June 9, 1942. D. DESKEY 2,286,068

PLYWOOD PANEL

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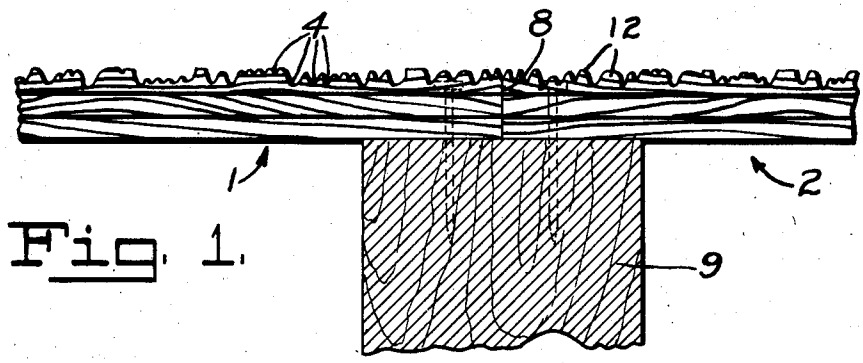


Fig. 1.

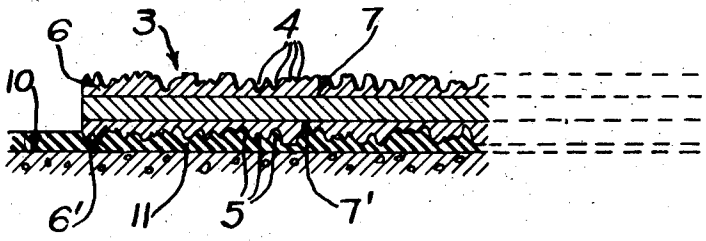


Fig. 2.

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PLYWOOD PANEL

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7 Claims. (Cl. 20—89)

Plywood panels, especially of soft woods, such as Douglas fir, are generally made of rotary-cut veneer, dried, laid up with the grain in the core at right angles to the grain in the faces, and glued together. The largest part of domestic production is of Douglas fir, and of this, three-ply wall board panels 4 feet wide by 8 feet long, constitutes a large percentage.

One of the objections to the use of such panels, in walls, arises from their tendency to separate at their abutting edges, and in the occasional checks and cracks which appear in the surface of the panels. Wood shrinks, in drying, and the panels, though made of dried veneer, nevertheless normally lose moisture after their installation. In the drying out process panels which have been placed in edge-abutting relationship, with their grain generally parallel, will shrink in time, and an open joint is left. This shrinkage is thus manifested particularly transversely of the grain. Shrinkage creates stresses in the various plies. Over their entire area the face plies are subject to stresses directed parallel to the panel's plane and transversely of their grain, resulting in checking or even in cracking, but at their edges in particular do such transverse stresses accumulate to produce an excess of shrinking (or swelling), and resulting edge separation.

Douglas fir, moreover (and like coniferous wood, e. g., pine of various sorts), has very decided graining, particularly when made from rotary-cut veneer, as is practically all commercial veneer. The fibers in the soft spring wood are less closely packed than in the contrasting harder summer and fall growth. The denser summer and fall wood, when subjected to moisture, swells more greatly than the spring wood, and accentuates the grain, making it visible even under paint or other finish coating.

It is often desirable to bend plywood around curves, particularly in executing modern architectural designs, but the stresses thus produced in the convex face ply, and the added present or future tendency to checking, cracking, swelling, and even laminar grain separation, deter or limit such uses, even more than the actual resistance to bending of the core.

I have found it possible to eliminate these stresses, and the deleterious effects thereof, by gouging the surface or surfaces of the panel with a multitude of closely spaced grooves, extending generally parallel to the grain, and preferably of uneven, irregular, and random depth, following no recurring pattern, but sufficiently closely spaced, and having, at sufficiently close intervals, sufficient depth as to cut through the recurring grain layers, and to break up each individual layer and the surface of the panel generally into narrow widths or ribs of uncut wood. Within these narrow widths the stresses which cause the shrinking, cracking, checking, and swelling may not accumulate to such an extent that they may not be relieved within the grooves in the surface.

Accompanying this application is a sample of a piece of plywood, thus grooved, and photographs showing such a panel before grooving and after grooving.

The accompanying drawing attempts to illustrate the appearance of the panels, and the manner in which the objectives are attained.

Figure 1 is an end view of two panels, viewed as in a section through a wall, showing the panels grooved on one surface only.

Figure 2 is a section through a wall, showing panels grooved on both surfaces, and differently supported.

