June 12, 1951 T. MULLER 2,556,884

SOUND ABSORBING SURFACE COVERING MATERIAL

Filed Jan. 14, 1947 2 Sheets-Sheet 1

Fig. 1

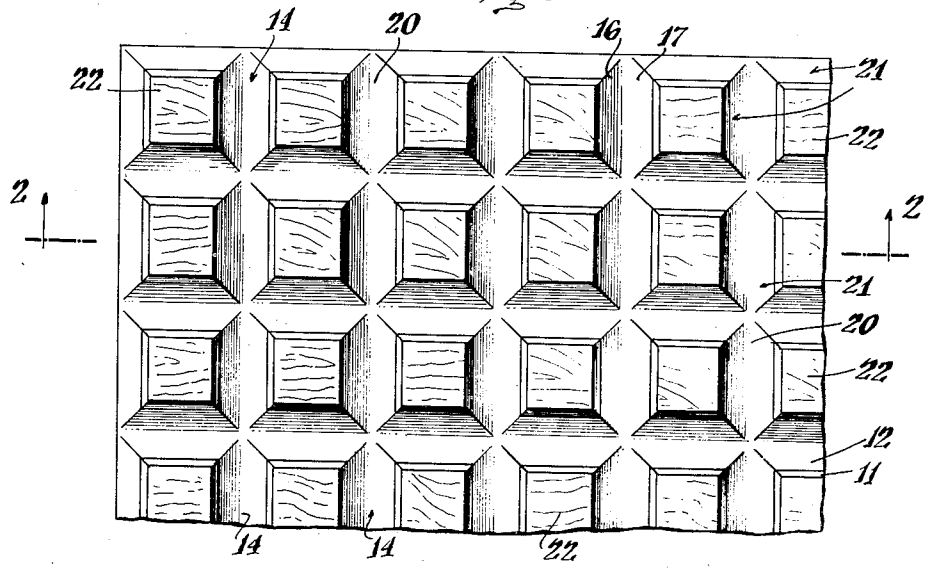


Fig. 2

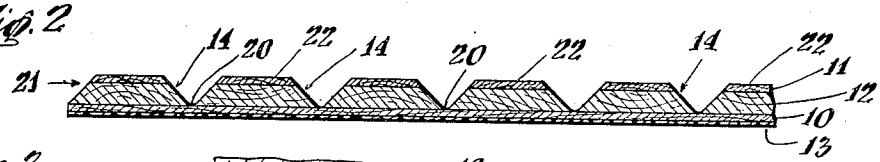


Fig. 3

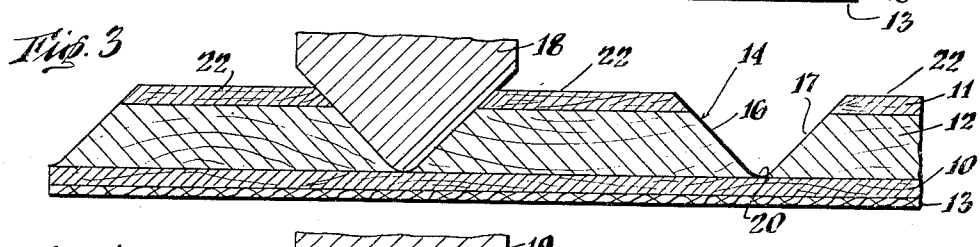


Fig. 4

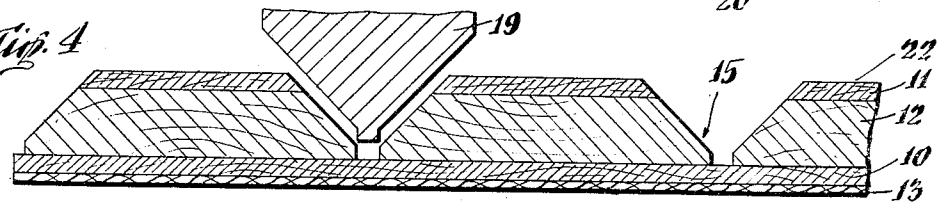
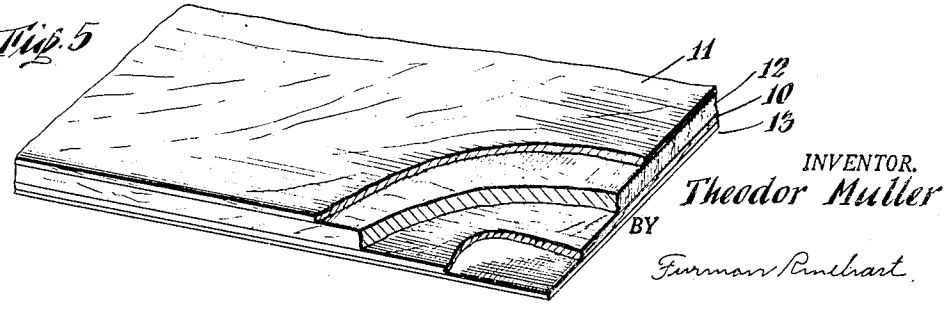


