

PATENT SPECIFICATION

(11) 1205 828

1205 828

NO DRAWINGS

- (21) Application No. 47932/68 (22) Filed 9 Oct. 1968
 (31) Convention Application No. 75310 (32) Filed 22 Nov. 1967 in
 (33) Japan (JA)
 (45) Complete Specification published 16 Sept. 1970
 (51) International Classification B 32 b 27/04
 (52) Index at acceptance

B5N 172 175 178 17Y 18Y 201 22Y 239 242 250 253X
 287X 290X 291X 292X 295X 296X 371 394 404 540
 548 560 56X 570 573 620 62Y 64Y 669 670 671
 679 682 683 68X 69X 736 754 756 759



(54) METHOD OF MANUFACTURING DECORATIVE LAMINATE
 BOARD AND RESIN IMPREGNATED SHEET THEREFOR

(71) We, OSAKA SODA Co., LTD., a Japanese Body Corporate of No. 53, 1-Chome, Edobori, Nishi-Ku, Osaka, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the preparation of resin impregnated sheet for use in the manufacture of laminates.

It is known to manufacture a decorative laminate board using as impregnating solution a solution in an organic solvent of a diallyl phthalate prepolymer to which has been added a curing catalyst and a processing assistant such as a release agent. This solution may be used to impregnate a sheet; generally of paper or cloth and optionally printed with patterns, designs or figures. The impregnated sheet is then dried and overlaid on a suitable substrate, and the layup is then heated under pressure whereby the resin is cured and the sheet is bonded to the substrate (see for example United States Patent No. 3,049,458).

Hitherto it has been regarded as essential to incorporate a small quantity of diallyl phthalate monomer into the diallyl phthalate prepolymer in order that the resin may have suitable flow properties and cure time (see United States Patent No. 3,049,458 and Belgian Patent No. 681,458). While the addition of the diallyl phthalate was effective in shortening the cure time as compared with the case of dialkyl phthalate prepolymer alone and improving the flow properties, serious problems arose in commercial scale operations.

In commercial operations a multiplaten press is generally used, in which a number of laminates are manufactured simultaneously. The most serious difficulty with this type of press is that curing of the resin may begin

before the temperature and pressure conditions throughout the press have become uniform. The result of this is that the flow of resin may be locally too fast or too slow, and cannot be made uniform even by careful adjustment of the amount of monomer incorporated and the pressing conditions. Consequently it is not possible to obtain a given product with good reproducibility, or without surface defects such as dull spots, pockmarks, swellings or blisters, such products have no commercial value. Furthermore, the surface defects and lack of reproducibility become more pronounced as the pressing cycle is shortened by increase in the curing speed. It was therefore impossible to reconcile the conflicting requirements of a short pressing cycle and a defect-free product.

It is therefore an object of this invention to provide a method for making a resin impregnated sheet which may be used to make laminated boards of improved surface smoothness with satisfactory reproducibility using a shortened pressing cycle.

In one aspect the invention provides a method of making a resin impregnated dried sheet for use in making laminate boards, which comprises impregnating a fibrous sheet with an impregnating solution containing substantially no diallylphthalate monomer to a resin solids content not less than 35 percent but less than 60 percent (on the weight of the resin-impregnated dried sheet), containing as its resinous components:

(A) One hundred parts by weight of diallyl phthalate prepolymer, and

(B) Twenty to eighty parts by weight of a polyester which is organic solvent-soluble at room temperature, has a softening point not over 30°C., and is derived from a mixed acid component consisting of:

- (i) 40—60.5% by weight of phthalic acid,
 (ii) 30—60% by weight of maleic acid or

[Price 5s. 0d. (25p)]

fumaric acid or a mixture of both, and

(iii) 0—30% by weight of a dicarboxylic acid other than those indicated in (i) and (ii), and a mixed alcohol component consisting of:

(iv) 60—80.5% by weight of propylene glycol,

(v) 10—20% by weight of ethylene glycol or diethylene glycol or a mixture of both, and

(vi) 0—20% by weight of a polyhydric alcohol other than those indicated in (iv) and (v); and drying the impregnated sheet.

In another aspect the invention provides a method of manufacturing decorative laminate boards which comprises overlaying a resin impregnated dried sheet obtained by the above process on a substrate and thereafter subjecting the assembly to heat and pressure, whereby the resin is cured and the sheet is adhered to the substrate.

