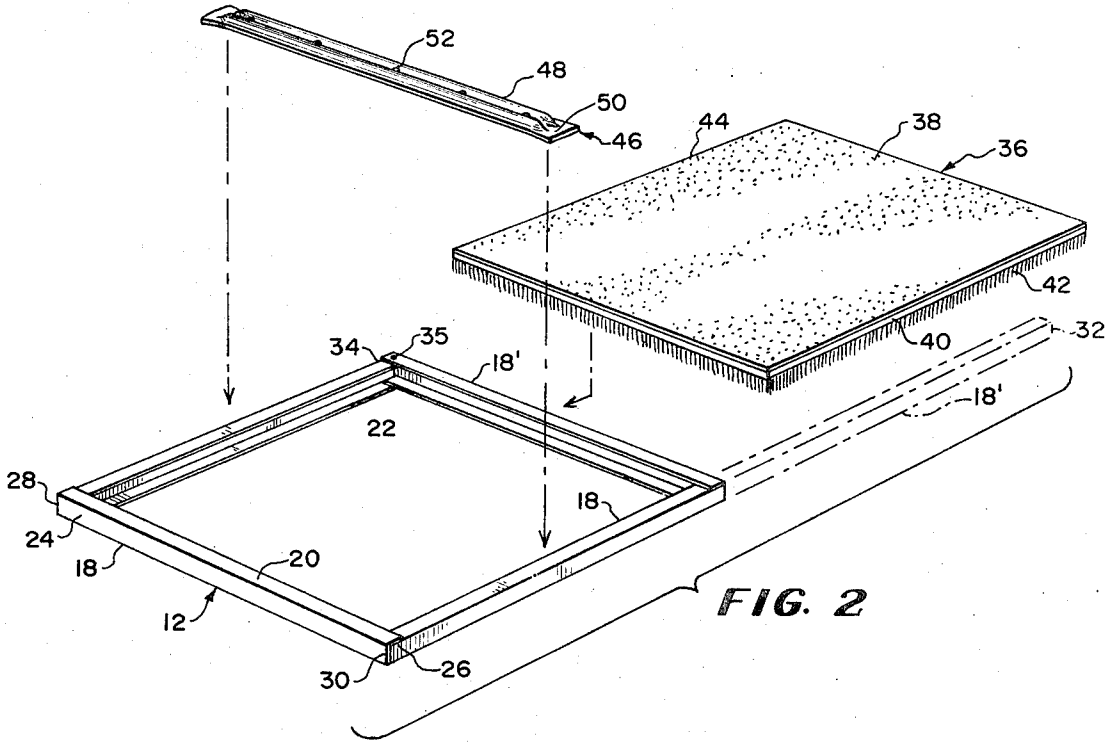


FIG. 2

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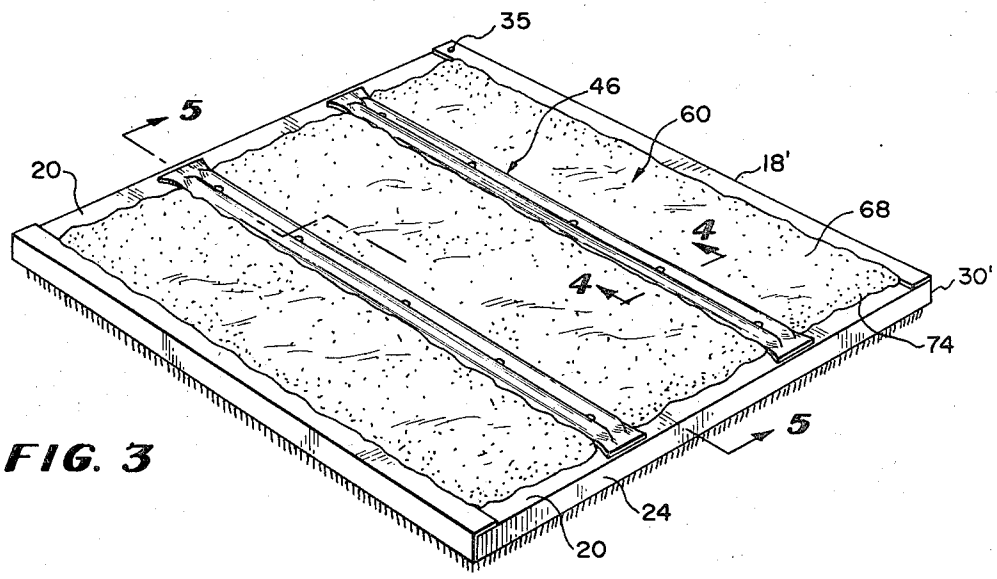
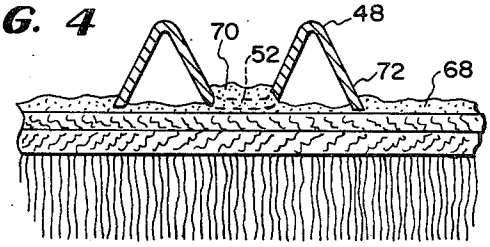


