

[72] Inventors Theodore Richard Rohweder
Toledo;
George J. Hannes, Maumee, Ohio
[21] Appl. No. 41,732
[22] Filed June 1, 1970
[45] Patented June 8, 1971
[73] Assignee Johns-Manville Corporation
New York, N.Y.
Continuation of application Ser. No.
779,748, Nov. 29, 1968, now abandoned.

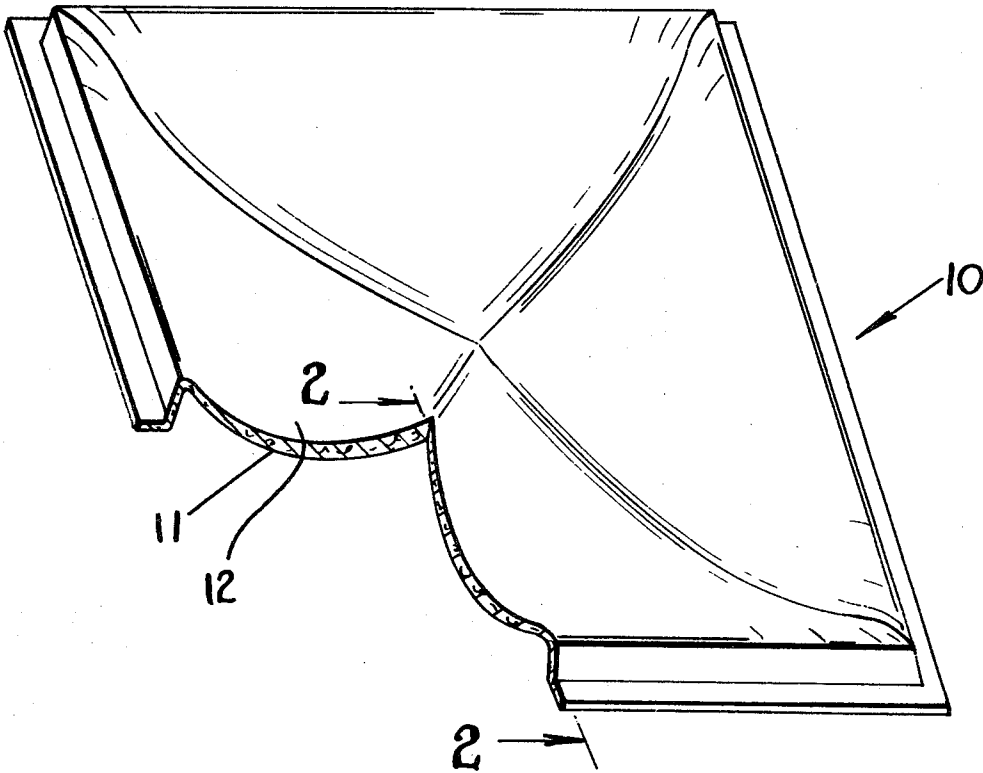
[56] References Cited	
UNITED STATES PATENTS	
2,450,911	10/1948 Park et al. 181/33.1
2,497,912	2/1950 Rees 181/33.1
2,694,025	11/1954 Slayter et al. 181/33.1
2,932,587	4/1960 Labino 161/157X
3,141,809	7/1964 DiMaio et al. 181/33.1
3,149,693	9/1964 Keller et al. 181/33.1
3,183,996	5/1965 Capaul 181/33.1
3,239,973	3/1966 Hannes et al. 181/33.1
3,328,086	6/1967 Johnston 181/33.1
3,418,766	12/1968 Jackson 181/33.1

