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TILE BUILDING PANEL WITH PLASTIC FOAM BACKING

Filed Nov. 27, 1964

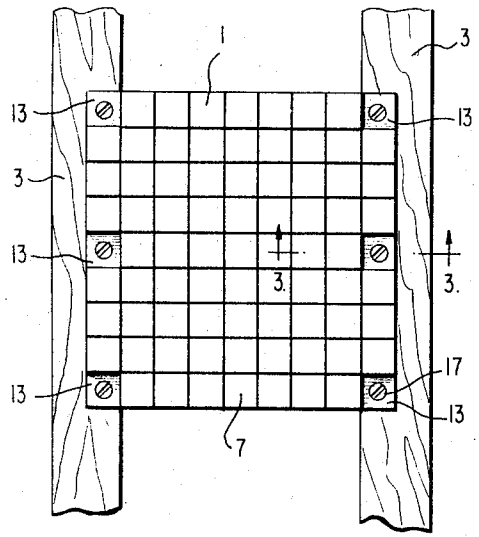


FIG.1

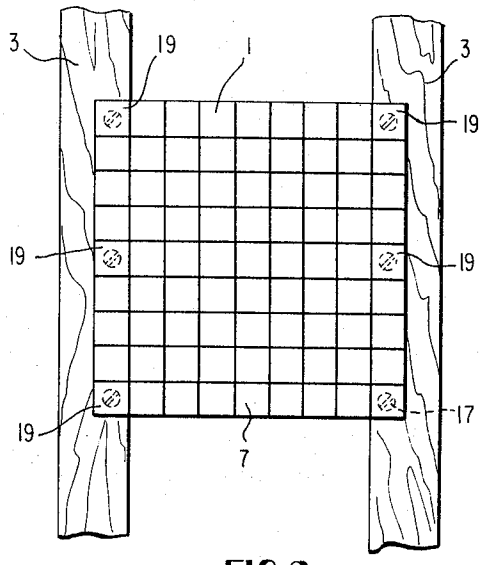


FIG.2

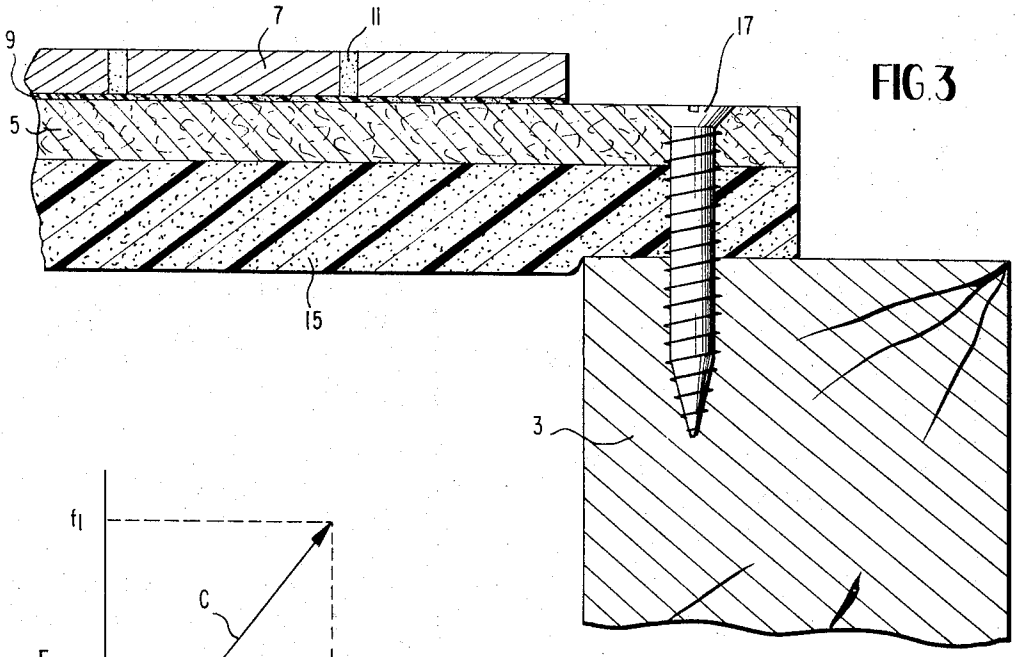


FIG.3

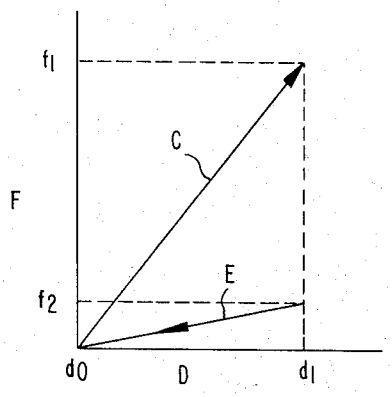


FIG.4

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TILE BUILDING PANEL WITH PLASTIC FOAM BACKING

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7 Claims. (Cl. 52—309)

This application is a continuation-in-part of my co-pending application Ser. No. 135,090, filed June 19, 1961, now abandoned.