Compositions other than that indicated above were prepared, wherein the molecular weight of the prepolymer, the acid and alcohol components making up the polyester, the proportion of the prepolymer to the polyester and the concentration of resin solution were varied. These resin solutions were used to prepare resin-impregnated dried sheets, which were then hot pressed onto a suitable substrate to form a decorated laminate. However, satisfactory results could not be obtained. When attempts were made to obtain sufficiently short pressing times to be commercially practical, the appearance of pockmarks could not be avoided. Also, it was found difficult to obtain satisfactory molded products with good reproducibility. Furthermore, it was found that the preparation of an impregnating solution by dissolving in an organic solvent in the conventional manner diallyl phthalate prepolymer and a solid polyester having a high softening point and subsequently adding a catalyst and a release agent, could not be carried out at room temperature and required heating conditions. Troublesome side reactions then occur between the two resinous components, thus making it impossible in actual operation to obtain resin-impregnated sheets of uniform quality which would reproducibly attain the optimum state of cure under identical pressing conditions. It was also found that unless the amount of the solvent was increased considerably, it was difficult to obtain an impregnating solution having a proper operating viscosity and that numerous limitations were imposed as to the drying of the impregnated sheet and the choice of sheet material, thus making commercial operations impossible.

While the amount of resin contained in the conventional diallyl phthalate impregnated sheets must generally be above 60% by weight as solids, when employing the present invention superior results may be obtained with a much smaller amount of the resin. In addition,

the amount of solvent required is less so that the drying operation is simplified. The preparation of the impregnating solution is exceedingly simple and there are no troublesome side reactions between the resin components.

The foregoing resinous components (A) and (B) may be prepared by methods known *per se*. The diallyl phthalate prepolymer (A) generally has a number average molecular weight of less than 25,000, and usually about 10,000.

The dicarboxylic acids (iii), above, which may be present in the component (b₁), may include isophthalic acid, terephthalic acid, tetrachlorophthalic anhydride, tetrahydrophthalic anhydride, chlorinated maleic acid, mesaconic acid, citraconic acid, adipic acid, succinic acid, itaconic acid, sebacic acid, 3,6-endomethylene tetrahydrophthalic acid and 3,6-endochloromethylenetetrahydrophthalic acid. The polyhydric alcohols (vi), above, which may be present in the mixed alcohol components, include dipropylene glycol, 1,3-butylene glycol, 2,3-butylene glycol, 2,2'-bis[4'-(β-hydroxy)ethoxyphenyl]propane, 2,2'-bis[4'-γ-hydroxy)-butoxyphenyl]propane, neopentyl glycol, 1,4-butanediol, trimethylolpropane, glycerine and pentaerythritol.

As in conventional resin impregnated dry sheets, an organic peroxide catalyst and a release agent may also be present in a suitable amount. The impregnating solution may contain 0.1—3 parts by weight of a release agent.

Suitable organic peroxides include benzoyl peroxide, tertiary butyl peroxide, and other catalysts which are effective at the curing temperatures which do not cause decomposition during the step of drying the impregnated paper.

The release agent may either be incorporated into the resin (internal release agent) or coated onto the surface of the platens in the press (external release agent). As such a release agent, INT—11A (mfd. by the Axcel Plastics Company, U.S.A.) is recommended. If desired, carnauba wax or beeswax may also be used.

Any organic solvent may be used in preparing the impregnating solution which dissolves the diallyl phthalate prepolymer and does not precipitate the polyester. Preferably the solvent volatilizes readily so that the resin-impregnated sheet may easily be dried. Suitable solvents include ketones such as acetone, methyl ethyl ketone and methyl isobutyl ketone, aromatic compounds such as benzene, toluene, xylene and isopropylbenzene, and esters such as ethyl acetate and butyl acetate, and mixtures of any of the above solvents.

Since one of the resinous components (B) is a polyester which has a softening point below 30°C. and is solvent-soluble at room temperature, a homogeneous solution can be obtained even when the amount of solvent is quite small. Moreover, since the resinous

components dissolve in a short time at room temperature, there is no need to heat the mixture which might cause troublesome interactions to occur between the two resinous components (A) and (B). Hence, the operation of preparing the resin solution is simplified and accidental denaturation of the resinous components used in preparing the impregnating solution can be completely avoided, so that an impregnating solution of uniform quality can be obtained. Since a smaller amount of the solvent is sufficient, the subsequent drying of the impregnated sheet is simplified, and the adjustment of the viscosity of the impregnating solution is also made much easier.