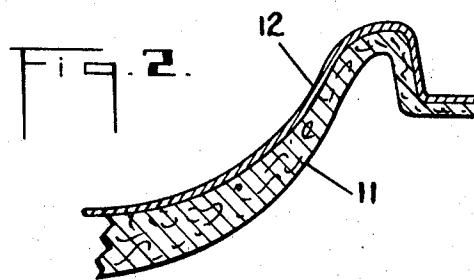
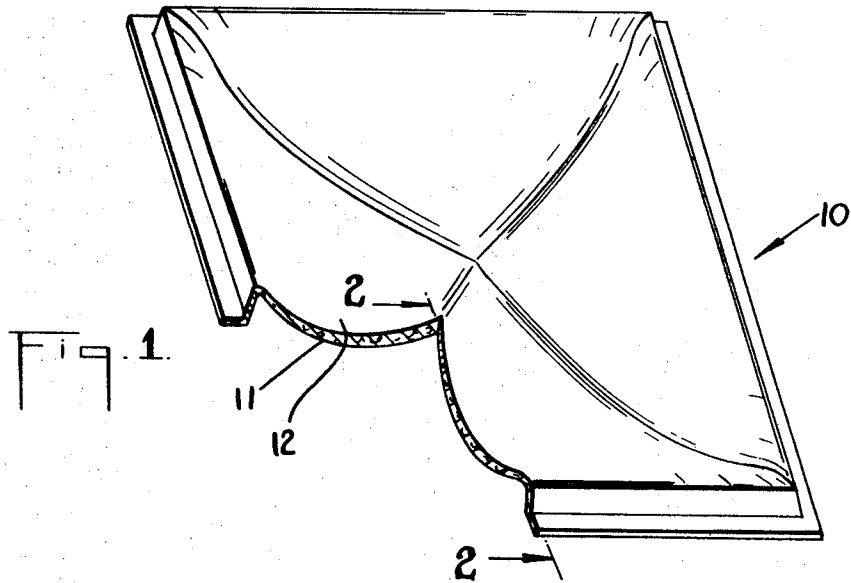
FOREIGN PATENTS	
1,137,584	1/1957 France 181/33.1

Primary Examiner—Robert S. Ward, Jr.
Attorneys—John A. McKinney and Robert M. Krone

[54] DECORATIVE ACOUSTICAL PANEL
CONSTRUCTION
12 Claims, 2 Drawing Figs.
[52] U.S. Cl. 181/33,
161/59, 161/155
[51] Int. Cl. E04b 1/84,
B32b 5/12, B32b 5/22
[50] Field of Search 181/33,
33.1, 33.11; 161/59, 155, 157

ABSTRACT: A porous acoustical-type panel having improved appearance and decorative value comprising a laminated structure of a combination of a substantially rigid fibrous body bonded with a translucent resin and adhered thereto a facing mat impregnated with a translucent resin and coloring pigment.





INVENTORS
THEODORE R. ROHWEDER
BY GEORGE J. HANNES

John A. McFinnery
ATTORNEY

DECORATIVE ACOUSTICAL PANEL CONSTRUCTION

This application is a continuation of copending application Ser. No. 779,748, which was filed Nov. 29, 1968 and which is now abandoned.

BACKGROUND OF THE INVENTION

Acoustical products such as ceiling or wall tiles and panels etc., must, for effective sound dampening—their prime function—be of a highly porous or open structure and in particular in their exposed functional surface. This essential open or discontinuous surface and porous structure of acoustical materials presents a significant obstacle in enhancing appearance or producing decorative effects, as for example the application of paint films, in products such as typical acoustical ceiling tiles. For instance, paint in sufficient amount to effectively hide the underlying surface and thus decorate the product significantly reduces the openings of the surface thereby blocking off the internal porous structure from its effective sound-reducing function. In addition to the old means of coloring the entire or a substantial portion of the material throughout its composition, a technique which although normally very effective in decorative aspects is unduly expensive, because of the usually high cost of pigments and amounts required, numerous other schemes have been proposed to improve the appearance of open-faced and porous acoustical products including for example surfacing with perforated metal or plastic sheets or of other materials, covering with plastic films either imperforate or perforated, etc. However, these means inevitably diminish the sound dampening qualities of the product and frequently detract from appearance and are often costly to manufacture or in materials.

