

Nov. 17, 1942.

E. FREDERICK, JR

2,302,020

DECORATIVE TILE

Filed May 19, 1937

Fig. 1.

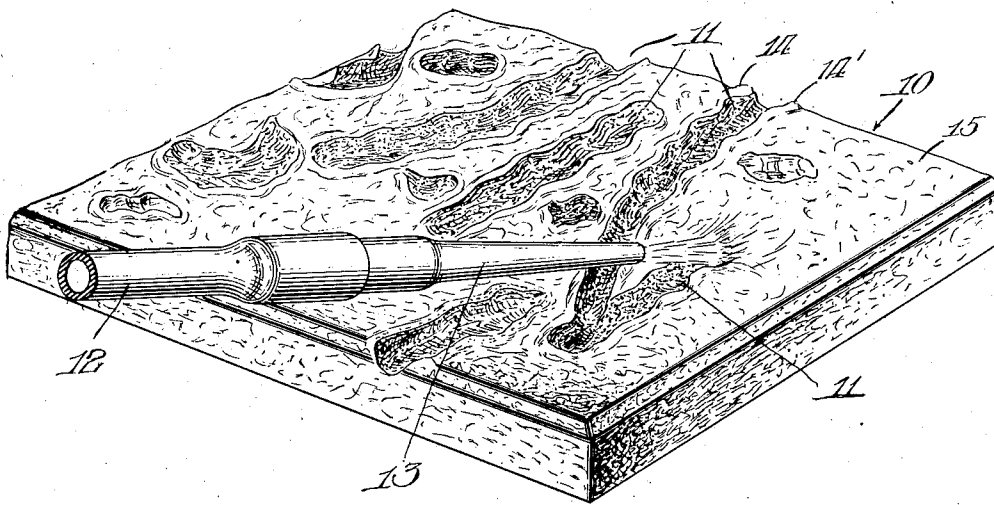


Fig. 2.

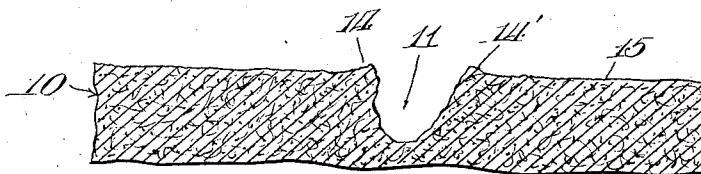
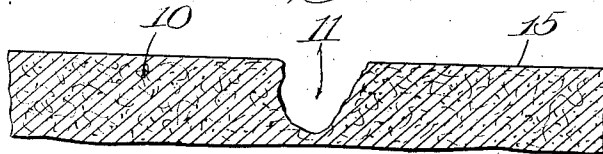


Fig. 3.



Inventor:
Emile Frederick, Jr.
by Edw. A. Hanson
Att'y.

UNITED STATES PATENT OFFICE

2,302,020

DECORATIVE TILE

Emile Frederick, Jr., New Orleans, La., assignor
to The Celotex Corporation, Chicago, Ill., a corporation of Delaware

Application May 19, 1937, Serial No. 143,453

9 Claims. (Cl. 92—39)

This invention relates to a building material of the nature of a wall finish, and more particularly to a sheet or tile-like material for use as a sound absorbing medium for acoustical treatment, and has for its object to provide such a material which will be less costly to manufacture and more efficient in use than those heretofore proposed.

With these and other objects in view the invention resides in the novel steps and combinations of steps constituting the method of manufacture, as well as in the novel product produced by such method, all as will be disclosed more fully hereinafter and particularly pointed out in the claims.

Referring to the accompanying drawing forming a part of this specification and in which like numerals designate like parts in all the views—

Fig. 1 is a perspective view of a portion of a sheet of the material produced by this invention and graphically represents one of the methods of treating a surface of the sheet to produce the acoustical characteristic desired;

Fig. 2 is a fragmentary vertical sectional view through the sheet illustrating one of the fissures formed in a surface thereof for receiving sound waves; and

Fig. 3 is a view similar to Fig. 2 but wherein the surface 15 has been treated to render the same planar.