FIG. 3

FIG. 4



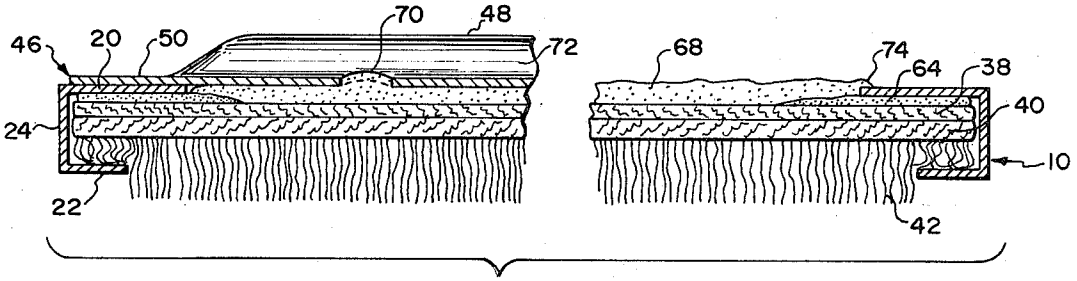


FIG. 5

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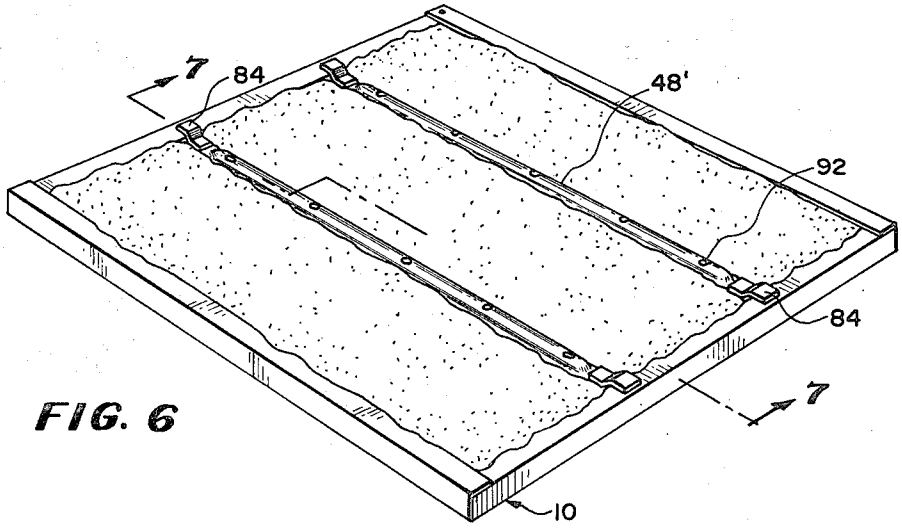


