

March 21, 1944.

M. PASQUIER

2,344,722

METHOD OF MAKING PLYWOOD PANELS

Filed July 1, 1940

Fig. 1.

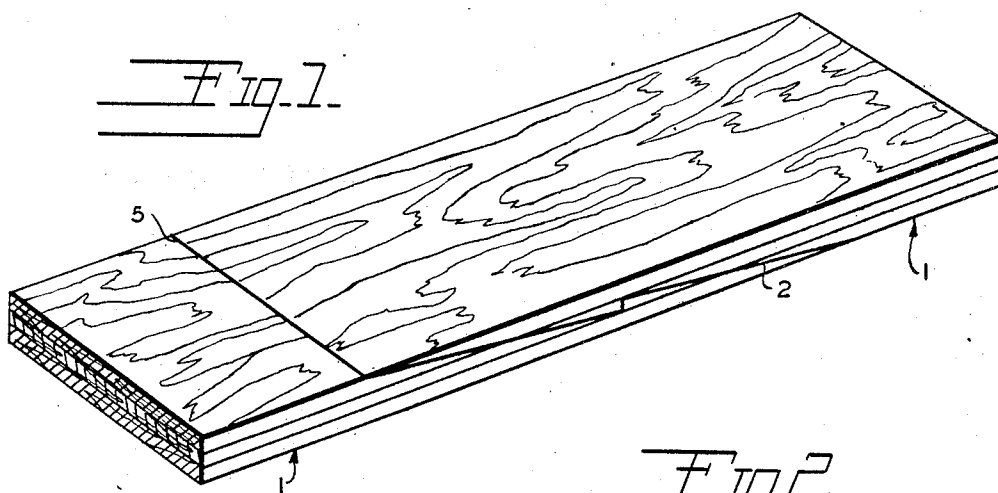


Fig. 2.

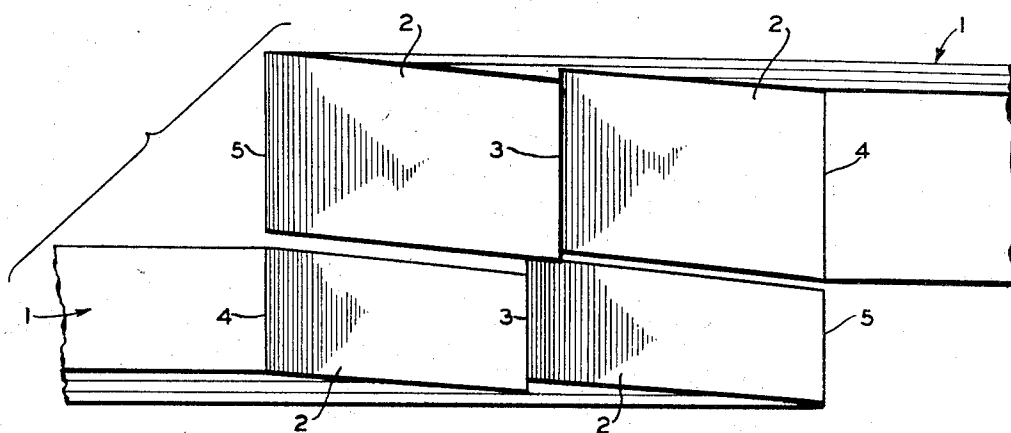


Fig. 3.

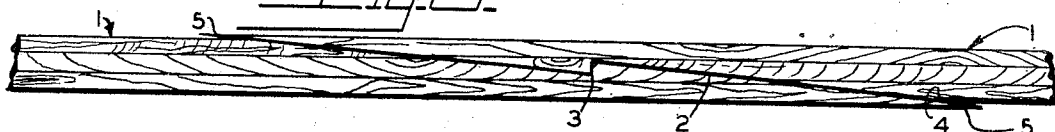
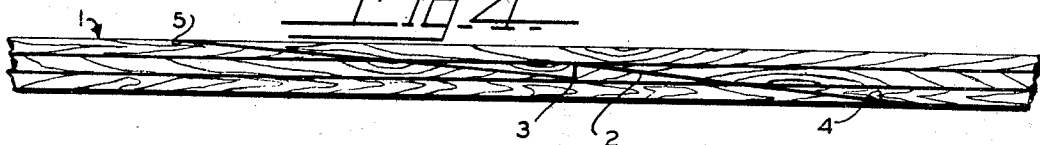


Fig. 4.