The present invention relates to building panels that are prefabricated or preassembled for application to joists or posts or other supports, for exterior or interior use, to finish the walls or floors or ceilings of a building, and more particularly that are adapted for the installation of preset tile.

It is an object of the present invention to provide a building panel that can be quickly and easily applied to a support regardless of whether the support provides a regular surface for the reception of the building panel.

Another object of the present invention is the provision of a building panel adapted for the installation of preset tile, which can be applied to a support regardless of whether the adjacent surface of the support is smooth.

It is also an object of the present invention to provide building panels adapted for the installation of preset tile, in which the installed panels have an appearance so resembling hand-set tile as to be indistinguishable therefrom.

It is also an object of the present invention to provide a building panel for the installation of preset tile, with the tile sealed relative to its substrate, which is so constructed as to avoid breaking the seal of the tile upon installation of the panel or during the life of the building.

Finally, it is an object of the present invention to provide a building panel which is easy to install and to maintain and repair when installed, and which is rugged and durable in use.

Other objects and advantages will become apparent from a consideration of the following description, taken in connection with the accompanying drawing, in which:

FIGURE 1 is a front elevational view of a partially installed building panel according to the present invention;

FIGURE 2 is a view similar to FIGURE 1 but showing a completely installed building panel according to the present invention;

FIGURE 3 is a fragmentary enlarged cross-sectional view taken on the line 3—3 of FIGURE 1; and

FIGURE 4 is a diagram showing certain properties of the backing of the panel of the present invention.

In general, the present invention comprises the discovery that preset tile can be installed without breaking the seal between the tile and its substrate, if the tile is embodied in a building panel comprising a rigid base sheet having the tile adhesively secured on one side thereof and having on the other side thereof a backing of substantial thickness of a low density, relatively low strength heat- and sound-insulating material, the panel having an exposed rear surface consisting of the surface of the backing which is opposite the rigid base, and the backing being readily deformable to conform to irregular surfaces to which the panel is applied without deforming the rigid substrate. In this way, a panel having such an exposed readily deformable backing material can be applied to a supporting surface regardless of whether the supporting surface is regular. The backing material will readily deform to accommodate to irregularities of the supporting surface; and there is thus imposed on the rigid

base sheet a minimum of flexure stresses. The absence of flexure of the base sheet assures that the tiles that are adhesively bonded to the base sheet will not be canted relative to each other, and hence the seal between the tiles and their support will thus remain unbroken. Moreover, during the life of the building, as portions of the supporting surfaces shift relative to each other, the tiles will remain intact as the relative movement is accommodated by deformation of the backing rather than deformation of the base sheet.

The tiles are not all assembled to the rigid base sheet in the panel as manufactured. Instead, certain tiles are omitted and fasteners are forced through the rigid base sheet and the backing and into the supporting surface or members. The missing tiles are then replaced over the fasteners, so that the fasteners are hidden.

In preferred embodiments of the invention, the readily deformable backing material is an expanded thermosetting resin, preferably a plastic foam selected from the class consisting of polystyrene and polyurethane foams. These backings are moisture proof and vermin resistant. Such backings have a modulus of elasticity in compression that is at least several times greater than their modulus of elasticity in expansion. In other words, the backing has minimum resiliency, and it thus can be crushed but does not have a correspondingly strong tendency to recover. The backing thus is not rubbery and does not tend to cause the panels to bounce when fasteners are driven through them. The layer of backing is at least about one-eighth inch thick, preferably about a quarter to one-half inch thick. It can be made substantially thicker, say, about one inch thick, for application to very uneven surfaces.

The tiles are preferably mineral tiles, most preferably of cut stone such as marble or the like. They can also be ceramic or glass, or, less preferably, plastic.

The rigid base sheet is also preferably mineral in nature, more preferably cementitious and most preferably of asbestos fiber in mineral cement. An example of a suitable base sheet is asbestos fiber 15–20%; silica 40–60%; and cement in the form of hydrated lime and/or Portland cement 25–40%, all percentages being by weight. The base sheet is made as thin as possible. About 3/16" is the minimum thickness for a suitable mineral sheet. More preferable is about 1/4" thickness.

Referring now to the drawing in greater detail, there is shown a building panel according to the present invention, indicated at 1. Panel 1 is shown installed on upright posts 3, thereby to comprise a unit of a vertical interior wall. As indicated above, however, the environment in which building panel 1 is used is subject to wide variation. It will also be understood that although a single panel 1 is shown in the drawing, it is nevertheless intended that a plurality of panels in fact be used, in edgewise abutting relationship. The panels thus can be arranged in horizontal rows or courses disposed one above the other; or in the case of elongated vertically extending panels, which may extend full height of the wall to be covered, it is possible simply to arrange them side by side in uniplanar relationship.

