

UNITED STATES PATENT OFFICE

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TREATMENT OF WOOD

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1

This invention relates to the treatment of wood and more particularly to a method for preventing cracking and checking of wood during drying and seasoning.

In the lumber industry one of the serious problems has been that of checking and splitting of wood during its storage or drying, or both. This adverse effect is due, primarily, to the shrinkage resulting from drying of the outer area or portions of green wood at a more rapid rate than the interior portions. As a consequence of this uneven shrinkage, surface strains or stresses are set up which cause extensive degradation of the green lumber, being most apparent at the ends and along the surface of the lumber in the central portion of the flat grain cuts. Inasmuch as wood dries more rapidly from the end grain than from the side grain, it is apt to check and split during seasoning on the ends even more than in any other portion of the wood.

Various proposals have been made for control over this adverse checking and splitting effect encountered in drying lumber of large dimensions but up to the present invention economically feasible methods have not been highly satisfactory, particularly for woods which tend to crack and split upon air seasoning or kiln drying such, for example, as oak, Douglas fir, hickory and the like. An important barrier to the widespread use of sealing materials to reduce moisture loss from wood has been the high cost of applying the sealers. To avoid time consuming effort in application, the sealer must spread out in a single brushing in a thick layer over the entire surface of the wood to be sealed. Furthermore, for high economy of material, the applied sealer must not be lost by drip. Materials available hitherto have not had these favorable properties. The liquid sealers which have been previously used flowed out to films which were insufficiently thick to provide adequate protection in a single coat. Loss by drip was high employing such materials, and more than one coat was necessary to obtain adequate protection against checking. Semi-pastes have also been used in order to overcome the above difficulties. However, such paste must be applied by spatula and the cost in such application is uneconomically high.

It is an object of the present invention to overcome the disadvantages attendant upon drying and seasoning of lumber and to provide an economical composition and method for the prevention of cracking, checking and splitting of lumber. Other objects and advantages of the invention will be apparent from the following description.

2

According to the present invention surface shrinkage of lumber, during seasoning or drying, is avoided by coating wood surfaces which are most susceptible to checking, cracking and splitting with a resinous aqueous dispersion of such a nature that, upon application to wood, there results a film of coalesced resinous particles which has extremely low water permeability characteristics. The resinous dispersions of this invention may be applied to the wood by brushing, spraying, dipping or any other known means.

Although various proposals have previously been made for the use of varnishes, lacquers, paints and the like for wood treatment, with the purpose of reducing the rate of change of moisture content of lumber, the disadvantage of these materials has resided in one or more of the following facts: (1) prior proposed materials have low water resistance; (2) prior materials rapidly deteriorate when exposed to the atmosphere; (3) the coated wood is undesirably stained or colored by the coating material; and (4) the films produced by the use of previous materials have not attached themselves sufficiently well to the wood surfaces as to seal the ends against the moisture within the wood. These effects are well recognized by anyone who has attempted to cover moist wood with paints, lacquers, or varnishes, i. e. the film fails to dry, or becomes filled with bubbles or holes due to the vapor pressure of the moisture within the wood and no success is obtained in sealing the ends of the lumber (the portions through which the moisture loss is most rapid) because of the permeability of the film which has been placed on the surface, and because of the poor adhesion to the wood surface.

The material of the present invention, however, which is particularly effective as an end-sealing composition, is not a paint or lacquer but is a film-forming composition which has the particularly advantageous properties of ease in application, non-absorption by wood and, contrary to previous film-forming compositions, production of a highly water-resistant, non-discoloring, firmly adhering film of coalesced resinous particles upon the surfaces of wood even when the wood contains a high percentage of moisture. By employing the compositions of this invention, wood surfaces may be maintained highly resistant to the passage of moisture from within the wood in its areas where evaporation of moisture ordinarily takes place with great rapidity. As a result, the rate of moisture change of the wood is more uniform over its area exposed to the atmosphere, with reduced drying stresses and tendencies to check.

