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(54) **REINFORCED DECORATIVE COMPOSITE MATERIAL**

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(57) **ABSTRACT**

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A reinforced composite material includes a laminate panel, a strengthening panel that includes a reinforcement embedded therein, and a layer of adhesive disposed between the laminate panel and the strengthening panel to adhere the laminate panel and the strengthening panel together. Preferably, the reinforcement in the strengthening panel may be fiberglass fibers, randomly oriented, or it may be provided in the form of a mesh or the like. In either case, the strengthening panel is preferably a plastic (polymeric) material of the type known as fiberglass reinforced polyester. Also provided is a method for the production of such a material.

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**Related U.S. Application Data**

(63) Continuation of application No. 10/992,606, filed on Nov. 18, 2004, now abandoned, which is a continuation of application No. 10/081,629, filed on Feb. 20, 2002, now abandoned.



FIG. 1



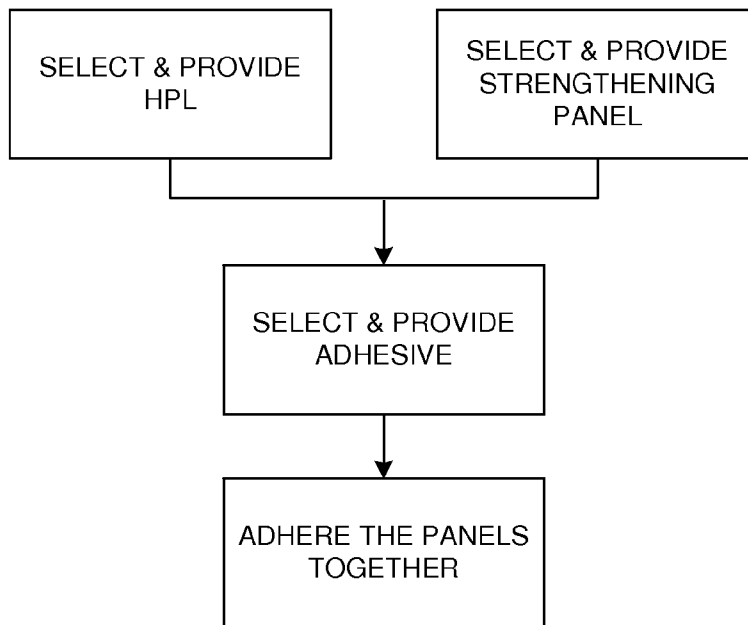
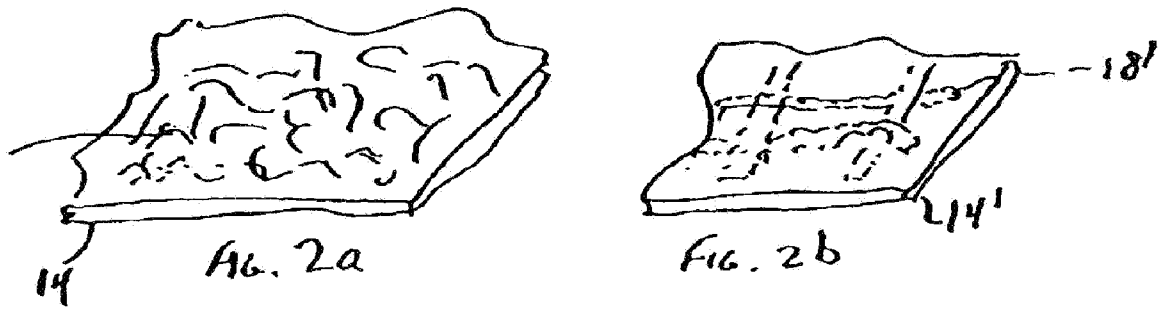


FIG. 3

## REINFORCED DECORATIVE COMPOSITE MATERIAL

### RELATED APPLICATIONS

[0001] This application is a continuation of application Ser. No. 10/992,606, filed Nov. 18, 2004, which is a continuation of application Ser. No. 10/081,629, filed Feb. 20, 2002, both of which are incorporated by reference herein in their entirety.

### BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to construction materials and more particularly to a reinforced composite material that includes a laminated material of the type called high pressure laminates ("HPL") and a strengthening panel such as fiberglass reinforced plastic ("FRP") adhered together, and to the manufacture of such a composite material.

