Oct. 28, 1941. A. W. ASHLEY 2,260,652

WOODEN TANK

Filed Oct. 25, 1937 2 Sheets-Sheet 1

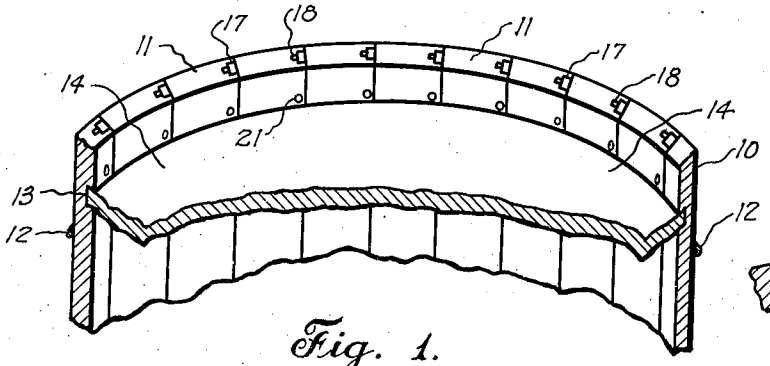


Fig. 1.

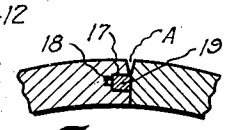


Fig. 4A.

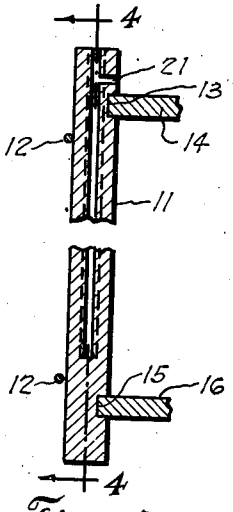


Fig. 3.

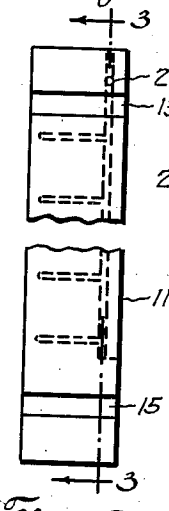


Fig. 2.

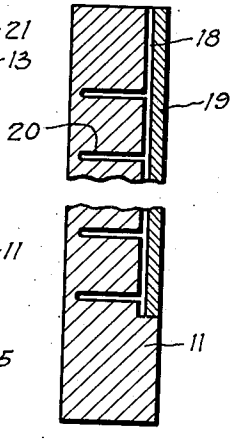


Fig. 4.

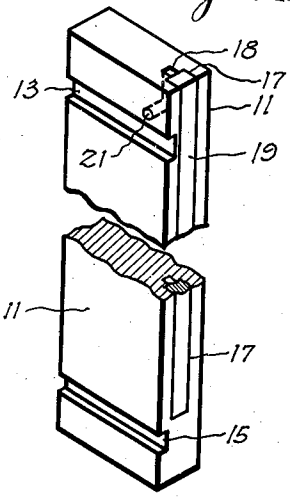


Fig. 5.

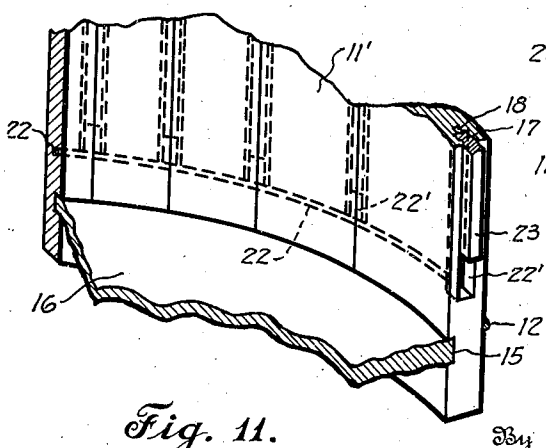


Fig. 11.

