June 2, 1936. C. B. ARNOLD 2,043,026

BARREL

Filed Oct. 4, 1934

Fig. 1

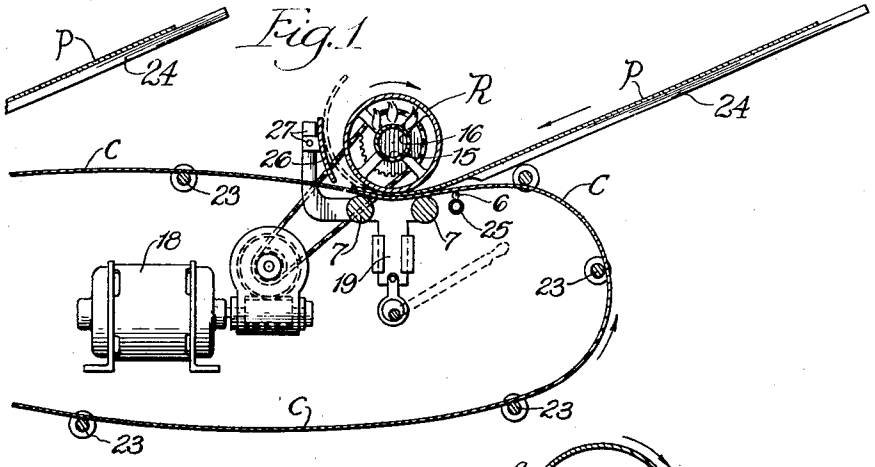


Fig. 2

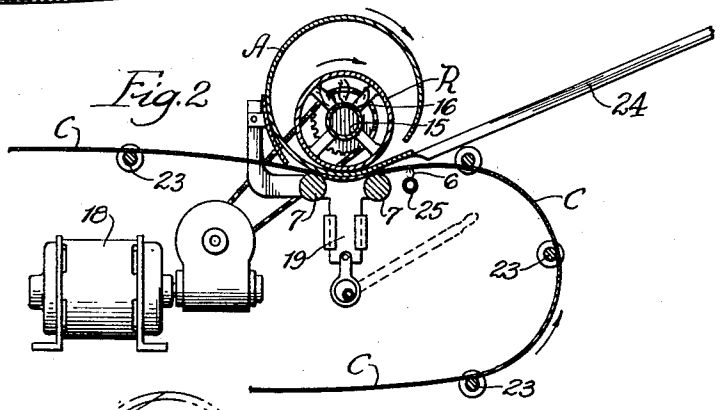


Fig. 3

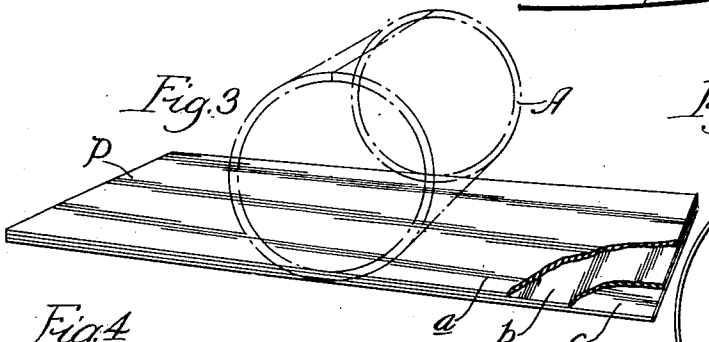


Fig. 5

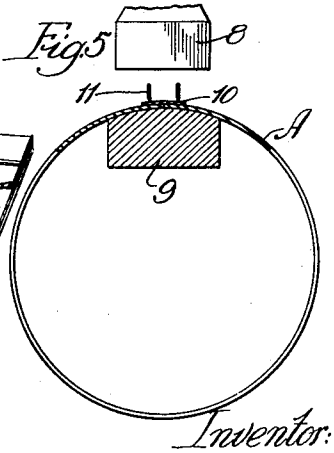
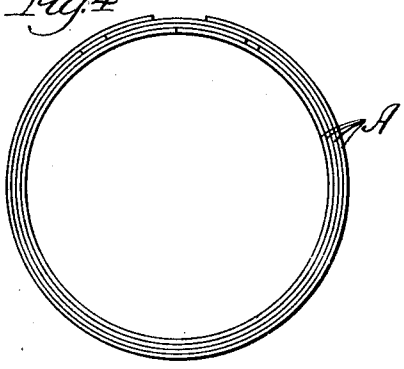