[0004] 2. Description of Related Art

[0005] High pressure laminate materials have been manufactured and sold for many years, and are familiar to many from their wide-spread use in kitchens and areas requiring very durable and decorative surface attributes. Such laminates are typically made of layers of paper impregnated with resin, compressed and heated to produce the desired laminate. One layer of paper may have a decorative pattern that remains visible in the finished product. The exact types of paper and of resins used, as well as the pressures and temperatures, and the precise order of steps, are well known to those in the art. A great variety of products of this type are commercially available from the Formica Corporation, under the trademark Formica, owned by that company.

[0006] HPL products, however, are generally brittle enough that they must be mounted on a layer of wood or other material of sufficient strength and rigidity, for use in the kitchen, and on any horizontal surface. Vertical surface applications of HPLs would be enhanced by a pre-laminated panel with the HPL as the outward side. A primary application of the proposed panel would be vertical wall surfaces, where drywall is a common substrate.

[0007] It would be desirable to be able to use HPL products in environments where the product will be exposed to relatively high levels of wear and tear, moisture, and mechanical loads, without the need to mount the HPL on a mechanically strong layer of wood or other materials. For example, it would be desirable to be able to use decorative materials like HPL products in schools, hospitals, restaurants and other public areas that are subject to large amounts of traffic, and where conventional HPL cannot easily be used.

[0008] Also known are sheets of plastic reinforced with fiberglass, which have long been employed as surfaces that are resistant to abuse (that is, resistant to tearing and the like), and resistant to moisture as well. Such products are obtainable commercially, for example, from Kemlite Corporation, the assignee of the present invention. FRP products thus far typically have an embossed surface, are a solid color (typically white), and have a hard and shiny appearance that makes them unsuitable for uses where esthetic appearance is of great concern.

### SUMMARY OF THE INVENTION

[0009] Accordingly, one object of the present invention is to provide a material that will have the aesthetic qualities of HPL and can be easily installed on vertical surfaces. It is also an object to provide such a material that will have sufficient mechanical strength for use in situations where conventional HPL products might not otherwise be usable, such as wall panel applications without a substantial structural substrate. Of primary importance, the present invention provides a panel which is installer-friendly and combines the custom color/pattern flexibility of an HPL face with a water-proof, dimensionally stable, user-friendly backer. Further, this laminated panel enhances the impact resistance and moisture resistance of known available decorative vertical wall panels. The subject panel will allow installation of an HPL vertical surface in a most expeditious manner saving labor costs in two ways: drywall preparation, and actual installation time of the panel, when compared to applying HPL directly over drywall.

[0010] These objects are met by the present invention, according to one aspect of which is a reinforced composite material that includes a laminate panel, a strengthening panel that includes a reinforcement embedded therein, and a layer of adhesive disposed between the laminate panel and the strengthening panel to adhere the laminate panel and the strengthening panel together. Preferably, the reinforcement in the strengthening panel may be fiberglass fibers, randomly oriented, or it may be provided in the form of a mesh or the like. In either case, the strengthening panel is preferably a plastic (polymeric) material of the type known as fiberglass reinforced polyester.

[0011] The invention also provides a method for the production of such a material, in which there are provided a laminate panel of a type made by heating and compressing at least a first layer of paper and quantity of resin, and a strengthening panel of a type made by embedding a reinforcement in a layer of a binder material. Then, the laminate panel is adhered to the strengthening panel with a layer of adhesive. The adhesive may preferably be a hot melt adhesive.

[0012] These and other objects, features and advantages of the present invention will be more fully apparent from a consideration of the following detailed description of the preferred embodiments, taken in conjunction with the accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a view of a preferred embodiment of a composite material according to the present invention.

[0014] FIGS. 2a and 2b are details showing two varieties of FRP that may be used in the embodiment shown in FIG. 1.

[0015] FIG. 3 is a chart illustrating a method of manufacturing a material according to the present invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] The first preferred embodiment of the present invention is a reinforced composite material having three layers, as shown in FIG. 1. Two outer layers sandwich, and

are secured together by, a third layer, of adhesive. One of the outer layers is a HPL material, and the other of the outer layers is a sheet or panel of a reinforced material. The intermediate layer is of an adhesive material. The reinforced material may be a FRP material of a type available from Kemlite Corporation, while the other outer layer is for example of a type available from the Formica Corporation. The exact choice of adhesive is not critical, and it is believed that many commercially available adhesives are suitable for adhering combinations of HPL and FRP materials in this fashion. The present inventor particularly contemplates, however, the use of a conventional hot-melt adhesive, a great number of which are known in the art, and detailed description of which is therefore not required. Nonetheless, the key quality of the adhesive used is not that it be a hot-melt adhesive, nor that it be any other particular kind, but that it provide the bonding qualities necessary to bond securely with the particular HPL and FRP materials used in a given instance. The selection of the right adhesive for a particular choice of the outer layers, thus, is well within the ordinary skill in the art.