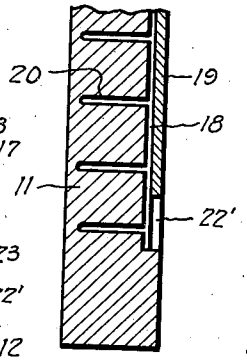


Fig. 6.

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WOODEN TANK

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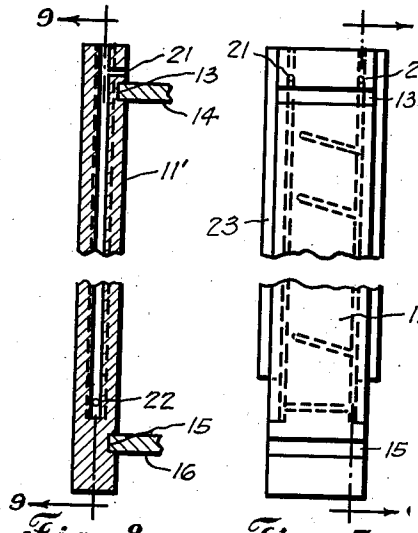


Fig. 8.

Fig. 7.

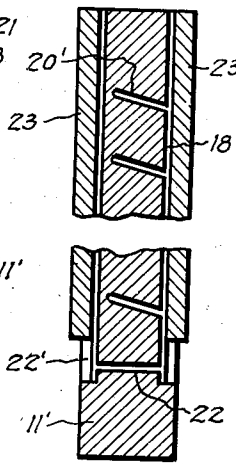


Fig. 9.

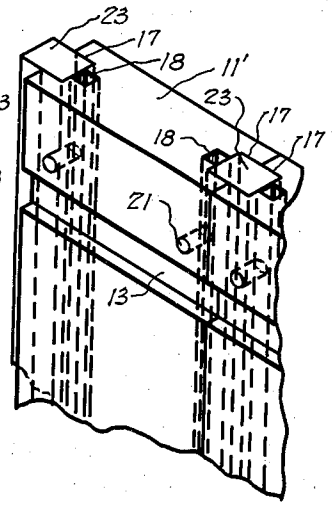


Fig. 10.

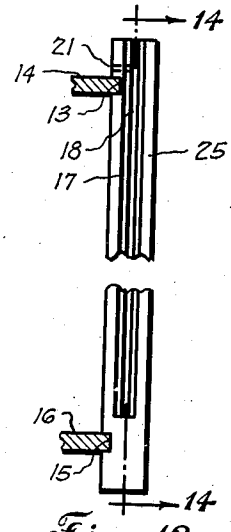


Fig. 12.

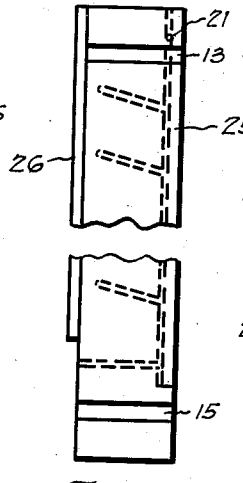


Fig. 13.

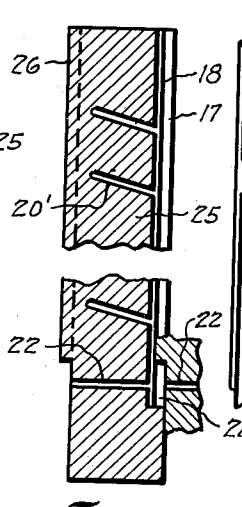


Fig. 14.

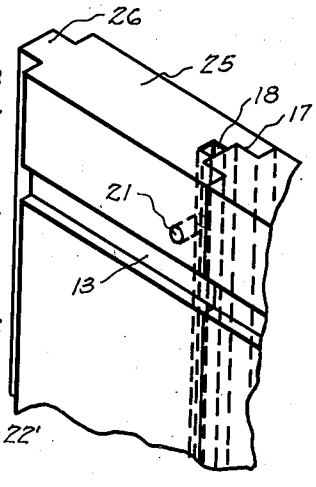


Fig. 15.