SUMMARY OF THE INVENTION

This invention comprises a unique laminated structure and composition amenable to the manufacture of conventional-type fibrous acoustical panels, such as common resin-bonded glass and/or other mineral fiber acoustical ceiling tile, etc., which by itself provides a decorative facing surface, or one which may be effectively decorated as by the application of paint in such amounts as to retain the porous and open surface essential to sound abatement while providing an appealing, highly uniform appearance.

The laminated structure and composition of the invention essentially includes a facing mat of open construction impregnated with a translucent resin binder and coloring pigment which is applied over the major and functional surface of the substantially rigid body of mineral fibers which may be of conventional structure and composition except for including a translucent thermosetting resin as the binder.

It is the primary object and advantage of this invention to provide an acoustical product having integral therewith a highly porous and open surface of good appearance itself and of effective sound dampening properties, which surface additionally is amenable to painting if desired to enhance or revitalize the decorative effect without effectively diminishing the porosity and acoustical values attributable thereto, and also enables the easy application of paint to contribute to or modify the decorative appearance of acoustical tiles and panels which is especially applicable to deeply concave domed or vaulted three-dimensional-type panels with steeply sloping sides.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a typical high-vaulted three-dimensional-type acoustical tile product with a cutout section illustrating the construction of this invention; and,

FIG. 2 is an exaggerated sectional view of the construction of the product illustrated in FIG. 1 taken along lines 2-2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The decorative and porous sound dampening acoustical panel products of this invention essentially comprise a two-

component laminated structure of a substantially rigid or self-supporting body of generally random felted mineral fibers bonded with a translucent resin, and having adhered to the major functional surface thereof which is to be decorated, a facing mat of mineral filaments lying generally transverse to each other and impregnated with a combination of translucent resin and particulate pigments of the color desired. This combination of the translucent resin bonded rigid mineral fiber body and facing thereon of open mat containing translucent resin binder and pigment produces a composite structure which is both highly porous and open in the exposed functional surfaces and continuing at least partly through the body thereof, and yet presents a pleasing color decorated surface finish, thereby rendering it well suitable for the manufacture of acoustical tiles and panels for ceiling, walls, partitions, and the like covering finishes. Moreover, when desired or fitting to paint the surface of the product, either initially in conjunction with manufacture, or subsequently to restore or change appearance, the exposed functional surface is more amenable to painting in that a decorative and effective hiding application with paint can be achieved with minimal amounts without closing or blocking the open and porous surface, thus maintaining acoustical values.

The substantially rigid or self-supporting body portion in the laminated structure of this invention comprises common mineral fibers, in particular including fibers composed basically of siliceous or silicate compositions such as typical glass fibers, or the wools or fibers derived from rock or other siliceous and argillaceous material, or metallurgical slags which are well known in the industry and have long heretofore been employed in acoustical panel or tile products. Fibers can be produced and collected in accordance with the common manufacturing procedures for glass fibers and related mineral compositions, for example, as illustrated in U.S. Pat. Nos. 2,663,906, 2,814,657, and 2,863,176, each to Labino, wherein the formed fine diameter fibers (about 1 to 5 microns) are collected from their dispersed state within a gas-suspending medium in a generally random or haphazardly arranged felted mass, including appropriate resin binder which is normally and preferably applied to the fiber while suspended substantially individually in the gas medium prior to their collection. The thermosetting resin binder for the purpose of this invention should consist of one which is translucent upon curing, such as melamine formaldehyde, ureaformaldehyde, polyester, and the like colorless or translucent synthetic materials.

However, to reduce cost, the generally rigid or self-supporting body component may be formed of two or more sections with only that section of the total body providing the outer functional surface to be faced with the mat, being necessarily bonded with the translucent resin whereby the back section or sections can employ substantially any thermosetting resin as a binder regardless of its color.

