Feb. 20, 1940. C. N. CONE 2,191,070

PROCESS OF MANUFACTURING PLYWOOD

Original Filed Feb. 19, 1935 2 Sheets-Sheet 1

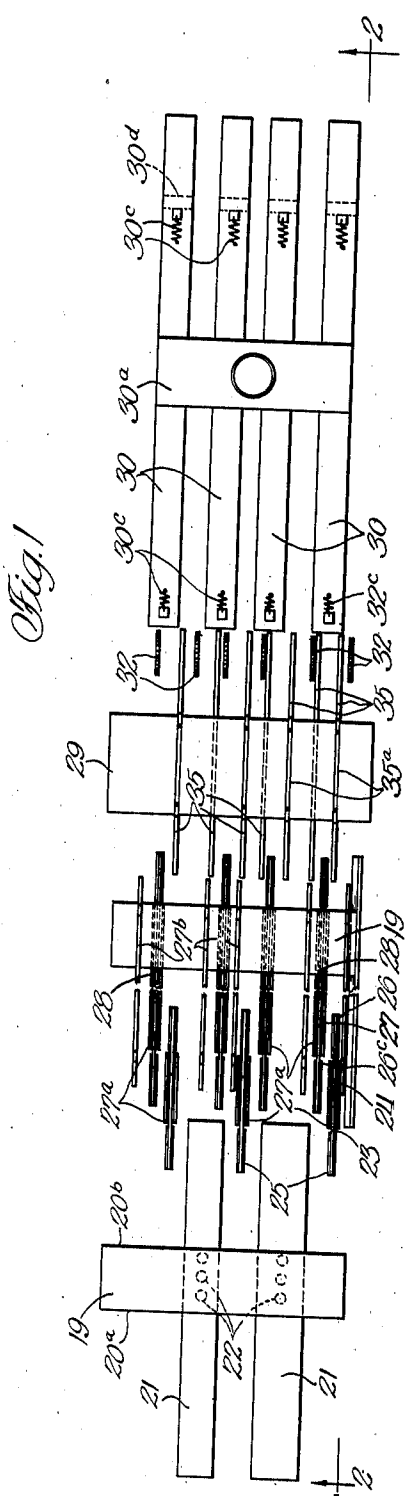


Fig. 1

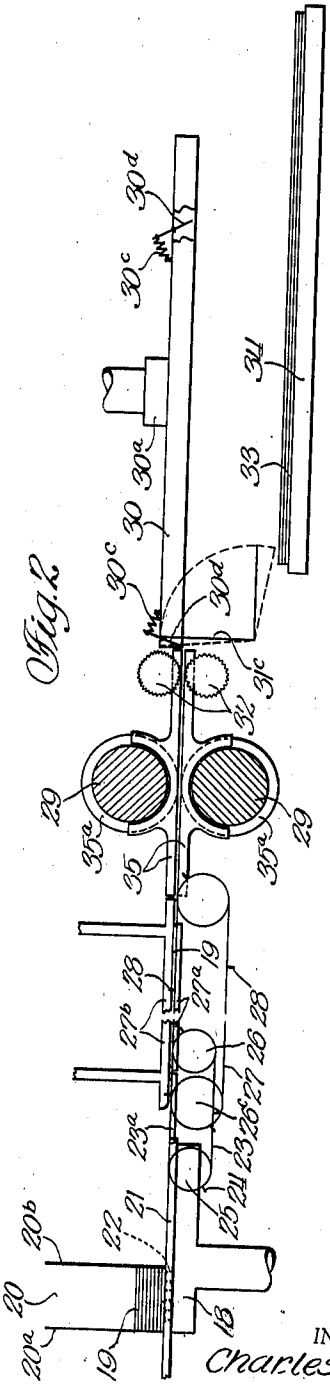


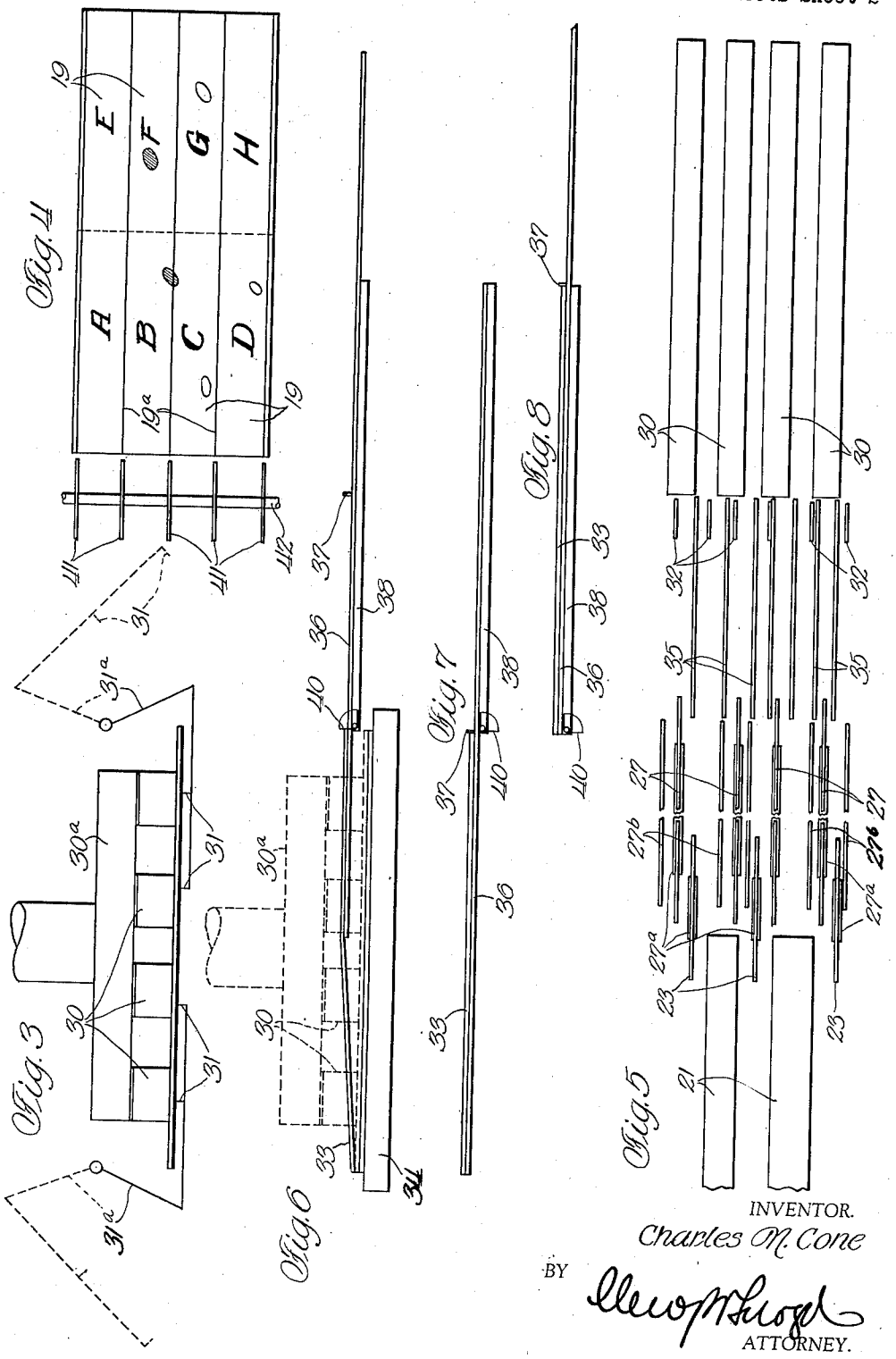
Fig. 2

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PROCESS OF MANUFACTURING PLYWOOD

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6 Claims. (Cl. 144—309)

The present invention has to do with plywood and the manufacture thereof.