In general, the compositions of the present invention comprise aqueous dispersions of such resinous materials, for example, as the polymers and interpolymers of vinyl- or substituted vinyl-type substances such as: vinyl acetate, vinyl chloride, isobutylenes, styrenes, acrylic and methacrylic esters, vinylidene chloride and butadiene; and ethylene polymers and interpolymers, alkyd resins, chlorinated rubber, cellulose acetate and nitrate, cumarone-indene resins, polyvinyl acetals and the like.

In the aqueous resinous dispersion compositions such as just described, and for the primary purpose of imparting further water-resistant properties and greater plasticity or both to the film resulting from application of the dispersion, there may be included such substances as paraffin, animal waxes, asphalt, vaseline, high molecular weight alcohols, heavy oils, mineral and animal oils, vegetable waxes, methyl abietate, chlorinated diphenyls, vegetable oils, tricresyl phosphate, dibutyl phthalate, butyl phthalyl butyl glycolate, and butyl stearate. Furthermore, dispersing agents are preferably included, such as lauryl, cetyl, oleyl, and stearyl sodium or triethanolamine sulfonates or sulfates; sodium salts of alkyl naphthalene sulfonic acids; sodium, ammonium or triethanolamine salts of lauric, stearic, oleic, linoleic, and like acids; amino stearin; ammonium sulfo ricinoleate; the ricinoleates, laurates, oleates, stearates, and like esters of glycerol, diethylene glycol, mannitol, and sorbitol; sodium abietene sulfonate; sulfonated hydrocarbons; sulfonated oils such as sulfonated castor oil and sulfonated olive oil; esters of sodium sulfo succinic acid, sodium oleo-abietate; ethylene glycol carboxylic acid condensation products; diethyl amino ethyl oleyl amide acetate; and lauryl or stearyl trimethyl ammonium bromide, polyvinylacetate, the polyethylene glycol known as "Carbowax," and morpholine esters.

I have found that the addition of an agent which has a thickening action on the resinous aqueous dispersions improves the ease with which the emulsion can be applied to wood, decreases the time required to cover the surface with a single coat which will give a continuous film on drying, and aids in preventing flow of the sealer from vertical surfaces after application. Agents which thicken resinous aqueous dispersions without decreasing the moisture resistance of the resulting film include partially hydrolyzed polyvinyl acetate, polyvinyl alcohol, alginates, water soluble cellulose ethers, casein, soya bean protein, glue, gelatin, water soluble starches, gums such as gum tragacanth and gum arabic, polyethylene glycols, and glycol polyformals.

The quantity of thickening agent required for best results depends upon the thickener employed and the total solids content of the emulsion. For a solids content of 20 to 30%, there is required 0.5 to 5.0% thickener. At higher solids content, the thickener concentration may be as low as 0.25%. The minimum quantity of thickener is employed to prevent substantial loss of the sealer by drip from brush or wood.

Effective thickening action is obtained with the above materials in the pH range 5-10, but I prefer to adjust pH to 8.5 to 9.5. When the resinous aqueous dispersion is acidic as prepared, ammonium hydroxide should be used, preferably, to increase pH to the preferred range; however, any commercial base is suitable for this purpose.

The preceding description outlines the invention in its broad aspects, but the more specific

and preferred compositions of the present invention comprise a resinous aqueous dispersion containing polymethacrylic esters, dispersing agents and water. To this resinous dispersion there may be added, and according to the preferred embodiments of this invention there is added, a vegetable oil and paraffin, as well as a thickening agent such as previously described. The proportions of the various constituents making up the compositions of the present invention may be varied over a fairly wide range, although the best results are obtainable by use of certain compositions in fairly specific proportions such as will be described hereinafter.