The facing mat consists of a scrim-type fabric either woven or nonwoven intercrossed strands of a highly open construction, and particularly mats of mineral filaments lying transverse to each other comprising the multilayered intercrossed filament product formed according to the processes and/or means of U.S. Pat. No. 2,574,221, 2,609,320, 2,729,582, 2,913,037, and 2,964,439, each to Modigliani, and Nos. 2,996,102, and 3,220,811 to Schuller. Continuous glass or other mineral filaments constitute the optimum material, but twisted textile strands of staple mineral fibers generally may serve.

The facing mat is impregnated with a combination comprising an admixture of translucent thermosetting resin and pigment, with the resin, as in the case of at least the adjoining section of the rigid or self-supporting felted fiber body, being of a translucent material such as melamine formaldehyde, ureaformaldehyde, or polyester resin. Panels for ceiling tile being generally white or off white, the pigment should be white comprising for example, titanium dioxide, zinc oxide, white lead, or a white clay and preferably titanium dioxide because of its

substantially greater hiding capacity and absence of toxicity. Nevertheless, a colored pigment can be utilized to achieve a particular color but such use is restrictive insofar as the advantageous color versatility of the product. Moreover, a flat white background such as provided with these pigments presents an optimum surface for the application of very light pastel paints of any color as well as white paint, comprising the most appropriate color schemes for ceilings and permits the application of such light-toned paint in rather thin and substantially discontinuous coatings which do not obstruct the porous structure of the facing mat but aptly transmit the color effect. Apt proportions of resin to pigment comprise approximately 30 to 100 percent by weight of resin to approximately 0 to 70 percent by weight of pigment, and preferably of ratios of about 30 to 50 percent by weight of resin to about 50 to 70 percent by weight of pigment, but, of course, depending upon the density of given pigments, the ratios can be varied. The inclusion of pigment is not entirely essential, particularly when the product is to be painted.

Referring to the drawings, numeral 10 designates a ceiling acoustical tile product of the common three-dimensional and high-domed or vaulted construction comprising a generally rigid body section 11 composed of a mat of felted glass fibers bonded with melamine formaldehyde resin which is translucent upon curing. Facing mat 12 is superimposed over the functional or front major surface of fiber body 11 of tile 10 and adhered thereto during manufacturing by means of the melamine resin binder content of the body section 11 and of the facing mat itself. Mat 12 contains a mixture of translucent melamine formaldehyde resin and titanium dioxide white pigment which provides a flat white and porous surface having good acoustical properties and which provides a pleasing uniform white appearance itself without the application of paint. The construction of the invention is thus especially advantageous in the manufacture of high domed or vaulted three-dimensional panels having steeply sloped side portions such as in the product illustrated because due to the deep concave configuration and the steeply sloped sides of the product it is especially advantageous in the manufacture of high domed or vaulted three-dimensional panels having steeply sloped side portions such as in the product illustrated because due to the deep concave configuration and the steeply sloped sides of the product it is especially difficult to apply paint uniformly over the article with usual factory equipment and methods and achieve a consistent overall color tone.

A typical product of this invention for use as an acoustical ceiling tile can be produced by means of the following exemplary procedure. A loose felt or mass of glass fiber of a thickness of about 1 inch and a density of about 1.5 pounds per cubic foot of a type commonly used in thermal insulations and related products, containing substantially uniformly distributed throughout about 15 percent by weight thereof of "B" stage melamine formaldehyde resin, is placed in a press mold with dyes of appropriate configuration design. Superimposed thereon is a facing mat of continuous glass filaments consisting of a plurality of layers oriented to lie generally transverse to each other as provided by the procedure of the aforesaid patents to Modigliani or Schuller, weighing approximately 2.5 grams per square foot and containing therethrough about 2.0 grams per square foot of a mixture 60 percent by weight titanium dioxide and 40 percent by weight of melamine formaldehyde resin in the "B" stage. The mold is closed upon the composite body of random fibers and facing mat of intercrossed filaments and the said contents compressed and subjected to a temperature of about 420° F. for 40 seconds, whereupon the melamine formaldehyde resin content of the fibrous body and the facing mat is substantially cured, bonding the fibers of the loose felt to a rigid body of about 11.0 pcf, and securing the titanium dioxide pigment within and about the facing mat while at the same time adhering the facing mat to the rigid body forming a composite laminate of sufficient structural integrity to be substantially self-supporting.

