

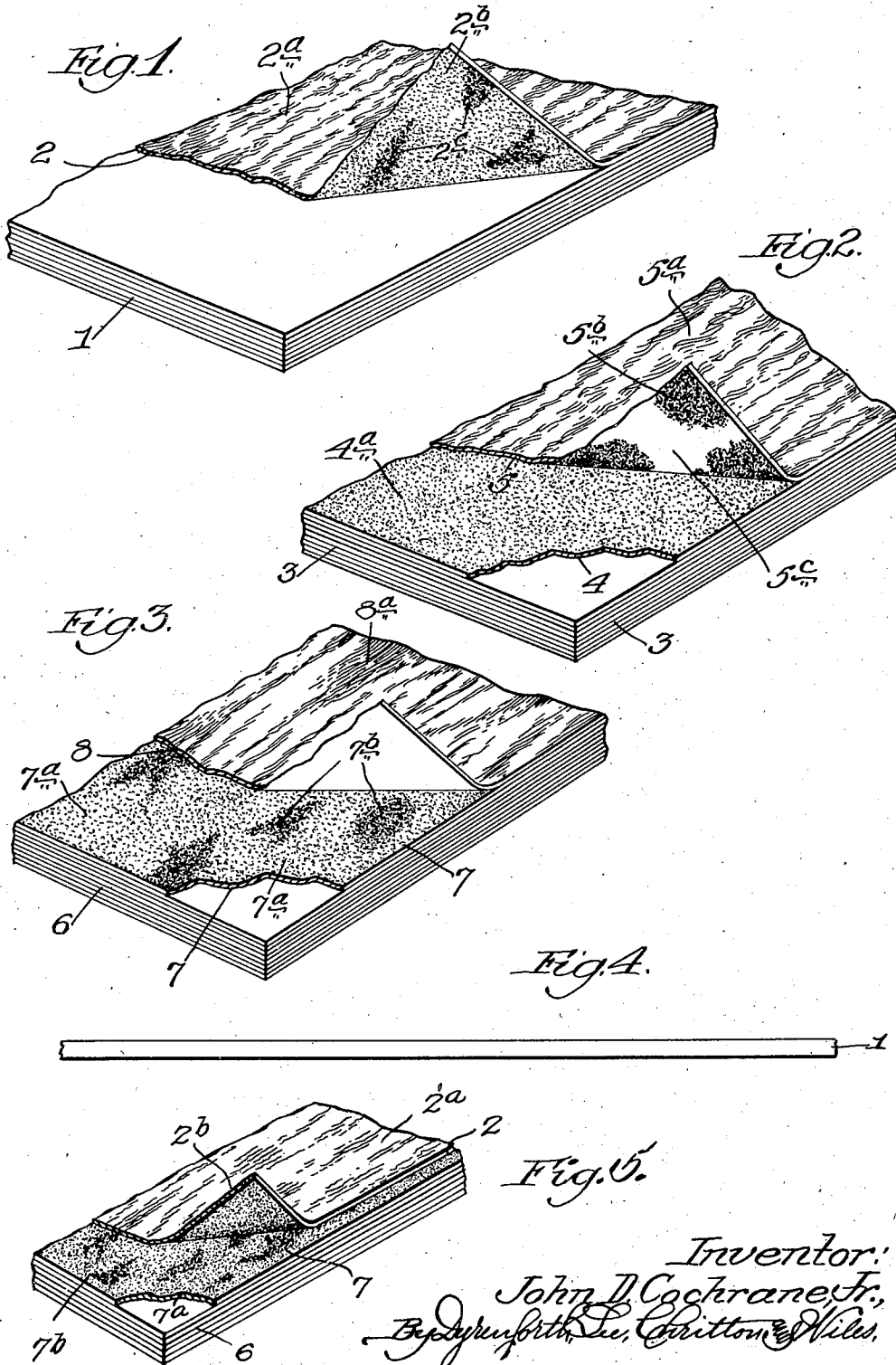
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DECORATED LAMINATED PRODUCT AND METHOD OF PRODUCING SAME

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## DECORATED LAMINATED PRODUCT AND METHOD OF PRODUCING SAME

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This invention relates particularly to improved laminated products provided with decorative surfaces, and to improved methods of producing such products.