Generally speaking, however, the proportions and ranges of my preferred composition are as follows (parts per 100);

- 5 to about 50 parts of a methacrylic ester polymer
- 0 to about 15 parts of a vegetable oil (blown or unblown)
- 2 to about 45 parts of paraffin, asiatic, vegetable or animal waxes
- $\frac{1}{2}$ to about 5 parts of a dispersing agent
- $47\frac{1}{2}$ to about 80 parts of water
- $\frac{1}{4}$ to about 5 parts of thickening agent

While the invention is not limited in the minimum quantity of vegetable oil which may be employed, a suitable quantity, as illustrated in the examples, is about 2.98 to 8 parts per 100 parts of the composition. Up to 15 parts of vegetable oil may be employed if desired.

Furthermore, although various methods may be used in the production of the end-sealing compositions of the present invention, the best results have been obtained by employing fairly specific steps in the manufacture of the compositions of this invention.

The following examples will serve to illustrate how this invention may be practiced, parts being given by weight unless otherwise indicated.

Example 1

Into a mixing vessel there is placed 115.2 pounds of n-butyl methacrylate monomer in which is dissolved 69.3 grams of benzoyl peroxide as a 20% water-80% benzoyl peroxide mixture. Thereafter 3.3 pounds of blown castor oil is added and stirred in the mixing vessel to form a homogeneous solution.

In a separate container, 240 grams of lauryl sodium sulfate is dissolved in 32.4 pounds of water, following which 6.6 pounds of a 10% aqueous solution of partially saponified polyvinyl acetate in water is mixed with the lauryl sodium sulfate and the whole heated to about 75° C.

The two solutions thus prepared, together with 7.9 pounds of paraffin, which has been separately heated to about 135° C., are then mixed with stirring or by circulation through a pump. The resulting mixture is then pumped twice through a 2 foot length of 0.134 inch internal diameter pipe under a pressure of 200-250 p. s. i. The resultant temperature of the solution is at this point approximately 55° C. and further heat is applied by means of a steam coil until the temperature is about 80° C.

After 30 to 45 minutes, an exothermic reaction (polymerization) begins during which the temperature may rise rapidly to as high as 95° C., the maximum temperature being reached in about fifteen minutes. After the maximum temperature has been reached, the charge is allowed to cool and polymerization is essentially complete.

5

Example 2

In a manner similar to that described in Example 1 and employing the same proportions of material, benzoyl peroxide is first dissolved in the n-butyl methacrylate monomer with stirring. Thereafter the blown castor oil is added and stirred to give a homogeneous solution. In a separate container the lauryl sodium sulfate is dissolved in the water, the partially saponified polyvinyl acetate (medium viscosity-saponification number of 125-130) stirred in and the whole mixture heated to 70-75° C. The paraffin is heated to 130-140° C.

The lauryl sodium sulfate-partially saponified polyvinyl acetate solution is thereafter poured into a colloid mill and the methacrylate-castor oil solution and the molten paraffin poured in simultaneously, with the mill running. The mill is then run for 2 minutes to produce emulsification after which the emulsion is transferred to a flask, fitted with a condenser, for polymerization.

Polymerization is accomplished by heating the flask by means of a water bath to about 80° C. and maintaining at this temperature until reaction is complete. The time required for polymerization is approximately 30 minutes to 1 hour. Gentle stirring may be employed during polymerization to maintain a uniform temperature throughout the flask. After polymerization the dispersion is allowed to cool and then filtered.

Example 3

Following the same manipulative procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer.....	230.0
Benzoyl peroxide.....	1.8
Paraffin (135° F.).....	120.0
Soya bean oil (blown soya bean oil).....	50.0
Partially saponified polyvinyl acetate.....	10.0
Lauryl sodium sulfate.....	8.0
Water.....	580.2

Example 4

Following the same manipulative procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer.....	230.0
Benzoyl peroxide.....	1.8
Paraffin (135° F.).....	120.0
Raw soya bean oil.....	50.0
Partially saponified polyvinyl acetate.....	10.0
Lauryl sodium sulfate.....	8.0
Water.....	580.2