As previously indicated, sheets of paper or cloth are impregnated with the resin to a content of resin solids of 35—60% by weight based on the weight of the dried sheet. The preferred range of solid content is 45—58% by weight, especially 50—55% by weight. These impregnated sheets may be formed into excellent laminates and have the advantage of using less resin than previously.

The impregnation of the sheet with the impregnating solution can be accomplished by the use of conventional equipment and technique. The impregnation operation is carried out at room temperature, and followed by evaporation of the solvent to obtain the resin-impregnated dried sheet. The drying is usually carried out until the residual solvent (including any absorbed atmospheric moisture) in the resin-impregnated sheet becomes less than about 5% by weight.

When the amount of polyester in the impregnating solution is below the lower limit specified sufficiently rapid curing and an improvement in the flow properties during pressing are not obtained. When the upper limit is exceeded, the desirable properties of the diallyl phthalate resin are adversely affected by the polyester and the rate of cure also becomes inadequate. If desired, the impregnating solution may contain a colorant or decorative insoluble powders, e.g. metallic flaky powder or mica. Further, *n*-propyl gallate, *p*-benzoquinone, tetramethylthiuram disulphide, hydroquinone and metoquinone (a mixture of metol (*p*-methylaminophenol sulphate) and hydroquinone) can also be incorporated in a minute amount of the order of 0.01—0.1 part by weight, based on the organic peroxide. The resulting resin-impregnated sheet can be stored for a prolonged period of time. The impregnated sheet can be used to make a decorative laminate board by overlaying such a sheet on one or each surface of a substrate and then heating the layup under pressure. Suitable substrates, include plywood, hardboard, particle board, cement-asbestos board, and gypsum board. In short, the pressing is effected at a temperature, pressure and time sufficient for curing the diallyl phthalate prepolymer. For example, a mold-

ing temperature of 110—140°C., a pressure of 7—22 kg/cm² and a molding time of about 3—10 minutes, usually 3—5 minutes may suitably be used.

In carrying out the pressing operation using resin-impregnated sheets made by the process of the invention, the short period pressing by means of the hot-hot cycle is advantageously used. Moreover, the superior effects of the sheet is best demonstrated by this technique.

The hot-hot cycle technique is a method which comprises maintaining the heating platen of the press and, as required, the mirror plate and the cushion as well as a prescribed temperature, assembling the substrate and the dry resin-impregnated sheet and inserting the resulting layup while the press is hot and thereafter removing the resultant board while the press is still hot.

When a conventional sheet was used with this method, numerous molding imperfections, particularly defects such as pockmarks, dull spots and swells appeared. These difficulties could only be avoided by increasing the pressing time, whereas the purpose of using the hot-hot cycle technique is to reduce the pressing time.

The present invention makes it possible to shorten the pressing cycle and to manufacture with high efficiency and good reproducibility a decorative laminate board having an excellent surface gloss and smoothness and with an acceptable level of surface defects such as pockmarks.

The following Examples illustrate the invention.

EXAMPLE 1 and COMPARISONS 1—7

As the resinous component, 100 parts of a diallyl phthalate prepolymer of molecular weight about 10,000 and 30 parts by weight of an unsaturated polyester (acid value 45) of softening point 20°C. were obtained by reacting a mixed acid component (b₁) consisting of:

	Wt. %
Phthalic anhydride	50.0
Maleic anhydride	23.5
Fumaric acid	7.4
Chlorinated maleic acid	19.1

with a mixed alcohol component (b₂) consisting of:

	Wt. %
Propylene glycol	80.2
Ethylene glycol	9.1
Diethylene glycol	10.7

in a weight ratio $b_1/b_2 = 1.58$. The resinous component was dissolved in 120 parts by weight of acetone together with 4 parts by weight of benzoyl peroxide and 0.5 parts by weight of the internal release agent INT—11A,

5 to prepare the impregnating solution. Using this solution, a 45 g/m² paper printed with a pattern was coated by the "dip and flow" method and dried to obtain a resin-impregnated sheet for lamination use having a resin solids content of 51% by weight based on the weight of the resin-impregnated dried sheet.

This sheet was overlaid on a lauan plywood 4 mm in thickness and was pressed under the following conditions using a hot press having a 3-mm-thick "Duralumin" (Registered Trademark) mirror plate suspended and fixed to a heating platen via a 5-mm-thick rubber cushion.

10

15

Molding temperature: 130°C.
Molding pressure : 15 kg/cm²
Molding time : 3.0 minutes

20 The results obtained are shown in Table 1, below. For comparison, the table also shows experiments carried out in the same manner except that the resin was varied and hence also the required molding time. The proportion of the catalyst and release agent used was
25 identical in all cases.