In the drawing the panels 1 and 2 are shown with grooves 4 in one surface only—that surface which is exposed when installed—whereas the panel 3 is shown with grooves 4 and 5 in its opposite surfaces. This grooving is preferably in the face ply 6 or 6' only, and does not extend past the glue line 7 or 7'. The panels 1 and 2 are secured (as by nailing) in edge-abutting relationship (indicated at 8) to a support such as the stud 9. The panel 3 is secured upon a wall surface 10 by a mastic 11 that enters the grooves 5.

The grooving may be done after sanding the panel's surface, but preferably this step is omitted, for the grooving in itself removes tapes and obscures patches, and completely alters the surface. The grooving may thus take the place of the sanding, and no extra handling is necessary. The grooves may be formed in various ways, preferably by planar knives having irregularly serrated cutting edges, but it might be done by a plurality of thin disc-like knives or saws, closely spaced along an arbor. The grooves need not conform, in cross-section, to any particular form, but may be V-shaped, rounded, or individually of different contours. Whatever the instrumentality used, each individual groove should be reasonably continuous and of the same depth, from end to end, through soft spring growth and hard summer and fall growth, for any material discontinuity or variation in continuity, particularly over an appreciable width

or area, will leave an area wherein stresses are cumulative. The grooving operation is performed by moving the panel lengthwise (that is, in the direction of the grain) beneath the rotating grooving tool, or vice versa, to positively remove the wood from the grooves and to leave upstanding ribs. Grooving of one surface only may be sufficient in some instances. In other cases both surfaces are grooved.

This grooving is to be distinguished particularly from grooving, as heretofore practiced, in patterns or groups of grooves, for purely visual effect. The grooving according to this invention is usually distinguished by an absence of any pattern. Moreover it is to be emphasized that while the visual effect is attractively rustic and informal, and does enhance the salability of the product to those who desire such effects, the grooving has as its principal objective the avoidance of undue shrinkage and swelling, and is of value for that purpose, and for the other purposes mentioned, regardless of appearance.

In the patterned grooving the grooves are so greatly spaced apart, and occupy so small a part of the whole surface area, even at the edges, that they have no material effect in preventing the shrinking and edge separation of the panel, or in avoiding the harmful effects of shrinking at or between the edges, whereas these are the principal functional effects arising from the type of grooving herein described, and the results achieved by the herein disclosed grooving have not before been attainable, neither by the patterned grooving nor by any other means or method known to me. If a patterned effect is desired, however, such may be still within this invention, providing the grooves are closely enough spaced, and sufficiently deep, to break up the continuity of the surface laterally, and to adequately groove the edge areas.

The essential of this invention is that the grooves are of such depth, relative to the thickness of the face ply, and are closely enough spaced, that the ribs are of slight width, and the stresses in the gouged surface areas of the face ply are relieved, and can not accumulate to any appreciable extent. Preferably the grooves do not extend to or through the glue line ("glue" meaning any adhesive such as is used or is suitable for use in plywood manufacture), but more or less frequently recurring grooves may extend almost to the glue line, with intervening grooves of lesser and irregular depth. The grooves vary in depth, as the sample and photographs show, from mere surface scratches to grooves of a depth to extend to or past the neutral plane of the grooved face ply (halfway through the ply), some being of a depth approaching the thickness of the ply itself.

The outer surface of the face ply being thus made discontinuous, the fibers in and just beneath the original surface are separated from other fibers at either side and the grain laminas are severed and cut through; stresses arising from shrinkage can not possibly be transmitted nor built up cumulatively in lateral directions. The most they can build up is across the base of each rib, and each such stress is minute; if there are sufficiently deep grooves, sufficiently closely spaced, the cumulative build-up of lateral stresses to an excessive value is very effectively prevented. Each stress is completely absorbed in its own rib or slight width. The individual ribs swell or shrink accordingly, but have ample room for so doing, laterally within the grooves or outwardly from the glue line, but always unnoticeably and harmlessly.

The irregular or "wild" graining of rotary-cut veneer, of fir or like coniferous wood which has pronouncedly different spring and autumn growth, has already been mentioned. Many persons are pleased by this graining; others dislike it. The gouging process destroys the graining pattern, by supplanting it with an obscuring pattern of parallel grooves of irregular or random depth, comparing one groove with another. This might be considered as objectionably monotonous, and hence no improvement on the graining effect, but while the graining is no longer discernible as such, and while there is no part of the surface which is not gouged, in many places where the grooving hits the summer wood there is a very slight alteration in the direction or appearance of the groove, and a break in the grain laminas, so that in the larger piece, there is not the monotony of perfectly straight and parallel lines. This effect is obtained on rotary cut veneer, whereas it would not be obtainable in sawn lumber. The result is a visual impression of pleasing variety, rather than monotony.