The objects of the invention include, among others, the provision of:

A plywood having tight fitting core joints without an excess of glue at such joints, and in which the glue is evenly spread.

An improved process for producing such plywood and in which the time for assembly and the glue consumption are reduced, and in which there is no wiping of glue from the core by the hands of the core layer.

These objects, and such other objects as may hereinafter appear, are obtained by the novel steps of manufacture in the presently discussed process, and by the unique combination of elements constituting the improved plywood herein described.

In the drawings which are made a part of this application, and which are generally schematic:

Figure 1 is a schematic plan of a layout in which the processes hereinafter described may be practiced mechanically.

Figure 2 is a longitudinal section substantially on line 2—2 of Figure 1.

Figure 3 is a transverse section showing the closed position of a core cradle for holding glued core strips, the open position thereof being in dotted lines.

Figure 4 is a plan view of a veneer and illustrates several methods of cutting and ripping it for the production of core material.

Figure 5 is a schematic layout of the parts shown in Figures 1 and 2 showing how large adjustability is obtained therewith.

Figure 6 is an end view showing the face veneer mechanism, midway of the return trip of the cradle and showing in dotted lines the core depositing position of the core cradle.

Figure 7 is an end view showing the face veneer laying mechanism at its fully extended position.

Figure 8 is an end view showing the face veneer laying mechanism in its retracted stage.

Like reference characters are used to designate similar parts in the drawings and in the description which follows:

In making the herein described plywood, pieces of core are disposed upon a conveyor so that they lie flat and side by side. The conveyor advances the pieces with the ends in alignment. The conveyor leads the pieces one after another to the nip of the rolls of a glue spreader, if a glue spreader is employed, as generally is the case. At the glue spreader the pieces are made contiguous at their side edges, if not previously so.

When the selected number of pieces of core that are necessary to make one panel are collected, this group of core pieces is moved forwardly between the glue spreader rolls. The ends of the strip are guided in continued alignment upon emerging from the glue spreader rolls. The core strips with glue applied thereto on both sides are held together at their edges and advanced to a position over a caul board upon which a press load of panels is assembled.

A sheet of face veneer is placed upon the caul board before the core material is deposited thereon. The positioning of the face veneer may be done manually or by a suitable mechanism which moves toward and from the press load. A cradle may be used for handling the face veneer. Generally the motion of such cradle is horizontal and transverse to the direction in which the core veneer moves through the glue spreader.

The core pieces to which glue has been applied are lowered as soon as a face veneer has been laid on the caul board. Members may press the core pieces upon the face veneer. The pressing members may be core holding members. The core holding members, after releasing their loads, are raised into position to receive a succeeding charge of glued pieces of core from the spreader. While the second charge is being loaded, the cradle mechanism (or an attendant) deposits one or two pieces of face veneer (depending whether a three-ply or five-ply material is being manufactured) on top of the glue coated core pieces which have just been deposited in the press load.

The core loading means then discharges onto the last laid or topmost face veneer another ply of glue treated core. The described cycle of operation is repeated until a desired load of panels has been assembled. The different operations, when mechanically performed, are synchronized.

The pieces of core 19 preferably are fed from a hopper 20 and then are guided through a glue spreader. In the several figures in the drawings, the hopper 20 and the mechanism for taking the core pieces out of the hopper are somewhat schematic. Pieces of core 19 are stacked flat one above another in the hopper 20. This stack of pieces is supported by a reciprocating slide 21. The movement of the slide 21 is transverse to the grain of the wood in the stacked veneers. One transverse section of slide 21 contains a number of ports 22 through which air is drawn. It may be desirable to have the slide 21 include a number of perforate panels and these panels

be so arranged that suction may be had through certain thereof or through parts of certain of such perforate panels.

