Aug. 11, 1936. T. D. PERRY 2,050,461

BARREL

Filed Dec. 21, 1933

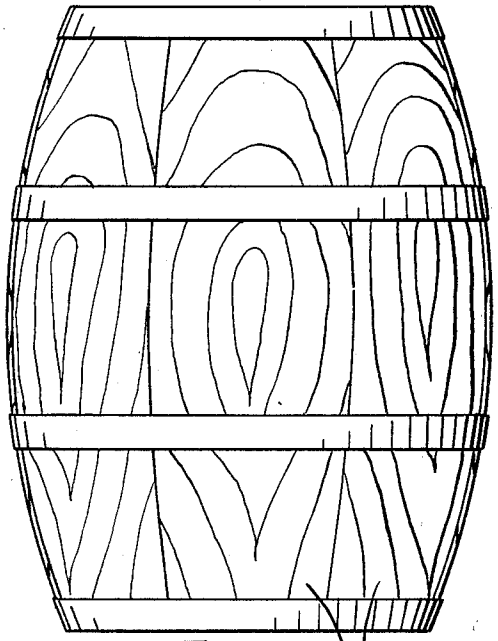


Fig. 1.

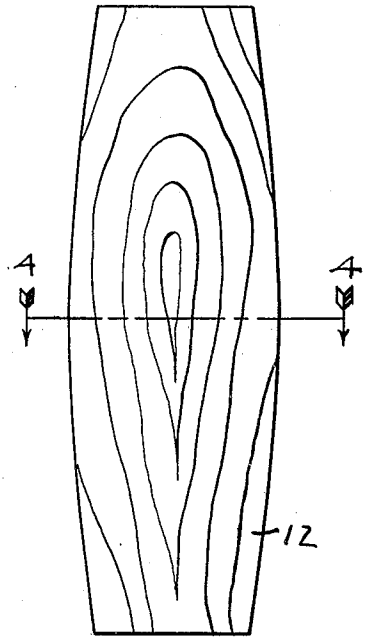


Fig. 2.

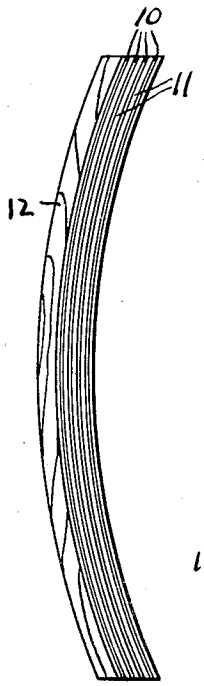


Fig. 3.

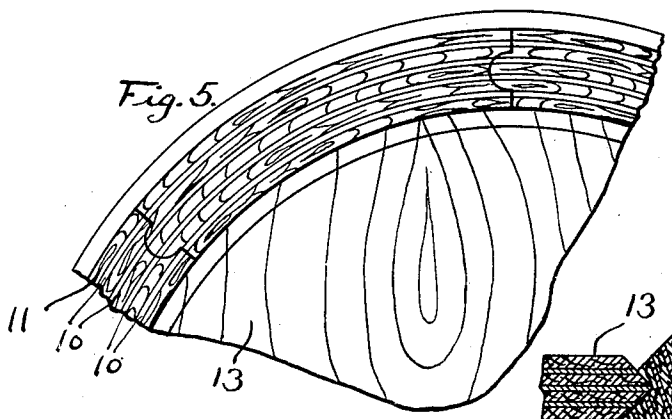


Fig. 5.

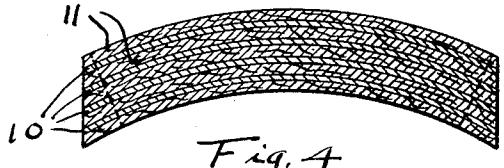


Fig. 4.

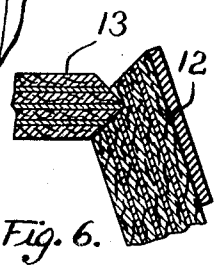


Fig. 6.