Note:—

1. Preparation of samples.

30 The hot-hot molding was carried out 5 times with a 10-stage press of the successive opening and closing type, and a total of 50 decorative laminate boards 3' × 6' in size were prepared.

2. Tests carried out

35 2—1 Resistance to chloroform test. Wads of chloroform-impregnated absorbent cotton were placed in different zones of each of the 50 decorative laminate boards. The spots where the cotton wads were placed were

covered with Petri dishes and the boards were allowed to stand for 20 minutes. The spots were then wiped and inspected, and boards whose surface was attacked were classified as (—) and the boards showing no change were classified (+), the number of boards in each class being indicated in parenthesis in the table.

40

45

2—2 Pockmark rate.

The areas of the groups of pockmarks on the surfaces of the aforesaid 50 decorative laminate boards were measured with an integrator. The area occupied by the groups of pockmarks expressed as a percentage of the total surface area of the boards, is the pockmark rate.

50

2—3 Rate of rejects.

55

The rate of rejects is the percentage of boards which have been rejected on account of their poor surface condition and lack of resistance to chloroform.

TABLE I

Experiment	Resin Contained in Impregnating Solution				Molding time (min)	Resistance to solvents	Pockmark rate of Pressing product (%)	Number of sheets in which pockmarks appeared	Rate of rejects (%)
	Diallyl phthalate polymer (parts by wt.)	Diallyl phthalate monomer (parts by wt.)	Unsaturated polyester						
			Softening point (°C)	Parts by wt.					
Example 1	100	—	20	30	3	+ (50)	0	0	0
Comparison 1	95	5	20	30	3	+ (50)	12	27	54
„ 2	100	—	—	—	10	+ (50)	0	0	0
„ 3	100	—	—	—	7	— (50)	0	0	100
„ 4	95	5	—	—	7	+ (25)	2	11	70
„ 5	95	5	—	—	—	— (50)	2	13	100
„ 6	95	5	40	40	3	— (50)	11	24	100
„ 7	100	—	40	30	3	— (50)	0	0	100

Note: The unsaturated polyester used in Example 1 and Comparison 1 was that indicated as B—1 in the subsequently presented Table II.

The unsaturated polyester used in Comparisons 6 and 7 was that indicated as B—4 in Table II.

EXAMPLES 2—13 and COMPARATIVE TESTS 8—12

5 The diallyl phthalate prepolymer A, the polyester B, the compositions of the impregnating solutions and the pressing conditions were varied, the tests being otherwise carried out as in Example 1, and the results

obtained are shown in Table II. For comparison, the table shows the results of several comparative tests wherein the conditions required by this invention are not satisfied. Details of the polyesters used in these experiments are given in Table III.

10

TABLE II

Experiment		Impregnating Solution								
		Diallyl phthalate prepolymer (parts by wt.)	Polyester		Organic peroxide		Internal release agent		Solvent	
			Class	Parts by wt.	Name	Parts by wt.	Name	Parts by wt.	Name	Parts by wt.
Comparison	8	100	B—1	11.1	BPO	3.3	INT—11A*2	0.44	acetone	111
„	9	100	B—1	11.1	BPO	3.3	do	0.44	do	111
Example	2	100	B—1	25	BPO	3.8	do	0.5	do	119
„	3	100	B—1	42.8	BPO	4.3	do	0.57	do	129
„	4	100	B—1	66.7	BPO	5.5	do	0.66	do	138
Comparison	10	100	B—1	100	BPO	6	do	0.8	do	150
„	11	100	B—1	100	BPO	6	do	0.8	do	150
Example	5	100	B—2	20	BPO	4	do	0.5	acetone toluene	80 40
„	6	100	B—2	20	BPO	4	lauric acid	3.0	acetone toluene	80 40
„	7	100	B—3	40	BPO	4	do	3.0	MEK	130
„	8	100	B—3	60	t-BPB	5	INT—11A	0.65	acetone toluene	70 70
„	9	100	B—2	25	t-BPB	4	do	0.5	acetone MIBK	100 30
„	10	100	B—2	70	BPO	5	INT—4 *3	0.7	MEK	150
„	11	100	B—5	20	BPO	2	INT—11A	0.4	acetone	120

TABLE II (Continued)