The invention hereof relates both to the product and its method of production, and is adaptable to the production of a structural building product having a decorative surface whether such product is for use merely as a decorative product or for the purpose of correcting acoustical conditions in a room, or for other uses, since it is readily conceivable that the teachings of the invention may be applied to the production of products for various technical uses. Primarily, this invention is concerned with the production of a sound absorbing product for use in acoustical correction but which product is adaptable for use as an exposed decorative surface having high efficiency in the absorption of sound energy.

Heretofore many various structures and constructions have been proposed in attempts to provide sound absorbing materials for use as acoustical correctives, which materials are not only sound absorptive but have been so constructed or constituted that the exposed surface thereof could be painted or otherwise given an attractive surface appearance without, however, impairing the properties of the material for its use of an acoustical corrective. The present in-

vention is directed to an improvement over the heretofore known structures both as to the product and the method of producing the same.

In order that a material used for acoustical correction may absorb sound waves impacting thereagainst it is necessary that the material be quite porous and that it have sufficient surface porosity so that sound waves impacting the face thereof may enter into the interior body of such material to be absorbed therein, and therefore it is a particular object of this invention to provide an acoustical corrective material with a surface having localized portions where sound waves can readily enter into the interior body of the material notwithstanding the fact that the other portions of the surface, or substantially all the other portions of the surface, may have little or no porosity, due either to the original character of the material or due to the fact that the surface has been coated with a decorative material, as by painting.

A still further object of the invention is the provision of a process of producing an acoustical material whereby, in producing therein localized areas at a surface so that the sound waves impacting such surface can readily pass into the interior of the material, the operation of providing such localized areas is such that assurance may be had that the sound waves which enter at such localized areas may readily pass into the interior body of the sound absorbing material to be absorbed therein, which result is accomplished by the process of production whereby the said localized areas for the entry of sound waves are such that the interior porosity of the sound absorbing material is not injured in any way.

The material of which the product is made may be of various substances which, however, are capable of imparting porosity to the material after the formation thereof. Hence, such material may include plastics, comminuted substances, and more or less interlaced material of fibrous nature, such material being capable of formation into a sheet or into a molded form provided with air cells, and the fibrous material may be of mineral or vegetable nature in a wide range of fiber consistency. However, for the purpose of further describing this invention the following example is given as illustrative.

Loose fiber is suspended in a large quantity of water, for example 1% fiber and 99% water, to which may be added 10% of cooked starch (based on the weight of the fiber) to form a fibrous stock which may be passed onto a screen in a machine which is quite comparable to a Four-

drinier paper machine, or a machine where the fiber stock is flowed upon a screen to permit the water to escape through the openings of the screen to leave the fiber on the screen as a mat. The wet felted fiber mass, thus formed on the screen, is slightly squeezed to expel most of the contained water, thereby forming a plastic mass wherein the fibers are interlaced and felted, but wherein it is possible to move, remove, or transfer a portion of these fibers from one position to another, as by means of a fluid jet, without destruction of the entire felted sheet of the fibrous mass.

By directing a small jet of water, for example, against the surface of the wet felted lap or sheet of fiber, such jet being moved over various parts of the sheet surface, the fibers in the areas impacted by the jet are, to a certain extent, eroded or bodily picked out of the structure, and other fibers are pushed back from the sides of the path of the jet, to form fissures or pits extending inwardly of the fibrous mass from the surface thereof. That is to say, the fibers in the path of the directed jet are moved bodily, or transferred, from their original position in the sheet to other positions in or on said sheet, leaving a depression or furrow in the surface against which the jet is directed. In this action of the jet there is, therefore, the strong tendency for the fibers both to be displaced and for the top edges of the formed fissures to be raised above the normal surface of the sheet in what may be termed small mountain-like ridges, due to the movement of the fibers as a result of the directed jet.

The felted mass, still wet and which has been so fissured by the jet, is then passed to a drier where the moisture is substantially eliminated, the material then being held together by the combined action of the felting of the fibers and the cementing action of the starch. After the material is dried, if desired, it may be suitably surfaced as by sanding or by the planing action of a cutter to make the fissured surface planar (i. e., with all parts in the same plane), although obviously for certain purposes this surface may be left in its natural uneven condition.

