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R. M. MULLEN

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TANK

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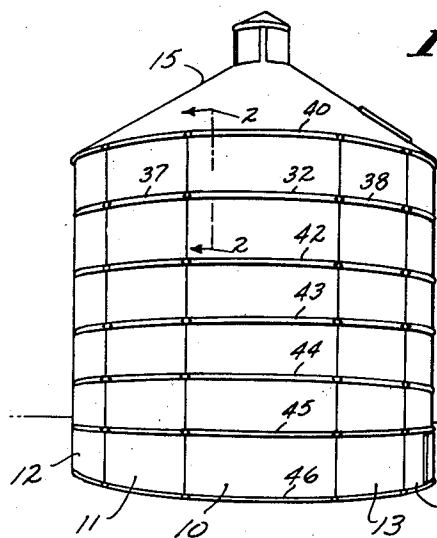


Fig. 1.

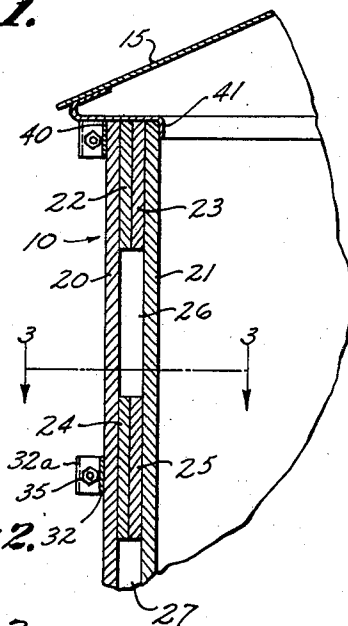


Fig. 2.

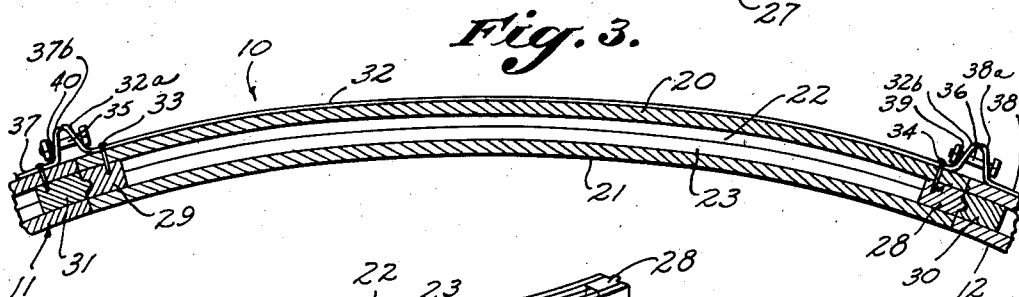


Fig. 3.

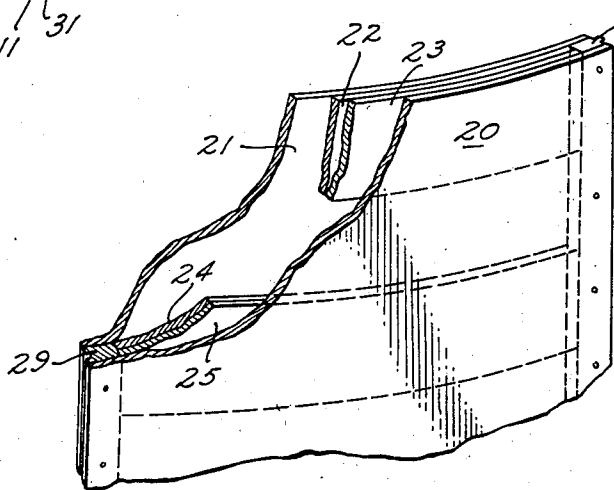


Fig. 4.

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TANK

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8 Claims. (Cl. 217—4)

My invention relates generally to structures suitable for storing materials, both in dry and liquid forms, and more particularly to cylindrical containers adapted to the storage of grains and other farm products, but which structures with suitable treatment can also be used to store liquids.

While the term "tank" is generally used to denote a container for liquids or gases, and the word "bin" is commonly used to denote wooden structures for the storing of solid granular materials, such as grains and the like, I will in the interest of simplicity herein use the word "tank" in its more generic sense as including structures of the type described herein suitable for storage of either solids or liquids, as the case may be.

While the tank of my invention has a very wide application in various fields of industry, one of the most important, particularly at the present time, is its use as a bin for the storage of grains and other farm products, although, as will become apparent hereinafter, the structure can be waterproofed and used to store liquids if desired.