5 The principal object of the invention is to provide a decorated laminated product whose surface has a variable background color resembling natural wood.

10 A further object is to provide an economical and effective method of adjusting the background color of a laminated product independently of the decorated surface thereof. The purpose of the invention is accomplished by a very simple method which  
15 possesses great flexibility of operation and enables a great variety of background colors and depth effects to be produced in such a manner as to render unnecessary the carrying of excessive stocks of materials in process and/or finished products.  
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The invention is especially useful in products provided with a surface or surfaces imitating the grains of woods. By means of the improved process laminated products  
25 having surfaces rivaling the most beautiful natural woods, finished by the most improved methods, may be produced at comparatively small cost.

30 The invention involves the principle of applying localized color-zones in association with an opaque layer of pigment located at or adjacent the inner surface of a surface-sheet of transparent, or semi-transparent (translucent), character which has  
35 its outer surface printed in a suitable design, such as a wood grain. The pigment-layer may consist of a coating of light-colored opaque pigment, for example, applied to the inner surface of the surface-sheet; or the pigment-layer may be provided by suitable coating or impregnating  
40 a special background sheet (barrier sheet) which lies between the surface-sheet and the under-lying body-sheets, the latter being  
45 impregnated with a darkly colored binder, if desired. The surface-sheet may be impregnated with a clear binder; and the assembly, assuming the use of heat-hardenable binders, may be consolidated and hardened  
50 under heat and pressure.

The printed design (for example, printed wood-graining) is then viewed against the opaque special background, varied by the localized color-zones associated therewith, thus giving a richness of tone not heretofore attainable. Owing to the fact that the print on the outer surface of the surface-sheet is in a higher plane than the background, "depth" and "perspective" are attained and "flatness" of appearance avoided.  
55 60

The local color zones at the back of the surface-sheet serve to give an effect which simulates closely effects which can be obtained with some of the best examples of the finer woods, due to staining and/or rubbing (giving depth of color to some of the grains) prior to the final finishing operation, such as varnishing and rubbing.  
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The binder employed in producing the laminated product preferably consists of a heat-hardenable synthetic resin, such as a phenolic condensation product, an urea condensation product, or a furfural condensation product.  
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A phenolic condensation product, such as bakelite, is quite commonly used in producing laminated products. The sheets to be consolidated to form the laminated product may be impregnated with a solution of bakelite which is potentially reactive; the  
75 80 sheets may be dried and cut to suitable size; and the sheets may then be stacked in a heated hydraulic press and hardened under heat and pressure.

Where a solution of phenolic condensation product is employed as a binder for the body-sheets, the ultimate color of the body of the laminated product usually is such that desirable decorative effects cannot be produced without employing a special opaque layer  
85 90 which is interposed between the surface-sheet and the body-sheets. Such special opaque layer preferably is light colored; and as indicated, it may be applied either to the back surface of the surface-sheet, or it may  
95 be applied to a special background sheet which is interposed between the surface-sheet and the body-sheets. In any event, this special opaque layer should be disposed at or adjacent the inner surface of the sur-  
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face-sheet. The local color-zones may be applied to the inner surface of the surface-sheet in cases where the surface-sheet is pigmented and in cases where a special pigmented background sheet is employed; or the local color-zones may be applied to the outer surface of the special pigmented background sheet, if desired.

In providing an opaque light-colored pigment-layer, the back surface of the surface-sheet may be coated with a solution of bakelite, for example, containing a suitable percentage of a light-colored pigment, such as white titanium oxide; or the front surface of the special background sheet (if employed) may be coated with a solution of bakelite containing such pigment; or the background sheet (if employed) may be impregnated with a solution of bakelite containing a suitable percentage of a light-colored pigment. If desired, a small percentage of a suitable dye may be introduced into the solution to produce a desirable tint.