Fig. 4



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UNITED STATES PATENT OFFICE

2,043,026

BARREL

Charles B. Arnold, Chicago, Ill., assignor to Seymour & Peck Co., Chicago, Ill., a corporation of Delaware

Application October 4, 1934, Serial No. 746,772

3 Claims. (Cl. 144—309)

This invention relates to a barrel formed of plywood, and more particularly to certain improvements in the method of its manufacture. The various objects attained by my invention include the production of a barrel from multi-plywood which is even and smooth, interiorly and exteriorly, permitting the close fitting of heads thereto so as to prevent leakage or sifting of loose material; and the steps followed in the making and handling of the barrel shells permitting, as desired, a nesting of several of them for storage, shipment, or other purposes. Additionally, the structure so produced is characterized by improved surfaces both interiorly and exteriorly, possesses a strength beyond that of other generally similar containers, and is susceptible of convenient and expeditious assembly with a consequent minimization of expense. This application is a continuation in part of my application filed October 5, 1931, Serial No. 566,866.

In order that my invention may be better understood, reference will now be had to the accompanying drawing wherein—

Fig. 1 is a fragmentary diagrammatic view of the machine employed to uniformly and progressively apply heat and pressure from the one edge of the square trimmed edge of the plywood panel to the other, and showing the position of a panel entering said machine;

Fig. 2 is a view similar to Fig. 1 showing the position and formation of a panel just prior to the completion of the progressive operation thereon in the machine;

Fig. 3 is a perspective view of a square trimmed plywood panel preliminary to the step of forming shown in Figs. 1 and 2 which results in the formation of the true cylindrical permanently bent shell indicated by dotted lines in this view;

Fig. 4 is an end elevation illustrating several of the shells in nested relation; and

Fig. 5 shows in end elevation a shell with its square trimmed edges in normal abutment upon an anvil of a strip applying nailing or stapling machine.

According to this invention, the barrel body or shell A is formed of multi-plywood made preferably from two or three sheets of veneer which are permanently adhered together over every portion of their contacting surfaces. In the three-ply construction illustrated, the outer sheets *a* and *c* are arranged with the grains running lengthwise, i. e., circumferentially of the cylindrical barrel body to be formed therefrom, whereas the inner sheet *b* has its grain oppositely disposed, i. e., longitudinally of the barrel body. Three sheets having their grains so disposed may be united into a panel or board P by glue or other adhesive following which they are placed in a press to insure perfect bond and flatness. Later the edges of the plywood board are cut, as required, to trim to the proper dimensions.

More specifically the preferred preliminary steps of the process may be carried out as follows: For making a three-ply panel a rotary cut veneer sheet, previously dried to about 12% moisture content and clipped to a size which will permit sawing or trimming after gluing, is passed through two glue rolls which spread a film of waterproof glue covering on each side. A dry face of other veneer sheets to occupy outer positions is then placed against each side of the glued sheet, thus completing the three ply panel. Both outer sheets are so arranged that their grains are parallel, but transversely of the grain of the inner sheet. This operation of assembling veneer sheets into plywood panels is repeated until a "bundle" is completed consisting of a convenient number of panels or boards that can thereafter be put under a pressure of from 100# to 200# per square inch to be held by retaining clamps for from seven to twenty-four hours until the glue has set.

The panels are next taken out from under pressure and sawed to exact size, extreme care being taken that each panel is true as to its width and length; a correct width so that the butt joint will be even and uniform and the adjacent ends at the top and bottom of the butt joint will be even, and a correct length so that the diameter of the barrel produced from such a panel will be of a predetermined size. Inasmuch as approximately ten to fifteen percent of moisture has been added to the plywood from the water in the glue mixture, the panel is next dried to about 15% moisture content by placing sticks between adjacent panels.

The plywood panel so formed with the glue set therein is perfectly flat and of maximum strength due, in part, to the disposition of the grains of its component sheets. It is susceptible of bending, however, when subjected to heat and pressure in the manner hereinafter described. This is accordingly the next step—the forming of the panel to fix a permanent and uniform curvature from edge to edge thereon, the material being thereby formed into a permanently fixed cylindrical shell, as shown in Figs. 3 and 4.