Fig. 5



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SOUND ABSORBING SURFACE COVERING MATERIAL

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Fig. 6

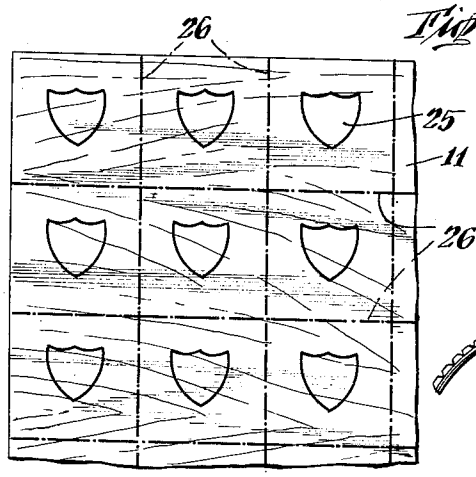


Fig. 7

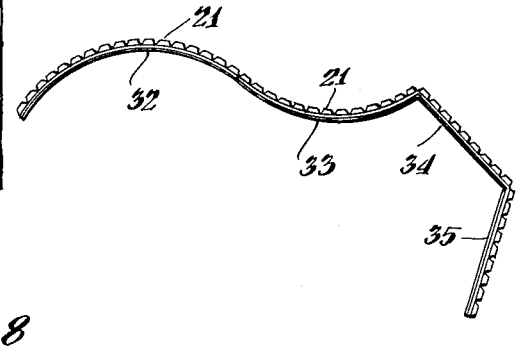


Fig. 8

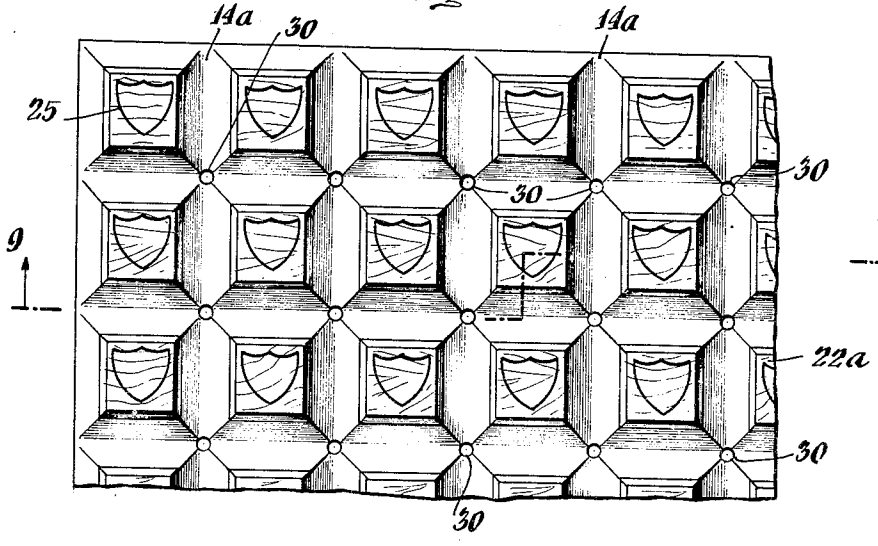
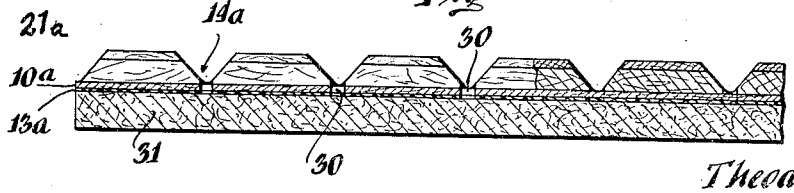


Fig. 9



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UNITED STATES PATENT OFFICE

2,556,884

SOUND-ABSORBING SURFACE COVERING MATERIAL

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Application January 14, 1947, Serial No. 721,899

15 Claims. (Cl. 181—33)

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This invention relates to sound diffusing surface covering material and more particularly surface coverings made of multiple ply wood. The surface covering is made to have a tesselated appearance and is therefore well suited for interior decoration.