Example 5

Following the same manipulative procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer.....	230.0
Benzoyl peroxide.....	1.8
Paraffin (135° F.).....	120.0
Raw linseed oil.....	50.0
Partially saponified polyvinyl acetate.....	10.0
Lauryl sodium sulfate.....	8.0

6

Example 6

Following the same manipulative procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate.....	100.0
Coumarone-Indene interpolymer.....	100.0
Blown castor oil.....	80.0
Benzoyl peroxide.....	1.8
Lauryl sodium sulfate.....	9.0
Paraffin (135° F.).....	120.0
Partially saponified polyvinyl acetate.....	10.0
Water.....	580.2

Example 7

Following the same procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer.....	230.0
Blown castor oil.....	50.0
Benzoyl peroxide.....	1.8
Lauryl sodium sulfate.....	8.0
Paraffin (135° F.).....	120.0
Polyvinyl acetate (high viscosity).....	10.0
Water.....	580.2

Example 8

Following the same procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
N-butyl methacrylate monomer.....	136.9
Blown castor oil.....	29.8
Benzoyl peroxide.....	1.1
Lauryl sodium sulfate.....	4.8
Paraffin (135° F.).....	71.4
Polyvinyl acetate.....	6.0
Water.....	750.0

Example 9

Following the same procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer.....	143.7
Blown castor oil.....	31.3
Benzoyl peroxide.....	1.4
Paraffin (135° F.).....	75.0
Ammonium oleate.....	20.0
Water.....	728.6

Example 10

Following the same procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer.....	143.7
Blown castor oil.....	31.3
Benzoyl peroxide.....	1.4
Paraffin (135° F.).....	75.0
Sodium oleate.....	20.0

7

Example 11

Following the same procedure as described in Example 2 but with the use of different proportions of materials, an emulsion composition of the present invention was prepared having the proportions of:

	Grams
n-Butyl methacrylate monomer-----	230.0
Benzoyl peroxide-----	1.8
Paraffin-----	120.0
Blown castor oil-----	50.0
Lauryl sodium sulfate-----	16.0
Water-----	582.2

Example 12

Following the same procedure as described in Example 2 an emulsion was prepared having the proportions of:

	Parts
n-Butyl methacrylate monomer-----	120.0
Benzoyl peroxide-----	1.8
Paraffin (135° F.)-----	200.0
Blown castor oil-----	80.0
Partially saponified polyvinyl acetate-----	10.0
Lauryl sodium sulfate-----	8.0
Water-----	580.2

Example 13

Into a mixing vessel there is placed 18 pounds of n-butyl methacrylate monomer in which is dissolved 66 grams of benzoyl peroxide as a 20% water-80% benzoyl peroxide mixture. Thereafter 6 pounds of blown castor oil is added to the mixing vessel and stirring continued until a homogeneous solution is obtained.

In a separate container 441 grams of lauryl sodium sulfate is dissolved in 35 pounds of water and the solution is warmed to about 60° C. The two solutions thus prepared are then mixed and a coarse emulsion is formed either by stirring or by circulation through a pump. The resulting coarse dispersion is then forced twice through a two-foot length of 0.134 inch internal diameter pipe under a pressure of 200-250 pounds per square inch. A quite stable, finely dispersed emulsion is thus produced. The temperature of the emulsion is approximately 50-55° C. Heat is then applied by means of a coil or jacket until a temperature of about 65-70° C. is reached. In about 30-45 minutes thereafter an exothermic reaction (polymerization) sets in causing a rapid temperature rise. Cooling may be employed to prevent excessive boiling. In about 15 minutes, a maximum temperature is reached, after the exothermic reaction sets in, following which the charge is cooled. Polymerization is essentially complete. This resulting emulsion is designated as emulsion A, and it is utilized as described hereinafter for the preparation of the complete dispersion.

A 10% solution of polyvinyl acetate in water is prepared by adding powdered partially saponified polyvinyl acetate to water with good agitation. The charge is gradually heated to 85° C. and is held at this temperature for two hours with stirring after which it is allowed to cool. This solution is used both in the preparation of emulsion C and the final dispersion which will be described hereinafter. This solution is designated as solution B.