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UNITED STATES PATENT OFFICE

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WOODEN TANK

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Application October 25, 1937, Serial No. 170,839

6 Claims. (Cl. 217—4)

This invention relates to new and useful improvements in wooden tanks.

The usual wooden tank which is generally used for the storage of oil, water or other liquid is constructed of a plurality of vertical wooden staves which have their longitudinal edges abutting each other and which are drawn together by suitable tie rods. Vertical liquid passages are ordinarily formed between the abutting edges of the staves and liquid is supplied to said passages to saturate the staves and thus prevent shrinkage thereof to obviate leakage. These vertical passages are located midway of the width of the stave, that is they are formed centrally within the longitudinal edge of the stave.

The interior of the tank so formed is, of course, filled with the stored liquid and the inner surface of the staves which form the tank is saturated at all times by this liquid and no danger of shrinkage of this inner surface is present. However, the outside or outer surface of the staves is exposed to the sun's rays and atmosphere and it has been found that this outer surface is dried out because the liquid from the vertical passages between the staves is insufficient to maintain this outer surface well saturated, particularly during the summer months when the atmospheric temperature is high.

As a result, the outer surfaces of the staves are dried out by sun and wind, while the inner surfaces of said staves remain in a moistened or saturated condition due to the liquid within the tank. The drying out of the outer surfaces of the staves causes a shrinkage in the transverse width of the staves which causes the longitudinal abutting edges of said staves to separate or pull away from each other at their outer surfaces. Their longitudinal edges at the inner surface of the tank may remain in contact but the separation at the outer surface permits leakage of the liquid from the vertical passages between the abutting edges with the result that the entire stave is dried out and shrinks, thereby causing the tank to leak.

It is, therefore, one object of this invention to provide an improved wooden tank which is constructed so that leakage of the liquid from the vertical passages between the abutting staves is prevented, in the event that the outer surfaces of the tank staves is dried out and shrinks.

An important object of the invention is to provide an improved wooden tank wherein vertical liquid passages are formed between the abutting edges of the tank staves with means for confining the liquid within said passages so that a slight clearance between the staves will not permit escape of the liquid from said grooves.

A further object of the invention is to provide an improved tank stave having a liquid receiving passage in one longitudinal edge and having a groove adjacent the liquid receiving passage, whereby an insertable confining member may be inserted in said groove to confine the liquid within the passage.

Another object of the invention is to provide an improved stave having a vertical groove in each longitudinal edge thereof with a liquid channel communicating with each groove; the grooves in each channel being alined when the staves abut each other, whereby a single member may be inserted in the alined grooves of adjacent staves to close the liquid channels of both staves and confine the liquid therein, the member also acting to connect the staves.

A still further object of the invention is to provide a tank stave of an improved construction having a groove with a liquid channel communicating therewith in one longitudinal edge and having a projecting rib or tongue on its opposite longitudinal edge, whereby when the staves are placed together to form a tank, the rib of one stave engages within the groove of the adjacent stave to confine the liquid within the channel, regardless of the clearance between the abutting edges of the staves.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is a partial isometric view of a wooden tank, made of staves, constructed in accordance with the invention,

Figure 2 is a face view of the inner surface of one of the staves,

Figure 3 is a vertical, sectional view, taken on the line 3—3 of Figure 2,

Figure 4 is a transverse, vertical, sectional view, taken on the line 4—4 of Figure 3,

Figure 4a is a sectional view of the joint between the staves,

Figure 5 is a partial isometrical view of one of the staves shown in Figures 2 to 4,

Figure 6 is a partial transverse, sectional view of one of the staves, showing a modified vertical member or bar,