The slide 21 moves across the open side of a suction box 18, closing such side except for the ports 22 in the slide. The back edge 20a of hopper 20 is substantially in contact with the top of slide 21. No veneer 19 may escape between the edge 20a and slide 21. There should be no binding between such parts.

The front edge 20b of hopper 20 is removed from or elevated above the top face of slide 21 a distance slightly greater than the thickness of a strip of veneer 19. Only one strip of veneer 19, therefore, can be drawn under the edge 20b at any one time. Removal of the bottom strip 19 from hopper 20 allows the next succeeding strip in the hopper to drop upon slide 21.

Slide 21, because of displaceable stops on edge 20b of hopper 20, will not displace the bottom veneer 19 from the hopper 20 unless the veneer 19 is held upon the slide 21 by suction through ports 22. Suitable suction means are associated with suction box 18.

When the section containing ports 22 registers wholly beneath the lowermost piece of veneer 19, the lowermost veneer is held tightly thereagainst. It is displaced laterally out of the hopper 20 by lateral movement of the slide 21. The slide 21, before freeing the piece 19, carries it from the hopper to a position where it will be acted upon by chains 23 having lugs 24.

The slide 21 is advanced toward the glue rollers until the piece of core 19 which it bears is in position to be acted upon by chain 23. When advanced to this position, all of the ports 22 in the plate 21, except those comprising a row in the back, have passed over the front edge of the suction box 18 so that a relatively small amount of suction holds the piece 19 upon the plate 21. It is then easy for the lug 24 on the chain 23 to pull the piece 19 free from the plate 21.

If preferred, the suction through box 18 may be intermittent so that such suction is effective only while the slide 21 is advancing toward chain 23.

The endless chain 23, at the beginning of its useful flight, rotates about a guide roller 25, and at the end of its flight rotates about a second guide roller 26. An endless chain 27, having a useful flight that overlaps chain 23, also rotates about roller 26c. The top and useful flights of chains 23 and 27 run along a channel or course 27a.

Over the chains 23 and 27 are guide strips 27b. These are long narrow members suitably spaced apart. They extend in the direction of the chain flight and are parallel thereto. The veneer strips 19 ride on the chain course 27a and are held thereon by the strips 27b when being advanced by chains 23 and 27.

The chain 27 has two lugs 28 which push the pieces 19 of core along the course 27a and into a glue spreader having rolls 29. As the chain 23 pushes a number of pieces of core along the course 27a, spaces are left between the pieces of core. After a selected number of strips 19 have been discharged from the chain 23 onto chain 27, one of the lugs 28 on the chain 27 registers with the last of these pieces 19 and thereafter pushes all of the pieces 19 of core together upon the chain 27 and then through the spreader. As the entire push of chain 27 comes from the plug 28, the preceding strips 19 are kept in edge contact in advancing to and through the glue spreader.

In the meantime, the chain 23 is pushing other strips 19 onto chain 27 back of the first lug 28. Such batch of pieces will be picked up by the next succeeding lug 28 and be advanced thereby through the glue spreader. To vary the number of pieces in each group of strips 19 that is carried through the spreader rolls, it is necessary to change the ratio between the speeds of the chain 23 and the chain 27 as by a gear shift.

The speed of the chain 23 is constant in relation to the reciprocation of slide 21 which picks the pieces 19 one by one out of the hopper 20. The peripheral speed of the glue spreader rolls 29 will always be the same as that of the chain 27.

When the strips 19 have passed through the rollers 29, they will be received onto a core cradle. The cradle schematically illustrated comprises four suction chambers 30. The chambers 30 shown are long narrow box-shaped members open on their under sides. They are connected by a header 30a through which air may be drawn by suction. The long edges of the under sides of the suction chambers 30 lie in a plane and form lines parallel to the direction in which the core strips 19 are moved as they come from the glue spreader rolls 29. The long edges of the chambers bear upon the upper surface of the core strips as the core strips are loaded onto the core cradle.