In a separate mixing vessel, or the mixing vessel used in preparing emulsion A, there is dissolved 34.8 grams of benzoyl peroxide (as a 20% water-80% benzoyl peroxide mixture) in 9.6

8

pounds of n-butyl methacrylate monomer. The resulting mixture was thereafter poured into 12.0 pounds of solution B which had previously been heated to 70-75° C. Thereafter, with continuous agitation, 14.4 pounds of paraffin (at a temperature of 135° C.) was then added to the resultant mixture and agitation continued until a coarse dispersion had been produced. Emulsification and polymerization were thereafter carried out in the same manner as described in connection with emulsion A. The resulting composition was designated as emulsion C.

The final dispersion is prepared by mixing together 47.5 parts of emulsion A, 47.5 parts of emulsion C and 5 parts of solution B to give 100 parts of complete dispersion. Preferably these emulsions and solutions are mixed as follows, to give 100 parts of the final end sealer dispersion: To 47.5 parts of emulsion C, in a mixing vessel, is added 5 parts of solution B, with agitation during the addition. Thereafter 47.5 parts of emulsion A is added to the resultant mixture followed by thorough agitation and mixing after addition of emulsion A.

Although in the examples n-butyl methacrylate monomer has been disclosed as one of the constituents employed in producing the dispersion of the present invention (because of its great compatibility with paraffin wax) it should be understood that a variety of other materials may be satisfactorily used in its place such, specifically, as methyl, ethyl, propyl, isobutyl, isopropyl cyclohexyl and methoxy ethyl methacrylates or mixtures of these with other polymerizable monomeric materials. Similarly, in place of blown or unblown castor or soya bean oil or linseed oil there may be used other materials such as cotton-seed, peanut, rape-seed, Perilla, tung and like oils.

Various changes may be made in the details and preferred embodiments of this invention without departing therefrom or sacrificing any of the advantages thereof.

I claim:

1. A resinous aqueous dispersion adapted to produce a water-resistant film of coalesced resinous particles upon application to moist wood and containing from 5 to 50 parts by weight of a n-butyl methacrylate polymer, about 2.98 to 15 parts of a blown castor oil, from 2 to 45 parts of paraffin, ½ to 5 parts of a dispersing agent and 47.5 to 80 parts of water having ¼ to 5 parts of partially hydrolyzed polyvinyl acetate dissolved therein, per 100 parts of the dispersion.

2. A resinous aqueous dispersion adapted to produce a water-resistant film of coalesced resinous particles upon application to moist wood and containing from 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl, n-butyl and isobutyl polymethacrylates, about 2.98 to 15 parts of a vegetable oil, from 2 to 45 parts of paraffin, ½ to 5 parts of a dispersing agent, 47.5 to 80 parts of water and ¼ to 5 parts of a thickening agent, per 100 parts of the dispersion.

3. A resinous aqueous dispersion adapted to produce a water-resistant film of coalesced resinous particles upon application to moist wood, said dispersion consisting of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl, n-butyl and isobutyl polymethacrylates, about 2.98 to 8 parts of a vegetable oil, about 2 to 45 parts of paraffin, about ½ to 5 parts of a dispersing agent, about 47.5 to 80 parts of water and about

$\frac{1}{4}$ to 5 parts of a thickening agent dissolved therein, per 100 parts of the dispersion.

4. A resinous aqueous dispersion adapted to produce a water-resistant film of coalesced resinous particles upon application to moist wood, said dispersion consisting of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl, n-butyl and isobutyl polymethacrylates, about 2.98 to 8 parts of a vegetable oil, about 2 to 45 parts of paraffin, about $\frac{1}{2}$ to 5 parts of a dispersing agent, about $\frac{1}{4}$ to 5 parts of partially hydrolyzed polyvinyl acetate, and about 47.5 to 80 parts of water, per 100 parts of the dispersion.