As an example, one may produce a special background sheet of ivory color by impregnating a sheet of paper with a mixture comprising about 15% of white titanium oxide, about 45% of bakelite or bakelite varnish, and approximately 40% of ethyl alcohol. The percentage of the pigment may be as high as 20% if desired, but preferably should not be lower than 10%, otherwise the opacity of the layer will be undesirably reduced. A small percentage of suitable dyes, or colored pigments may be used to vary the effect.

A purple colored special background sheet, which is practically opaque, may be produced by impregnating in a similar manner a sheet of paper with a mixture comprising about 18% of white titanium oxide, about 1.5% of a red pigment toner, about 0.5% of a blue pigment toner, and the balance a suitable solution of bakelite.

The invention is illustrated in the accompanying drawing, in which:

Figure 1 is a broken perspective view of an assembly of sheets adapted to be consolidated to form a laminated product in accordance with the invention, this figure illustrating the application of the pigment and also of localized zones of color to the inner surface of a surface-sheet of transparent character, the outer surface of the surface-sheet being printed in imitation wood-graining; Fig. 2, a similar broken perspective view, illustrating a modification, in which the back surface of the surface-sheet has applied thereto, localized color-zones, and there is interposed between the surface-sheet and the body-sheets a special background sheet impregnated with a binder carrying a suitable pigment, preferably of light color; Fig. 3, a similar broken per-

spective view, showing another modification in which the rear surface of the surface-sheet is uncoated and a special background sheet is interposed between the surface-sheet and the body-sheets, the background sheet being impregnated with a binder carrying a percentage of pigment and a special background sheet having applied thereto localized color-zones; Fig. 4, an edge view of a laminated product produced in accordance with any of the modifications illustrated; and Fig. 5 is a perspective view of a modification of the product.

In the illustration given in Fig. 1, 1 designates a stack of body-sheets which may be assumed to have been impregnated with an ordinary solution of bakelite, for example, and dried; and 2 designates a surface-sheet having its outer surface printed in a suitable design, such as wood-graining indicated at 2<sup>a</sup>; having its inner surface coated with an opaque-pigment, preferably light in color, the opaque coating extending over the whole inner surface of the sheet and being designated 2<sup>b</sup>; and having localized color-zones 2<sup>c</sup> which may be spaced in any desired relation to each other, each color-zone itself varying in degree of color, if desired.

The surface-sheet may be of any suitable fabric, such as light-colored paper or light-colored thin cloth, silk, or the like, although paper is preferred in producing wood-grain effects. The surface-sheet should be impregnated with a clear solution of a suitable binder, such as a clear solution of bakelite. The solution may, however, contain a very small percentage of a suitable dye, if desired.

The impregnating of the surface-sheet 2 with a clear bakelite solution preferably is performed after the surface printing (wood-graining) has been applied; and the application of the pigment and the application of the localized color-zones preferably are applied to the inner surface of the sheet 2 subsequently to the printing on the outer surface and the dipping of the sheet in the clear solution of bakelite. The order of the steps may be varied in any suitable manner, however.

The assembly shown in Fig. 1 may be introduced into a heated hydraulic press and consolidated under heat and pressure, say a temperature of in the neighborhood of 175° C. and a pressure of 1000 to 2000 pounds per square inch, the consolidating operation being continued until the binder has been transformed into the final infusible and substantially insoluble condition. Usually a period of fifteen minutes to forty-five minutes is desirable, depending upon the product to be made.

In the modification shown in Fig. 2, 3

designates a stack of body-sheets; 4 designates a special back-ground sheet; and 5 designates a surface-sheet.

In this modification, the body-sheets may be assumed to be sheets which have been impregnated with an ordinary solution of bakelite and dried.

The special background sheet 4 may be assumed to have been impregnated with a solution of bakelite having suspended therein a suitable percentage of pigment, say 15 or 20% of white titanium oxide. The film of pigment should cover the whole area of the special background sheet. It is indicated by stippling, designated 4<sup>a</sup>.

