

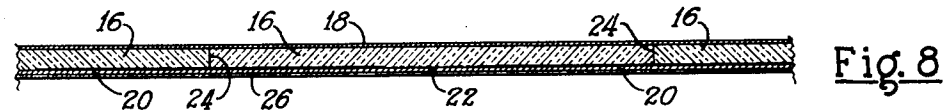
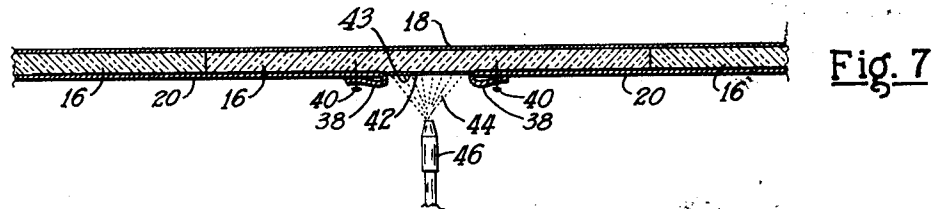
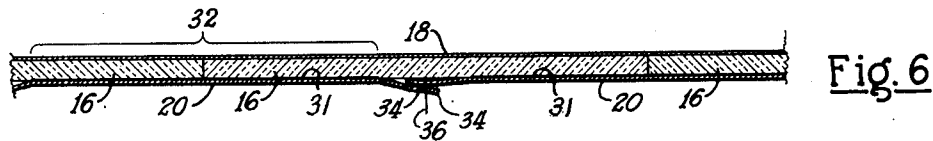
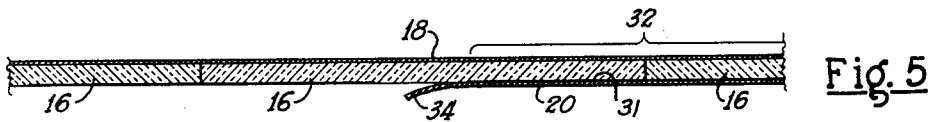
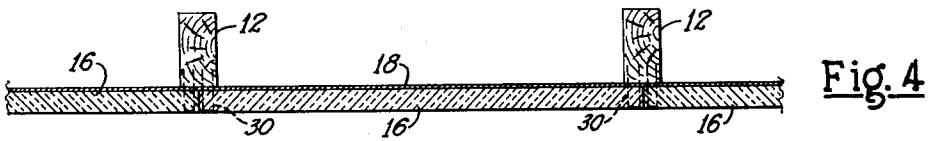
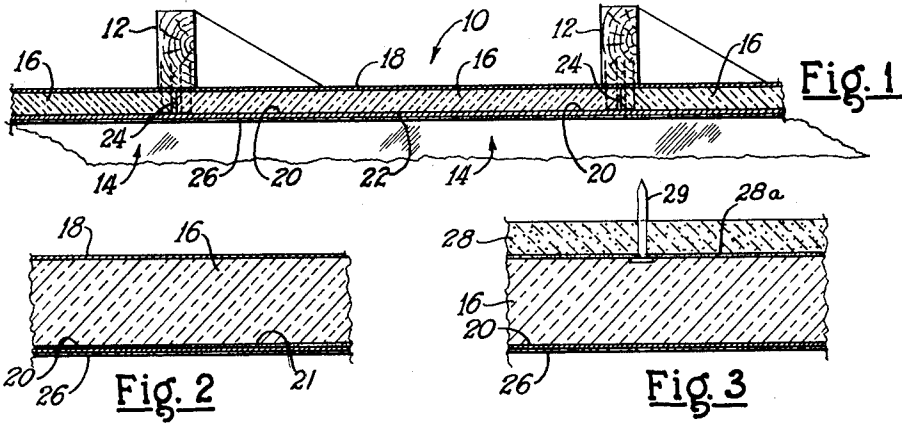
Sept. 22, 1964

F. C. KELLER ETAL

3,149,693

ACOUSTICAL SURFACES

Filed Aug. 1, 1960



INVENTORS
F. C. KELLER &
R. R. HARRIS
BY
Stecher & Overman
ATTORNEYS

1

3,149,693

ACOUSTICAL SURFACES

Fred C. Keller, Thornville, and Ronald R. Harris, Newark, Ohio, assignors to Owens-Corning Fiberglas Corporation, a corporation of Delaware
Filed Aug. 1, 1960, Ser. No. 46,564
3 Claims. (Cl. 181-33)

This invention relates to improved acoustical surface panels for ceilings and walls and to a method of applying such panels.