Figure 7 is a view similar to Figure 2 of another form of tank stave,

Figure 8 is a vertical, sectional view taken on the line 8—8 of Figure 7,

Figure 9 is a partial transverse, vertical, sectional view, taken on the line 9—9 of Figure 8,

Figure 10 is a partial isometric view of the upper portion of the tank stave shown in Figures 7 to 9,

Figure 11 is a partial isometrical view of the lower portion of a tank constructed of the tank staves shown in Figures 7 to 10,

Figure 12 is an end elevation of still another form of stave,

Figure 13 is an elevation of the inner surface thereof,

Figure 14 is a transverse, vertical, sectional view taken on the line 14—14 of Figure 12, and

Figure 15 is a view similar to Figure 11, showing the upper portion of the tank stave disclosed in Figures 12 to 14.

In the drawings, the numeral 10 designates the upper portion of a wooden tank which has its side composed of a plurality of upright or vertical staves 11. The longitudinal vertical edges of the staves abut each other in the usual manner and are held together by the usual tie rod 12. Each stave is constructed of relatively thick lumber and is provided with an upper croze 13 for receiving the top 14 of the tank, while a lower croze 15 is formed in the stave for receiving and supporting the bottom 16 of the tank (Figure 3).

Each stave has one longitudinal edge flat, as is clearly shown in Figure 4, while a vertical groove 17 is formed in the opposite longitudinal edge. The groove 17 extends from the extreme upper end of the stave and terminates short of the lower end thereof at a point above the lower croze 15. The groove is preferably angular in cross-section and a reduced vertical channel 18 is formed in the stave and extends inwardly from the base of the groove 17. The groove 17 is adapted to receive a vertical bar or member 19 which is substantially the same cross-sectional shape as said groove, whereby it has a snug fit therein. The bar is preferably constructed of wood and extends throughout the vertical length of the groove 17, as is clearly shown in Figure 4. Obviously, when the bar or member 19 is inserted within the groove, it closes or covers the open end of the channel 18 whereby when liquid is introduced into said channel, it is confined therein.

Horizontal passages 20 have one end communicating with the channel 18, while their opposite ends terminate short of the longitudinal edge of the staves. The passages are disposed at spaced elevations throughout the staves. For introducing a liquid, which is preferably water, into the channels 18 and into the passages 20, whereby the staves may be saturated, inlet ports 21 extend from the upper end of the channel 18. The ports 21 communicate with the tank above the top 14 of said tank whereby any liquid retained on said top may flow through the inlet ports 21 and into the channel and ports 20.

When the tank is assembled with the staves 11, the flat longitudinal edge of one stave abuts the bar or member 19 and the edge of the adjacent stave, as is clearly shown in Figure 1. Water or other liquid is stored on the top 14 of the tank and, obviously, this water may flow through the ports 21 of the staves 11 and into the channel 18 thereof. From the channels, this water may enter the horizontal passages 20, whereby the entire stave may be maintained in a moistened or saturated condition, whereby said staves are swelled and shrinkage thereof is prevented. Manifestly, the water or other liquid within the channel 18 will contact the insertable bar or member 19 to saturate said bar and cause swelling thereof. The swelling of the bar within its groove 17 will positively prevent any displacement of said bar from the groove, whereby the liquid is confined within the channel 18.