Experiment	Impregnating Solution								
	Diallyl phthalate prepolymer (parts by wt.)	Polyester		Organic peroxide		Internal release agent		Solvent	
		Class	Parts by wt.	Name	Parts by wt.	Name	Parts by wt.	Name	Parts by wt.
Example 12	100	B—6	30	dicumyl peroxide	3	INT—4	0.4	do	100
„ 13	100	B—7	50	t—BPB	5	lauric acid	3.0	acetone	110
								toluene	40
Comparison 12	100	B—8	20	BPO	4	INT—11A	0.5	acetone	100
								toluene	80

TABLE II (Continued)

Experiment	Resin solids content based on impregnated dry sheet (wt. %)	Pressing time (min.) [at 130°C, 15 kg/cm ²]	Resistance to solvents	Rate of rejects (%)
Comparison 8	50 (80)* ¹	4	— (50)	100
„ 9	do	7	+ (50)	0
Example 2	do	4	+ (50)	0
„ 3	do	4	+ (50)	0
„ 4	do	4	+ (50)	0
Comparison 10	do	4	> (50)	100
„ 11	do	6	+ (50)	34
Example 5	54 (60)	3	+ (50)	0
„ 6	do	3	+ (50)	0
„ 7	48 (80)	5	+ (50)	0
„ 8	58 (60)	5 (150°C)	+ (50)	0
„ 9	39 (80)	5 (150°C)	+ (50)	0
„ 10	55 (45)	5	+ (50)	0
„ 11	50 (80)	4 (120°C)	+ (50)	0
„ 12	50 (80)	5 (150°C)	+ (50)	0
„ 13	55 (60)	4 (150°C)	+ (50)	0
Comparison 12	50 (80)	3	+ (50)	100 (surface condition poor)

*1 — Weight of pattern [g/m²].

*2 — Internal release agent from Axcel plastics Co. in U.S.A.

*3 — Internal release agent from Axcel plastics Co. in U.S.A.

TABLE III

Class of polyester	Mixed Acid Component (b ₁)			
	i) Phthalic anhydride (as phthalic acid) (wt. %)	ii) a Maleic anhydride (as maleic acid) (wt. %)	ii)b Fumaric acid (wt. %)	iii) Other dibasic acids (wt. %)
B—1	50.0 (51.0)	23.5 (24.6)	6.7	17/7 (chlorinated maleic acid)
B—2	53.8 (53.1)	40.5 (41.5)	—	5.4 (adipic acid)
B—3	60.0 (60.2)	27.6 (29.0)	10.8	—
B—4	60.0 (57.0)	40.0 (43.0)	—	—
B—5	43.4 (42.1)	53.8 (55.5)	—	2.4 (tetrahydrophthalic anhydride)
B—6	45.0 (43.7)	50.0 (51.9)	—	4.4 (3,6-endodichloro- methylenetetra- chlorphthalic acid)
B—7	45.0 (43.4)	55.0 (56.6)	—	—
B—8	30.0 (28.6)	70.0 (71.4)	—	—

TABLE III (Continued)

Class of polyester	Mixed Alcohol Component (b ²)				b ₁ /b ₂ (wt. ratio)	Softening point of polyester (°C)	Acid value polyester
	iv) Propylene glycol (wt. %)	v)a Ethylene glycol (wt. %)	vi) Diethylene glycol (wt. %)	vi) Other polyhydric alcohol (wt. %)			
B—1	80.0	9.3	10.7	—	1.52	20	45
B—2	70.0	4.0	6.0	20.0 (dipropylene glycol)	1.72	25	43
B—3	67.0	—	20.0	13.0 (dipropylene glycol)	1.42	27	51
B—4	100.0	—	—	—	1.62	40	25
B—5	65.0	—	16.0	19.0 (glycerine)	1.39	25	33
B—6	80.0	—	20.0	—	1.37	—5	55
B—7	70.0	—	20.0	10.0 (trimethylolpropane)	1.22	10	42
B—8	50.0	—	50.0	—	1.23	60	18

WHAT WE CLAIM IS:—

1. A method of making a resin-impregnated dried sheet for use in making laminate boards, which comprises impregnating a fibrous sheet with an impregnating solution containing substantially no dialkylphthalate monomer to a resin solids content not less than 35 percent but less than 60 percent (on the weight of the resin-impregnated dried sheet), containing as its resinous components:

(A) One hundred parts by weight of diallyl phthalate prepolymer and

(B) Twenty to eighty parts by weight of a polyester which is organic solvent-soluble at room temperature, has a softening point not over 30°C., and is derived from a mixed acid component consisting of:—