INVENTOR
MICHEL PASQUIER
BY *Harold L. Cook*
ATTORNEY

UNITED STATES PATENT OFFICE

2,344,722

METHOD OF MAKING PLYWOOD PANELS

Michel Pasquier, Portland, Oreg., assignor to
M and M Wood Working Company, Portland,
Oreg., a corporation of Oregon

Application July 1, 1940, Serial No. 343,433

5 Claims. (Cl. 144—309)

This invention relates to an improved method of making plywood panels, and has particular reference to a method of uniting preformed panels of standard lengths, or shorter, to make panels of any desired length.

Plywood is manufactured by one of two methods. In cold press operations the newly laid up panels are stacked one upon another until a press load of panels has been made, and this press load of panels is placed in a hydraulic press and subjected to a pressure of approximately 150 pounds per square inch to insure intimate contact of the respective plies along the glue line between the plies forming each panel. Thereupon suitable clamps are applied and the pressure applied by the hydraulic press is maintained by these clamps until the bond has set. While cold press glues may be water resistant, so that plywood bonded therewith may be soaked in water for as long as 72 hours without serious detriment thereto, it generally is conceded that plywood made by this process is not suitable for use where it will be subjected to weathering conditions, or for other purposes where moisture is a factor.

On the other hand, plywood made by the hot press process is suitable for any use, including uses which will subject the plywood to intimate contact with water or other weathering conditions. This plywood is fabricated in hot plate presses with the use of a thermo-setting resinous glue, which is first liquified by the application of the heat of the press, and thereupon is forced into the pores or cells of the wood, where the further action of the heat converts it into an inert substance permanently bonding the veneer plies together to form a plywood panel. The bond produced by this process is not affected by water, acids or organic solvents, and is impervious to fungi, termites or bacteria. For this reason, hot press plywood has found a large market for use for every purpose where moisture is a factor, as in the construction of boats, concrete forms, sign boards, and the like, and very recently has come into vogue as exterior surfacing for all types of buildings.

The use of hot pressed plywood has been more or less limited, however, to constructions which may utilize standard length, or shorter, panels, since cracks or crevices formed by joints between abutting panels are not desirable in certain of the uses to which such plywood may be adapted. It will be appreciated that hot press plywood panels can, of course, be made as large as available hot plate presses, and panels of dimensions

up to the maximum dimensions of available hot plate presses are standard products in most plywood mills. Heretofore, special lengths of plywood panels made by the hot plate process have been made by applying heat and pressure to as much of the panel as could be received between the platens of a press, and thereafter repeating the process upon those portions of the panel which projected from between the platens during the previous pressing operations. By this method, however, the capacity of the press is reduced as much as 90%, and the cost of the completed panel is accordingly increased out of proportion to the benefits enjoyed by the consumer.

The present invention refers to the manufacture of plywood panels of special lengths by splicing together preformed, completed, hot press panels by means of long scarf joints, the scarfed ends of the panels being first coated with a resin glue. The glue thus applied to the scarfed ends of the panels is allowed to dry, whereupon the ends of the panels are placed in overlapping relation and the scarf joint thus formed is introduced between platens of a hot plate press. Heat is transmitted to the glue line from the heated platens of the press through the wood forming the separate panels to be spliced. The application of heat acts initially to liquify the glue, and the simultaneous application of pressure forces the liquified glue into the pores and cells of the respective panels. The continued application of heat sets the resin glue into a substance which is not again affected by the application of heat. However, in this process, if heat is transmitted to the glue so as to cause it to liquify and then set without at the same time being forced into the pores and cells of the respective panels, no bond whatever is created, and no amount of pressure subsequently applied to the joint would serve to form a bond. Likewise, the application of pressure alone, without heat, would not serve to create the bond. The application of heat to the glue, and the application of pressure to the joint must be simultaneous.