5. A process for the prevention of checking and cracking of wood during drying which comprises the steps of coating the portions of green wood susceptible to such checking and cracking with a resinous aqueous dispersion of such a consistency that upon application to the green wood there is produced a water-resistant film of coalesced resinous particles, the resinous aqueous dispersion consisting essentially of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl, n-butyl and isobutyl polymethacrylates, about

2.98 to 8 parts of a vegetable oil, about 2 to 45 parts of paraffin, about $\frac{1}{2}$ to 5 parts of a dispersing agent, about 47.5 to 80 parts of water and about $\frac{1}{4}$ to 5 parts of the thickening agent dissolved therein, per 100 parts of the dispersion.

6. A process for the prevention of checking and cracking of wood during kiln-drying which comprises the steps of coating only the end portions of green wood susceptible to such checking and cracking with a resinous aqueous dispersion of such a plasticity that upon application to the green wood there is produced a water-resistant film of coalesced resinous particles, the resinous aqueous dispersion consisting essentially of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl n-butyl and isopropyl polymethacrylates, about 2.98 to 15 parts of a vegetable oil, about 2 to 45 parts of paraffin, about $\frac{1}{2}$ to 8 parts of a dispersing agent, about 47.5 to 80 parts of water and about $\frac{1}{4}$ to 5 parts of a thickening agent dissolved therein, per 100 parts of the dispersion, and thereafter kiln-drying the said wood.

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Certificate of Correction

Patent No. 2,402,331.

June 18, 1946.

HAMLIN M. KVALNES

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 4, line 44, Example 1, for "placed 115.2" read *placed 15.2*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of October, A. D. 1946.

[SEAL]

LESLIE FRAZER.

First Assistant Commissioner of Patents.

$\frac{1}{4}$ to 5 parts of a thickening agent dissolved therein, per 100 parts of the dispersion.

4. A resinous aqueous dispersion adapted to produce a water-resistant film of coalesced resinous particles upon application to moist wood, said dispersion consisting of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl, n-butyl and isobutyl polymethacrylates, about 2.98 to 8 parts of a vegetable oil, about 2 to 45 parts of paraffin, about $\frac{1}{2}$ to 5 parts of a dispersing agent, about $\frac{1}{4}$ to 5 parts of partially hydrolyzed polyvinyl acetate, and about 47.5 to 80 parts of water, per 100 parts of the dispersion.

5. A process for the prevention of checking and cracking of wood during drying which comprises the steps of coating the portions of green wood susceptible to such checking and cracking with a resinous aqueous dispersion of such a consistency that upon application to the green wood there is produced a water-resistant film of coalesced resinous particles, the resinous aqueous dispersion consisting essentially of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl, n-butyl and isobutyl polymethacrylates, about

2.98 to 8 parts of a vegetable oil, about 2 to 45 parts of paraffin, about $\frac{1}{2}$ to 5 parts of a dispersing agent, about 47.5 to 80 parts of water and about $\frac{1}{4}$ to 5 parts of the thickening agent dissolved therein, per 100 parts of the dispersion.

6. A process for the prevention of checking and cracking of wood during kiln-drying which comprises the steps of coating only the end portions of green wood susceptible to such checking and cracking with a resinous aqueous dispersion of such a plasticity that upon application to the green wood there is produced a water-resistant film of coalesced resinous particles, the resinous aqueous dispersion consisting essentially of about 5 to 50 parts by weight of a polymethacrylic ester of the class consisting of methyl, ethyl, propyl, isopropyl n-butyl and isopropyl polymethacrylates, about 2.98 to 15 parts of a vegetable oil, about 2 to 45 parts of paraffin, about $\frac{1}{2}$ to 8 parts of a dispersing agent, about 47.5 to 80 parts of water and about $\frac{1}{4}$ to 5 parts of a thickening agent dissolved therein, per 100 parts of the dispersion, and thereafter kiln-drying the said wood.

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