The preferred step of forming the processed

panel into a permanently fixed cylindrical shell may be carried out as follows:

The completed panel may be passed through a special forming machine progressively from one trimmed edge of the board to the other, as shown diagrammatically in Figs. 1 and 2. In this movement, it is fed in a direction which is parallel to the grains of its outer plies. The forming machine is provided with a conveyor band C heated as at 6 at a point about one foot from where the panel engages a pressure roll R. In this manner, the fibres of the board are preheated. The pressure, heat and speed of the machine is predetermined to insure the production of a perfect shell or cylinder of a certain diameter. For example, for a twenty-one inch diameter cylinder, the temperature of the pressure roll is approximately 300 degrees F., the speed of the machine about one foot of panel per minute and the pressure on $\frac{3}{16}$" thick stock calculated at about 135,000 pounds per square inch.

At points below the pressure rolls are spaced idler rollers 7 upon which rests the conveyor band. The disposition of these idlers with reference to the pressure roll is such that the band bends downwardly and thence upwardly in passing between these points. The panel is accordngly required to bend similarly under conditions of heat and pressure, as above indicated, and thereby acquires a desired cylindrical set. During travel of the panel under the pressure roll, the fibres of the panel are softened somewhat, due to liberation of the moisture therein. The cylindrical form imparted to the panel will accordingly remain indefinitely without change.

As a result of this treating operation, the fibres of the individual plies of the board are independently expanded or contracted, according as they occupy outer or inner positions, and fixed in such condition, so that the trimmed board ends remain square cut as before. When the cylinder has been completed, the moisture is about 7%, and the shell is then taken off to cool and set.

With reference to the steps of the process, as above defined, it is essential to saw the panel after it has been assembled, glued and placed under pressure to permanently set the glue, because, if the veneer sheets were cut to exact dimensions before gluing, it would be impossible to assemble with the edges remaining even. This is due, in part, to the slippery character of the glue, when liquid, permitting the layers of veneer to slide and move away from their initial positions relative to each other. A drum of merchantable character could hardly be made from such a panel. It is further essential that the heat and pressure be progressively and uniformly applied from one square trimmed edge to the other in the manner set forth in order to produce the permanently fixed and true cylindrical shells, the trimmed edges of which remain substantially in normal abutment.

Due to the manner in which the board plies are arranged, assembled and bent, each shell will retain indefinitely its cylindrical shape without reinforcement. In addition, the grains of the inner and outer plies, being circumferentially disposed, are required to bend in conformity with the cylindrical curvature which is imparted to the plywood. This takes place without surface distortion or separation of the wood fibres. The surfaces of the veneer sheets being smooth prior to assembly into a plywood board, it follows that these surfaces will remain smooth after the board is bent to cylindrical form. Splitting or splintering of the exposed plywood surfaces, with possible detriment to the barrel contents is thereby avoided. In addition, the retention of these smooth surfaces will permit the application to the barrel of linings, labels, and the like with greater security.

In the manufacture of the barrel shells, it may be of advantage to produce one size only for a considerable time rather than to make up a number of different sizes concurrently. In so proceeding, a number of barrel shells, all the same size, may be nested together by slightly springing the bodies, as illustrated in Fig. 4. The nested bodies may then be set aside so as to occupy a minimum of space pending subsequent need for them. If desired, these shells, together with others differing slightly in size, may be nested the same way for storage, shipment, or other purposes.

Since it is desirable for economical transportation and storage, and also for uniform diameter, that these cylinders or drum shells be nested, a series of over-bent and under-bent shells are made (over-bent so that the ends lap, under-bent so that the ends gap), and while the shells are still warm and the material pliable, this nesting is accomplished by over-bent shells being nested on the inside of the bundle and the under-bent shells on the outside. By so nesting the shells, any tendency away from true cylindrical form is opposed. The bundle or nest of the shells may then be set aside to cool and set.

The barrel shells produced and handled as above described, will, when unnested, assume substantially their original cylindrical shape and form. Each shell is next operated upon by a nailing or stapling machine 8. For this purpose, the meeting ends of the shell are rested upon an anvil 9 (see Fig. 5). A strip 10, preferably of sheet metal, is then laid over the shell at the seam, and the machine is operated to drive nails or staples 11 through the strip and shell by which to securely join the ends thereof in butt relation. The strip so applied makes a joint which is close and neat. If desired, upon the interior of the shell a tape of paper, fabric, or the like, may be adhered along the seam to further close the joint and prevent leakage or sifting of loose material from within the barrel.