Each panel 1 comprises a rigid base sheet 5 as described above. A plurality of tiles 7 are arranged on each base sheet 5 and all the tiles 7 are arranged contiguously over and wholly within the periphery of one surface of sheet 5. This means that the tiles do not extend any substantial distance beyond the edges of sheet 5. This is important in connection with handling and storing the building panels, so as not to break off any protruding tiles.

The tiles 7 are bonded to sheet 5 adhesively, by means of a layer of an appropriate adhesive 9. Adhesive 9 may be any of the usual tile fixing adhesives, and may be

pressure sensitive or may be of the hardening type as in the case of a cement. Asphaltic adhesives are quite suitable, along with polyvinyl adhesives and any of a wide variety of others known to persons skilled in this art. The space between adjacent tiles **7** is filled with a grout **11** which may if desired be of conventional composition. Preferably, grout **11** is about flush with the exposed or outer surfaces of tile **7**.

At a plurality of spaced locations **13**, the tiles **7** are omitted so that the base sheet **5** at those locations is exposed. The pattern of locations **13** shown in FIGS. 1 and 2 need not be adhered to. It is enough that a plurality of such locations are provided and that those plural locations be spaced apart from each other.

A backing **15**, as described above, is secured to the side of base sheet **5** which is opposite tiles **7**. The surface of backing **15** which is opposite or remote from base sheet **5**, in turn, is exposed; and this a very important feature of the present invention for the reasons set forth above, namely, that it thus provides a deformable surface to accommodate the panel or irregularities in the surface to which the panel is applied.

In the condition of the panel shown in FIG. 3, the backing **15** is partially crushed between post **3** and base sheet **5** and is maintained in that partially crushed condition by fasteners in the form of screws **17**. To complete the assembly, further tiles **19** are adhesively applied at locations **13** to cover the heads of screws **17**.

FIG. 4 shows the stress-strain relationship of the backing material **15**. FIG. 4 is in effect a force diagram, with force on the ordinate and distance on the abscissa. FIG. 4 should not be confused with a stress-strain hysteresis diagram for a particular material, FIG. 4 is only representative of the incremental modulus of elasticity relationships that obtain at a random point in the compression and expansion of the backing material. It is for this reason that the vectors in FIG. 4 are represented as straight lines. The compressive vector C thus indicates the force f_1 that must be applied to compress the material of the backing a distance d_1. The expansion vector E indicates the force f_2 that is relieved as the material of backing **15** recovers from that distance d_1 back to d_0, at which point the datum level force is applied. It must particularly be noted that for any value of d, the corresponding value of f_1 will be at least several times as great as the corresponding value of f_2. This means that the modulus of elasticity of the material of backing **15** in compression is at least several times as great as the modulus of elasticity of the material in expansion, or in other words, the force necessary to crush the material of backing **15** is much greater than the force exerted by material **15** during recovery. The stress-strain relationship illustrated by FIG. 4 are present to a high degree in polystyrene foam and polyurethane foam.

The present invention is not to be confused with building panels including a core of plastic foam disposed between two rigid facing panels. Such sandwich panels that have a plastic foam core are not applicable to uneven surfaces in the manner of the present invention. Moreover, the core is provided for a purpose entirely different from the purpose of the present invention, as the foam core of a sandwich panel is for the purpose of lending rigidity to the panel with the least weight.

From a consideration of the foregoing disclosure, therefore, it will be evident that all of the initially recited objects of the present invention have been achieved.

Although the present invention has been described and illustrated in connection with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit of the invention, as those skilled in this art will readily understand. Such modifications and variations are considered to be within the purview and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A building wall panel comprising a rigid sheet of asbestos fiber in mineral cement having a thickness of at least about 3/16", a series of mineral tiles arranged contiguously over and wholly within the periphery of one surface of said sheet and secured to said sheet by adhesive, and a backing secured to the other surface of said sheet, said backing being expanded plastic foam having a modulus of elasticity in compression that is at least several times greater than its modulus of elasticity in expansion, said backing having a thickness of about 1/8" to about one inch, said panel having an exposed rear surface consisting of the surface of said backing which is opposite said rigid sheet, said backing being readily deformable to conform to irregular surfaces to which the panel is applied without deforming said rigid sheet thereby to maintain the integrity of the adhesive bond of the tiles to said sheet.

2. A building wall panel as claimed in claim **1**, said backing being polystyrene foam.

3. A building wall panel as claimed in claim **1**, said backing being polyurethane foam.

4. A building wall panel as claimed in claim **1**, said tiles being pieces of cut stone.

5. A building wall panel as claimed in claim **1**, the thickness of said backing being about 1/4" to about 1/2".

6. A building wall panel as claimed in claim **1**, the thickness of said sheet being about 1/4".

7. A building panel as claimed in claim **1**, several spaces for tiles being unoccupied by tiles so as to permit fastening of the panel to a support through those spaces after which the missing tiles can be applied.

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