

Aug. 2, 1960

J. C. HART ETAL

2,947,647

FISSURED COATED FIBERBOARD AND METHOD OF MANUFACTURE

Filed Sept. 24, 1958

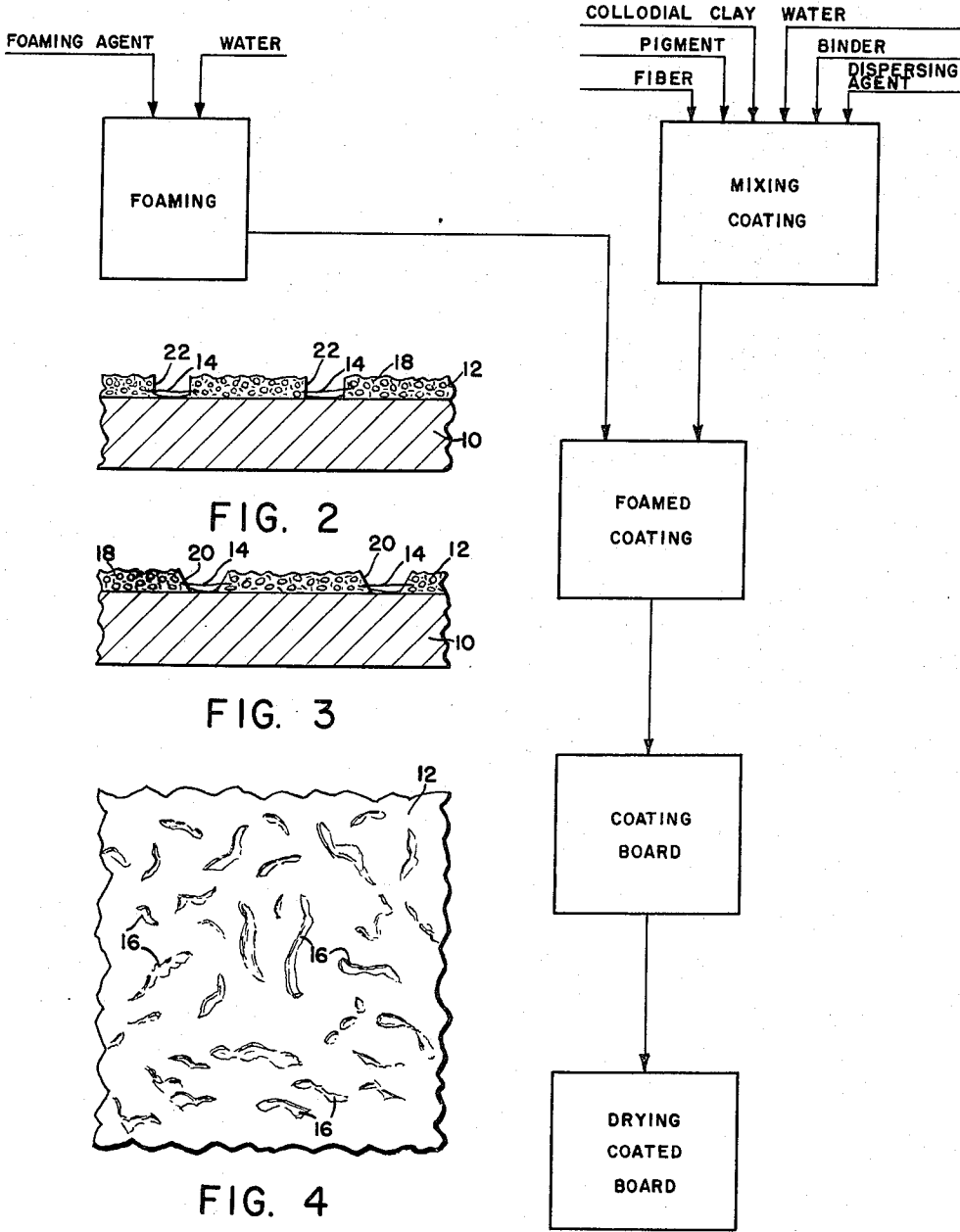


FIG. 1

INVENTOR.  
JOHN C. HART  
EDGAR. A. LAURING

BY

*H. F. Woodward*  
att

1

2,947,647

## FISSURED COATED FIBERBOARD AND METHOD OF MANUFACTURE

John C. Hart and Edgar A. Lauring, International Falls, Minn., assignors to Minnesota and Ontario Paper Company, Minneapolis, Minn.