The resulting formed and cured panel product exhibited a uniformly white surface for exposure having a flat or mat surface of good appearance. The product is decorative and useful without painting or other surface treatment. However, upon the spray application of white or light pastel color paint by means of a usual factory reciprocating spray gun, coverage is entirely adequate including the steep side slopes of deeply concave or vaulted three-dimensional tile. The openness of the facing mat causes the paint film to open up into many small pores producing a discontinuous coating effectively preserving the good acoustical properties attributable to the original unpainted product and yet exhibiting a good appearance of uniform coloring.

We claim:

1. A decorative, porous vaulted panel having sound dampening acoustical properties consisting essentially of a composite laminated structure of deep concave configuration composed of a substantially rigid self-supporting body of generally random felted mineral fiber bonded with at least one thermosetting translucent resin selected from the group consisting of melamine formaldehyde, ureaformaldehyde and polyester, and having a facing mat superimposed continuously with one major surface of the said substantially rigid self-supporting body of felted fiber and adhered thereto, said facing mat being composed of mineral filaments lying generally transverse to each other and impregnated with at least one thermosetting translucent resin selected from the group consisting of melamine formaldehyde, ureaformaldehyde and polyester.
2. The porous acoustical vaulted panel product of claim 1, wherein the facing mat superimposed continuously with and adhered to the said rigid body of felted mineral fibers is impregnated with a combination of translucent resin and pigment in a ratio of about 30 to 100 percent by weight of resin to about 0 to 70 percent by weight of pigment.
3. The porous acoustical vaulted panel product of claim 2, wherein the said impregnating composition of the facing mat comprises approximately 30 to 50 percent by weight of resin and approximately 0 to 70 percent by weight of pigments.
4. The porous acoustical vaulted panel product of claim 2, wherein the pigment comprises at least one white pigment selected from the group consisting of titanium dioxide, zinc oxide, white lead, and clay.
5. The porous acoustical vaulted panel product of claim 4, wherein the thermosetting resin bond for the substantially rigid body of generally random felted mineral fiber is melamine formaldehyde resin.
6. The porous acoustical vaulted panel product of claim 5, wherein the thermosetting resin of the impregnate for the facing mat of mineral filaments lying generally transverse to each other is melamine formaldehyde resin.
7. The porous acoustical vaulted panel product of claim 6, wherein the white pigment is titanium dioxide.
8. The porous acoustical vaulted panel product of claim 7, wherein the impregnating combination for the facing mat comprises approximately 40 percent by weight of the resin and approximately 60 percent by weight of the white pigment.
9. The porous acoustical vaulted panel product of claim 8, having a porous coating of paint on the exposed surface of the facing mat.
10. The porous acoustical vaulted panel product of claim 9, wherein the facing mat of mineral filaments lying generally transverse to each other in a nonwoven fabric.
11. The porous acoustical vaulted panel product of claim 10, wherein the nonwoven fabric facing mat of mineral filaments lying generally transverse to each other is an open scrim having a weight of approximately 2 to 3 grams per square foot.
12. The porous acoustical vaulted panel product of claim 1, wherein the substantially rigid body of generally random felted mineral fiber bonded with thermosetting resin is composed of a plurality of sections with at least the section adjacent to the facing mat being bonded with a thermosetting translucent resin.