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UNITED STATES PATENT OFFICE

2,050,461

BARREL

Thomas D. Perry, near New Albany, Ind., assignor to New Albany Veneering Company

Application December 21, 1933, Serial No. 703,330

11 Claims. (Cl. 217—72)

This invention relates to barrels of both the tight and slack type, in which the staves are made of plywood or laminated wood. When timber is cut for staves, it requires a considerable length of time for the wood to season before it is safe to utilize it. Should the seasoning be speeded up by artificial drying, it often happens that the wood becomes brittle and under the pressure of the hoops, the staves will crack and break transversely. Also certain kinds of wood such as white oak which is used in making whiskey barrels is becoming scarce and what is available is not of a quality as good as is desired. Moreover when spirituous liquids are to be contained in barrels, a loss in evaporation generally occurs in that the porosity of the wood allows the escape of the alcohol therethrough. In employing solid wood staves, the assembly of such staves into barrel requires considerable bending of the individual stave to bring them around into the desired shape and into contact laterally one with the other as the hoops are forced over the staves. This action of the hoops puts the individual staves under considerable stress which is obviously undesirable.

A primary object of my invention is to provide a stave wherein the desired species of wood may be employed on the inside and on the outside of the stave with intermediate plies of other species which may not be as expensive or which may be secured more readily and wherein the stave is preformed to substantially the shape it will be required to assume when incorporated in the barrel. It is a further important object of my invention to provide a stave wherein there is incorporated a non-porous wall to prevent evaporation of the barrel contents through the wall. A still further important object of my invention is to provide an adhesive between the plies of the stave which will indurate the wood for at least a slight distance from the faces of the plies whereby the wood itself is strengthened as well as bonded with the wood of the adjacent ply. A still further important advantage of the invention is to provide in combination with the wood a bond or adhesive between the plies thereof which not only forms a non-porous wall and not only serves to strengthen the wood, but also is heat resistant in that where the barrel is to be employed to contain whiskey and the inner ply is made of white oak, this oak may be charred in the usual way without damaging the adhesive which secures that ply of oak to the next or under ply.

Another advantage of my invention lies in the fact that by means of the particular combination employed, the staves neither shrink nor swell to such an extent that seepage or leakage is occasioned although the barrels stand idle over periods of time. This is important when the barrel is to be used, for example, as a container for beer since by employing my invention, it is not necessary to apply pitch to the inner side thereof.

The invention may be incorporated in two types of staves, namely a laminated stave and a plywood stave. By laminated stave, I mean a stave having layers of wood veneer arranged to have the grain of each layer in parallel relation to the grain of the other layers. By a plywood stave, I mean a stave having alternate layers of wood veneer arranged to have their respective grains turned at angles one to the other. In the laminated stave, it is obvious that with parallel grains, the stave will shrink and swell to an extent intermediate between solid wood and plywood. In the plywood stave, the shrinkage and swelling will almost be wholly eliminated and the interlocking feature of the end fibers of cross layers will be in full effect.

These and many other objects and advantages will become apparent to those versed in the art in the following description of the invention, one particular form of which is illustrated more or less diagrammatically in the accompanying drawing, in which

Fig. 1 is a side elevation of a barrel;

Fig. 2, an outer side elevation of a single stave;

Fig. 3, an edge elevation of a stave;

Fig. 4, a transverse section on the line 4—4 in Fig. 2;

Fig. 5, a detail in end view showing an interlocking joint between adjacent staves; and

Fig. 6, a detail in vertical section of the barrel head lock with the barrel stave.

Like characters of reference indicate like parts in the several views.

It is to be understod that my invention applies to barrels in general and as above indicated may be utilized in either slack or tight cooperage. As one particular embodiment of my invention I shall herein describe and refer to a barrel such as may be employed to contain whiskey during a mellowing and aging process, which type of barrel perhaps represents one wherein the requirements are most exacting to produce a usable product. In this type of barrel it has always been deemed necessary to employ white oak in order that the whiskey contained therein may be mellowed through action of the tannic acid and other wood chemicals carried by the oak. Therefore, in order to have an exposure of white oak on the

inner side of the barrel, I select a number of plies of wood for my stave of a plurality of layers with the inner ply being white oak. The thickness of these various plies and the number used will depend upon a number of factors, namely the degree of curvature which the stave is to assume; the length of stave; and the strength of the stave to meet the conditions to be imposed. In other words the exact number of plies is variable and determined by consideration of the factors enumerated but is generally more than three.