Filed Sept. 24, 1958, Ser. No. 762,919

7 Claims. (Cl. 117-41)

This invention relates to acoustical tiles and to methods of manufacturing them.

One of the objects of this invention is the provision of an acoustical tile that is provided with a fissured surface which results in high sound absorbing efficiency.

Another object of the invention is to provide an improved method of treating the surface of a fibrous building unit in order to improve the appearance of the product and enhance its sound-absorbing properties. The method of treating provides an open surface resembling travertine marble.

It is a further object of the invention to produce a fissured tile by a process which is simple, economical and practical.

Other objects of the invention will become apparent from consideration of the following description of the invention.

A variety of base materials may be used to form the blank tile to be processed in accordance with this invention. The base may be lignocellulose fiber, glass fiber, synthetic fiber, as well as mineral wool or a combination of two or more of the class of fibers as the source of fiber to produce the acoustical tile baseboard, or it may be a mineral board (example, gypsum or cementitious tile).

It is to be understood that the composition tile of the invention need not necessarily be an acoustical correction tile but that it may be merely a decorative tile and this in part depends upon the sound-absorbing properties of the baseboard.

Figure 1 is a schematic diagram of the steps involved in the method of producing the new fissure coated board;

Figure 2 is a side view with parts broken away of a coated board produced in accordance with the new process;

Figure 3 is a side view similar to that shown in Figure 2, with parts broken away, showing the fissures having sloping banks and

Figure 4 is a top plane view of a tile with portions broken away showing arrangement of the fissures.

If the baseboard is lignocellulose fibers it is preferred that the board be divided into the desired size such as for example 12 x 12 and  $\frac{3}{4}$  of an inch thick or 12 x 24 and  $\frac{1}{2}$  of an inch thick. It is to be understood that any size board may be used. To one surface is applied the material hereinafter to be described. The material applied may be film, a very light coating. A coating  $\frac{1}{8}$  to about  $\frac{1}{4}$ " in thickness provides a good variation of fissures. Generally, the thicker the coating, the larger the fissures. In some cases it may be necessary to also coat the back side of the tile to correct for warp. The backside treatment may be different from the front side.

The material to be applied is foamed and contains a

2

colloidal clay that swells immensely upon wetting and shrinks immensely upon drying. Bentonite and wilkinite are such clays, and are typified by containing the mineral montmorillonite. If bentonite or its equivalent is not used, the coating will not fissure, however there may be openings due to the foam and fiber pattern.

A foam may be prepared by the use of several different types of apparatus and in several different ways. The stability and size of the foam bubbles has a large bearing on the texture and type of fissure that may be produced. The foam used for any particular formula must be compatible with such formula. For any particular formula, stability adjustments can be achieved by bubble size. Generally, the preferred range for usable foam is from .03 to .2 specific gravity. Certain foaming agents may be mixed with the other ingredients and foamed in this form, while certain other foaming agents require the foam to be made separately. From the standpoint of ability to obtain the same results time after time the separate foaming and then incorporating it in the material is the preferred way. The final coating, regardless of how produced, preferably should have a specific gravity between .5 and .8. Some of the foaming agents that will produce satisfactory results are Triton (ether sulphate), Igepal (non-ionic polymerized ethylene oxide), Santomerse D (aromatic sulfonic acids), Emulphor (non-ionic water-soluble polyethylene ethers of fatty acid or alcohol), saponin, alpha protein and sulphite waste liquor. The non-ionic type of foaming agent gives the best and most consistent results.