With the above arrangement, the liquid channels have been moved inwardly of the staves so that they are not disposed at the junction or engaging edges of said staves. Therefore, if the outer surface of the tank wall is dried out due to atmospheric conditions and temperatures, while the inner surface of said wall is maintained in a saturated condition due to the liquid stored within the tank, this outer surface would shrink the staves and tend to separate the same at the joints or abutting faces thereof. In such event, the abutting or engaging edges of the staves at their outer surfaces would tend to separate so as to provide a slight space or clearance A therebetween. The action of the staves under the above conditions is clearly shown in Figure 4a and as shown in this figure, separation of the edges of the staves at their outer surfaces would have no effect on the confinement of the liquid within the channels 18 because said channels are closed by the insertable bars or members 19. It has been the practice in the construction of tank staves to provide the liquid channels in the edge of the staves and depend upon the abutting face or edge of the adjacent stave to close the liquid channel. In such case a separation of the engaging faces of adjacent staves would permit a leakage of the water or liquid from the channel. When this occurred, the entire stave would dry out, resulting in a leakage of the liquid stored within the tank. These disadvantages, present in the usual type of construction, are overcome by the stave disclosed herein. There is no possibility of the insertable bar or member 19 becoming dried out which would result in it shrinking because the liquid within the channel 18 maintains the same in a saturated condition. Since the bar is located at substantially the central portion of the stave along one edge thereof, the weather conditions cannot effect the same and, therefore, the liquid is confined, at all times, within the channel 18 and passages 20. With such structure, the staves 11 may separate at their outer surfaces without resulting in a leakage of the liquid which is stored within the tank.

Through actual use, it has been found that when the outer surfaces of the staves are dried out due to the atmospheric conditions, a separation of the abutting edges of the staves occurs only between the tie rods 12, which are located nearer the upper and lower ends of the tank between the crozes 13 and 15. Due to the tie rods 12, no separation of the faces occurs beyond said tie rods. Therefore, if desired, the bar 19 may be terminated above the lower end of the groove 17 whereby a space 22' is left between the end of the bar and the end of the groove (Figures 6 and 9). No escape of liquid can occur at this point because the abutting edges of the staves will not separate at their lower ends. In other words, the separation of the edges of the staves occurs at the central portion of the tank between the tie rods 12 and,

therefore, it would be only necessary to make the bar 19 sufficiently long to cover the area which has a tendency to shrink.

A modified form of stave 11' is shown in Figures 7 to 11 and this stave is very similar to the stave 11 with the exception that the groove 17 and the channel 18 are provided in each edge of the stave instead of in only one edge thereof. With such arrangement, the assembling of the tank causes the grooves 17 of adjacent staves to be alined with each other as is clearly shown in Figure 10. An insertable bar or member 23, having a cross-sectional shape substantially the same as the combined cross-sectional shape of the alined grooves 17, is inserted into said grooves. The member 23 closes the open ends of the liquid channels 18 in the adjacent staves and serves the same purpose as the single bar 19.

In the forms shown in Figures 1 to 6, there is no communication between the individual staves 11, each stave being supplied with water through its individual inlet port 21. In some instances, and particularly where the bar 23 is not flush with the end of the stave, it might be desirable to establish a liquid communication between the lower ends of all of the staves which comprise the tank. In such case, the modified form of stave 11' is provided with a cross duct 22 at the lower end of the liquid channel 18 and this passage is formed by boring through the stave. The bars or member 23 terminate short of the ducts, as clearly shown in Figures 9 and 11, whereby the space 22' is formed between the end of each bar and the lower end of the grooves 17. Thus, when the staves 11' are secured together to form the tank, the cross ducts 22 of the staves are alined with each other to form a continuous passage around the lower end of the tank. It is pointed out that the space 22' between the lower end of the bar 23 and the end of each groove 17 is closed by the abutting face of the adjacent stave, whereby the liquid within the channel 18 cannot escape from said channel. Instead of the short cross passages 20, the staves 11' are provided with inclined passages 20' which extend from the channel 18.

