March 29, 1932. T. W. DIKE 1,851,949

ART OF GLUING MATERIALS

Filed May 22, 1930

Fig. 1.

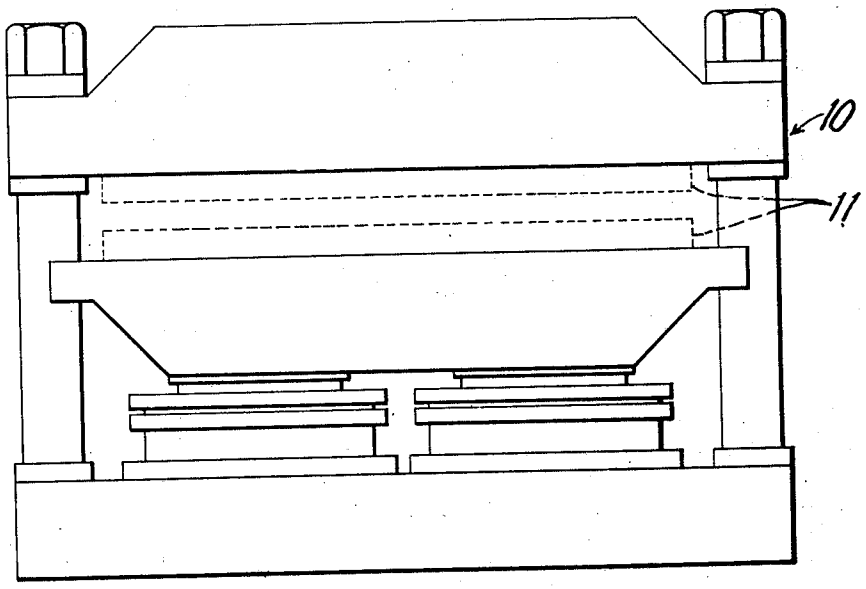


Fig. 2.

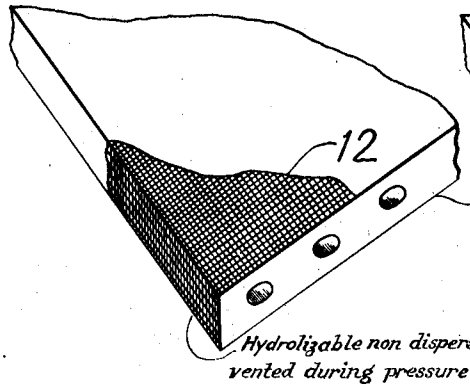
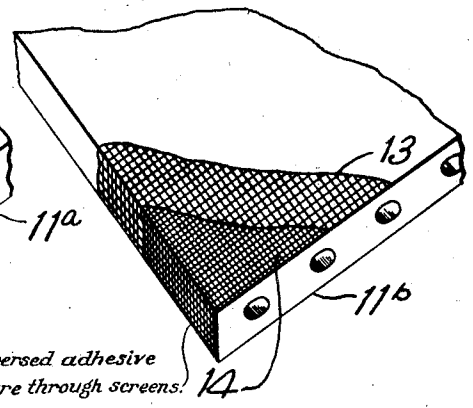


Fig. 3.



Hydroligable non dispersed adhesive vented during pressure through screens. 14

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UNITED STATES PATENT OFFICE

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ART OF GLUING MATERIALS

Application filed May 22, 1930. Serial No. 454,832.

In gluing materials together, for instance in the manufacture of ply-wood or veneer, heat is frequently used along with the pressing. If a structure which has been thus glued together be carefully examined, it is found that unevenness of adhesion is general, and occasionally certain areas show that blistering has occurred. By reason of the setting of the glue or adhesive such as to block off more or less of the natural channels in the wood and thus retain the vapors under compression, thoroughness and uniformity of adhesion is prevented. In accordance with the present invention, however, it now becomes possible to apply heat in a manner to avoid pocketing of compressed vapors and hydrolytic change and blistering, and a superior uniformity of adhesive field results. Moreover, it becomes possible to apply degrees of heat not otherwise in general advisable with wood structures; and not only is the wood safeguarded against damage, but a superior adhesive result in general may be had.

In gluing in accordance with my invention, the plies or pieces to be united are assembled with an interposed adhesive base, this being applied to one of the surfaces in such manner as desired, preferably however in the form of undispersed material or in discrete particle form. This for instance may be an animal or vegetable proteinous material in ground or finely divided form, or oleaginous seed flour, starches, etc., and whether such discrete particles be supplied as the dry finely divided particles or moistened or carried in a suspension of water, the material in such case is non-dispersed as distinguished from a liquid or dispersed form of glue; and the non-dispersed particles show the property of absorbing a certain amount of water merely and swelling and softening, but with a limitation as to the amount of water which can be so taken up, and without breakdown and diffusion of the particles. By "dispersion" is of course meant a colloidal system that presents an indefinite extension in respect to its aqueous menstruum, further addition of water in such a system increasing the extent of dispersion.