The use of acoustical ceiling tiles is becoming more and more widespread, particularly in commercial buildings and also in less formal rooms of residences, such as recreation rooms. Ceiling tiles are produced in units usually measuring one foot square, although larger tiles are not uncommon, and have beveled edges so that the individual tiles are readily discernible after being applied to a ceiling or wall. Because of the overall appearance produced by the installed acoustical tiles, they are seldom used in more formal rooms of houses, such as living rooms, dining rooms, and bedrooms. Larger ceiling boards, which are similar to acoustical tiles but are of rectangular shape, usually measuring 2' x 4' or larger, are also used, frequently supported below a ceiling by metal T-bars which are exposed below the ceiling boards, thereby giving a broken appearance to the overall ceiling similar to that obtained with acoustical tiles. Hence, acoustical ceiling boards are generally limited to the same applications for which ceiling tiles are used.

The present invention provides an acoustical surface panel and a method of applying such a panel to a basic wall or ceiling structure. The new panels, when in place, provide a smooth appearance with no joints or seams whatsoever being visible. Hence, the surface product with the new panels looks similar to a textured plastered wall and can be used whenever plastered walls are deemed appropriate which includes practically any room in a commercial building or house, including the more formal rooms such as living rooms, dining, rooms, and bedrooms.

Basically, the new panels consist of fibrous, sound-absorbing boards preferably made of glass fibers because of their very high degree of sound absorption. The fibrous boards are stapled or otherwise affixed in abutting relationship to structural members constituting part of the wall or ceiling to which the acoustical panels are to be applied. Sheets of bonded mats of glass fibers are then adhered to the exposed faces of the fibrous boards with the edges of the sheets in abutting relationship and staggered with respect to the abutting joints of the fibrous boards so that old joints are almost imperceptible. With the sheets of bonded mat in place, an acoustical paint is then applied to the exposed surfaces of the sheets to completely hide all joints and to give the effect of a continuous slightly textured surface. Acoustical panels according to the invention are as effective in absorbing sound as are conventional acoustical tiles and will not crack as does plaster. Hence, the panels combine most of the advantages of both acoustical tiles and plastered walls without incurring the disadvantages thereof.

It is, therefore, a principal object of the invention to provide an acoustical panel capable of absorbing a high percentage of sound yet still having a smooth, unbroken appearance, rendering a wall or ceiling made of such panels suitable for use in many environments.

Another object of the invention is to provide a method of applying acoustical panels to a basic wall or ceiling structure, which method produces an unbroken surface, free of any visible joints.

2

A further object of the invention is to provide a sound-absorbing wall or ceiling structure which has an appearance somewhat similar to plaster but does not have a tendency to crack or spall.

Other objects and advantages of the invention will be apparent from the following detailed description of preferred embodiments thereof, reference being made to the accompanying drawing, in which:

FIG. 1 is a sectional view in perspective of a ceiling or wall structure embodying the principles of the invention;

FIG. 2 is a fragmentary, sectional view on an enlarged scale of a portion of an acoustical panel which is a part of the structure of FIG. 1;

FIG. 3 is a fragmentary, sectional view on an enlarged scale of a slightly modified panel;

FIGS. 4-8 are fragmentary, sectional edge views of elements of the acoustical panels of FIG. 1 and showing the steps employed in applying such panels on a wall or ceiling structure;

FIG. 9 is an enlarged view of a portion of a sheet of bonded fiber mat employed in the acoustical panel; and

FIG. 10 is a greatly enlarged view of a portion of the mat shown in FIG. 9 with a coating of paint on part of the mat.

Referring to FIG. 1, a wall or ceiling structure indicated generally at 10 includes structural members 12 and acoustical panels according to the invention which are indicated generally at 14. While the panels 14 make an excellent acoustical ceiling, they are equally effective for walls. In the latter instance, the panels are preferably used only above a height of three or four feet, with more shock-resistant panels used therebelow, because the panels 14 are subjected to damage when struck too hard, although they are more shock resistant than most conventional acoustical tiles. The structural members 12 are shown as wooden studs but can be numerous other structures such as concrete blocks on steel beams, for example, and where the acoustical panels 14 are applied on old walls, the structural members 12 might constitute a combination of studding, lath, and plaster, plaster board, or plywood, by way of illustration. In the case of concrete blocks, or similar materials into which nails or staples cannot readily be driven, furring strips can be employed, 1" x 3" boards being suitable for this purpose.

The panels 14 basically include fibrous boards 16, preferably of glass fibers, which are backed with layers 18 of heavy paper adhered thereto. Strips of heavy paper can also be used behind the joints of the boards 16. Sheets 20 of bonded fiber mat are adhered to the exposed faces of the fibrous boards 16 with abutting joints indicated at 22. The joints 22 are staggered relative to joints 24 between adjacent ones of the boards 16. Finally, a coat 26 of acoustical paint covers the exposed side of the bonded mat sheets 20. The board joints 24 are hidden by the sheets 20 and the abutting joints 22 of the sheets 20 are barely visible before the paint coat 26 is applied and cannot be seen at all thereafter.