In the preferred form of shell forming machine shown more or less diagrammatically in Figs. 1 and 2, I utilize a pressure roll R which is open-ended and journaled to revolve about a hollow shaft 15 having rows of gas burner openings 16 positioned to direct flames on the inner cylindrical surface of the roll. This roll is preferably driven by means of a sprocket and chain gearing, which gearing may be driven by a suitable source of power 18. Beneath the roll is a vertically adjustable support 19 for the idler rolls 7 which may be of relatively small diameter. The endless steel conveyor band C which may be substantially the same in length as the rolls, is mounted upon suitable guiding supports 23, which support the band directly between the opposed surfaces of the pressure and the idler rolls R and 7, respectively. Slightly in advance of the idler rollers and beneath the panel feeding incline 24 and conveyor band is positioned a second gas burner 25 having rows of openings arranged to direct flames on the underside of the steel band at the point 6 prior to movement of the band beneath the heated pressure roll R. A vertically and upwardly curved guide 26 is mounted in spaced relation to the rear side of the pressure

roll upon a support 27 extending above the sides of the band from the vertically adjustable support 19 for the idlers.

Experience has demonstrated that the barrels of this invention may be produced expeditiously and economically. In some places, it may be preferred to unite the veneer sheets into a unitary plywood board, trim the board to the required dimensions, and then form the board into a cylindrical shell to be nested with other like shells for shipment to an assembly point. The space occupied by the nested shells during such shipment is, of course, less than would otherwise be required. Where all production operations from beginning to end are carried on in the same premises, economy may often be effected in making shells of certain sizes before proceeding with others, or before commencing the later operations of joining the shell ends and fitting thereto the hoops, stays and heads. All such manufacturing advantages are possible with the barrel of this invention due to economization of space through nesting of the made-up shells. In addition, the strength, endurance and tightness of the barrel is far beyond that which is usual. For example, a barrel of standard dimensions is capable of withstanding external pressure across the ends up to 10,000 pounds, and along its side, from end to end, of nearly 6,000 pounds with deflection of less than one inch. When subjected to even such stresses, there is no resulting damage.

I claim:

1. The method of forming a cylindrical plywood barrel shell which comprises adhering veneer sheets over every portion of their contacting surfaces with the grain of one sheet extending transversely of the grain of the sheet adhered thereto, pressing the sheets while uniting to permanently set the glue therein and insure perfect bond and flatness of the combined sheets, trimming the edges of the combined sheets to provide a plywood board of desired dimensions, and thereafter bending the board while uniformly and progressively applying heat and pressure between rollers from one trimmed edge of the plywood board to the other to redistribute and fix the fibres of the united sheets to produce a cylindrical permanently formed shell having its outer portion expanded with respect to its inner portion so that the abutting edges remain as trimmed.

2. The method of forming a cylindrical plywood barrel shell which comprises adhering three veneer sheets over every portion of their contacting surfaces with the grain of the outer and inner sheets extending transversely to the grain of the intermediate sheet, pressing the sheets while uniting to permanently set the glue therein and insure perfect bond and flatness of the combined sheets, trimming the edges of the combined sheets to provide a plywood board of desired dimensions, heating the plywood board and thereafter passing the board between rollers while uniformly and progressively applying heat and pressure from the rollers to opposite faces of the board in the direction of the grain of the outer and inner plies and from one trimmed edge of the board to the other to redistribute and fix the fibres of the united plies, whereby to produce a structurally reinforced cylindrical barrel shell having its outer portion expanded with respect to its inner portion so that the free abutting edges remain as trimmed.

3. As an article of manufacture, a permanently bent integrally strengthened cylindrical barrel shell formed from a flat plywood panel in which the plies are permanently adhered against slippage and trimmed to uniform dimensions with the grain of one ply extending transversely of the ply adhered thereto, wherein the adjacent fibres of the superimposed portions comprising the plywood cylindrical shell are compacted and positively interconnected from edge to edge in such compressed and expanded condition respectively that the free longitudinal edges of the shell remain as trimmed, whereby the shell is transversely strengthened through interlocking of the fibres of the plies and the said longitudinal edges held in abutment.

CHARLES B. ARNOLD.