With the surfaces to be united supplied with intervening adhesive and assembled, the assemblage is subjected to pressure and heated, but in a manner to afford free venting of the vapors from all faces of the assemblage. For this, I may employ a press construction of any suitable type, having its contact faces provided with interruptions of continuity affording venting openings, or venting channels along the face. One particularly advantageous arrangement for instance is the use of a wire mesh screen in one or more layers as a facing against the platen of the press. For instance, a screen of about 30-mesh and one of about 50-mesh in superpositions provide ample points of pressure contact against the ply-wood or other composite structure being treated and at the same time venting openings are had in such predominant proportion as to allow an application of the desired pressure, but without substantial obstruction to venting at any point. In this manner, the gluing of materials may be carried out with subjection to such pressures as desired, and an intense degree of heat may be readily applied without detrimental localized action.

Apparatus whereby the invention may be performed is exemplified in the accompanying drawings in which:

Fig. 1 is a side view of a press with the platens indicated in dotted lines;

Fig. 2 is an enlarged fragmentary view of a platen covered by wire mesh; and

Fig. 3 is a similar view of a platen covered by superposed layers of wire mesh.

In these drawings, there is shown a press 10, with the position of two platens 11 indicated in dotted lines, it being understood that any desired number of platens may be used, depending on the number of openings in the press.

In Fig. 2, platen 11^a is shown faced with one layer of wire mesh 12; and in Fig. 3, a platen 11^b is shown as faced with a wire mesh screen 13 and a supplemental layer of screen of smaller mesh 14 superposed thereon.

The advantages of the invention in providing hot pressure without blocking of

trapped vapors and occasioning blistering may be realized in proportion with any adhesive in customary usage, but in conjunction with the application of adhesive base in discrete particle form particularly good and uniform results may be realized. In the case of such adhesives as starches, which, where employed with wood heretofore, have been devoid of water-resistant character, the present method affords highly satisfactory results. It has been regarded as impossible to apply a very high degree of heat where gluing wood with a starch adhesive, both on account of the irregular setting tendency and on account of the tendency to localized hydrolytic decomposition. By the present method however, press temperatures of a high order are available, and platen temperatures for instance above 212° up to 375° F. may be applied.

Depending upon the particular material to be glued, the pressures are subject to some range of variation. For instance, a loose textured wood in a softened condition, such as green cottonwood, may be subjected to about 40 lbs. pressure per square inch, while in the case of a dense hard material, such as a dry birchwood, pressures of about 300 lbs. may be employed. In general, the upper limit may be guided by care as to the possibility of crushing-damage to the texture. Depending upon the thickness of the panels or the like being treated, the time factor in pressing may be longer or shorter. For instance, a panel of 3/17 in. thickness of green cottonwood containing 150 per cent. moisture may be heated about 15 minutes with a platen temperature of about 360° F., where employing a starch as adhesive. A similar assembly of dry cottonwood may be pressed in three minutes. Similar, where employing an adhesive base of other character, temperatures of quite high order may be successfully used.

As illustrative of the difference in type of action characterized by my process in comparison with the old practice which employed close fitting press surfaces, a green cottonwood panel 3/12″ × 34″ × 68″ assembled with dry soya bean flour as adhesive and subjected to hydraulic pressure of 238 lbs. per square inch for 50 minutes between the old type of smooth platen-press plates heated with steam at 145 lbs. was found to be considerably charred, and badly blistered and checked, while the center also still showed considerable moisture. On the other hand, a panel identical in make up, treated according to my present process with ventilated pressure for only 20 minutes at the same pressure and temperature, on being removed from the press was found to be uniformly dry and the plies united throughout by a strong bond and free from blisters or checks or any evidence of hydrolysis of the wood.

As another feature, the multi-contact character of the pressure surfaces employed in accordance with my invention also provides in the wood surface a pressed indentation design. This may be further varied where desired, by sanding off or otherwise removing selected portions of the indentation surface, and thereby various characteristic designs may be readily had in contrasting indentation and plain areas.