FIG. 6

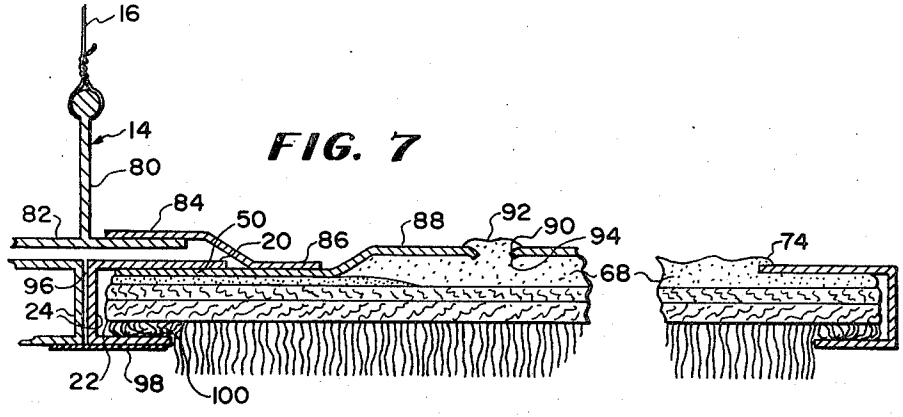


FIG. 7

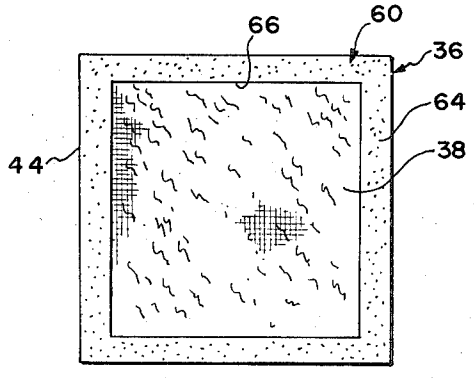


FIG. 8

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DECORATIVE ACOUSTICAL PANEL

RELATED APPLICATION

This application is a continuation-in-part of the copending application, Ser. No. 130,611 filed Apr. 2, 1971 by the instant inventor, now U.S. Pat. No. 3,706,171 and represents an improvement thereover.

BACKGROUND OF THE INVENTION

Sound control decorative ceilings made up of a plurality of rectangular panels arranged in edge-to-edge relation and suspended from support members attached to a ceiling are well known. The support members for such ceiling panels are provided in a variety of forms adapted for installation from ceilings having wooden joists, and ceilings comprising the plane undersides of reinforced concrete floor constructions. Provision is made for the attachment of various types of hangers in the form of wires, hanger clips and the like which attach to and suspend a system of spaced parallel inverted T-shaped support members in substantially planar relationship from the rough, unfinished ceilings. The spacing between the support members is such that the decorative panels are inserted therebetween and hung adjacent to each other in a plane spaced downwardly in the so-called false ceiling arrangement.

The prior art ceiling panels are constructed of a variety of materials. There are sculptured three-dimensional fiber glass panels, textured flat fiber glass panels, mineral wood fiber panels, mineral wood panels, aluminum clad panels and panels of expanded perlite with mineral binders, etc. Other panels are constructed of stone-like ingredients reduced to a molten state spun into mineral fibers and formed into rigid tiles or are formed of asbestos-cement such as the proprietary product known as "Transite" the trademark of Johns-Manville Company of New York.

Although the prior art panels are quite suitable for their intended purposes, little attention has been paid to soft textured materials in ceiling coverings. One of the problems associated with the use of soft flexible materials is the provision of satisfactory rigidity and freedom from sag while not adding appreciably to the weight of the panels. Of course, once in place the weight of the individual panels is immaterial, however, manufacturing, handling and shipping costs are increased with increased weight of the panels, plus the added factor of the work required in setting them in place. Coupled with this is the problem of providing soft panels of carpeting material and the like which are fire-resistant, mildew proof, water proof and acid proof.

SUMMARY OF THE INVENTION

In accordance with this invention, decorative and acoustical panels for ceiling structures exhibiting the foregoing properties are provided which when assembled in edge-to-edge relation, present the appearance of a blanket of carpeting covering the ceiling. A method of fabricating the panels to impart the required rigidity with the least amount of cement without causing the carpet backing to buckle or otherwise deform, is provided wherein as a step thereof a thin layer of cement is applied to the edge of the carpet panel before it is fitted within and finally cemented to both the frame and its reinforcing member. The supporting frames and reinforcements further enhance the decorative effect, simplify the construction, provide complete edge support, contribute to the ease of manufacture, and produce a product which is aesthetically appealing and effective as a decorative and acoustically efficient panel.