The surface-sheet 5 is shown provided on its outer surface with a printed design 5<sup>a</sup> (imitation wood-grain); and the inner surface of the surface-sheet is shown provided with localized color-zones, designated 5<sup>b</sup> and intervening lighter zones designated 5<sup>c</sup>. The localized color-zones may be so located with reference to the printed graining as to intensify the colors produced in the printing operation, or they may be arranged so as to otherwise modify the effect of the graining after the consolidating operation.

The surface-sheet 5 should be impregnated with a clear solution of bakelite, or the like. If desired, a small percentage of a suitable dye may be incorporated in the bakelite solution without injuring the effective transparency of the surface-sheet after the product has been consolidated by heat and pressure.

In the modification illustrated in Fig. 3, the stack of body-sheets is designated 6; the special background sheet is designated 7; and the surface-sheet is designated 8.

In this example, the outer surface of the surface-sheet bears a printed design 8<sup>a</sup>, and the inner surface of the surface-sheet is unpigmented and unprovided with localized color-zones.

The special background sheet 7 is provided with a coating of opaque pigment 7<sup>a</sup>, indicated by light stippling. This pigment should extend throughout the area of the special background sheet. The special background sheet is also provided with localized color-zones 7<sup>b</sup>. Thus, the pigment of the sheet 7 and the localized color-zones of said sheet are located adjacent the back surface of the surface-sheet 8. It is understood, of course, that the sheets 7 and 8 are impregnated with a suitable binder such as bakelite, the binder of the surface-sheet being of suitable character to render the surface-sheet transparent or semi-transparent after the consolidating operation.

In Fig. 5 is shown a further combination. The surface sheet is provided with a pigment as in Fig. 1, but is not provided with color zones, the latter being provided on the

background sheet. The other pigment in the background sheet can of course be omitted.

The localized color-zones, may, in any case be applied to the sheet by spraying, or in any desired manner. Where spraying is employed, the color-zones naturally vary in strength of color, the outer areas of each zone tending to be lighter in color than the main portion of the color-zone. Desired effects may be obtained, even though the lighter portions of the color-zones broach closely together or even encroach upon each other.

The localized color-zones give to the sheet to which these zones are applied a variegated appearance. However, after the consolidating operation under heat and pressure, there is a certain blending of all colors, which eliminates any undesirable result, so that the final effect is the imitation, with true fidelity, of the best examples of the finer woods finished according to the most approved methods.

The surface-sheet may be of the same area as the special background sheet and the body-sheets; or, the surface-sheet may be of less area than the background sheet (if employed), and of less area than the body-sheets, as shown in Fig. 5. If desired, the surface-sheet may be cut away, skeletonized or given any desired contour to produce any desirable design. This is particularly feasible where the back surface of the surface-sheet is coated with the opaque pigment, and where the body-sheets are given a solid dark color (ebony, for example), in which case a beautiful inlay effect may be produced, the inlay design being according to any fancy of the designer.

Any binder suited to the purpose may be employed in the practice of the invention, and any suitable order of steps may be employed in producing the laminated product having a decorative surface in accordance with the invention.

As an example of the process in producing a product having a decorative surface imitating a specific wood, the following may be stated: A special background sheet having an opaque pigmented ivory colored surface may be applied to a stack of ordinary impregnated body sheets; a surface-sheet of transparent character having its outer surface printed in imitation of a mahogany grain and having localized zones of color applied to its inner surface may be superimposed upon the background sheet; and when such a composite stack of sheets is consolidated under heat and pressure, the effect is to produce a laminated product having a background color, contrasting in some zones with the surface wood-grain print, and in other zones deepening or intensifying the

graining effect, the whole simulating the "depth" effect, zone-like in character, which occurs naturally in some of the best examples of the finer woods.

5 By employing a surface-sheet which is transparent, or semi-transparent (translucent) in character, the effect of "depth" or "perspective" is obtained, after the consolidating operation, due to the fact that the  
10 printed or grained surface is on a higher plane than the localized zones of color, whether these localized zones be on the back of the surface-sheet or be on a pigmented special background sheet.

