Sept. 1, 1964 E. H. KEPPLER ETAL 3,146,499

WALL PANEL

Filed June 25, 1959

FIG. 1

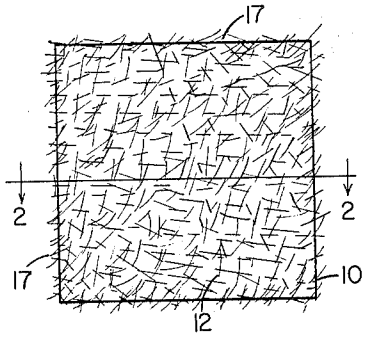


FIG. 3

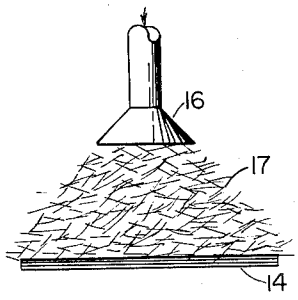


FIG. 2

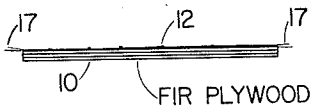


FIG. 4

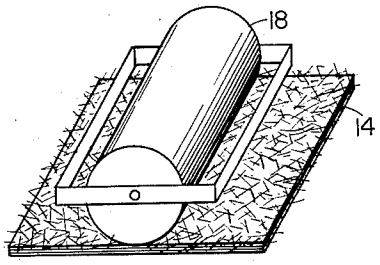


FIG. 6

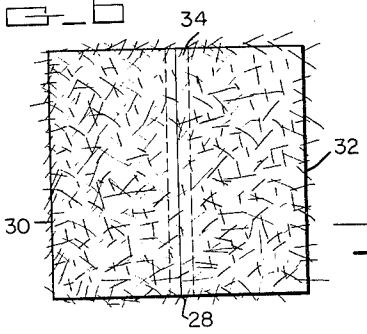
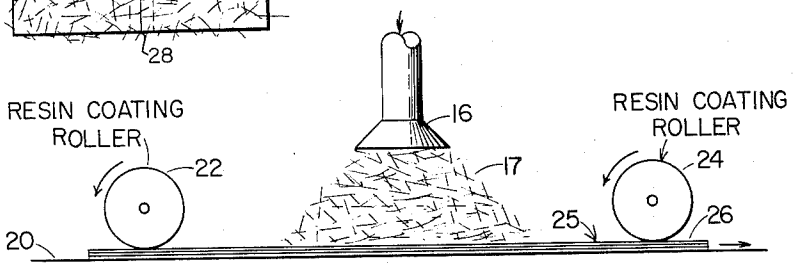


FIG. 5



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WALL PANEL

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The present invention relates to a wall panel and more particularly to a decorative panel for use as interior walls (side walls and ceilings) of houses and the like.

The use of wood paneling, and especially the finer grades of plywood paneling, is quite popular and conventional in the construction of houses and the like. Such woods include mahogany, walnut, maple, birch, etc., which not only present a pleasing and decorative appearance with respect to the grain pattern but which are durable to the extent that the appearance is maintained over long periods of time.

Certain types and kinds of woods are not as desirable for interior paneling, one of these being fir. Plywood made from Douglas fir, for example, has generally been regarded as undesirable for interior finishing for the reason that after a period of time its exposed surface becomes filled with cracks or checks which normally extend in the direction of the grain of the wood. The appearance of these checks is obvious and renders the wood unsightly as paneling. Also, the wood grain accentuates in appearance with the passing of time. Thus fir plywood is not regarded as material desirable for finishing the interior of houses and the like.

While many attempts have been made to solve the problem of checking, these have proved to be inadequate, especially those attempts involved in covering the plywood surface with paint-like material and fibrous compositions. Such materials do not solve the problem, inasmuch as the wood continues to check, the checks showing through the paint covering.