The major object of my invention is to provide a tank of the character described, which is made up of strong, light-weight, prefabricated sections which are easy to handle and which can be rapidly assembled into the completed tank structure.

It is also an object of my invention to provide a tank of the character described which is well insulated against temperature changes, and which will not warp out of shape or be otherwise adversely affected by the elements.

It is also an object of my invention to provide a tank which combines the desirable features of steel, concrete and wood tanks without incorporating the many disadvantages inherent in these various types of tanks.

It is a further object of my invention to provide tanks which not only possess the advantages above-mentioned, but which also are easily demountable and can be readily moved from one place to another with a minimum loss of time and effort.

These and other objects and advantages of my invention will become apparent from the following description of a preferred form thereof and from the accompanying drawing illustrating the same, in which

Fig. 1 is an elevational view slightly in perspective showing a completed tank made according to my invention,

Fig. 2 is an enlarged vertical section of said tank taken along the line 2—2 in Fig. 1,

Fig. 3 is a horizontal section of the tank wall taken along the line 3—3 of Fig. 2, and

Fig. 4 is an elevational section in perspective partially broken away to further illustrate the construction of the wall sections.

The tank of my invention is constructed of a plurality of prefabricated vertically extending horizontally curved wall sections, made of pulp board or the like, those visible in Fig. 1 being indicated by the numerals 10, 11, 12, 13, and 14, it being noted that each of the sections extends from the bottom to the top of the tank so that there are no horizontal seams or breaks to contend with. The top of the tank is indicated by the numeral 15, and may be formed in a conventional manner. As seen best in Fig. 3, each of the vertically extending wall sections is pre-curved in the horizontal plane to form an arc of a circle so that when the sections are assembled they will form a cylindrical tank of the required diameter, it being understood of course that the degree of curvature is predetermined and depends upon the diameter of the tank desired. For grain bins I have found that diameters of 12 ft., 15 ft., or 18 ft. are the most practical when used with sections 10 ft. long giving a tank 10 ft. high. Since all of the sections are identical and are provided with tongue and groove members along their vertical edges, I have only illustrated and will only describe one of the sections in detail to bring out the novel features of my tank construction.

Referring now particularly to Figs. 2, 3, and 4, it will be seen that the section 10 is formed of two parallel sheet members 20 and 21 spaced from each other by horizontally extending spacing strips 22 and 23, which are curved to the same arc as surface sheets 20 and 21. These spacers are provided at intervals along the vertical expanse of the wall and the distance between them depends largely upon the required strength of the wall and how many reinforcing bands are used to hold the structure together. In Figs. 2 and 4 another pair of spacers, indicated by the numerals 24 and 25 are indicated as being positioned somewhat below the spacers 22 and 23, it being understood of course that additional spacers are located further down the tank wall as required, the number depending upon the total length of the tank and the tensile characteristics required. It will also be understood of course that the spacers can be made in one piece instead of in the two pieces as shown, but I prefer to use the double strips 22 and 23 since this permits of using only one thickness of material for both the outer

sheets and the spacers, which of course simplifies the construction considerably. It will be seen that a dead-air space is formed between the outer and inner wall sheets 20 and 21, which dead air space is broken up into smaller spaces 26, 27, etc., by the horizontally extending spacers.

The vertical edges of the section 10 are provided with vertically extending tongue and groove strips indicated by the numerals 28 and 29. The female or groove strip of wall section 12, which complements the tongue strip of section 10, is indicated by the numeral 30, and the tongue strip of wall section 11 is indicated by the numeral 31 of Fig. 3.

In constructing the curved wall sections of my invention and referring particularly to section 10, the tongue and groove strips 28 and 29 are first nailed to the outside wall sheet 20, which is then bent to the desired degree of curvature by suitable means, such as a press operating on the vertical edges of the sheet to warp it the required amount. The horizontal spacers are then positioned between the vertical tongue and groove strips 28 and 29 and are cemented to each other and to the outer wall 20 and caused to assume the correct curvature in the press, so that intimate engagement will be had between their entire surface and the outer wall 20. The inner wall 21 is then covered with suitable adhesive, curved to the proper shape and nailed to the end strips 28 and 29 and pressed into intimate engagement with the spacer strips so that the adhesive when set will cause all of the engaging surfaces to be securely bonded to one another, thus forming a composite unitary section.