Referring to the drawing 10 indicates a felted fibrous mass in sheet or tile form wherein the surface 15 has formed therein a plurality of pits, fissures, or furrows 11 which have been formed as above described by the action of a fluid jet conducted through the pipe 12 and nozzle 13 against said surface, the ridges 14 and 15' being formed along the upper edges of said fissures. No particular design effect is contemplated by this invention since the nozzle may be moved over the surface in more or less haphazard manner, the purpose being only to provide such surface with enough fissures to render the completed sheet or tile sufficiently acoustical corrective.

The fissures may be made as shallow or as deep as desired dependent upon the purpose for which the product is intended and the preservation of strength of the product. Further, the erosive action of the jet is such that the interior surface of the fissures will not be regular but rather composed of irregularities due to the fibrous nature of the material. In other words, this interior surface will be composed of fiber ends as well as relatively smooth sides of fibers, and consequently sound waves ultimately entering such fissures will be positively interrupted by the irregular interior surface thereof, caught and retained thereby, and thus caused to enter the air cells of the porous body of the fibrous sheet to be absorbed

therein, all as distinguished from a reflection of such sound waves as would occur if the interior surface of the fissures was smooth. Even though the surface 15 of the sheet is ultimately sanded or made planar, yet sound waves striking such surface will not be reflected therefrom to any material extent because of the fibrous and porous nature of the body of the sheet, unless of course said surface is later treated with a coat of paint or the like, this being optional in accordance with the effect desired in building construction, and even with such paint treatment it has been found that the fissures can be so closely spaced and/or made sufficiently deep that the total of the interior surfaces of all of the fissures is as great as if not greater than the painted surface, to the end that the sound waves will be caught and absorbed to a great extent by virtue of such fissures.

The fluid jet above referred to may be suitably controlled as to pressure and may be of air, gas, or liquid, or a combination of any of these with discrete particles, or the jet may comprise discrete particles alone which are projected from the nozzle 13, or the fissures may be formed by purely mechanical means such as by drawing through the top surface of the material a suitable instrument for making the fissures, and while fibers have been particularly mentioned it will be understood that the invention covers treatment of a material composed of granular particles or the like. In other words the real invention lies in the movement, removal, or transfer of individual fiber units, or particle units, from one position in the sheet to another position while the material of the sheet is in its wet or plastic state, without substantial breaking of such fibers or particles, as distinguished from a fissure-forming operation such as produced by sawing, drilling or otherwise cutting with an edged tool which more or less produces a smooth cut surface. Hence, the units (whether fibers or granular particles) are unreduced by the method of this invention and therefore they are merely moved from their original positions in the sheet, and consequently these fissures are truly localized openings extending from the surface of the sheet into the interior body of the acoustical material, the pits being small holes or the like in distinction from the more or less continuous openings termed fissures.

The jet will be suitably controlled as to pressure and angle of application. That is to say, the factors governing the regulation of the pressure will include the consistency and relative weight of the mass being fissured, as well as the nature and size of the stream being jetted and the depth of fissure desired. Much latitude is therefore possible since, also, the angle may be considerably varied between the axis of the jet and the plane of the surface against which the jet is directed, when considering the above mentioned factors.

Whereas above the production of a product in accordance with the invention hereof has been described in connection with the production of a product composed of fiber generally, it is to be understood that such fiber, depending upon the specific character desired for the final products or the particular purpose for which it is to be used, may be various of the cellulose fibers such as are commonly used in the manufacture of fiber insulating board and paper as, for example, wood fiber, sugar cane fiber, and other like or similar fibers, or may be hair or the like, or inorganic fibers such as rock wool, asbestos, and the like,

or various combinations of any of such said fibers. The product of the invention hereof may also be produced from materials such as ordinary hydrated gypsum, cement, or various other setting materials of generally like characteristics, or composed of any other suitable plastic substance which is self-setting or which may be caused to set or harden by appropriate treatment and any such plastic may incorporate or include if desired various foams or bubbles as, for example, foam formed from saponine, soap, or casein, or the like, which foam or bubbles will impart porosity to the material in which they are incorporated.