Referring now in more detail to FIG. 2, which shows the nature of the specific elements of the panels 14, the fibrous boards 16 are preferably made in 2' x 4' rectangular sections, each having a thickness of approximately 3/4", although larger and smaller as well as thicker or thinner panels can be used. The boards preferably consist of intertwined glass fibers which are densified and bonded together with a phenolic resin, resulting in an apparent density of the fibers and binder of approximately 9 pounds per cubic foot. Glass fiber boards of this nature with apparent densities between approximately seven pounds per cubic foot and approximately twelve pounds per cubic foot have been found to be suitable for the panels 14. Fibrous boards with densities

below about seven pounds per cubic foot tend to lack sufficient stiffness while boards with densities above approximately twelve pounds per cubic foot are more expensive and heavier, due to the additional materials employed therein, without adding any benefits to the panels 14.

The layer 18 of paper backing on each of the boards 16 is used to reduce the amount of air flow therethrough. Such air flow tends to occur quite readily when slight pressure variations occur in a room in which the panels 14 are located because the boards 16 are quite porous, and when the air flows through the panels 14 from the exposed side, it deposits air-borne dirt thereon and causes the surfaces to darken or soil over a period of time. While the panels 14 can be repainted without any great loss in sound absorption, the period of time before soiling becomes apparent can be lengthened by using the paper layer 18 to reduce such air flow. In a specific embodiment of the panel 14, a 40 pound natural kraft paper is adhered to the rear side of the boards 16 with asphalt applied in an amount of four ounces per square foot.

The bonded glass fiber mat 20 basically is made of long, glass filaments 20a (FIGS. 9 and 10) having diameters in the order of 0.00060 inch which are arranged in overlapping swirl patterns. The overlapping filaments are dipped in a phenolic binder consisting essentially of 42 pounds of a 50% solids deionized resole, 35 pounds of an 88% solids bone glue, and enough water to make 80 gallons of the binder. The binder in the bonded mat preferably ranges from 10% to 25% by weight, and, most desirably, from 15% to 21% by weight. The mat 20 has a thickness of approximately 0.015" and weighs approximately 0.012 pound per square foot, depending principally upon the amount of binder employed. It is packaged in rolls which are three feet wide and are of varying lengths, up to 5000 feet. The mat 20, as described above, is stiffer than most bonded mats known in the art in order to facilitate its application to the exposed surfaces of the fibrous boards 16 without excessive wrinkling. The stiffness can be achieved by using more binder 20b (FIG. 10) than is normally used, by using a harder binder, or by using a thicker layer of continuous glass filaments. The binder in the mat 20 adheres the overlapping fibers together at their points of intersection but does not completely fill interstices between the fibers so that many gaps are present through the mat.

The mat 20 is adhered to the exposed faces of the fibrous boards 16 with an adhesive 21 (FIG. 2) containing a binder which dries rather quickly, is water resistant, and is somewhat elastic. The adhesive also must not deleteriously affect the binder in the board 16 whether it be phenolic, urea, melamine, mixtures thereof, or other materials. Solutions of polyvinyl acetate in toluene have been found suitable for use in this adhesive, as well as rubber-type cements, for example.

The acoustical paint in the coat 26 can be a water based latex type, several of which are known in the art. The paint preferably coalesces on the surface of the mat 20 in small individual globules 26a (FIG. 10) which cover only some of the gaps in the mat 20 and leave the surface of the mat quite porous. The globules of paint give a slightly textured appearance to the surface to the panels 14.

In some instances, it is preferred to fasten plaster board or the like to the structural members 12 before applying the fibrous boards 16. Accordingly, a plaster board 28 of FIG. 3 can be nailed or otherwise fastened by fasteners 29 to the members 12 with the fibrous boards 16 then applied to the plaster board 28 with acoustical mastic 28a or the like. In this instance, the layer 18 of backing paper is eliminated because its purpose is served by the plaster board.

The acoustical panels 14 are applied to the structural components of a wall or ceiling according to the following technique:

The fibrous boards 16 are first fastened in abutting relationship to the structural members 12 of FIG. 1 or other structural portions of the ceiling or wall, staples 30 (FIG. 4) being preferred when the structural portions are of an appropriate nature. The staples 30 have good holding power and can be applied quickly with numerous types of staple guns now known in the art. The staples are applied so that their transverse portions are flush with the exposed surfaces of the boards 16.