In the art of interior decoration the desire for new and decorative materials which lend themselves to artistic and aesthetic treatment is an ever-increasing one. There are, of course, many kinds of materials available for covering interior surfaces and these provide for a wide variety of treatment of large surfaces such as walls and ceilings of rooms and some are used on surfaces which are of curved or of irregular shape. For flat surfaces, rigid or stiff materials in sheet form are suitable but such rigid materials are not well suited for covering curved, convex, concave or irregular surfaces. Many kinds of flexible sheet materials are suited for the covering of these latter mentioned surfaces to present a pleasing appearance. However most, if not all, of the surface coverings available to the interior decorator, while they may in many instances present a pleasing appearance, are of a kind which, aside from their appearance, have little else of utilitarian value to recommend them. There is therefore a need for a surface covering material which not only serves an aesthetic purpose in the field of interior decoration but as well serves other useful purposes without sacrificing other characteristics desired by interior decorators and designers working in domestic and industrial fields.

It is an object of this invention to provide a surface covering material which not only is well adapted for interior decoration because of its pleasing appearance but also because it serves as a sound wave or noise diffuser while at the same time it is adapted for the decorative covering of all manner of surfaces whether large or small; concave or convex; angular or flat; or otherwise irregular.

It is a further object of the invention, as will appear in further detail hereinafter, to provide a decorative surface covering material having, if desired, sound absorption qualities in addition to its pleasing appearance.

According to the invention there is provided a multi-ply wood board having a thin flexible wood ply at its base reinforced by a textile backing sheet bonded thereto and a plurality of transverse and lengthwise parallel rows of miniature truncated pyramids arranged closely adjacent one another adhesively bonded to the flexible base whereby the resultant product is made to have sound wave diffusing properties as well as a very pleasing tesselated appearance.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings, forming a part hereof, in which:

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Fig. 1 is a view looking at the surface of a representative portion of the surface covering board made according to the invention;

Fig. 2 is a view in cross-section on line 2—2 of Fig. 1;

Fig. 3 is a view in cross-section to larger scale showing one manner of making grooves to provide a surface of tesselated appearance;

Fig. 4 is a view in cross-section similar to Fig. 3 and showing a different form of grooves;

Fig. 5 is a view in perspective of the multi-ply board and textile backing which shows the material in its initial stage prior to grooving;

Fig. 6 is a view of a multi-ply board showing the surface initially ornamented prior to grooving;

Fig. 7 is an end view of the surface covering tesselated multi-ply board showing how it may be fitted to various surface contours.

Fig. 8 is a surface view of a modified form of tesselated surface covering material adapted for sound absorption made according to the invention; and

Fig. 9 is a view in section along line 9—9 of Fig. 8.

Referring now to the drawings, the surface covering material (sometimes hereinafter referred to as "board" for convenience of description) provided by the invention is made from a laminated multi-ply composite board (see Fig. 5) which is comprised of a lower ply 10 of wood which is sufficiently thin as to be flexible, and upper thin ply 11 of wood, an intermediate ply 12 of wood between the upper and lower wood plies 11 and 10 and a backing sheet 13 of textile material firmly bonded to the lower ply 10. The lower ply 10 should be thin enough to be flexible for reasons pointed out hereinafter; a thickness of the order of one-sixteenth of an inch being suitable. The intermediate ply 12 may be of less expensive wood and is several times thicker than the lower ply 10; a thickness of the order of two to six times greater than the thickness of the lower ply. The upper ply 11 may be of the order of one-sixteenth inch in thickness or thicker but is preferably of a hard wood. The three plies 10, 11 and 12 of wood are arranged so that the grain of one ply does not run parallel with the grain of its adjacent ply and the plies are firmly bonded together with a suitable adhesive, such adhesives, glues and cements being well known. The textile backing sheet 13 is preferably of a strong woven cotton fabric,

The composite board just described is then grooved laterally and longitudinally along parallel lines through the upper and intermediate plies 11 and 12 to form V-shaped grooves 14 (see Fig. 3) or funnel shaped grooves 15 (see Fig. 4). When it is grooved the board comprises adjacent rows of truncated pyramids running parallel crosswise and lengthwise. Preferably, the cut should not extend into the lower ply 10; at least not further than to score it a little but should go substantially through the thickness of the intermediate ply 12 so as to permit the finished board to be flexed convexly or concavely and in either direction, i. e., longitudinally or laterally. However, it is sometimes desirable to cut through the lower ply 10 so that the material will more easily stretch.