It has been determined that this problem of checking can be solved in either one of two ways, or both: (1) covering the surface of the plywood with paint or some suitable plastic material which covers and hides the checks as they occur and (2) preventing the checks from occurring in the first instance.

According to the present invention, a satisfactory solution to the problem has been found in the provision of a lamination of suitable material on and impregnated in one surface of the fir plywood panel, which not only hides any checks that might form but which also prevents or inhibits the checks from forming in the first instance. Such an impregnated lamination must possess at least two essential properties: (1) it must bond securely to the plywood surface and (2) it must be stretch-resistant to the extent that it will prevent the cracks from forming. Such a lamination is provided by this invention in the form of a composite material which presents a hard surface which may be cleaned, does not support combustion, is decorative, tough, flexible, stretch-resistant and tenaciously adhesive. This composite material comprises a particular plastic in combination with short lengths of glass roving, the plastic being of the class known as "vinyl resin" or "vinyl enamel."

It is therefore an object of this invention to provide a decorative panel which is so treated as to retard the tendency of the same to check or crack.

It is another object of this invention to provide a lamination for fir plywood panels or sheets, which lamination is in the form of a tough, flexible, stretch-resistant layer or film which hides any cracks or checks which may form in the surface and which also inhibits the cracks or checks from forming in the first instance.

Other objects will appear as the description proceeds.

In accordance with the present invention, a sheet of fir or the like plywood to be decorated is first surfaced with a vinyl resin material, which surface has imbedded therein a multiplicity of short lengths of glass fibers or glass roving. It is known that glass roving possesses extremely high tensile strength and, further, is resilient and pliable. Such lengths of glass roving are adhered to the plywood surface throughout the length thereof in a position parallel or approximately parallel to the surface, the number of roving lengths being such as to leave some of the area (as covered by vinyl resin material) of the plywood visible between the lengths. To produce this lamination, the wallboard or plywood panel is first rendered sticky with a coating of suitably pigmented vinyl resin. While thus sticky, the glass roving, cut into lengths of one and one-half (1½) to three (3) inches, is delivered onto the same in such a manner as to adhere thereto flatwise with open spaces between roving lengths. Following this, another coating of resin material is applied over the roving. When the resin material hardens, the fibers are firmly held in relation to each other as well as being bonded firmly to the surface of the plywood. Many of these roving lengths lie across each other and extend transversely to the direction of the cracks or checks which would tend to form in the wood. The lamination so formed not only hides any cracks or checks which form, but bonds the plywood surface so firmly together that checks do not tend to form in the first instance.

To the accomplishment of the above and related objects, the invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that specific change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

In the drawings:

FIG. 1 is a top plan view of an embodiment of this invention;

FIG. 2 is a sectional illustration taken substantially along section line 2—2 of FIG. 1;

FIG. 3 is a diagrammatic illustration of apparatus used in the formation of the decorative panel of FIG. 1;

FIG. 4 is a perspective illustration of the step of rolling glass fiber into the resin coated surface of a sheet of plywood;

FIG. 5 is a schematic illustration of other apparatus for forming the panel; and

FIG. 6 is a top plan view of a modification of our invention.

Referring to the drawings, a wooden panel, indicated by the numeral **10**, is provided with a surface lamination **12**. The panel **10** may include almost any kind of rigid material, such as wood, brick, plaster or the like, but particular emphasis is placed on fir plywood and inferior grades of plywood which have a tendency to crack or check after a period of usage.

The lamination **12** on one surface of the plywood panel is composed of essentially two ingredients, one of these being a modified vinyl hydrocarbon resin reduced with acetate and the other being short lengths of glass fiber or roving randomly dispersed over the entire panel surface, as indicated in FIG. 1. These lengths of glass roving are preferably one and one-half (1½) to three (3) inches long and have a strand-like appearance, but, as will appear from the following description, the length may vary to suit a particular plywood material. For fir plywood, one and one-half (1½) to three (3) inches has been found to be satisfactory for the glass roving.

The roving and the vinyl resin material together constitute a single lamination or film wherein the roving lengths are imbedded or completely enclosed in the resin.