A suitable adhesive is employed to cause adherence between the plies. The type of this adhesive is extremely important. The adhesive employed must not only be water and spirit proof but also must be free from odor and taste so that whatever may be carried within the barrel may not be contaminated by odors or taste imparted thereto from the adhesive. This is particularly important where the barrel is to be utilized as a food container. It is of course within the realm of my invention to utilize the barrels to carry alcohol, beer, wine, whiskey, sugar, and in fact any product capable of being packed in barrels. The salt water or brine, for example, as employed in preserving fish presents another example wherein much difficulty is ordinarily encountered in preventing seepage of the brine in the container.

In addition to the qualities above set forth as being required of the adhesive, it must be nonporous, capable of indurating wood, and must resist heat to the extent that, in the case of the whiskey barrels, the oak may be charred without damage to the adhesive behind it. I find that a class of synthetic resins such as the condensation products of phenol formaldehydes when rendered odorless and tasteless provides adhesives meeting the requirements. One particular synthetic resin well adapted for use as an adhesive in my stave of a plurality of layers is a urea aldehyde condensation product as described in the U. S. Patent No. 1,355,834, issued October 19, 1920, and in the British Patent No. 151,016, of September 14, 1920.

I am not claiming any particular adhesive as my specific invention but do require an adhesive of the qualities above set forth plus that quality of being thermo-plastic and thermo-setting to make my invention effective. A casein or other adhesive meeting these requirements could be employed as well as that class of synthetic resins above indicated.

The synthetic resin above indicated may be had in a powdered, liquid or colloidal, and film or sheet form. The liquid or colloidal synthetic resin may be either a solid suspended in any suitable liquid as a mechanical mixture or a water soluble resin dissolved in varying proportions. When the sheet form is employed, a sheet is laid between the veneers or plies of my stave of a plurality of layers which are selected to have the proper moisture content wet enough to produce a firm bond and not wet enough to cause steam blisters or other damage in pressing under heat. In using the powdered form, the powder is spread or sifted onto the plies in the presence of a vapor or moisture such as steam or atomized (sprayed) aldehyde or caustic soda solution. In using the liquid or colloidal form, I spread the adhesive over the veneer and then dry it to secure a moisture content within the limits above stated in the operation to follow.

With the adhesive 10 placed between the veneers 11 as above indicated in any one of the forms, the veneers or plurality of layers of my stave are carried to a press where they are placed between male and female plates or dies which have been formed to have the compound curvature required to define the curvature of the stave. Both of these plates or dies are heated so as to present heated surfaces against both the top and bottom sides of the pile of veneers. The two heated plates are then relatively brought together to compress the veneers therebetween to set up some pressure in the order of 200 to 300 pounds to the square inch on the veneers simultaneously with the application of the heat. This application of pressure and heat is maintained until the adhesive between veneers polymerizes and sets, whereupon the plates may be separated and the stave removed without having to wait for cooling of the plates since the adhesive employed has that quality of being thermo-setting.

By reason of the pressure employed in making my stave of a plurality of layers of veneer, the wood adjacent the adhesive and the veneer on either side becomes indurated, the fibers thereof while in the compressed state becoming embedded and surrounded in effect by the adhesive so that the strength is greatly increased. This type of adhesive actually permeates the veneer for a slight distance to effect the induration. In the pressing and heating operation, the various veneers or plies are bent around to assume both the longitudinal and lateral curvature as they will have when in the finished stave 12 and in the barrel. These curvatures are maintained by the adhesive when it polymerizes and sets. The widths and/or lengths of the veneers employed will depend upon the width of staves desired. For example, Fig. 2, the width herein shown is for a single stave although where narrower staves are desirable, this one stave may be utilized as a blank and cut into narrower staves. In any event, after the pressed blank is taken from the press, it is trimmed and machined as is done with solid staves. Being preshaped, no steaming of the stave is then required to bring it around into shape in the barrel when the hoops are driven down thereover. The staves may then be assembled in the usual barrel machinery in a much simpler manner than where solid staves are employed. Where the staves are to have a considerable degree of curvature, more and thinner plies are employed than where the staves assume straight or nearly straight forms.

In the laminated stave of the plurality of layers which is the one having parallel grains in adjacent layers of veneer, the stave will be preshaped, indurated, and held in shape by the intervening layers of the bonding material so that the curvature will be fixed. In the plywood stave which is the one having non-parallel grains in adjacent layers of veneer, the stave will be also preshaped, indurated, and held in shape by the intervening layers of the bonding material, and in addition, will possess the interlocking feature of end wood fibers which provides a more or less knitting action between adjacent staves in the barrel by reason of these end grains being exposed, since the end grain will spring back slightly in cutting and subsequently extend beyond the normal line of cutting. This action applies in both the straight and interlocking edge forms of staves.