It will be appreciated that a slight difference in thickness between two panels scarfed together will prevent a satisfactory application of heat and pressure upon the joint, since the thicker panel at one end of the joint tends to support the platens of the press away from the thinner panel at the other end of the joint. In such event the transmission of heat through the thicker panel will cause the glue to set before the application of pressure upon the thinner

panel, and by the time both panels have been compressed sufficiently to apply pressure equally along the joint, the glue will have set, and no amount of heat and pressure applied subsequently will create a bond. It is a well known fact that irregularities commonly occur in the thickness of plywood panels, and for this reason the bonds produced by the hot press process in scarf joints are very often spotty. That is to say, that only in spots along the overlapping scarfed faces of abutting panels will there have been a simultaneous application of heat and pressure sufficient to form a bond. Subsequent sanding operations reveal the crevices in the joint between those spots where a bond has been formed.

Moreover, even where the abutting panels are of the same thickness, the scarfed ends of the respective panels may remain infinitesimally far apart, so that no pressure actually is applied to the joint. For example, if no greater pressure is applied by the press than was initially applied during the manufacture of the respective panels, no pressure whatever will be applied to the joint. By way of illustration, if the respective panels were fabricated in a press which applied a pressure of 200 pounds per square inch, when it is afterwards attempted to splice such panels by a scarfed joint bonded together with a thermosetting resinous glue, no pressure will be applied to the wood at the joint until after the pressure exerted by the press is more than 200 pounds per square inch, and only then insofar as the friction between the abutting panels along the scarfed joint, and pressure upon the panels beyond the joint, tends to hold the panels in stationary abutting relation. However, if pressure is applied to the panels during the splicing operation in an amount over and above that which was used in the manufacture of the separate panels, then the spliced panel is further compressed within the area of the platens of the press, creating a depression in the surface of the completed panel. It will be seen that in the absence of some means for so positioning the abutting panels that pressure will be applied directly to the joint, and for maintaining the panels in that position during the application of heat and pressure, the portions of the respective panels beyond the joint will tend to arrest the action of the press so that no pressure actually is applied to the joint.

Applicant has provided a solution to this problem by providing preformed hot pressed panels with scarfed edges, which together form a scarf joint, the scarfed end or edge of each panel being provided with a tenon or projection interlocking the scarfed face of one such panel with the similarly scarfed face of another panel. By so interlocking the preformed panels at the scarf joint, slippage between the panels along the scarfs is prevented. In the preferred embodiment of the invention the coak or tenon is positioned slightly closer to the inner end of each scarfed or beveled surface than to the outer end. Each plywood panel being so scarfed or beveled, and the scarfed faces of abutting panels placed in interlocking position, the feathered edge of each panel will be caused to extend over the face of the abutting panel beyond the scarf. Such construction will provide a scarf joint between abutting panels in which the thickness of the panels at the joint will be greater than the thickness of other portions of the panels, the increased thickness being determined by the following formula:

$2 (\sin \text{ angle of scarf}) (\text{distance of coak from center of scarf})$. By reason of the greater thickness of the panel at the joint, and the fact that abutting panels are prevented from slipping endwise when pressure is applied to the joint, applicant is enabled to obtain a simultaneous application of heat and pressure to the wood at the joint, thus insuring a satisfactory bond.