The glued core strips are supported on their under sides by long narrow members 31 contacting the veneer in straight lines parallel to the direction of the movement of the veneer. Elements or members 31 are supported in place by hook-like arms 31a pivoted at each side of the core cradle. The arms 31a and the members 31 pivot in small circles.

The lines of contact of the long edges of members 30 and members 31 which bear on the upper and lower surfaces, respectively, of the core strips after they leave the spreader rolls 29 are spaced so as not to lie directly across the veneer from each other. By so arranging the guide members, much better guidance of the strips is obtained. The vertical clearance between the contacting surfaces of members 30 and 31 below and above the veneer strip can be adjusted to the exact thickness of the veneer strip to be guided thereby without danger of undue binding due to ununiform thickness of the veneer strips, for in case the thickness of a veneer strip exceeds the vertical clearance between the opposed guides, the veneer is merely slightly flexed.

Pairs of saw-like discs 32 operate upon the glue coated core strips as they emerge from the glue spreader. The discs 32 serve to advance the last core strip in each charge of pieces into position in the core cradle so that the rear edge of the last piece will form an outer edge of the core ply which is assembled in the press load. The rear edge of this last piece is not protected from becoming covered with glue as it passes through the spreader. It is, therefore, desired that this edge should not form a joint within the panel, else such a joint might contain an excess of glue which might cause staining.

It is necessary also that the core pieces 19 be fed forward over the elements or channels 31 to a definite point so that each succeeding group of core pieces will be deposited in vertical alignment with the next preceding group of strips. The lowering and raising of the core cradle is

synchronized with the movements of the chain 27 so that the deposit of one group of strips is completed before a next succeeding charge or group of pieces 19 has been advanced to the receiving end of the core cradle.

While a group of core strips 19 is being fed through the spreader rolls 29 and onto the underside of the core cradle, no suction is being applied to the header 30a. As soon as the whole group of core strips 19 is in position in the core cradle and no longer is moving, suction is applied in the header 30a. This will hold the strips in the cradle. The lower pressure bars 31 supported by hooks 31a then are swung out from beneath the core cradle, leaving the strips therebeneath and held thereon by suction. Such suction holds the glued core strips in contiguity as well as in place.

The core cradle is then lowered so that the core strips are positioned upon a face veneer 33 in the press load being built upon a caul board 34, as previously described. The core cradle does not move straight down but preferably is actuated by cranks 31c to describe an arc. The core pieces 19 held thereon by suction remain in a horizontal plane while the cradle is being lowered. The mechanism for lowering the core cradle is arranged so that if the core pieces contact the top of the press load upon the caul board before the arc of normal movement is completed, the cranks 31c actuating the core cradle may complete their arcuate movements while leaving the core cradle resting upon the press load.

When the cranks 31c have come to the end of their downward arcuate motion, the suction in the header 30a is turned off. The cranks 31c then move back through their arcs and pick up the core cradle from its position of rest upon the press load. The lift of the cradle by the cranks 31c places the cradle in position to receive another charge of glue coated strips 19. The cradle will rest in receiving position until another group of glue coated core strips is fed into position ready to be lowered into the press load in the manner just described.

The cranks 31c actuating the core cradle, as illustrated, swing through an arc of about 105 degrees. A shaft that may be used to actuate the cranks 31c also may be geared to shafts which swing the hook arms 31a supporting the lower pressure bars 31, the connection therebetween being by gears with tooth ratios of twenty-one to twenty-eight so that the hooks 31a swing through an arc of 140 degrees.

The hooks 31a begin their arcuate movement when the core cradle begins its lowering movement. The gear ratio described is necessary so that the hooks 31a will swing rapidly enough to carry the pressure bars 31 out of the path of the body of core strips as the group is being lowered to the press load. The arc described by the core cradle is in a vertical plane parallel to the direction in which the core strips move through the spreader. The arc described by the hook arms 31a is in a vertical plane perpendicular to this direction.