It is to be understood that the fissures or pits, or the like, formed in the surface of the product produced in accordance with the invention hereof need only cover an area comprising a relatively minor portion of the surface area of the product since sound waves impinging against a surface act somewhat like water poured on such surface, that is, the sound waves in effect tend to flow over the surface and penetrate into any pores, fissures, or crevices so that it is unnecessary that the entire interior porous structure of the product be directly exposed to impact by the sound waves, that is, spaced fissures or the like, within limits well understood by those skilled in acoustics, will serve to cause the absorption of sound with substantially the same effect as though the entire surface of the porous structure were exposed to impact by the sound waves.

It is obvious that those skilled in the art may vary the steps and combinations of steps constituting the process by which this product is produced, without departing from the spirit of the invention and therefore it is not desired to be limited to the exact foregoing description except as may be demanded by the claims.

What is claimed is:

1. The process of forming a decorative and sound absorptive structural material in board form comprising the formation of a settable sound absorptive substance into shaped form followed by the lateral displacement of portions thereof by a fluid jet forcibly projected against a face thereof causing fissures to be formed for the reception of sound waves, the settable sound absorptive substance thereafter caused to set, and subsequent treatment of the outer face against which the fluid jet was projected to make the same planar for forming an ornamental and sound absorptive surface.

2. The process of forming fissures and pits in a sheet of sound absorptive plastic material in board form which comprises subjecting a surface of said sheet while plastic to the erosive action of a fluid jet causing lateral displacement of the plastic material, and subsequently drying said sheet causing an acoustical corrective and decorative material to be formed.

3. The process of forming a decorative and sound absorptive structural material comprising the formation of a settable sound absorptive substance into shaped form followed by the displacement of portions thereof for the reception of sound waves by a fluid jet forcibly projected against a face thereof, the settable sound absorptive substance thereafter caused to set, and sub-

sequently removing projecting portions of said substance from the outer face against which the fluid jet was projected causing a decorative and sound absorptive surface to be formed.

4. The process of producing a decorative and sound absorptive fibrous sheet in board form comprising the formation of a wet pulp sheet and the fissuring of a surface thereof for the reception of sound waves by the forcible projection of discrete substance against selected portions of said surface, the sheet thereafter dried and the outer face of the sheet, upon which the substance was projected, removed by an abrading action causing a decorative and sound absorptive surface to be formed.

5. The process of producing a decorative fibrous sound absorptive product in board form, which comprises the steps: forming a wet pulp sheet into board form and porous throughout, fissuring a surface thereof for the reception of sound waves by the forcible projection of discrete substance against selected portions of said surface causing lateral displacement of the material within the selected portions, and drying the aforesaid sheet causing a decorative and acoustical product in board form to be formed.

6. The process of producing a decorative fibrous sound absorptive product in board form, which comprises the steps: forming a wet pulp sheet into board form and porous throughout, fissuring a surface thereof for the reception of sound waves by the forcible projection of a fluid jet against selected portions of said surface causing lateral displacement of the material within the selected portions, and drying the aforesaid sheet causing a decorative and acoustical product in board form to be formed.

7. The process of producing a decorative fibrous sound absorption product in board form, which comprises the steps: forming a wet pulp sheet into board form and porous throughout, fissuring a surface thereof for the reception of sound waves by the forcible projection of a fluid jet against selected portions of said surface causing lateral displacement of the material within the selected portions, drying the aforesaid sheet, and smoothing the outer face of the sheet against which the jet was directed causing a decorative and acoustical product in board form to be formed.

8. The method of forming a sound absorptive and decorative structural material which comprises fissuring the porous material by impinging a fluid jet on a surface thereof causing lateral displacement of the material to form fissures for the absorption of sound within the porous material and the displaced material forcing upwardly the material contiguous to the fissures forming a decorative surface.

9. As an article of manufacture, a sound absorptive and decorative structural and porous material formed by fissuring the porous material by impinging a fluid jet on a surface thereof causing lateral displacement of the material to form fissures and the displaced material forcing upwardly the material contiguous to the fissures, whereby a decorative surface is formed.

EMILE FREDERICK, JR.