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ACOUSTICAL PANELS

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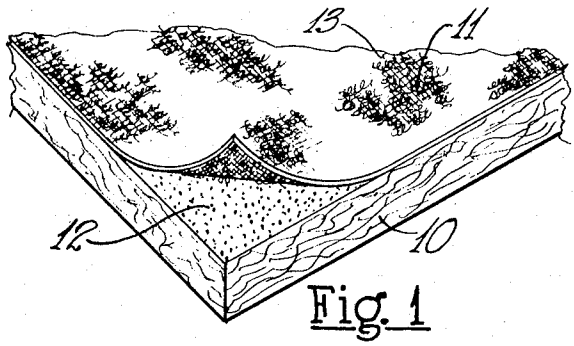

Fig. 1

Fig. 2

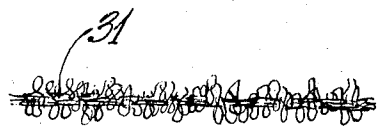

Fig. 3

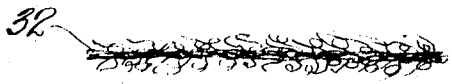

Fig. 4

INVENTOR.
WAYNE L. SMITH
BY Staelin & Overman
ATTORNEYS

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ACOUSTICAL PANELS

Wayne L. Smith, Granville, Ohio, assignor to Owens-Corning Fiberglas Corporation, a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

An acoustical panel having a main sound attenuating body of integrated fibers and a fabric facing adhered thereto. The fabric is preferably woven from a glass fiber yarn having nubs of glass fibers extending outwardly from the fabric. A coating is preferably applied to the nubs to provide a discontinuous layer which will admit sound therethrough to and through interstices in the fabric between the nubs into the sound attenuating body.

This invention relates to acoustical panels of sound absorbing material for installation as wall, ceiling or other surfacing structures. More particularly, the invention pertains to such panels or boards having effective thermal-insulating properties as well as effective sound absorption.

Panels of this invention are preferably composed of masses of glass fibers, that may be compressed if desired to give a desired degree of density and/or rigidity. The masses of glass fibers contain binder to integrate the fibers into a porous body. Such porous, low-density bodies of fibrous glass are most effective in noise abatement due to the capacity of the myriad, minute communicating air cells in the maze of fibers to baffle and absorb sound waves. The tiny pockets of static air are also responsible for the high thermal insulating power of such fibrous masses. Such panels, mats, sheets, boards or tiles formed of compressed mineral fibers as, for example, glass fibers have been found to be admirably suited as acoustic attenuating, wall or ceiling surfacing materials, but it is to be understood that wall boards or surfacing sheets or the like formed of other fibrous materials such as vegetable fibers or animal fibers may be utilized in forming the boards, panels, sheets, tiles, etc., of this invention.

These fibrous glass panels are conventionally supplied in various planar dimensions ranging from ten inches by ten inches for acoustical tile up to and beyond four feet by eight feet for wall tile board. The more common thicknesses are one-half and three-fourths of an inch, but the broader boards are occasionally used in thicknesses up to and past two inches.

These products, when employed in ceiling installations, are generally attached by adhesives or hung upon mechanical suspension systems. The large panels are also laid upon framework as form boards in roof construction where they may carry poured-in-place gypsum decks generally two inches in depth.

From the standpoint of lightness and acoustical effectiveness of the boards, glass fibers of a diameter in the area of fifty hundred thousandths of an inch serve satisfactorily. Fibers of still smaller diameters would enhance some properties of the products, while fibers of larger dimensions give adequate results and may be practical for some commercial purposes.

The size of the fibers is determined by the type and the control of the forming equipment utilized. Such apparatus ordinarily employs air, steam, or combustion gases for attenuating molten threads of glass issuing from small orifices. However created, the fibers are collected at the forming station in blank form, generally with an uncured binder component dispersed therethrough.

A binder composed of a combination of melamine and phenol formaldehyde resins in a proportion of roughly one to two, has acceptable strength and fire resistance characteristics. Various other fibrous glass bonding agents are well known and would be equally effective. These include epoxy, urea and polyester resins. The amount of binder may run between seven and fifteen percent by weight of the finished panel, depending upon the balance desired between sturdiness and fire protection.

The blanket of fibers with the uncured binder dispersed therethrough may be held compressed to the desired density in the final board while the binder is set by heat. The mass is thus dimensionally stabilized. The individual panels or boards may be created by a longitudinal slicing and cross-wire shearing the fibrous blanket according to the selected measurements.