15 The finest gradations in tones can be produced by varying the colors and grains employed, it being noted that the ultimate color of the decorative surface is a composite of the color-zones at the back of the surface-sheet, the printed outer surface of the surface-sheet, the pigment-layer at or adjacent  
20 the back of the surface-sheet, and the binder in the surface-sheet. The opaque pigment-layer at the inner face of the surface-sheet, it is to be understood, substantially cuts off or eliminates the undesirable color of the body-sheets beneath.

The process is one of great flexibility, and may be practiced without the necessity of  
30 carrying in stock an objectionably large number of surface-sheets or special background sheets. Thus a suitable stock of impregnated, dried body-sheets may be carried in stock; a limited quantity of grained surface-sheets adapted to the imitation of  
35 various kinds of woods may be carried in stock; and a limited quantity of pigmented background sheets colored or tinted to give desired effects may be carried in stock; and  
40 laminated products may be produced by an appropriate selection of the sheets which are to enter into the assembly, as desired.

Any suitable coloring materials may be employed for producing the localized color-zones mentioned above. Thus, suitable  
45 dyes, suitable inks, or solutions containing colored pigments in suspension, as desired, may be employed. The application of the color-zones may be effected in any suitable  
50 manner.

A possible further modification, decidedly less desirable, however, is to apply a very thin pigment coating to the inner surface  
55 of the surface-sheet and rather heavy localized color zones to a sheet beneath the surface-sheet, thus permitting some color from said zones to show through the pigment-layer.

60 The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as  
65 permissible, in view of the prior art.

What I regard as new and desire to secure by Letters Patent, is:

1. In the manufacture of laminated products having decorative surfaces, the method which comprises: consolidating under heat  
70 and pressure body-sheets impregnated with a binder, a surface-sheet of transparent character impregnated with a clear binder and having a printed design on its outer surface, and an opaque pigment-layer be-  
75 tween the body-sheets and the surface-sheet and localized color-zones associated therewith, forming a special background for said printed design.

2. A process as set forth in claim 1, in which the opaque pigment-layer employed is relatively light in color and the body underlying said pigment-layer is of a different  
80 color.

3. A method as set forth in claim 1, as practiced by applying localized color-zones  
85 to the inner surface of the surface-sheet.

4. A method as set forth in claim 1, as practiced by applying the localized color-zones and the pigment-layer to a special  
90 background sheet interposed between the surface-sheet and the body-sheets.

5. A method as set forth in claim 1, as practiced by applying the coating of pigment to the inner surface of the surface-  
95 sheet.

6. The process as set forth in claim 1, as practiced by applying a pigment coating and also localized color-zones to the inner surface of the surface-sheet.  
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7. A method as set forth in claim 1, characterized by producing the pigment-layer by applying a coating of pigment to the inner surface of the surface-sheet and further  
105 characterized by applying the localized color-zones to a background sheet interposed between the surface-sheet and the body-sheets.

8. A process as set forth in claim 1, characterized by said surface-sheet being of less-  
110 er area than the area of the body-sheets.

9. A process as set forth in claim 1, in which the binders employed are heat-hardenable binders adapted to be transformed to the infusible and substantially insoluble  
115 state during the consolidating operation.

10. A laminated product having a decorative surface, comprising: body-sheets of fabric impregnated with a heat-hardenable binder; a surface-sheet of transparent character having a printed design on its outer surface, said surface-sheet being impregnated with a clear heat-hardenable binder; and an opaque pigment-layer and associated  
120 localized zones of coloring materials interposed between said surface-sheet and body-sheets—all of said sheets being consolidated together under heat and pressure and the heat-hardenable binder being in the final in-  
125 fusible and substantially insoluble condition. 130

11. A product as specified in claim 10, in which said opaque pigment-layer is relatively light in color and in which the body of the product is relatively dark in color.

5 In witness whereof I have hereunto set my hand this 28 day of December, A. D. 1931.

JOHN D. COCHRANE, JR.

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