The resin material itself tenaciously adheres to the plywood surface, thereby securely and strongly fastening the glass rovings to the plywood surface.

The characteristics of this lamination as just described are best understood when the physical properties of the individual ingredients are independently considered. First, considering the plywood surface itself, after a period of usage, checks or cracks which extend essentially in a parallel direction appear in the plywood surface. These cracks are not only in the surface of the wood, but extend through to the adjacent ply.

The vinyl resin material alone, as a film, is pliable, tough and somewhat elastic. It can be stretched to a considerable extent without breaking or tearing, and adheres so tenaciously to the plywood surface that it cannot be removed therefrom without removing at least some of the plywood surface. The adhesive qualities of this resin are much more pronounced than those of ordinary paints, such as alkyd enamels and the like.

The glass roving has extremely high tensile strength, is resilient and can be flexed to a considerable extent without breaking. Also, and quite important, the roving in short lengths is self-straightening and thereby imparts the high tensile strength thereof to the lamination.

When the glass roving is in substantially straight, random, transverse dispersion throughout the resinous material, the resulting film takes on the physical properties of being exceedingly tough and stretch-resistant, the film also being flexible and pliant, somewhat resembling non-elastic rubber.

Since the resinous material tenaciously adheres to the surface of the plywood and, further, since the film or covering **12** is stretch-resistant, the breaking or tearing apart of the wood surface to form cracks or checks is strongly opposed. In conducting actual experiments, it has been found that the strength of this lamination and its adhesive qualities to the wood are so great that checking of the wood is almost completely eliminated. In some instances, where the ground or field of the wood surface shows through between relatively widely spaced rovings, a crack or check will appear; however, by using a suitable quantity of roving lengths randomly dispersed in transverse directions over the entire wooden surface, checks or cracks in the surface are for all practical purposes non-existent.

The wall panel may be fabricated in accordance with the following operations. First, an ordinary plywood panel, as indicated by the numeral **14** in FIG. 3, is coated by either spraying, brushing, or roll-coating with liquid vinyl resin material. The consistency of the resin should approximate the viscosity of ordinary house paint or enamel. It may be thinned or thickened to suit manufacturing requirements. This resinous coating is permitted to dry partially, at which time the glass rovings cut to proper length are delivered thereto. Delivery of the rovings may be accomplished by any suitable means, such as by means of an air blast issuing from a funnel-shaped nozzle **16** or by merely manually scattering the fibers over the surface according to the desired distribution. If the fibers are blown onto the sticky surface, the nozzle is moved along so as to leave the fibers adhering flatwise in sufficient number to yield a fibrous or textile effect, while permitting some area of the wood surface as coated with resin material to appear between the fibers.

After delivering the rovings to the sticky surface, the rovings are pressed in some suitable manner onto the surface and covered with another coating of resin material. This pressing and flattening may be accomplished by means of a suitable roller **18**. After the rovings and fibers have been suitably flattened and covered with a second coat of resin material to be totally imbedded therein, the panel is permitted to dry.

A preferred method of applying the lamination **12** is schematically illustrated in FIG. 5 wherein like numerals indicate like parts. The apparatus here illustrated comprises a table top or conveyor **20** above which are rotatably mounted two horizontally spaced-apart cylindrical coating rolls **22** and **24**. In between these rolls **22** and **24** is positioned the nozzle **16**, or some other suitable device, for delivering the roving to the plywood panel. The rollers **22** and **24** are conventional in construction, having a length approximately equal to the width of the panel **25** and being of the kind used in applying directly to a surface the coating material such as liquid paint or resin. These rollers are continuously supplied with a liquid resin material as they rotate.