A particular advantage of the invention is the fact that instead of requiring hot plate presses of special sizes for producing hot pressed plywood panels of special lengths, panels of any desired length may be produced by the use of a hot plate press of a length sufficient only to cover the scarf joint between abutting plywood panels. Considering the "length" of the press as running in the direction of the grain of the face sheets of the panels placed therein, and the "width" of the press as running in a direction transversely thereto, or parallel with the joint, a hot plate press suitable for carrying out the present invention need be of no greater length than the length of the joint, and of any standard width. Since special sizes of plywood panels made by the hot press process are commonly asked for in special lengths rather than in special widths, the "width" of the hot press need be no greater than is necessary to handle standard widths of panels.

It is a primary object of the present invention to provide a method of making special lengths of plywood panels in which preformed panels are spliced together by bonds created by the hot press process.

It is a further object of the invention to provide a new and improved method of splicing completed, preformed plywood panels by the use of scarf joints bonded together with a thermosetting resinous glue.

It is a further object of the invention to provide a method of making special lengths of plywood panels with the use of hot plate presses adapted for making standard size panels.

Additional objects and advantages of the invention will become apparent from the following detailed description of the preferred process, studied in connection with the disclosure of the accompanying drawing, and from the appended claims.

In the drawing:

Figure 1 is a perspective view of a plywood panel created by scarfing the ends of plywood panels, the scarfed end of each panel being provided with a tenon interlocking the scarfed end of one panel with the similarly scarfed end of the other panel, and treating the joint in the manner hereinbefore described.

Figure 2 is a perspective view of the scarfed ends of plywood panels, illustrating the manner in which the scarfed ends are provided with interlocking means.

Figure 3 is a fragmentary elevation of a joint between the adjacent ends of preformed panels, illustrating the greater thickness of the panel at the joint prior to the application of heat and pressure.

Figure 4 is a fragmentary elevation of a joint between adjacent panels after the application of heat and pressure.

In the present disclosure the "length" of the plywood panel is intended to be that dimension parallel to the grain of the wood veneer forming the face ply; the "width" being that dimension of the panel transversely of the grain of the face

ply.

In the manufacture of plywood panels embodying applicant's invention, preformed, completed, hot pressed panels 1—1 are scarfed at their ends to provide a bevel 2 having an upstanding coak or tenon 3 on the beveled surface, said coak or tenon 3 being slightly closer to the inner end 4 of the bevel than to its outer end 5. The end 5 of the bevel or scarf terminates in a feather edge. When the scarfed or beveled faces of abutting panels are placed in overlapping engagement to form a scarf joint, the off-center position of the coaks or tenons 3—3 will cause each of the feathered edges to overlie the face of the abutting panel beyond the scarf. Moreover, the thickness of the scarf joint between the two panels 1—1 will be greater than the thickness of other portions of the respective panels, the increased thickness being computed as follows: 2 (sin angle of scarf) (distance of coak from center of scarf).

After the panels to be spliced are formed as above described, a resin base glue is applied to the scarfed surface of each panel and the scarf joint by which the separate panels are spliced is thereafter introduced between the heated platens of a hot plate press and subjected to temperatures ranging from 220° to 350° F. during the pressing operation, the amount of heat applied being determined by the type of resin glue employed, and the period of time varying with the thickness of the panel being pressed. The application of heat liquifies the resinous glue, and the simultaneous application of pressure to the joint forces the liquified glue into the pores or cells of the wood where it sets and permanently bonds the abutting panels to form a completed plywood panel of the desired length. The pressure applied by the press in a direction normal to the faces of the panel is transformed by the presence of the coak or tenon 3 into a resultant force which is exerted in a direction normal to the glue line. The coak or tenon resists the vertical force of the press, and so prevents displacement of the abutting panels, and causes the pressure to be applied in a direction normal to the line of cleavage between the panels. The action of the hot plate press serves to compress the wood at the scarf joint to the thickness of the remainder of the panel, thus insuring a satisfactory application of pressure to the joint simultaneously with the transmission of heat from the platens to the resinous glue.