It is in the relief of stresses and in the avoidance of checking, shrinking and edge separation that the gouged panels have their greatest functional advantage. Indeed, even should some small edge separation occur between panels, the resulting crack would blend with the grooving, to such an extent that the crack would be virtually unnoticeable. If some laminar separation of the grain does occur, it can only be very small in extent, as compared to smooth-surfaced panels, and less noticeable—indeed, quite invisible. Likewise, if checking or cracking does occur, as it might in isolated instances, the grooving will effectively conceal it.

As has been noted, the grooving may be done only on that surface which is to be visible after installation, and it will serve the intended purposes well. On the other hand, certain other or additional stresses may be relieved if the two surfaces of the panel are thus grooved. A plywood panel, the concealed surface of which is thus grooved, may be held by cement upon a wall. The movement of the cemented surface in shrinking, if it is not grooved, breaks the bond between the panel and its support. A similar panel, the cemented surface of which is grooved, does not break away from the supporting wall, because there is no accumulation of stresses and shrinkage across the cemented surface. This offers a means for attachment and support of such panels where nails and like means can not well be used to support it.

Reference has been made to three-ply panels, to wall-board size panels, to panels the faces of which are rotary-cut, and to fir panels, but these have been referred to chiefly because the invention will find its greatest field of usefulness with such panels, and yet the invention may, with corresponding advantage, be employed with panels of various thicknesses, areas and sizes, of more than three plies, made, in part or wholly, of wood other than the woods specified, and in general, varying from the panels described.

What I claim as my invention is:

1. As a new article of manufacture, a plywood panel having a face ply of rotary-cut wood having pronouncedly different hard and soft growth, and consequent "wild" graining when rotary-cut, the exposed surface of said face ply having a

plurality of substantially continuous grooves of random depth over the surfaces, but each groove being of the same depth throughout its length, frequent grooves being of material depth to pass through any hard growth layer encountered, said grooves extending substantially lengthwise of the grain in said ply, and generally across its width, and being sufficiently closely spaced to localize within the individual ribs or groups of ribs the normal stresses arising from shrinking, expanding and the like, and to prevent accumulation of such stresses across any appreciable width of the ply, and also to largely destroy the normal grained effect.

2. As a new article of manufacture, a plywood panel having a multiplicity of grooves in the exposed surface of at least one of the face plies thereof, frequent grooves being of substantial average depth relatively to the thickness of said face ply, and each groove being relatively narrow and disposed closely adjacent other grooves, all of such grooves extending substantially lengthwise of the grain of the wood, the depth of said frequent grooves and their frequency being such as to prevent stresses, normally arising from shrinking and expanding, from accumulating across any appreciable width of the grooved ply.

3. As a new article of manufacture, a plywood panel having a multiplicity of grooves in the exposed surface of a face ply, said grooves being each sufficiently deep to prevent stresses, normally arising from shrinking and expanding, from accumulating across any appreciable width of the grooved ply, and of uniform depth throughout its length, but of random depth relatively to other grooves, and each groove being relatively narrow, and disposed closely adjacent other such grooves, and all such grooves extending substantially lengthwise of the grain of the wood.

4. A plywood panel as in claim 2, wherein the exposed surface of each face ply is provided with grooves as specified.

5. As a new article of manufacture, a plywood panel having a multiplicity of grooves in the exposed surface of one face ply extending substantially parallel to one edge of the panel and substantially lengthwise of the grain of the wood, said grooves being each of substantially uniform depth throughout its length, and of such depth as to prevent stresses, normally arising from shrinking and expanding, from accumulating across any appreciable width of the grooved ply, but of random depth relative to other grooves, and being each of a width not appreciably exceeding its depth, and spaced without material interval from adjoining grooves.

6. A grooved plywood panel as in claim 5, wherein certain deeper grooves are of a depth approaching or exceeding half the thickness of the grooved face ply.

7. A plywood panel having, across the exposed surface of a face ply, a multiplicity of grooves, extending substantially lengthwise of the grain in such face ply, the grooves being each of substantially constant average depth throughout its length, but of random depth as compared to adjoining grooves, and being each narrow and deep, and closely adjacent other grooves, certain such grooves being so deeply cut that their bottom is closer to the glue line than to the outer surface, and such grooves of all kinds being of sufficient frequency and narrowness, and sufficiently closely spaced, across the panel, to localize stress accumulation within the width between grooves, and within the width between such deeply cut grooves.

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