The core strips 19, while they are passing through the glue spreader rolls 29, may be guided. The guides used in the glue spreader comprise thin plates 35, which have straight edges that bear upon the pieces of core in a straight line parallel to the direction of the motion of the strips. The configuration of the members 35 in a direction opposed to the straight edge that contacts the strips 19 is that of a U. The U-section fits into a narrow groove 35a which is formed about the glue spreader rolls 29. The guide members 35 extend to either side of the spreader rolls 29 so that the strips 19 will at no time be unguided as they pass through the spreader. The guides will prevent the strips 19 from buckling and will maintain them in a flat plane while passing through the rolls.

While the core cradle is receiving a load, the face veneer cradle mechanism is actuated. The face veneer cradle comprises a face veneer supporting surface 36 and a lug 37. It operates on a bed 38 over which it moves. A dog 40 that is raised as the cradle is withdrawn from above the press load prevents the face veneer from being withdrawn with the bed 38 and causes the face veneer or face veneers which has or have been moved over the glue coated core strips to be retained for deposit upon the press load. The face veneers 3 are laid upon the cradle surface 36 by an attendant as required. Any suitable means may be employed for moving the cradle over the press load and for thereafter retracting it. The dog 40 may be positively operated or gravity controlled, as preferred.

For varying thicknesses of core strips 19, adjustment is made in the clearance between the reciprocating suction plate 21 and the wall 20b of the hopper 20 beneath which the pieces of core are withdrawn. No adjustment need be made of the vertical clearance between the edges of the channels which carry chains 23 and 27 and the guide strips which bear upon the upper surfaces of the pieces of core being conveyed to the spreader rolls 29 since the guide strips are to be held down by gravity or by a spring action, as preferred. The clearance between the spreader rolls 29 will be adjusted by raising or lowering the upper roll. This adjustment will carry with it the guide members 35 extending partly about the rolls 29.

The core cradle may be adjusted up and down so as to accommodate various thicknesses of core veneer by varying the vertical clearance between the lower edges of the chambers 30 and the upper edges of the members 31, the latter supporting the glue coated core strips from below.

Means may be provided for varying the effective length of the suction chambers 30. This may be done by partitions 30d which drop down across the chambers at points such that the partitions will be about an inch in from the ends of the core strips 19. The partitions 30d and the ends of the suction chambers 30 next to the glue spreader are hinged at the top and swing out at the bottom while the core is being moved into place under the core cradle. This is done to prevent the bottom edges of the ends from scraping the glue from the core strips as they pass under the suction boxes. The ends are held out by light springs 30c. When suction is applied, such suction draws the ends into place, sealing the openings.

For making panels of various widths which require core strips of various lengths, but little adjustment is necessary. The core strips, no matter what their length may be, always travel through the machine with one of their ends in alignment with one of the sides of the machine on which the cradle depositing the face veneers in the press load operates.

The various elements of the machine which operate to move and guide the strips of core into position under the core cradle are so spaced, one with respect to another, that no adjustment is

required for the various lengths of core strips used in panels ranging in width from twenty-four inches to forty-eight inches. The core strips will be two inches longer than the width of the corresponding finished panels and will vary by two inch steps from twenty-six inches to fifty inches. It should be understood that in the plywood industry the "length" of a member is the dimension parallel to the grain of that member. The grain of the core member in a plywood panel is always perpendicular to the grain in the face member. It will be seen, therefore, that the dimension of the core member referred to as "length" is comparable to that dimension of the face member referred to as "width." The plate 21 may have means for employing selected ports 22 as previously indicated. This may be had by sectionizing the part containing the ports 22. For core strips of different lengths, only certain ports are effective.