Still another form of stave 25 is disclosed in Figures 12 to 15. This stave is constructed in substantially the same manner as the stave 11, shown in Figures 1 to 4, except that instead of a flat surface along one edge of the stave, an elongate vertical rib or tongue 26 is formed. This tongue has substantially the same cross-sectional shape as the groove 17 but has a length less than the vertical length of the groove. When the staves are assembled to form the tank, the tongue 26 of one stave engages in the groove 17 of the adjacent stave and as shown, the space 22' is formed between the end of the tongue and the bottom of the groove. The stave 25 is also provided with the cross ducts 22 and inclined passages 20' shown in Figures 7 to 11. It will be manifest that the rib 26 takes the place of the insertable bars 19 and 23 in the other forms and functions in the same manner. It is noted that in the forms shown in Figures 7 to 11 and 12 to 15, the bar 23 and the rib 26 also act to hold the adjacent staves together, as well as to confine the liquid within the liquid channel 18. It is pointed out that the passages 20' are inclined in those forms wherein the bar 23 engages both grooves of adjacent staves and also where the rib 26 on one stave engages the groove of the adjacent stave. In these forms, it is obvious that so long as the bar 23 or rib 26 is saturated, separation of the staves is not possible. By tapping into the lower end of the liquid channel 18, or into the duct 22, all the water may be drained from the channel and passages 20' to permit the bars 23 or ribs 26 to dry out and thereby allow separation of the staves.

In all forms, the vertical liquid channels 18 are located at a point spaced from the edge of the stave and are not disposed at the junction between the staves. Suitable insertable members close the longitudinal open end of the channels and act to confine the liquid therein, irrespective of the spacing between the abutting or engaging faces of the staves. Therefore, the liquid is trapped within the liquid channels and cannot escape therefrom due to a slight separation of the abutting edges of the staves. It is pointed out that although it is desirable to construct the groove 17 of a greater width than the liquid channel 18, it is not essential to do so as it would be possible to make a single groove in the longitudinal edge of the stave and insert the member 19 in the outer portion thereof, whereby the space between the inner surface of the member and the base of such grooves would form the liquid channel.

What I claim and desire to secure by Letters Patent is:

1. A tank stave having one longitudinal edge flat and having its opposite longitudinal edge grooved with a liquid channel formed in the stave and communicating with the groove, and an insertable member within the groove and covering the channel to trap liquid therein.

2. A tank stave having one longitudinal edge grooved with a liquid channel formed in the stave and communicating with the groove, and an insertable member within the groove and covering the channel to trap liquid therein.

3. A tank including, a plurality of upright staves joined in the tank wall, each stave having a longitudinal groove along one of the abutting faces of each joint and provided with a liquid channel at the bottom of the groove, and separate means disposed longitudinally in each groove overlying the channel thereof to trap liquid therein and provide the tank with upright moisture joints.

4. A tank including, a plurality of staves having their longitudinal edges abutting each other to form a tank wall, the staves having crozes in their upper and lower ends for receiving and supporting the top and bottom of the tank, each stave having a longitudinal groove along one of the abutting faces of each joint and provided with a liquid channel at the bottom of the groove, and separate means engaging within the groove for forming a closure for said channel to trap liquid therein and prevent leakage therefrom in the event that separation of the abutting edges of the staves occurs.

5. A tank including, a plurality of staves having their longitudinal edges abutting each other to form a tank wall, the staves having crozes in their upper and lower ends for receiving and supporting the top and bottom of the tank, each stave having a longitudinal groove along one of the abutting faces of each joint and provided with a liquid channel at the bottom of the groove, separate means engaging within the groove for forming a closure for said channel to trap liquid therein and prevent leakage therefrom in the event that separation of the abutting edges of the staves occurs, the top of the tank being spaced from the top of the staves whereby a liquid

reservoir is formed on said top, and means for supplying the liquid from said reservoir to the channel.

6. A tank including, a plurality of staves having longitudinal edges abutting each other to form a tank wall, the staves having crozes in their upper and lower ends for receiving and supporting the top and bottom of the tank, each stave having a longitudinal groove along one of the abutting faces of each joint and provided with a liquid channel at the bottom of the groove, and separate means engaging within the groove for forming a closure for said channel to trap liquid therein and prevent leakage therefrom in the event that separation of the abutting edges of the staves occurs and also horizontal cross passages communicating with the channel.

ARTHUR W. ASHLEY.