- (i) 40—60.5% by weight of phthalic acid,
(ii) 30—60% by weight of maleic acid or fumaric acid or a mixture of both, and

TABLE III (Continued)

Class of polyester	Mixed Alcohol Component (b ^a)				b ₁ /b ₂ (wt. ratio)	Softening point of polyester (°C)	Acid value polyester
	iv) Propylene glycol (wt. %)	v)a Ethylene glycol (wt. %)	vi) Diethylene glycol (wt. %)	vi) Other polyhydric alcohol (wt. %)			
B—1	80.0	9.3	10.7	—	1.52	20	45
B—2	70.0	4.0	6.0	20.0 (dipropylene glycol)	1.72	25	43
B—3	67.0	—	20.0	13.0 (dipropylene glycol)	1.42	27	51
B—4	100.0	—	—	—	1.62	40	25
B—5	65.0	—	16.0	19.0 (glycerine)	1.39	25	33
B—6	80.0	—	20.0	—	1.37	—5	55
B—7	70.0	—	20.0	10.0 (trimethylolpropane)	1.22	10	42
B—8	50.0	—	50.0	—	1.23	60	18

WHAT WE CLAIM IS:—

1. A method of making a resin-impregnated dried sheet for use in making laminate boards, which comprises impregnating a fibrous sheet with an impregnating solution containing substantially no dialkylphthalate monomer to a resin solids content not less than 35 percent but less than 60 percent (on the weight of the resin-impregnated dried sheet), containing as its resinous components:

(A) One hundred parts by weight of diallyl phthalate prepolymer and

(B) Twenty to eighty parts by weight of a polyester which is organic solvent-soluble at room temperature, has a softening point not over 30°C., and is derived from a mixed acid component consisting of:—

- (i) 40—60.5% by weight of phthalic acid,
(ii) 30—60% by weight of maleic acid or fumaric acid or a mixture of both, and

- (iii) 0—30% by weight of a dicarboxylic acid other than those indicated in (i) and (ii), and a mixed alcohol component consisting of:
- 5 (iv) 60—80.5% by weight of propylene glycol,
- (v) 10—20% by weight of ethylene glycol or diethylene glycol or a mixture of both, and
- 10 (vi) 0—20% by weight of a polyhydric alcohol other than those indicated in (iv) and (v); and drying the impregnated sheet.
2. Method according to claim 1, wherein the impregnated sheet is dried to a residual solvent content (including any absorbed atmospheric moisture) of 5% by weight.
- 15 3. Method according to claim 1 or 2, wherein the dicarboxylic acid (iii) is isophthalic acid, terephthalic acid, tetrachlorophthalic anhydride, tetrahydrophthalic anhydride, chlorinated maleic acid, mesaconic acid, citraconic acid, adipic acid, succinic acid, itaconic acid, oxalic acid, sebacic acid, 3,6-endomethylenetetrahydrophthalic acid or 3,6-endodichloromethylenetetrahydrophthalic acid.
- 20 4. Method according to any one of claims 1—3, wherein the polyhydric alcohol (vi) is dipropylene glycol, 1,3-butylene glycol, 2,3-butylene glycol, (2,2'-bis[4'-(β -hydroxy)ethoxyphenyl]propane, 2,2'-bis[4'-(γ -hydroxy)butoxyphenyl]propane, neopentyl glycol,
- 30 1,4-butenediol, trimethylolpropane, glycerine or pentaerythritol.
5. Method according to any one of the preceding claims, wherein the impregnating solution contains, in addition to the resinous component, 2—6 parts by weight of an organic peroxide as a curing catalyst and 0.3—3 parts by weight of an internal release agent.
- 35 6. A method of manufacturing resin-impregnated dried sheets according to claim 1 substantially as hereinbefore described.
- 40 7. Resin-impregnated dried sheets obtained by a process claimed in any one of claims 1—6.
8. A method of manufacturing decorative laminate boards which comprises overlaying a
- 45 resin-impregnated dried sheet claimed in claim 7 on a substrate and thereafter by heating the assembly under pressure, whereby the resin is cured and the sheet is adhered to the substrate.
9. A method according to claim 8, wherein the assembly is heated by the hot-hot cycle technique (as defined herein).
- 50 10. A method of manufacturing decorative laminate boards according to claim 8 substantially as hereinbefore described.
- 55 11. Decorative laminate boards obtained by a process claimed in any one of claims 8—10.

J. A. KEMP & CO.,
Chartered Patent Agents,
14, South Square,
Gray's Inn, London, W.C.1.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1970.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L M S *