The tracks or channels which carry chains 23 and 27 are approximately four inches wide. The chains 23 and 27 carry lugs three and one-quarter inches wide. The relative position of the chains and lugs is shown in Figure 2. The guides 35 which pass through the upper spreader rolls and the lower spreader rolls are differently spaced as shown in Figure 1. The upper guides extend far enough in both directions from the spreader rolls that they overlap on the one hand the elements which guide the strips to the rolls 29 and on the other hand, the guides 30 upon the core cradle. The guides through the lower rolls overlap the chain 27 and the runners 31.

No adjustment need be made in the face cradle for varying widths of panels since, no matter what the width, the edge of the cradle will always be laid down on the same line. The edges of the core ply strips on the side toward the glue spreader will also be in the same position, regardless of length of the strips.

Core ply strips are obtained from plywood veneer sheets having clear areas insufficient to make standard size face veneers. Figure 4 shows how a sheet of veneer having both sound knots and open knot holes may be cut into the strips A, B, C, etc., so that the wasted wood will be minimized.

The caul board upon which the press load may rest is upon a hydraulic lift. It should be lowered as the press load is built up to keep the top of the press load at approximately the same height at all times. The ideal height will be such that the core ply strips carried by the core cradle will contact the face ply on the press load when the core cradle has reached the horizontal radius in the arc of its downward motion.

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 process of making plywood comprising cutting a plurality of core pieces from suitable core material, arranging a predetermined number of said core pieces in a plane, bringing each of said core pieces into tight abutting arrangement so that a longitudinal edge of each core piece abuts the longitudinal edges of each adjacent core piece in the assembly, maintaining said tight abutting relationship and spreading a suitable adhesive over the surfaces of said core pieces, removing said core from said plane while maintaining said tight abutting relationship and placing it on a suitable piece of plywood backing material, superposing on the assembly thus formed a suitable piece of plywood face veneer and inserting the entire assembly into a press.

2. In making plywood, the process of making a core of predetermined dimensions which comprises, arranging dissociable strips of wood veneer having parallel edges one after another in a plane, moving a sufficient number of said strips into edge to edge abutting relation to form said core, maintaining said edge-to-edge abutting relationship, applying glue to both faces of said core, and removing the assembled core from said plane into assembled relation with a sheet of plywood veneer.

3. In the process of making a plywood panel of predetermined dimensions, the steps of assembling a plurality of wood veneer core pieces into dissociable compact edge-to-edge relationship to form a core assemblage, applying an even layer of adhesive material to one surface of said core assemblage while maintaining said edge-to-edge relationship with sufficient pressure to prevent the penetration of adhesive material between the abutting edges, and transferring said core assemblage bodily as a unit to a sheet of plywood veneer of said predetermined dimensions.

4. In the process of making a plywood panel of predetermined dimensions, the steps of assembling a plurality of wood veneer core pieces into dissociable compact edge-to-edge relationship to form a core assemblage, advancing said core assemblage through a glue spreader while maintaining said edge-to-edge relationship with sufficient pressure to prevent the penetration of glue between the abutting edges, and bodily transferring said core assemblage to effect a simultaneous, complete, face-to-face contact between said core assemblage and a rigidly inflexibly supported sheet of plywood veneer having said predetermined dimensions.

5. In the process of making a plywood panel of predetermined dimensions, the steps of arranging dissociable strips of wood veneer one after another in a plane, passing said strips through a glue spreader with their adjacent edge surfaces in tight abutting relationship to prevent the penetration of glue therebetween, and placing all of said glue coated strips simultaneously and as a unit on a veneer sheet of said predetermined dimensions.

6. In the process of making a plywood panel of predetermined dimensions, the steps of applying adhesive material to the flat surface of a plurality of dissociable wood veneer core pieces while maintaining adjacent edge surfaces of said pieces in tight abutting relationship to prevent the penetration of adhesive material therebetween, and assembling all of said pieces simultaneously and as a unit into gluing relation with a veneer sheet of said predetermined dimensions.

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