DESCRIPTION OF THE DRAWINGS

The foregoing objects, features and advantages of the soft ceiling panels of this invention become more readily apparent from the following detailed description of the drawings, wherein like reference characters indicate like parts throughout the several figures and in which:

FIG. 1 is a fragmentary perspective view of an installation of ceiling panels constructed in accordance with the present invention;

FIG. 2 is an exploded perspective view showing the component parts of one form of ceiling panel of this invention and their relationship prior to assembly;

FIG. 3 is a perspective view of the back side of a ceiling panel in assembled form;

FIG. 4 is an enlarged cross-sectional view taken along the line 4—4 of FIG. 3 and showing the interlocking relationship of the cross-brace and cement;

FIG. 5 is an enlarged cross-sectional view taken along the line 5—5 of FIG. 3 to show the relationship of the parts along the edges of the ceiling panel;

FIG. 6 is a perspective view of the back side of a modified form of ceiling panel;

FIG. 7 is an enlarged cross-sectional view taken along the lines 7—7 of FIG. 6; and

FIG. 8 is a plan view of the back side of a square of carpeting material showing the manner in which the first layer of cement is applied in constructing the panels.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings (FIG. 1) the reference numeral **10** indicates generally the decorative acoustical panel of the present invention having the frame member **12**, as is shown in FIG. **2**. The panels are mounted in a ceiling installation on spaced, parallel inverted T-shaped support members **14**, suspended from a ceiling in rectilinear orientation by means of the suspension or hanger members **16** which can be of any desired construction including wires attached to the ceiling proper.

Each of the panels **10** comprises a single rigid rectangular frame member **12** preferably formed of a light gauge, lightweight metal such as aluminum or the like. The frame member **12** is formed of four generally U-shaped side members **18** which in the embodiment shown in FIGS. **2** and **3** are all substantially the same length so as to provide a frame member having a square configuration measuring about 12 × 12 inch as an example. Each side member **18** includes a top inwardly directed flange **20**, a bottom inwardly directed flange **22** and a peripheral side wall or flat edge **24**. The flanges **20** and **22** are generally parallel to each other and vertically spaced.

The frame member **12** is fabricated from a single piece of sheet metal strip as wide as the total width of the flanges and sides. The flat strips are cut into lengths long enough to form one frame member, i.e., about 48 inches long for a 12 × 12 inch panel. Opposite pairs of slits or 90° notches are cut into the outer edges of the strips at three 12 inches intervals intermediate the ends. Each slit or notch extends into the side edge the

total depth of the flange for the side leaving sufficient stock between their points to form the side wall **24.** The slits, indicated by the cut edge **26,** receive the flanges so that the strips can be folded at the two corners **28** and **30** to form an open U-shape, leaving the remaining side member **18'** (shown in broken lines) ready to fold into the full line position to form the square framework. The slit portions of the flanges can overlap each other to a degree at the corner bends depending on the angle of these cuts. The end **32** of the side member **18'** overlaps with the free end **34** of the other strip to form a similar joint and complete the folded structure. These ends are provided with bore holes, which align in the folded position to receive the sheet metal screw **35.** The top flange **20** is normally fabricated wider than the bottom flange **18,** their respective widths being about seven-eighths inch and seven-sixteenths inch for the small panel shown. These flanges can be of equal widths or otherwise dimensioned as desired.

The rectangular piece of carpeting **36** (see FIG. 2), is the next component of the panels **10** of this invention. These carpet pieces are of any known construction and carpet type and generally comprise the jute backing **38,** the intermediate latex layer or binding **40** and the carpet pile or raised surface of yarn ends or loops **42.**

The carpeting material **36** is cut to the same dimensions as the frame **12,** with the peripheral side edges **44** being adapted to fit in alignment with the inside of the side walls **24** around the space between the flanges **20** and **22,** and be supported thereby.

One or more reinforcing and support members **46,** comprising generally flat, elongated sheet metal strips with a pair of parallel, spaced, elongated reinforcing, raised embossments **48** struck therein, intermediate the flat ends **50,** are provided for each panel **10.** The embossments can be irregular in cross-section or provided with holes **52,** spaced as desired, along the flat area between the embossments. The distance between the ends **50** of each brace member **46** is such that the members **46** fit across opposite sides of the frame **12** with the ends **50** over the top flanges **20** without extending beyond the side walls **24.**

In accordance with this invention, the component parts shown in FIG. **2** are assembled into the completed panel **10,** the back side of which is shown in FIG. **3,** by the application of a cementous material **60** which hardens into a rigid, interlocking fire resistant bond for the parts. To accomplish this, the carpeting material is first partially reinforced at its edges, then inserted into the frame, the frame is closed, the screw **35** inserted, and the last layer of cement applied as will be described.