The grooves as shown in Figs. 1, 2 and 3 are such that the angle between the slanting planes, for example, planes 16 and 17, is of the order of 90° (see Fig. 3). The grooves may be made by a milling cutter, indicated by reference character 18, having an outline suitable to make the appropriate grooves, such for example as grooves 14. Funnel shaped grooves such as shown at 15 in Fig. 4 may be made by a tool of the shape shown at 19. The grooves may be spaced at various distances from each other but I prefer to make the apices 20 of the valleys of the grooves one inch apart in both directions so that the bottoms of the grooves form one inch squares constituting the bases of the adjacent truncated pyramids, indicated generally by reference character 21. Consequently there are provided parallel rows of adjacent truncated pyramids 21 having square bases bonded to the thin flexible ply 10. I prefer to have the top surfaces 22 of the truncated pyramids of the order of one-half inch square. It will be noted that when the dimensions mentioned are used, wherein the thickness of plies 10 and 11 is of the order of one-sixteenth inch and the thickness of intermediate ply 12 is of the order of three-sixteenths inch, the combined areas of the flat surfaces 22 is less than half the combined areas of the slanting sides of the truncated pyramids 21. Thus the board (see Fig. 1) in addition to its unusual and pleasing tesselated appearance, is such that the slanting surfaces comprising more than twice the area of the flat surfaces, serve better to diffuse sound waves than would a flat surface. This feature is particularly advantageous as the surface covering board not only lends itself to be used as a decorative material but at the same time it serves the additional function mentioned above.

If desired, the areas ultimately forming the upper surfaces of the truncated pyramids may be embossed or otherwise decorated with insignia 25 or other ornamentations such as illustrated in Fig. 6. This may be done prior to grooving; the groove lines being indicated by reference character 26.

In Figs. 8 and 9 there is illustrated a small portion of the tesselated board provided by the invention which is modified to enhance its sound absorption properties. In this embodiment of the invention a plurality of sound wave passageways are provided in the valleys between the truncated pyramids. As shown, the truncated pyramids 21*a* of the same kind as described in connection with Figs. 1 to 6 are superimposed upon and bonded to a thin flexible ply 10*a* of wood which is reinforced by a backing sheet 13*a* of textile as described above. At the junctures of the crossing grooves 14*a* there are provided sound wave passageways 30 which extend through the ply 10*a* and the textile reinforcing backing sheet 13*a*. Better to absorb the sound waves passing through the apertures there is provided a relatively thick layer 31 of loose felt or other material known to have good sound absorbing qualities. This layer 31 may be spot-glued to the board in those instances where a unitary construction is desirable or the layer 31 can be installed separately on the surface or other area to be covered by the board as the board may be nailed, if desired, to anchor it in place. The nailing may be done in the valleys of the grooves to keep the nails out of sight. Or, if the board is to be secured to a flat wall such as a previously plastered wall, or the like, this may be done with glue or paste, especially in those instances where the thick layer 31 of felt is dispensed with. As shown, the sound wave passageways 30 are located only at the junctures of the crossing grooves but additional passageways may be provided all along the valleys of the grooves, thus to present a greater number of apertures for the penetration of the sound waves through the laminated board.

It will be seen from the foregoing description that the invention provides a laminated board having an attractive tesselated appearance which lends itself to various artistic and aesthetic treatments. The laminated tesselated board is designed to have sound diffusing properties, which renders it particularly useful as an interior decoration material for walls and other surfaces where the surfaces are in rooms in which there is considerable noise and in certain types of music studios and more particularly in the rooms or offices where radio broadcasting or receiving is done. Moreover, the laminated board provided by the invention lends itself admirably to modification where enhanced sound absorption qualities are desired. Where the material is used on large forms designed for acoustical absorption properties for low sound frequencies, it combines with these the acoustical absorption properties for high frequencies.

In addition, the material is flexible and is capable of being applied to all manner of surfaces, whether large or small, round or square, concave or convex, and it may be bent in either direction, i. e., longitudinally or laterally, even to curvatures of small radii, of the order of three inches. As illustrated in Fig. 7, it may be curved convexly as shown at 32, concavely as shown at 33, or at an angle as shown at 34 and 35.

Also, the invention provides a tesselated board which may be stretched as much as an eighth of an inch per foot or a half inch total stretch in a four foot length. This characteristic is particularly advantageous as slight discrepancies in measurement are not a drawback and the material may be neatly fitted to areas and in corners which are not square or "true" without exposing unsightly seams and joints. Furthermore, the surface material may be finished in various ways. In cases where opaque finishes are used, such as sprayed paint or spatter, scrap plywood may be used, regardless of its color or type and this represents a big economy in its manufacture and provides to the manufacturer an outlet for scrap plywood.