Adhesive 31 is then applied to the boards 16 over an area designated 32 (FIG. 5) and one of the sheets 20 is adhered thereto with portions 34 at all four edges thereof extending beyond the adhesive area 32. With one of the sheets 20 in place, a second area 32 (FIG. 6) of adhesive 31 is applied on the fibrous boards 16 and a second of the sheets 20 is placed thereon with a second of the portions 34 overlapping the portion 34 of the first of the sheets 20. Other edge portions of the sheets 20 at the upper or lower edges thereof also overlap any adjacent sheets in a similar manner. Parts of the two overlapped portions 34 are then severed, preferably by running a sharp edge through the two portions 34 along a single cutting line represented in FIG. 6 by a line 36. Remaining parts 38 of the overlapped portions 34 are then pulled back, away from the board 16, as shown in FIG. 7, and the severed parts of the portions 34 are discarded. The remaining parts 38 of the overlapping portions 34 can then be held back by means of pins 40 or the like which are inserted through the sheets 20 and into the board 16. An exposed portion 42 of the board 16 between the sheets 20 is then covered by adhesive 43, as from a spray 44 of a spray apparatus 46. The pins 40 are removed subsequently and the remaining parts 38 are adhered to the adhesive on the portion 42 of the board 16 in substantially perfect abutting relationship. A smooth surface is thereby effected with the seams or joints of the abutting sheets 20 barely visible.

The coating 26 of acoustical paint is then sprayed on, or otherwise applied to, the exposed surfaces of the sheets 20 of bonded mat, as shown in FIG. 8, to complete the acoustical surface. The acoustical paint globules 26a form a discontinuous layer on the sheets 20, covering some of the gaps therein, but leaving many of the minute gaps exposed, whereby the entire acoustical surface is discontinuous, with openings extending through both the paint coat 26 and the sheets 20 to the fibrous, sound-absorbing boards 16 to enable sound to enter the boards 16. The individual gaps and the paint globules surrounding them are not readily discernible, per se, but give an overall textured effect to the wall. The surface of the wall is entirely free of any visible seams or joints and has the appearance of textured plaster. Because the fibrous boards 16 and the mat 20 are somewhat elastic, the acoustical surface cannot crack as does plaster due to shrinkage, shift in the structural portion of the wall, or the like.

Various modifications of the above described embodiment of the invention will be apparent to those skilled in the art, and it is to be understood that such modifications can be made without departing from the spirit and scope of the invention, as defined in the accompanying claims.

We claim:

1. A sound-absorbing wall structure for a wall, ceiling, or the like, and having an appearance similar to that of a textured plastered surface, said wall structure comprising a substantially non-pervious layer substantially preventing flow of air therethrough, a plurality of fibrous boards, adhesive attaching said boards to said layer in abutting, coplanar relationship, said boards having apparent densities between approximately seven pounds per cubic foot and twelve pounds per cubic foot, a plurality of sheets of fibrous mat of long glass filaments bonded together by a binder present in an amount of from 10 to 25%, by weight, a second adhesive adhering said sheets

5

of fibrous mat to said fibrous boards in substantially coplanar relationship, with joints of said sheets being out of alignment with the joints of said fibrous boards, and a coating of acoustical paint on the exposed surfaces of said sheets, said coating of paint being on said sheets in the form of small globules which leave the surfaces of said sheets porous and provide a textured appearance for said wall structure.

2. A sound absorbing wall structure for a wall, ceiling, or the like, and having an appearance similar to that of a textured plastered surface, said wall structure comprising a substantially non-pervious layer substantially preventing flow of air therethrough, a plurality of fibrous boards, adhesive attaching said boards to said layer in abutting, coplanar relationship, said boards having apparent densities between approximately seven pounds per cubic foot and twelve pounds per cubic foot, a plurality of sheets of fibrous mat of long glass filaments bonded together by a phenolic binder present in an amount of from 10 to 25%, by weight, a second adhesive adhering said sheets of fibrous mat to said fibrous boards in substantially coplanar relationship, with joints of said sheets being out of alignment with the joints of said fibrous boards, and a coating of water-based paint on the exposed surfaces of said sheets, said coating being on said sheets

6

in the form of globules which leave the surfaces of said sheets porous and provide a textured appearance for said wall structure, said coat also hiding the joints of said sheets.

3. A wall structure according to claim 2 wherein said non-pervious layer comprises heavy kraft paper coated with asphalt.

References Cited in the file of this patent

UNITED STATES PATENTS

822,602	Gross et al. -----	June 5, 1906
1,894,933	Venzie -----	Jan. 17, 1933
1,950,420	Stitt -----	Mar. 13, 1934
1,999,856	Austin -----	Apr. 30, 1935
2,205,423	Lefebure -----	June 25, 1940
2,450,911	Park et al. -----	Oct. 12, 1948
2,587,884	Palmer -----	Mar. 4, 1952
2,692,219	Slayter et al. -----	Oct. 19, 1954
2,703,627	D'Eustachio -----	Mar. 8, 1955
2,850,109	Benjamin -----	Sept. 2, 1958
2,984,312	Brisley et al. -----	May 16, 1961
3,025,197	Sheidley -----	Mar. 13, 1962
3,044,919	Stoneburner -----	July 17, 1962