It is preferred that suitable fibers 14 be incorporated in the foamed coating to give strength and enhance the fissuring. The fibers incorporated in such coating should bridge across the fissures and in open areas. In part, the surface texture is dependent upon the amount, size and kind of fiber used. The fibers that may be used include cellulose, glass fiber, mineral fiber or synthetic fibers, it being understood that a combination of two or more of the type of fiber may be used. Each of these fibers will produce a different result in the appearance of the finished surface. Cellulose fibers have several desirable properties such as hydrating and being limp in the coating and upon drying out become hard and stiff. The amount of fiber by weight which it is preferred to use should vary up to 7.5% for cellulose fibers and up to about 10% for mineral fibers on dry weight of coating. The size of the fibers used should be of such length as to bridge across the large fissures produced. If cellulose fibers are used they should be in lengths up to about  $\frac{3}{4}$  of an inch. Where really fine and short fibers are used which do not bridge the fissures produced, they act principally as filler in the coating. Generally, a variety of fiber sizes should be used, but in any case most of the fibers should be of such length as to bridge the fissures that will be in the finished product.

The drying of the coating may vary from room temperature up to a temperature where the coating starts to darken. A desirable working range will fall within about 250° F. to about 350° F. Generally, it may be said the lower temperature produces larger fissures than a high temperature for any given coating. For some formulas it is preferred that the initial drying be slower or by radiant heat as high velocity air causes the fissures to curl and be without any given pattern. Some of the factors that control the size and shape of the fissures are: (It is understood that a material similar to bentonite or its equivalent will be used in all formulas.)

- (1) The montmorillonite mineral. (The more such mineral or its equivalent used, the larger and more numerous will be the fissures. General range 5 to 15 parts.)
- (2) The thickness of the coating. (The thicker the coating, the larger the fissures.)
- (3) Drying rate.
- (4) Fiber size.
- (5) Foam.
- (6) Viscosity of coating. (Low viscosity produces wide fissures.)

As a specific example, the coating material may contain the following approximate parts of material based upon the dry weight of the coating:

Water	-----	150
Binder	-----	30
Bentonite	-----	10
Dispersing agent	-----	0.1
Wood fiber	-----	5
Expanded vermiculite	-----	5
Filler pigment	-----	50

A coating prepared as given in the example will have a specific gravity of about .5, when incorporated in a foam containing about 2 parts by volume to about 1 part by volume of the pigment.

It is to be understood that the vermiculite may be replaced by filler pigment or fiber or a combination thereof. The use of vermiculite increases the flame resistance of the coating.

The coating may be applied by puddling ahead of a reverse roll slice. The amount of coating may be controlled by varying the height of the reverse roll above the surface of the fiberboard being coated. The board must be kept flat while applying the coating. Special fingers on the board is one way of keeping the board flat when going through the reverse roll slice. This is important in achieving uniform coating thickness. The roll rotates in a direction opposed to the direction of the board and the linear speed of the roll may vary above or below the speed of the board travel.

Some of the binders that may be used are latex, protein, urea formaldehyde, starch and the like. Also, a combination of two or more of the binder may be used. The amount of binder may be varied, for example, from 20 to 35 parts.

It is to be understood that latex as used herein is intended to include latices such as butadiene-styrene.

The filler pigment may be clay, titanium, calcium carbonate and the like or a combination of two or more such pigments. The dispersing agent may be any suitable material. In general, there are four types of compound which may be used as dispersing agents:

- (1) Crystalline and glassy sodium polyphosphates,
- (2) Crystalline and amorphous sodium silicates,
- (3) Sodium salts of lignin sulphonic acids, and
- (4) Sodium salts of aryl alkyl sulphonic acids.

The phosphates are generally preferred in this process.

It is preferred to control and predetermine the fissure sizes and shapes by controlling the viscosity of the wet coating. The wet coating at rest on the baseboard has a direct relationship to the type and size of the fissure produced. A coating with a low viscosity will produce random arranged large fissures with wide valleys and sloping banks 20. The same coating at a higher viscosity will produce narrow fissures with nearly perpendicular banks 22. The viscosity of the coating on the board can be controlled by varying the solid contents of the coating and/or the type and amount of dispersing agent used. For the purpose of this application high viscosity coatings are those having about 4,000 centipoise or higher at 20 r.p.m., the value being obtained by the use of the Brookfield synchroelectric viscometer. The preferred range for the high viscosity coatings falling be-

tween the range of about 4,000 to about 4,500 centipoises.