The terms and expressions which have been employed herein are usued as terms of description and not of limitation and there is no intention in the use of such terms and expressions

of excluding any equivalent of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of invention claimed.

What is claimed is:

1. A surface covering plyboard which comprises an initially laminated plywood board comprising a lower layer of thin flexible wood, a top layer of thin flexible wood, and an intermediate layer substantially thicker than said lower layer, said plywood board being grooved with grooves of substantially V-shape cut substantially through said intermediate layer and which run in parallel closely spaced relation crosswise and lengthwise of said plyboard, and across the entire area of said plyboard, whereby said surface covering plyboard presents a tesselated appearance and is capable of being flexed either concavely or convexly and either crosswise or lengthwise.

2. A flexible plywood surface covering board made from a multi-ply laminated board having a thin flexible backing layer of wood, a sheet of textile fabric adhesively secured to the back of said backing layer, an intermediate layer of wood adhesively bonded to the face side of said backing layer of wood, a surface layer of wood bonded adhesively to said second layer of wood, said surface and intermediate layers of wood being grooved crosswise and lengthwise with substantially V-shaped grooves which run in parallel spaced relation in both of said directions and cut through said top and intermediate layers, said grooves crossing to define parallel rows of adjacent truncated pyramids having square bases, square exposed top surfaces substantially smaller in area than said bases and slanting sides, the area of the slanting sides of the truncated pyramids being greater than their top exposed surface area.

3. A tesselated laminated plywood board having a thin flexible backing layer of wood, said laminated board being grooved crosswise and lengthwise with substantially V-shaped grooves in parallel spaced relation, to form parallel rows of adjacent truncated pyramids, the apices of said grooves lying adjacent the face of said backing layer of wood, and a plurality of sound wave passageways extending through said board in the valleys at the apices of said grooves.

4. A tesselated laminated plywood board having a thin backing layer of wood, a sheet of textile material adhesively bonded to the back of said backing layer of wood, rows of V-shaped grooves running crosswise and lengthwise of the board in spaced relation and defining rows of truncated pyramids having their bases superimposed on said backing layer of wood and arranged in adjacent parallel spaced relation crosswise and lengthwise with their top surfaces exposed, sound wave passageways extending through said board and located on lines at the apices of said grooves and a backing layer of porous felt-like sound absorbing material lying adjacent said backing sheet of textile material.

5. A surface covering material made from a laminated plywood board which comprises a thin backing layer of wood thin enough to be flexible, an intermediate layer of wood at least three times thicker than said backing layer and a top surface layer of wood, said top and intermediate layers being grooved to form parallel V-shaped grooves through said top and intermediate layers

whereby said laminated board is rendered flexible and a sheet of textile material bonded to the back of said thin backing layer of wood.

6. A material as set forth in claim 5 in which the backing layer of wood is of the order of $\frac{1}{16}$'' which may be bent to form convex and concave surfaces of large radii without breaking or separating into a plurality of elements.

7. A material as set forth in claim 6 in which sound passageways are located in the intermediate layer.

8. A material as set forth in claim 7 in which sound passageways are located in the flexible backing layer.

9. A material as set forth in claim 8 in which a thick layer of loose felt of sound absorbing qualities is secured to the sheet of textile material.

10. A material as set forth in claim 9 in which the size of the composite material may be varied to utilize inexpensive short lengths and short widths of plywood.

11. A material as set forth in claim 3 in which said backing layer of wood is broken so that said textile material may be flexed, extended, or compressed.

12. A material as set forth in claim 2 in which said backing layer of wood is broken into individual elements and said sheet of textile fabric may be flexed to be placed on a convex surface, compressed to avoid bulging caused by small ripples in the supporting surface, and extensible to cover the supporting surface completely.

13. A material as set forth in claim 1 in which the top and bottom layers of wood are approximately one-sixteenth inch thick and the intermediate layer is approximately one-quarter inch thick.

14. A material as set forth in claim 1 in which the top and bottom layers of wood are made of a good quality wood of approximately one-sixteenth inch thick and the intermediate layer is made of less extensive wood of approximately three-eighths inch thick.

15. A decorative material as set forth in claim 2 in which the top and bottom layers of wood are approximately one-sixteenth inch thick and the intermediate layer is approximately one-eighth inch thick, and said sheet of textile fabric is of strong woven extensible cotton cloth, capable of being stretched an eighth of an inch in each foot while bonded to said backing layer.

THEODOR MULLER.

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