[0017] While it is preferred to use a sheet of FRP material for the reinforcing sheet, it is also possible to use other types of reinforced plastic. For example, a plastic sheet having reinforcing material in the form of a mesh, rather than in the form of randomly-oriented fiberglass, as in FRP, forms a second preferred embodiment of the invention. FIGS. 2a and 2b indicate these two types of material for use in the composite material shown in FIG. 1.

[0018] The method of manufacturing the composite material shown in FIG. 1 is straightforward, and is illustrated in FIG. 3. First, one selects the appropriate HPL and reinforced plastic materials to use as the outer layers. While these materials may be custom manufactured, either or both may be a commercially available material instead. Once these two materials have been formed, or otherwise provided, the appropriate materials and techniques for adhering the two layers to each other can be selected and used.

[0019] While the present invention has been described in detail with reference to the currently-preferred embodiments, many modifications and variations of those embodiments will now be apparent to those skilled in the art. Accordingly, the scope of the invention is not to be limited by the details of the foregoing detailed description, but only by the terms of the appended claims.

What is claimed is:

1. A reinforced composite material comprising:
  - a laminate panel;
  - a strengthening panel, the strengthening panel including a reinforcement embedded therein; and
  - a layer of adhesive disposed between the laminate panel and the strengthening panel to adhere the laminate panel and the strengthening panel together.
2. The reinforced composite material as set forth in claim 1, in which the strengthening panel further includes a sheet of plastic.
3. The reinforced composite material as set forth in claim 2, in which the reinforcement is embedded in the sheet of plastic.

4. The reinforced composite material as set forth in claim 2, in which the sheet of plastic is at least partially formed of a polyester copolymer.

5. The reinforced composite material as set forth in claim 1, in which the strengthening panel is a sheet of fiberglass reinforced plastic.

6. The reinforced composite material as set forth in claim 1, in which the reinforcement includes a plurality of fibers of a reinforcing material.

7. The reinforced composite material as set forth in claim 6, in which the plurality of fibers of the reinforcing material are one of randomly oriented and oriented in a mesh within the strengthening panel.

8. The reinforced composite material as set forth in claim 6, in which the plurality of fibers of the reinforcing material are at least partially formed of glass.

9. The reinforced composite material as set forth in claim 1, in which the layer of adhesive includes a layer of a hot melt adhesive.

10. The reinforced composite material as set forth in claim 1, in which the strengthening panel includes a fibrous reinforcement embedded in a polymeric material.

11. The reinforced composite material as set forth in claim 10, in which the fibrous reinforcement includes a plurality of fibers of glass.

12. A method of forming a reinforced composite material, the method comprising the steps of:

forming a laminate panel by heating and compressing at least a first layer of paper and quantity of resin;

forming a strengthening panel by embedding a reinforcement in layer of a binder material; and

adhering the laminate panel to the strengthening panel with a layer of adhesive.

13. The method as set forth in claim 12, in which the step of forming a strengthening panel includes the step of providing a sheet of fiberglass reinforced plastic.

14. The method as set forth in claim 12, further comprising the steps of applying a layer of hot melt adhesive between the laminate panel and the strengthening panel and curing the layer of hot melt adhesive.

15. A method of forming a reinforced composite material, the method comprising the steps of:

providing a laminate panel of a type made by heating and compressing at least a first layer of paper and quantity of resin;

providing a strengthening panel of a type made by embedding a reinforcement in layer of a binder material; and

adhering the laminate panel to the strengthening panel with a layer of adhesive.

16. The method as set forth in claim 15, in which the strengthening panel is a sheet of fiberglass reinforced plastic.

17. The method as set forth in claim 15, further comprising the steps of applying a layer of hot melt adhesive between the laminate panel and the strengthening panel and curing the layer of hot melt adhesive.

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