While I have described quite specifically a particular embodiment of the invention, it is to be understood that the foregoing is to be interpreted as illustrative, and not in a limiting sense, except as required by the prior art, and by the spirit of the appended claims.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. The method of splicing completed preformed plywood panels, comprising the steps of forming like scarfs on the abutting ends of said panels, providing each said scarfed surface with a transverse upstanding coak or tenon adapted to interlock with a like coak or tenon on the scarfed surface of the abutting panel for preventing longitudinal separation of said panels upon application of pressure to the joint, positioning each said coak or tenon closer to the inner end of said scarfed surface than to the outer end thereof whereby the thickness of the joint prior to the application of pressure thereto will be greater than the thickness of the panel beyond the joint to insure a satisfactory applica-

tion of pressure to the joint simultaneously with the application of heat to the glue, applying a thermo-setting resinous glue to said scarfed surfaces, overlapping the scarfed ends of abutting panels to make a scarf joint, and applying heat and pressure to said joint simultaneously, sufficient to liquify said glue and force it into the cells and pores of the abutting panels and then cause said glue to set.

2. The method of splicing preformed plywood panels, which comprises providing preformed hot pressed plywood panels with like scarfed end faces, providing the scarfed end face of each panel with a transverse coak or tenon slightly closer to the inner end of said scarfed face than to the outer end thereof whereby the thickness of the joint prior to the application of pressure thereto is greater than the thickness of the panel beyond the joint to insure satisfactory application of pressure to the joint simultaneously with the application of heat to the glue, said coak or tenon adapted to interlock with a like coak or tenon on the scarfed surface of the abutting panel for preventing longitudinal separation of said panels upon application of pressure to the joint, applying a resin base glue to the scarfed end face of each of two panels, overlapping the scarfed faces of abutting panels with said coaks or tenons in interlocking relation to form an interlocked scarf joint, and applying heat and pressure to said joint simultaneously, sufficient to liquify said glue and force it into the cells and pores of the abutting panels and then cause said glue to set.

3. The method of making a plywood panel which comprises providing a relatively long scarf flatwise on the end of each of a pair of preformed panel sections, forming a shoulder intermediate the ends of the scarf and facing toward the body of each section, positioning said shoulder slightly nearer the inner end of each scarf than the outer end, applying a thermo-setting adhesive to the faces of each of said scarfs, placing said scarfed ends in an overlapping face to face relation to form a joint wherein said shoulders engage with each other to cause the combined thickness of said overlapping scarfed ends to be greater than the thickness of either of said panel sections, applying heat and pressure simultaneously to the overlapping portions of said sections to reduce the thickness of the joint to substantially the thickness of said sections and to form a bond, said cooperatively engaging shoulders preventing endwise separation of said panel sections upon the application of said pressure and insuring satisfactory application of pressure to the joint simultaneously with the application of heat to the glue.

4. The method of splicing plywood panels, comprising the steps of providing preformed panels with scarfed end faces, applying glue to said scarfed faces, placing the scarfed ends of panels to be joined in an overlapping relation to form a scarf joint, so forming said joint that the thickness of the joint is greater than the thickness of either of said panels beyond the joint, providing said overlapping faces with interlocking means coextensive with the width of said joint for preventing relative longitudinal separation of said panels during the application of pressure thereto, and applying pressure to said joint and allowing said glue to set.

5. The method of splicing plywood panels, comprising the steps of providing preformed panels

with scarfed end faces, applying a thermo-setting resinous glue to said scarfed faces, placing the scarfed ends of said panels in an overlapping relation to form a scarfed joint, so forming said joint that the thickness of the joint is greater 5 than the thickness of either of said panels beyond the joint, providing said overlapping faces with interlocking means coextensive with the

width of said joint for preventing relative longitudinal separation of said panels during the application of pressure thereto, and applying heat and pressure to said joint simultaneously, sufficient to liquefy said glue and force it into the cells and pores of the scarfed end faces of said panels and cause the glue to set.

MICHEL PASQUIER.