As indicated, wood and other materials as well which are capable of being bound together by an adhesive may thus be readily glued; and with a corresponding absence of the obstacles characteristic of the old methods. In the case of veneer or ply-wood gluing, particular advantageous utilities are noted. The actual temperatures effective in the wood can be closely controlled without the uncertainties introduced by lag and irregular conduction, and by reason of the pressure-relieving effect of internal vapors, the present ventilating type of pressure application eliminates local excesses internally and corresponding hydrolytic detriment. When the moisture is driven out, the temperature of the wood rises, and by gauging the time of heating thence, the application of any desired temperature to effect a further coagulating action on the binder material may be readily accomplished. I am thus enabled to attain superior water-resistance with the various possible adhesive bases, and as noted in the case of such a substance as starch, the heat may be applied in such a manner as to avoid the hydrolytic breakdown characteristic of this material heretofore, and instead attain a condensative effect with attendant water resistance, a result hitherto unknown.

This application is a continuation-in-part of my application Serial No. 335,998, filed January 29, 1929.

Reference is likewise made to the following applications which are also continuations in part of said application Serial No. 335,998: Serial No. 455,977, filed May 26, 1930; Serial No. 455,978, filed May 26, 1930; Serial No. 456,813, filed May 28, 1930; Serial No. 456,814, filed May 28, 1930; Serial No. 518,944, filed February 28, 1931; Serial No. 538,983, filed May 21, 1931; Serial No. 565,929, filed September 29, 1931; Serial No. 565,930, filed September 29, 1931.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A process of gluing, which comprises assembling the surfaces to be glued with in-

terposed hydrolyzable adhesive, and inhibiting undesirable hydrolysis by pressing and heating while freely venting vapors from all faces of the assemblage.

2. A process of gluing, which comprises supplying to a surface to be incorporated an adhesive base in discrete particle form, assembling, and pressing and heating while providing venting channels along the faces of the assemblage.

3. A process of gluing, which comprises assembling the layers with interposed adhesive, and pressing between surfaces having venting interruptions of continuity and forming an indentation design.

4. A process of gluing, which comprises assembling the layers with interposed adhesive, and pressing between surfaces having venting interruptions of continuity and forming an indentation design, and removing portions thereof from the surface of the assemblage.

5. A process of gluing, which comprises supplying to a surface to be incorporated a starch in discrete particle form, assembling, and pressing with a temperature above 212° F. while inhibiting undesirable hydrolysis.

6. A process of gluing, which comprises supplying to a surface to be incorporated a starch in discrete particle form, assembling, pressing, and imparting water resistance to such starch by heating to a temperature above 212° F. while inhibiting undesirable hydrolysis.

7. A process of gluing, which comprises supplying to a surface to be incorporated a starch in discrete particle form, assembling, and inhibiting undesirable hydrolysis by pressing and heating while freely venting vapors from all faces of the assemblage.

8. A process of gluing, which comprises supplying to a surface to be incorporated a starch in discrete particle form, assembling, and inhibiting undesirable hydrolysis by pressing and heating between pressure surfaces having venting interruptions of continuity.

9. A process of gluing, which comprises supplying to a surface to be incorporated a starch in discrete particle form, assembling, and pressing between pressure surfaces having venting interruptions of continuity, while heating at a temperature of above 212° F. whereby the starch is rendered water resistant.

10. A process of gluing, which comprises supplying to a surface to be incorporated a starch in discrete particle form, assembling, pressing between pressure surfaces having venting interruptions of continuity, and imparting water resistance to such starch by heating to a temperature above 212° F.

11. A process of gluing, which comprises supplying to surfaces to be incorporated a hydrolyzable adhesive base in discrete particle form, assembling, and inhibiting undesirable hydrolysis by pressing and heating while freely venting vapors from all faces of the assemblage.

12. A process of gluing, which comprises heating and pressing, and fully and rapidly surface-venting the moisture from sheets having an interposed adhesive plasticized by such moisture but not brought into a state of chemical dispersion thereby.

13. A process of gluing, which comprises assembling the surfaces to be glued with the interposed hydrolyzable adhesive in the presence of moisture, and heating and pressing and fully and rapidly surface-venting the moisture, the adhesive being in plasticized state but not in a state of chemical dispersion.

14. A process of gluing, which comprises concurrently heating, pressing and surface-venting an assembly having an internal layer of adhesive material plasticized by a vaporizable medium but not brought into a state of chemical disperson thereby.

15. A process of gluing, which comprises supplying to a surface to be incorporated a hydrolyzable adhesive, and pressing between pressure surfaces having venting interruptions of continuity.

Signed by me this 12th day of May, 1930.

THEODORE WILLIAMS DIKE.