Any hydraulic furnace cement material possessing the property of hardening in water as well as air, comprising for example, highly basic silicate compounds including Portland cement with or without gypsum as a negative catalyzer, retarding the hardening rate of the cement and also containing prescribed amounts of asbestos, can be used. Cements prepared by heating an intimate mixture of bauxite and limestone until molten and ground to a fine powder can also be used as the carrier for the asbestos and a suitable retarder such as gypsum.

A particularly suitable fire-resistant coating material **60** is "Harnisch's Asbestos Furnace Cement," which is manufactured by L. E. Harnisch & Co., of Chicago, Ill. These compositions can be applied by troweling or spraying upon the backing **34** of the carpeting material **32.** The Harnisch & Co. product is particularly suitable, since besides its fire-resistant properties, it also renders the carpeting material mildew proof, waterproof and acid-proof and further imparts added strength and stiffness to the carpeting material so as to eliminate sagging thereof.

In accordance with one aspect of this invention, the furnace cement **60** is applied in a certain sequence of steps and in a prescribed manner on the backing **38** of the carpeting material. It was found that if a thin layer of the cement was applied over the entire area of the backing material, the carpet panels **36** tended to warp and have upturned edges **44** when the cement dried. This was true regardless of the use of fast or slow drying cements. The application of layers of various thicknesses over the entire area of the back of the carpet was equally deficient regardless of the setting time. The corners of the panels exhibited a particularly large curl. Adjustment of the amount of asbestos in the cement composition did not overcome the problem of curling. After some experimentation it was found that the application of a thin layer about one-sixteenth to one-eighteenth inch thick in a peripheral strip **64** (see FIG. **8**) about 1 to 2 inches wide to the backing material **38** overcame this problem and the carpet panels did not curl at the edges **44** as the cement hardened, nor did the partially reinforced carpet panels warp in the frame **12** after completion of the assembly steps.

FIG. **8** shows the back of a carpet panel **36** to which a peripheral strip or band **64** of relatively slow-setting furnace cement **60** has been applied along all four edges as the first step in the fabrication of the panels. The band **64** extends to the edge **44** of the carpeting material and also to the corners. The central part of the backing **38** is uncovered and the inner edge **66** of the strip **64** can be irregular and thin out to a feather edge. In other words, the uncovered portion need not be rectangular in configuration. About 30 percent of the area of the jute backing **34** is covered with cement **60** in this first step. Two thin coats of cement can also be applied to form the edge-reinforced panel shown in FIG. **8.**

As the second step in the process, carpet material shown in FIG. **8** is inserted edgewise into the open-sided frame shown in FIG. **2** before or after the edge strips or bands **64** have hardened, with the pile side **42** against the bottom flanges **22.** The frame **12** is then closed by bringing the remaining side **18'** into position as previously described forming the corner bend **30'.** A second coating of cement **68** is then applied over the uncovered area of backing **38.** The reinforcing members **46** are laid in this fresh cement with any desired spacing and with their ends **50** in the positions shown in FIG. **3.** The frame **12** can of course be closed after this operation. The reinforcing members **46** are preferably spaced from each other and from the remaining sides of the frame **12** in a uniform manner. The second coating **68** of cement is forced upwardly through the holes **52** in the manner shown in FIG. **4** to form a rivet head **70** of cement that squeezes through the holes. The sloping edges **72** of the embossments **48** become embedded into the fresh cement layer **68** to tie the reinforcing member thereto along its entire length. Additional edge-tying portions of the cement **60** are applied along the edges over the flange **20** and over the corners as indicated at **74.** The second cement coating **68,** if applied before the bands **64** have set becomes integral

therewith. The cement layers 64 and 68 may be applied by troweling or spraying.

Since the back sides of the panels 10 are not exposed when they are suspended from a ceiling structure, no particular care need be exercised to apply the cement evenly. Since, also the center portion 38 of the panel carpeting 36 is still somewhat flexible, the insertion of the cement layer into any voids is facilitated. These operations are performed with the frame and carpet panel laying on a flat surface although horizontal positioning is not essential. The completed panels can, however, be allowed to set in the position shown in FIG. 3 with their pile sides down on the flat surface. The layer 68 of cement 60 can be as thick as required to rigidify the structure, as for example about one-sixteenth to one-eighteenth inch in thickness, depending somewhat on the softness or flexibility of the carpet panel 36.