In operation (FIG. 5), the plywood panel or sheet **25** is moved along the conveyor surface **20**, the right-hand end thereof first engaging the roller **22** and then progressing toward the right until it engages the second roller **24**. As the sheet moves between the two rollers, roving lengths are applied thereto. The first roller **22** applies the first coat of resin material, the nozzle **16** delivers the roving **17** to the coated surface and, lastly, the second roller **24** applies a final coat of resin material over the roving, thereby flattening and imbedding the roving in the resin material in a single operation. The sheet thereafter is permitted to dry, completing the fabricating operation.

Depending upon the color of the pigment used in the resin material, the finished panel will have a decorative surface which is somewhat rough and fibrous or textrous in appearance, as seen in FIGS. 1 and 2. Even though the finished panel is fabricated of fir plywood, the finished surface does not check or crack to an extent which is either noticeable or objectionable. Experiments have shown that cracking or checking is materially reduced almost to the point of being non-existent.

The glass roving used for the roving lengths **17** are cut from ordinary glass roving or yarn. This may be the same roving or yarn which is used in the fabrication of glass reinforced plastic fishing rods and boats. The cut lengths **17** therefore are strand-like in appearance.

The resin material is a modified vinyl hydrocarbon resin reduced with acetate, the resin portion being 24% to 32% by weight of the total, and the acetate portion being 68% to 74% by weight of the total. For the resin, 28% by weight is considered optimum.

While it will be understood that the amounts of ingredients in the resin material may vary within limits so long as the physical properties of the finished panel as described herein are achieved, the following formula of the resin material is given by way of example as suitable for use in fabricating a panel of this invention:

Pounds	Gallons	Material
270	7.70	Titanium dioxide.
1	.03	Burnt umber.
540	15.00	Barium sulphate.
373	43.70	Vinyl resin, Bakelite BA-28-18.
80	10.90	Ethyl acetate.
77	11.80	Isopropanol.
78	11.30	Toluol.

The product of this formula for a suitable resin material may be characterized as "white vinyl enamel," and is product LX-3682 of the O'Brien Corporation, of South Bend, Indiana.

The Bakelite vinyl resin, BA-28-18, has a formula, by weight, of 4.9% polyvinyl alcohol, 23.1% polyvinyl acetate and 72.00% butyl acetate.

The pigments in the above formula may obviously be changed to obtain a different color or eliminated entirely, depending upon the color desired in the final product.

The quantity of glass roving or glass fibers applied to the plywood preferably is from one-eighth (⅛) ounce to one-half (½) ounce per square foot of plywood area, in a substantially even dispersion.

When a plurality of panels such as the one illustrated in FIG. 1 are used to cover the wall of a room, it is necessary, of course, that the edges of the panels be

butted together or joined in some other suitable manner. In this invention, as seen in FIG. 6, the joint 28 between butting panels 30 and 32 is easily and completely covered by assuring that some of the fibers 17 extend over only one or both of the adjoining panel edges as shown in FIGS. 1, 2 and 6. With two adjoining panels having a fringe of edge fibers or rovings extending therefrom, the fringes will overlie each respective panel. This alone partially covers the joint. However, the fringe fibers are loose and must be secured in place to appear the same as all of the other fibers and rovings, and this is accomplished by either spraying or applying in some suitable manner one or two coats of the same vinyl resin material over the seam and then rolling or otherwise flattening the fibers covering the same as at 34. Since the vinyl resin material dries into a tough integrated film and, also, since the composite roving-resin film is tough and stretch-resistant, the joint between the joining panels is completely covered.

If desired, the joint may be first covered with a batten strip composed of the resin-roving lamination 12 bonded to a thin, flexible backing of paper or the like before the final application of vinyl resin material. This provides a continuous common-appearing surface which covers and hides the joint.

While the invention is particularly useful in connection with ordinary fir plywood, perhaps one of its greatest attributes resides in the fact that it can be used with quite inferior grade plywoods such as those known as being infected with "white speck." Such inferior grades are normally never used for interior decorating, thereby reducing the utility thereof to uses where its appearance is no factor. However, by means of this invention, these inferior grades of plywood are rendered useful and acceptable for interior decorating purposes, thereby expanding the field of usefulness for these grades into new areas.