In the plywood stave of a plurality of layers, the grains of adjacent layers of veneer being nonparallel, the swelling and contraction of the stave of a plurality of layers as such is restricted so

that there is less tendency for a barrel made of these staves to open up after once assembled. The laminated staves would be subject to about the same shrinkage as occurs in a solid stave.

An additional property secured by use of the particular type of stave with the various plies thereof being bonded by the resin adhesive indicated, is that of resistance to mold and fungus growth. After the barrel staves have been assembled, as for example in a whiskey barrel, the interior surface being of white oak, this oak may be charred in the usual manner without causing any damage to the bond thereunder since it is of that type which is infusible once it is polymerized.

Since each individual stave 12 has been preformed in the press, the possibility of fracture as occurs in the solid stave when bent is eliminated. Where desirable, the abutting lateral edges of the staves may be matched as indicated in Fig. 4 although the joints between staves may be made on radial planes exactly as in the case of the solid staves.

It is thus to be seen that by the structure I have shown and described, it is entirely possible to make up a barrel from individual staves of a plurality of layers of veneer each of which is preshaped and definitely held in that shape by means of bonds between the plies of the stave which not only strengthens the stave but also provides an impervious wall. Moreover the desired exposure of wood may be obtained by employing a thin veneer in place of having to make the entire stave thereof so that a considerable saving in time and expense is occasioned since it is not necessary to wait for the seasoning of the solid staves.

Much experimenting has been done in trying to develop barrels particularly of a type to contain beer. Along this line barrels are being produced made out of metal and porcelain lined or internally coated with some other protective substance. Such barrels of course present the problem of having walls of great heat conductivity and of having an inner lining which will chip off should the barrel be dropped. My invention provides a structure which may be well utilized to contain beer in that the barrel is built up from staves with wood surfaces of low heat conductivity and free from danger of fracturing either of inner or of outer surfaces or of the stave itself. It is to be noted that while the bonding adhesive employed is somewhat rigid, when combined with the veneers of wood, the desired resilience is preserved.

The adhesive when polymerized and set is elastic and when bonded with the wood there is a combined elasticity which is of considerable advantage in preventing fracture of the staves in rough usage of the barrel.

There is no danger of outside oils or liquid passing through the barrel made of my staves of a plurality of layers to contaminate the contents and neither is there the possibility of the adhesive contaminating the contents or imparting an odor or taste thereto.

So far nothing has been said as to the formation of the barrel heads. These heads 13 may be made up in the usual shape out of plywood or laminated wood in the flat form with the same type of adhesive being employed to effect the bonding together of the plurality of plies or laminations. As indicated in Fig. 6, the staves 12 are notched to receive the peripery of the head 13 therein. Obviously the solid type head may be employed but the advantages of the bonded wood would be lost. There is also an advantage to be derived in employing my invention of a stave of a plurality of layers in that the inner and outer surfaces or either one of such surfaces may be made out of the species of wood desired, in most cases a hard wood, and the inner plies or core may be made out of softer woods which are not only generally cheaper and easily attained, but also provide more resilience with less danger of fracture in the finished barrel.

An additional advantage I secure by my invention of a stave of a plurality of layers is found in the fact that I change the relationship of the grain in the wood which is exposed within the barrel as compared to that in the solid stave. In producing the solid wood stave, the wood is skived in the forming of the curvature of the stave in such manner that ends of the grain of the wood are exposed on the inner stave surface particularly above and below the barrel center so that the alcohol or liquid in the barrel may enter the wood along these exposed end grains and follow them as capillaries to bleed from the exposed ends of the grains on the outside of the barrel.

In shaping the stave of a plurality of layers of my invention, the grain of the inner layer of wood is maintained parallel to either of the two curvatures and is not exposed by its ends on the inner surface of that layer, thereby, by reason alone of that arrangement, the grain does not set up a longitudinal capillary action.

While I have herein shown and described my invention in more or less minute detail, it is obvious that structural variations may be employed without departing from the spirit of the invention and I therefore, do not desire to be limited to the precise form shown and described beyond the limitation as may be imposed by the following claims.

I claim:

1. A veneer barrel stave comprising a plurality of plies of wood preformed to the required stave shape, said plies being bonded one to the other by a synthetic phenolic resinous adhesive, the adhesive forming an impervious, chemically inert wall covered by wood, the adhesive serving as a bond to maintain the plies in the predetermined stave shape comprising a compound curve with longitudinal and lateral curvatures.