No spot-welding or other fastening means are employed to complete the panels 10 and the screw 35 can be omitted if desired since the cement layer 68 ties the side 18' in place. The panels 10 are ready for packaging and shipping in about 6 to 12 hours, depending on the hardening time of the cement used. The hardening process is carried out at ambient conditions in the presence of air. Larger panels, i.e., measuring 23⅞ × 23⅞ inches are fabricated in the same way using a larger frame and three reinforcing members 46, instead of a pair as shown in FIG. 3. It is also apparent that the end portions 50 of the reinforcing members do not need to be attached to the flanges 20.

FIG. 5 illustrates the manner in which the carpet backing 38 and cement layers become unified with the reinforcing members 46 and the frame 12 in the completed panel 10. There is no tendency for the panels to sag when suspended from a ceiling. The panels 10 are laid between the upright portions 80 of the hangers 14 with their bottom flanges 20 resting on the horizontal flanges 82 of the hangers in a manner known in this art to form the completed ceiling.

FIGS. 6 and 7 illustrate an alternative structure of the panels 10 wherein the reinforcing members 48' have the upstanding tabs 84 comprising a piece of sheet metal formed into a flattened Z-shape with the base portion 86 spot-welded or otherwise firmly attached to each of their flat ends 50, and the latter are placed under the top flanges 20 instead of on their top sides. In this embodiment a single embossment 88 can be used and spaced holes 90 are provided along the apex of the embossment. As the modified reinforcing members are placed in the second cement layer 68, portions thereof are squeezed through the holes 90 to form the cement rivet heads 92 therealong. The reinforcing members 48' illustrated in FIG. 7 can have a pair of embossments 88 as shown in FIG. 2.

The reinforcing members 46 can have different cross-sections. Thus, instead of the embossments 48, a flat piece can be used with spaced bore holes to receive cement therethrough. Such a flat strap can have downturned edge flanges and be U-shaped in cross-section.

In order to facilitate entry of the cement layer 64 up into the length of the embossment additional cement can be laid or sprayed along the areas where these members are to be placed or the embossments can be more shallow or both expedients can be used. Also the reinforcing members shown in FIGS. 2 and 3 can be fabricated like the member 48' with one or a pair of more shallow embossments with spaced piercings or holes 90. By piercing the holes 90 therein the ragged edges 94 form an additional holding means embedded in the cement. The holes are preferably pierced inwardly so that no metal edges are exposed upon which the workman can be injured. The holes 52 in the web wall between the embossments 48 of the reinforcing members 46 (FIG. 4) can also be pierced to form an edge to catch in the cement.

The panels 10 illustrated in FIG. 6 are hung rather than laid upon the flanges 82 of the hanger members 14 as illustrated in FIG. 7. The grid suspension system of FIG. 1 or so-called lay-in system is modified so that the flanges 82 are parallel and the panels 10 are inserted edge-wise therebetween so that the tabs 84 engage over the top of the flanges 82 on each side of the panels. Cross-members or spacing splines can be used where desired. The side walls 24 of adjacent panels come to a close abutting relationship and any space 96 can be covered with strips of pressure sensitive tape 98 as illustrated in FIG. 7. The tape can be colored to harmonize or blend with the carpet coloring.

The spacing or relative lengths of the tabs 84 and the flanges 82 is such that some side play is provided for proper orientation of adjacent rows of panels with no tendency for the tabs to become disengaged during or after installation. Provision can be made for the easy removal of selected panels or groups of panels in the ceiling, as desired, for ready access to the space above the panels, in either type of installation and in a manner known in this art. The carpet pile 42 is pressed along its edges, as indicated at 100, upon the top of the lower flanges 22 and is firmly held in place.

For some installations the partially reinforced carpet panels illustrated in FIG. 8 can be used without the frame 12 and applied to a surface to be covered by spots of adhesive applied at the four corners and pressed against a flat surface in edge-to-edge relationship. The reinforcing members 48 need not be parallel and may be placed on the diagonal if desired. Also the clips 84 can attach to the flange 20 instead of to the ends of the reinforcing members, particularly where diagonal bracing is used. Any form of carpeting material can be used and the three layer carpet 38 is merely illustrative. The completed panels can be cut in any desired shape by using a metal cutting blade. A scroll type of saw can be used to cut curved edges where needed or cut apertures therethrough to fit over fixtures or ducts, etc. Other advantages and modifications of the invention become apparent to one skilled in the art.