What is claimed is:

1. A decorative panel comprising a sheet of fir plywood having opposite surfaces, at least one of said surfaces having a smoothness suitable for paint-type decorative finishes, and a stretch-resistant lamination on said one surface of said sheet and having an outer surface which is rough and fibrous in appearance, said lamination comprising a binder in the form of a film of vinyl hydrocarbon resin reduced with acetate, the quantity of resin in said binder being in the range of 24% to 32% and the quantity of acetate being 65% to 74%, said binder being in cured state, a plurality of pieces of substantially straight glass roving of substantial length randomly dispersed through out and covered by said film, some of said roving pieces crossing each other, all of said roving pieces extending in the plane of said one surface, said film enclosing and bonding said roving pieces to each other and to said one surface, thereby providing a prefinished, decorative lamination which inhibits and conceals checking of the wood surface.

2. A decorative panel comprising a sheet of fir plywood having opposite surfaces, a stretch-resistant lamination on one surface of said sheet and having an outer surface which is rough and fibrous in appearance, said lamination comprising a binder in the form of a film of vinyl resin, said binder being in cured state, said film alone being elastic, stretchable, pliable and bondable to said one surface, a plurality of elongated pieces of substantially straight glass roving of predetermined length randomly dispersed throughout and covered by said film, said lengths being such as to give a definite strand-like appearance, some of said elongated pieces crossing each other, all of said pieces extending in the plane of said one surface, said pieces also being dispersed to provide spaces between some of them thereby exposing randomly shaped areas of field over said one surface which are outlined by respective ones of said pieces, said film enclosing and bonding said elongated pieces to each other and to said one surface, thereby providing a prefinished, decorative lamination which inhibits and conceals checking of said one surface.

3. The decorative panel of claim 2 wherein said one surface has checks therein resembling straight, elongated parallel lines of relatively short length, some of said checks being concealed by said lamination and others of said checks being crossed by said elongated pieces whereby the total finished appearance is uniformly rough and fibrous in texture.

4. A decorative panel comprising a sheet of fir plywood having opposite surfaces, at least one of said surfaces having a smoothness suitable for paint-type decorative finishes, and a stretch-resistant lamination on said one surface of said sheet and having an outer surface which is rough and fibrous in appearance, said lamination comprising a binder in the form of a film of vinyl hydrocarbon resin reduced with acetate, the quantity of resin in said binder being in the range of 24% to 32% and the quantity of acetate being 65% to 74%, said binder being in cured state, a plurality of short lengths of substantially straight glass roving of a maximum length no greater than three inches and a minimum length sufficient to give a definite strand-like appearance, said lengths being randomly dispersed throughout and covered by said film, there being from one-eighth to one-half ounce of such lengths per foot of area of said one surface, some of said roving lengths crossing each other, all of said roving lengths extending in the plane of said one surface, said film enclosing and bonding said roving lengths to each other and to said one surface, thereby providing a prefinished, decorative lamination which inhibits and conceals checking of the wood surface.

5. A decorative panel comprising a sheet of fir plywood having opposite surfaces, a stretch-resistant lamination on one surface of said sheet and having an outer surface which is rough and fibrous in appearance, said lamination comprising a binder in the form of a film of vinyl resin, said binder being in cured state, said film alone being elastic, stretchable, pliable and bondable to said one surface, a plurality of elongated pieces of substantially straight glass roving of predetermined length randomly dispersed throughout and covered by said film, said pieces being such as to give a definite strand-like appearance, some of said elongated pieces crossing each other, all of said pieces extending in the plane of said one surface, said pieces also being dispersed to provide spaces between some of them thereby exposing randomly shaped areas of field over said one surface which are outlined by respective ones of said pieces, there being from one-eighth to one-half ounce of such pieces of glass roving per foot of area of said one surface, said film enclosing and bonding said elongated pieces to each other and to said one surface, thereby providing a prefinished, decorative lamination which inhibits and conceals checking of said one surface.

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