In order to admit sound, the surfaces of the resulting boards must be either of a porous nature or must be composed of a thin, unattached film with sufficient flexibility to vibrate and thus transmit sound waves to the interior of the panel. In the past this plastic covering or smooth film has been generally preferred over the other type of porous openings because it is more easily washed and discourages dust accumulation. In contrast, porous paint surfaces were sometimes inclined to disintegrate upon washing and to smudge easily. Further, porous paint surfaces are less abuse resistant than the smooth or plastic film surfaces and sometimes show an impression from a blow to the facing surface. Therefore, more care was required in the installation of the porous paint surface tiles. However, porous paint surfaces did provide a high degree of flexibility in decorative appearance making them applicable to more formal rooms or interiors as well as the informal areas of a residential or commercial building.

Accordingly, it is an object of this invention to provide an improved acoustical panel.

It is a further object of this invention to provide an improved acoustical panel having a novel facing means which is sufficiently flexible in application to be utilized in formal and informal areas.

A further object of this invention is to provide an improved acoustical panel having a high degree of sound absorption efficiency and further having an abuse resistant surface.

It is a still further object of this invention to provide an improved acoustical panel, preferably of fibrous glass, having high acoustical properties and presenting a pleasing textured surface.

A further object of this invention is to provide a method for the production of the improved acoustical panels of this invention.

The invention features an acoustical panel having a main porous body of sound absorbing materials, preferably of fibers integrated by a binder, and a facing for said body comprising a textured fabric having variations in shade and shadow on the surface thereof. The fabric admits sound to the main porous body through interstices in the fabric. The fabric is preferably continuously adhered to the face of the main porous body. Further, the fabric is advantageously woven from glass fibers which will not deteriorate, stretch, tear, and are substantially abuse resistant. Further, the fabric may provide the panel with more integrity when bonded or adhered to one face thereof and tends to reduce warping or cupping. While not as advantageous, the fabric may be produced from animal or vegetable fibers. In a preferred embodiment of the invention, the acoustical panel utilized textured fabric which includes small nubs of material extending outwardly from the face thereof.

The acoustical panel may advantageously further include a coating for the surface of the fabric facing. The

coating leaves sufficient interstices of the fabric unfilled to allow admission of sound to the main porous body. The coating may be a paint. If the coating is a paint, it may preferably be of a latex, resin or other base which is not inclined to disintegrate upon washing or to smudge easily. When the textured fabric includes small nubs of material protruding from the face of the fabric, the nubs are operative to shield interstices of the fabric from the coating material during application of the coating.

The invention also features a method for producing an acoustical panel which comprises the steps of providing a main porous body of integrated fibers and adhering a textured fabric facing thereto. The method may include the further step of applying a coating to the fabric facing without filling all the interstices in the fabric. This may be accomplished by providing textured fabric with a nubby surface to further protect the interstices of the fabric from filling during the coating step. The coating step may include spraying a liquid coating on the fabric facing. The spraying is advantageously conducted from an angle with respect to the facing to prevent spraying directly down into and filling all of the interstices in the fabric.

Other objects, advantages and features of this invention will become apparent when the following description is taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a view in perspective of an acoustical panel embodying the teachings of this invention;

FIGURE 2 is an enlarged view of a slub yarn that may be utilized to make a textured fabric fo this invention;

FIGURE 3 is an enlarged side view showing the appearance of a bulky yarn which may be utilized in weaving a textured fabric for this invention; and

FIGURE 4 is an enlarged view of a yarn having an improved bulk characterized by the presence of a multitude of ring-like loops and protruding fiber ends irrgularly spaced along the yarn surface, which yarn may be utilized to weave a fabric for use in this invention.

Referrinng to FIGURE 1, there is illustrated an acoustical panel embodying the teachings of this invention which comprises a main porous sound attenuating body **10**. The body **10** is preferably a fibrous blanket integrated by binder, which may have been compressed to the desired density and/rigidity. The body **10** is preferably composed of glass fibers having the effective noise abatement characteristics discussed hereinbefore. A textured fabric **11** is adhered, preferably continuuosly across the face of the main porous body **10** by an adhesive **12**, in a first embodiment of the teachings of this invention. This provides an acoustical panel of high sound absorbing efficiency in which the fabric provides an abuse resistant surface. The fabric is preferably woven from glass fibers so that the fabric will not deteriorate, stretch, tear as easily, and is easy to clean. The textured surface shows variations in shade and shadow and makes the surface suitable for use in formal and informal areas. The fabric gives the panel more integrity when bonded to one face thereof and tends to reduce warping and cupping.

The textured fabric **11** may be of the type which provides the variations in shadow and shade in the surface thereof while the interstices admit sound to the absorbent interior of the main porous body. The textured fabric may be also of the type which not only provides variations in shade and shadow of the surface by the weaving thereof, but also includes nubs of material extending outwardly from the face. The nubs may be small or tiny loops or may be loose fiber ends or both. Again, if the material is woven from glass fibers, it has the attendant advantages set forth above including ease of cleaning whether with a vacuum cleaner to remove dust, or a wet cloth to remove spots. Since the glass fibers will not retain moisture, spotted areas or variations in color after cleaning will not show.