It is further apparent that although a pair of reinforcing members 46 is used for each 12 × 12 inch panel 10 as shown in FIG. 3 and the strips are preferably equally spaced from the edges and from each other in substantially parallel position upon the back side of the carpeting material other arrangements can be used. No other reinforcements have however been found to be necessary. The reinforcing members can be laid at an angle to the side members 18 as long as their ends extend sufficiently to engage the flange 20.

What is claimed is:

1. A decorative acoustical ceiling panel comprising:

a rigid rectangular frame member including side members having spaced top and bottom flanges defining a central opening;

a rectangular layer of carpeting material supported at its edges between said flanges with the backing

thereof facing the top flange and the pile thereof facing the bottom flange;

a first peripheral layer of cementous material around said backing and against said top flange;

a second layer of cementous material covering the remaining portion of said backing and overlapping said first layer; and

a reinforcing member engaging between opposite top flanges with portions thereof embedded in locked relationship with said cementous material.

2. A decorative acoustical ceiling panel in accordance with claim **1** in which:

said cementous material is characterized by its strength, fireproof, waterproof and mildew proof properties.

3. A decorative acoustical ceiling panel in accordance with claim **1** in which:

said cementous material comprises a furnace cement containing asbestos.

4. A decorative acoustical ceiling panel in accordance with claim **1** in which:

mounting means are included for mounting said panel in a ceiling.

5. A decorative acoustical ceiling panel in accordance with claim **4** in which:

said mounting means comprise hook members extending upwardly and outwardly from said reinforcing members toward the edge of said frame member for engagement over spaced flanged hanger members.

6. A decorative acoustical panel in accordance with claim **1** in which:

said reinforcing member includes a longitudinal embossment to receive said cementous material.

7. A decorative ceiling panel in accordance with claim **1** in which:

said rectangular frame member comprises four end-to-end connected side members formed of sheet metal with three bendable portions therealong whereby same is adapted to be folded into said rectangular configuration and a terminal side member is positionable in an open position to receive said rectangular layer of carpeting material, and positionable in a second position to peripherally enclose said carpeting material.

8. A decorative acoustical ceiling panel in accordance with claim **1** in which:

said peripheral and second layers of cementous material are integral.

9. A decorative acoustical ceiling panel in accordance with claim **1** in which:

said layers of cementous material comprises a first portion laid peripherally around the edges of the backing of said layer of carpeting material which has been allowed to set and a second portion laid within the periphery thereof and in overlapping relationship on the inner edges with said first portion, and allowed to set with said reinforcing member embedded therein.

10. A decorative acoustical ceiling panel comprising:

a rigid rectangular frame member including side members having spaced top and bottom flanges defining a central opening;

a rectangular layer of carpeting material supported at its edges between said flanges with the backing thereof facing the top flange and the pile thereof facing the bottom flange;

a layer of cementous material extending over the surface of said backing; and

a reinforcing member engaging between a pair of said top flanges and lying continuous to said layer of cementous material in adhering relationship whereby said layer of carpeting material is stiffened in substantially coplanar relationship within said frame member.

11. A decorative acoustical ceiling panel in accordance with claim **10** in which:

said reinforcing member extends in overlapping relationship with the upper sides of opposite top flanges of said frame member; and

includes spaced apertures along its length into which said cementous material engages in locking relationship.

12. A decorative acoustical ceiling panel in accordance with claim **10** in which:

a pair of space reinforcing members extend in overlapping relationship with the under sides of opposite top flanges of said frame member; and

tab means are provided at the ends of said reinforcing members adapted to engage upon a framework to suspend said panel from a ceiling structure.

13. A decorative acoustical ceiling panel in accordance with claim **10** in which:

said reinforcing member includes a longitudinal embossment and said apertures comprise pierced openings in a wall thereof presenting inner edges engaged within said cementous material.

14. A decorative acoustical ceiling panel in accordance with claim **10** in which:

said reinforcing member includes a pair of longitudinal spaced embossments and said apertures comprise pierced openings in the web wall therebetween presenting inner edges engaged within said cementous material.

* * * * *