The colloidal clay such as bentonite may be of any suitable particle size, for example, a 55- to about 65-mesh size gives satisfactory results. The amount of colloidal clay should generally fall within the range of about 5 parts to about 15 parts, although it is to be understood that the amounts varying from those stated may be used as the amount of bentonite or its equivalent used controls in part the size of the fissures in the finished product.

By way of example, the foam may be prepared by aerating waste sulphite liquor having a solid contents of about 10% to about 12% and a pH of about 8.5 to about 9. To provide a foam of the type required the waste sulphite liquor should be increased in volume about four to five times.

What is claimed:

1. A process of making a cellular material comprising applying to a baseboard a coating of a slurry incorporated in a foam and having a viscosity in excess of 4,000 centipoises at 20 r.p.m. as measured by the Brookfield viscometer; said slurry containing wood fiber, 5 to 15 parts of bentonite, 20 to about 35 parts of a non-oil binder and a filler, and then drying the coating at a temperature in the range of about 250° F. to about 300° F. whereby fissures extending inwardly from the surface are formed in the coating.

2. A process of making coated baseboard having acoustical and insulating properties consisting of preparing a foam of a density of about .03 to about .02 specific gravity; incorporating in the said foam a slurry containing 20 to about 35 parts of a non-oil binder, about 5 parts to about 15 parts of bentonite, fibers and a filler pigment, applying the foam-slurry to a baseboard and then drying at a temperature within the range of about 250° F. to about 300° F. whereby fissures are formed in the dried foamed-slurry.

3. A process of coating a tile consisting of the steps of preparing a foam coating having a viscosity in excess of 4,000 centipoises at 20 r.p.m. and measured by the Brookfield viscosimeter; said coating containing about 5 to about 15 parts of a colloidal clay, a non-oil binder and filler, applying the foamed coating to a fiberboard and then drying at an elevated temperature of about 250° F. to about 350° F. whereby fissures in the coating extending inwardly from a face thereof are produced.

4. A fissured coated acoustical tile having a fiberboard base and a coating having fissures therein extending inwardly from a surface, said fissures having substantially perpendicular walls with fibers extending across the fissures, the said coating containing about 10 parts of a colloidal clay, fibers, a non-oil binder and a filler pigment.

5. An acoustical tile comprising a baseboard having a layer of foamed and fissure composition thereon, the said fissures extending inwardly from a surface and having sloping walls with fibers extending across the fissures, said composition containing about 5 to about 15 parts of a bentonite, a non-oil binder and a filler pigment.

6. A coating composition for producing a fissured coated tile consisting of 20 to 30 parts of a non-oil binder, 5 to 15 parts of colloidal clay, 5 to 7.5 parts of wood fiber said wood fiber of a length up to ¼ of an inch, vermiculite and about 50 parts of a filler pigment.

7. A process of making a cellular material that has fissures extending inwardly from a surface, consisting of foaming waste sulfite liquor until the liquor increases in volume of about 4 times to about 5 times; said sulfite liquor having a solid contents of about 10 to about 12% and a pH of about 8.5 to about 9.0; incorporating about one part by volume of a slurry comprising water, about 5 to 15 parts of a colloidal clay, about 20 to about 35 parts of a non-oil binder and a filler into about two 75 parts by volume of said foam waste sulfite liquor, apply-

5

ing the foamed-slurry mixture to a supporting base and drying the said mixture at an elevated temperature of about 250° F. to about 350° F. whereby fissures form therein said fissures extending inwardly from an exposed surface.

## References Cited in the file of this patent

## UNITED STATES PATENTS

2,292,012	Parsons	Aug. 4, 1942	
2,332,369	Burton	Oct. 19, 1943	10

2,354,593	
2,388,549	
2,632,743	
2,664,406	
2,684,953	5
2,708,643	
2,755,260	
2,763,568	
2,768,091	
2,838,806	

6

Greider et al.	July 25, 1944
Kieselbach	Nov. 6, 1945
Eckert	Mar. 24, 1953
Armstrong	Dec. 29, 1953
Stilbert et al.	July 27, 1954
Page et al.	May 17, 1955
Stilbert et al.	July 17, 1956
McBride	Sept. 18, 1956
Cubberley	Oct. 23, 1956
Sabine	June 17, 1958