FIGURES 2, 3 and 4 illustrate examples of yarns which may be utilized to weave the fabric **11**. The illustrations are not intended to be inclusive and are shown herein only as examples. The yarn **30** in FIGURE 2 illustrates a slub yarn characterized by variations in cross section along the length of the yarn. Such yarns have been made from continuous filaments, from staple fibers and from mixtures of continuous filament yarns in which tufts have been incorporated, i.e., by twisting, into the continuous filament structure. When made into fabric, such yarns provide a decorative effect of slubs distributed throughout the surface of the fabric.

The yarn **31** in FIGURE 3 is composed of a plurality of substantially continuous, individually convoluted filaments. The individual filaments have coils, loops or whorls at random intervals along their lengths. The loops may be tiny complete loops formed by a filament doubling back upon itself, crossing itself and then proceeding substantially in the same direction, konwn as a crunodal loop, The yarn **32** in FIGURE 4 is a spun staple yarn of improved bulk characterized by the presence of a multitude of ring-like loops and protruding fiber ends irregularly spaced along the yarn surface. Any or all of the yarns **30**, **31** and **32** may be utilized to form a fabric suitable for use in this invention.

To further improve the decorative appearance and to provide a surface which is even more readily cleaned, a coating **13** may be applied to the surface of the textured fabric **11**. The coating **13** is applied in such quantity so that not all of the interstices of the fabric **11** are filled, thereby admitting sound to the main porous body through the interstices for absorption. The coating **13** may be applied by spraying preferably from an angle with respect to the facing fabric **11** so that the spray does not impinge directly down into and fill all of the interstices in the fabric. Quantity control of the sprayed liquid is, of course, important. The textured fabric is preferably provided with a nubby surface which further protects the interstices of the fabric from filling during the coating step since the nubs protruding from the fabric will catch or deflect the sprayed coating coming from the spraying apparatus toward the fabric and prevent interstices in the nubs from being filled.

Since all of the interstices in the facing fabric **11** have not been filled, the coating material **13** may advantageously be composed of ingredients that do not deteriorate or smudge readily, such ingredients including latex, resin and/or other bases. The resulting product is quite effective in appearance and in acoustical efficiency. Further, the imperviousness of such bases to air, moisture, etc., prevents the coating from acquiring anything but a surface soil which may be vacuumed or wiped away.

In both the coated and uncoated embodiments of this invention the textured surface of the fabric and the coating in providing variations in shade and shadow on the surface presents a clean appearance even when some soiling has occurred, thus prolonging the period before the surface must be cleaned, even in a very dusty environment. In normal residential use, no cleaning should be required.

It is to be noted that proportional dimensions shown in the drawings are without significance since in most cases dimensions have been enlarged to clearly show the invention. It will be realized that proper dimensioning in actual practice would reveal very thin coatings and perhaps substantially invisible interstices in those instances where applicable. It is also apparent that, within the scope of this invention, modifications may be made, the present disclosure being merely illustrative and the invention covering all variations thereof.

I claim:

1. An acoustical panel having a main porous sound attenuating body comprising a mat of glass fibers integrated by a binder, and a facing for said body comprising a woven glass fiber fabric adhered to said body having

variations in shade and shadow on the surface thereof through the extension of nubs of glass fibers extending outwardly from the fabric, said fabric admitting sound to said main porous body through interstices in said fabric between said nubs.

2. An acoustical panel according to claim 1 in which said fabric is woven from glass fibers formed into a slub yarn characterized by variations in cross section along the length of the yarn.

3. An acoustical panel according to claim 1 in which said fabric is woven from glass fibers formed into a yarn composed of a plurality of substantially continuous, individually convoluted filaments; the individual filaments having coils, loops or whorls at random intervals along their length.

4. An acoustical panel according to claim 1 in which said fabric is woven from glass fibers formed into a spun staple yarn characterized by the presence of a multitude of ring-like loops and protruding fiber ends irregularly spaced along the yarn surface.

5. An acoustical panel according to any of the claims 1, 3, 4 or 5 which further includes a coating for the nubs of glass fibers extending from the fabric facing to provide a discontinuous layer to allow admission of sound to said main porous body through the interstices in said fabric between said nubs.

6. A method for producing an acoustical panel comprising the steps of facing a main porous sound attenuating body of integrated glass fibers by adhering a fabric thereto woven from glass fiber yarn having nubs of glass fibers that extend outwardly from the fabric, and applying a coating to said outwardly extending nubs to form a discontinuous layer which admits sound through interstices of said fabric between said nubs to said main body.

7. A method according to claim 6 in which coating applying step includes a step of spraying liquid coating on said fabric facing at an angle with respect to the fabric so that the spray does not impinge down into the interstices in the fabric between the nubs.

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ROBERT S. WARD, JR., *Primary Examiner.*

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161—43