2. A barrel having a composite wall with inner and outer surfaces of wood veneer, preformed to the required shape of the wall, and an intermediate wall bonded with the wood to form an integral wall, said intermediate wall being water insoluble, and comprising a pressure and thermoset synthetic resin said preformed stave shape comprising a compound curve with longitudinal and lateral curvatures.

3. A barrel having a composite wall with inner and outer surfaces of wood veneer, and an intermediate wall bonded with the wood to form an integral wall, said intermediate wall being water insoluble, chemically inert and impervious, and said wood being preformed to the shape of the barrel wall and indurated adjacent said intermediate wall the preformed shape comprising a compound curve with longitudinal and lateral curvatures.

4. A barrel having a composite wall with inner and outer surfaces of wood veneer, and an intermediate wall bonded with the wood to form an integral wall, said intermediate wall being water insoluble and impervious, said composite wall being formed from a plurality of staves each

preshaped with longitudinal and lateral curvatures, each of which staves holds its preshaped form by bonding of the wood to said intermediate wall.

5. A barrel comprising a plurality of veneer staves held together by hoops, each stave having a preformed compound curvature embodying both longitudinal and lateral curves, an inner ply of wood, a wood core and an adhesive bonding the inner ply to the core, said adhesive being water insoluble and of sufficient thickness to form a wall retaining the inner ply and core in said curvature, and said adhesive permeating the wood sufficiently to cause an induration thereof adjacent said wall, whereby said barrel may have an inner wood surface combined with a barrier therebehind to prevent seepage and evaporation through the staves.

6. A barrel comprising a plurality of veneer staves held together by hoops, each stave having a preformed compound curvature embodying both longitudinal and lateral curves, an inner ply of oak, a wood core and a synthetic phenolic resin adhesive bonding the oak to the core, said adhesive being of sufficient thickness to form a wall retaining the oak and core in said curvature, and said adhesive permeating the wood sufficiently to cause an induration thereof adjacent said wall, whereby said barrel may have an inner oak surface combined with a barrier therebehind to prevent seepage and evaporation through the staves, said adhesive being impervious and chemically inert.

7. A barrel comprising a plurality of veneer staves held together by hoops, each stave having a preformed compound curvature embodying both longitudinal and lateral curves, an inner ply of wood, a wood core and a phenolic resin adhesive bonding the inner ply to the core, said adhesive being of sufficient thickness to form a wall retaining the inner ply and core in said curvature, and said adhesive permeating the wood sufficiently to cause an induration thereof adjacent said wall, whereby said barrel may have an inner wood surface combined with a barrier therebehind to prevent seepage and evaporation through the staves, said core being made of a wood softer than that of said ply of wood, and an outer ply of wood bonded to said core by an adhesive.

8. A wood veneer barrel stave preformed and fixed as to final curvature both laterally and longitudinally formed out of a plurality of layers curved longitudinally and laterally in performing the stave, having the stresses set up by the compound bending distributed and carried by relatively thin wood members spaced apart one from the other by non-stressed phenolic resin bonding members.

9. A wood veneer barrel stave preformed and fixed as to final curvature both laterally and longitudinally formed out of a plurality of layers curved longitudinally and laterally in preforming the stave, having the stresses set up by the compound bending distributed and carried by relatively thin wood members spaced apart one from the other by non-stressed phenolic resin bonding members, said wood members being arranged to have their grains parallel in adjacent layers.

10. A wood veneer barrel stave preformed and fixed as to final curvature both laterally and longitudinally formed out of a plurality of layers curved longitudinally and laterally in preforming the stave, having the stresses set up by the compound bending distributed and carried by relatively thin wood members spaced apart one from the other by non-stressed phenolic resin bonding members, said wood members being arranged to have their grains non-parallel in adjacent layers.

11. In a composite veneer barrel stave having a curvature, a plurality of plies of wood preformed to the curvature of the stave, and a bonding wall of phenolic resin between adjacent plies maintaining said curvature, the inner ply of wood being arranged to have its grain follow the curvature whereby capillary action longitudinally of the stave is prevented as would tend to carry liquids from within the barrel in which the stave may be incorporated, the stave being preformed by curving it both longitudinally and laterally.

THOMAS D. PERRY.