I have found that silica jell makes the best adhesive for my use when using a relatively porous pulp board, such as graylite, celotex, or the like, and that the resulting product when removed from the press retains its shape and curvature as a unit without serious flexing. Silica jell also has the advantage of setting up very hard and is particularly advantageous in making grain bins, since by coating the inner face of the outer wall sheet, a hard glass-like surface is produced which is impervious to rat gnawing and therefore makes the bin rat-proof.

In assembling the tank from a plurality of curved sections of the type described, the sections are raised to a vertical position and the adjacent tongues and grooves of adjoining sections are engaged with one another to form a vertical cylinder of the required diameter. Reinforcing bands are of course desirable to hold the sections in place and to prevent spreading when the tank is loaded, and for this purpose I provide each wall section with separate metal bands attached to that section so that they cannot slide to the ground if they become loosened.

Referring again to Fig. 3, it will be seen that I provide a metal band 32 which is fastened to the outer wall sheet 20 by means of nails 33 and 34. The ends 32-a and 32-b of the band 32 are bent outwardly and provided with suitable holes to allow the passage of bolts 35 and 36 there-through. In Fig. 3, a portion of a band 37 is shown attached to wall section 11 and provided with an outwardly bent end 37-b, which engages with the portion 32-a of band 32. Similarly, a metal band 38 is secured to wall section 12 and is provided with an outwardly extending end portion 38-a adapted to engage the similar portion 32-b of band 32. Thus it will be seen that when the bolts 35 and 36 are tightened, the outwardly extending portions a and b of the metal bands

will be flexed or sprung inwardly so that they will compensate for changes in length of the bands due to temperature changes. To further increase the range of the expansion joint thus provided, I use lock washers 39 and 40 on the bolts 35 and 36 to further take up slack or allow compression, to compensate for expansion or contraction of the metal bands due to temperature changes. A similar band 40 is also shown in Fig. 2, attached to the upper edge of the wall section 10 and adapted to clamp the top 15 in place, it being seen that the top 15 is provided with an internal flange 41 against which the wall sections are securely clamped by the band 40. Additional bands 42, 43, 44, 45, and 46 are illustrated in Fig. 1, all being attached to vertically extending wall section 10 in the manner hereinbefore described, it being understood that other band sections not indicated by numerals are attached to the other wall sections and cooperate therewith in the manner described.

As previously mentioned, the structure of my invention is particularly suitable for grain bins and the storage of other farm products, but by merely painting the inside face of the inner wall sheet with a water proof paint or varnish and by caulking the joints in suitable fashion, the tank can be made to hold liquids very satisfactorily. I have found that while single sheets of building board, or pulp board, may not have a particularly high tensile or compression strength alone, that when assembled as herein set forth with a suitable adhesive and pre-formed to the correct curvature, they demonstrate a truly remarkable strength and resistance to wear. Furthermore, the provision of dead-air spaces between the outer and inner walls greatly increases the insulation characteristics of the material and provides a tank which is eminently suitable for all climates and conditions.

It is to be understood of course that while I have described a particular form of my invention in considerable detail, that it is merely illustrative of the broad scope thereof as defined by the appended claims.

I claim:

1. A tank of the character described, which includes: a plurality of vertically extending curved wall sections, each of which comprises inner and outer wall sheets spaced apart by horizontal spacer strips, and vertically extending spacer strips along their vertical edges, one of said vertically extending spacer strips being provided with a tongue and the other of said vertically extending spacer strips being provided with a groove, whereby adjoining wall sections can be complementally engaged to form a vertical tank; and a plurality of reinforcing bands composed of sections fastened to said wall sections and engageable with each other to form a continuous reinforcing band about said tank.

2. A tank as described in claim 1, in which each of the wall sheets is cemented to the enclosed spacers by silica jell.

3. A tank as described in claim 1, in which each of the wall sections is curved to a predetermined radius prior to assembly.

4. A tank of the character described, which includes: a plurality of vertically extending curved wall sections, each of which comprises inner and outer wall sheets spaced apart by horizontal spacer strips, and vertically extending spacer strips along their vertical edges, one of said vertically extending spacer strips being provided with a tongue and the other of said vertically

extending spacer strips being provided with a groove, whereby adjoining wall sections can be complementally engaged to form a vertical tank; and a plurality of horizontally disposed bands encircling said tank to reinforce said curved sections.

5. A tank of the character described, which includes: a plurality of vertically extending curved wall sections, each of which comprises inner and outer wall sheets spaced apart by vertically extending spacer strips along their vertical edges, one of said vertically extending spacer strips being provided with a tongue and the other of said vertically extending spacer strips being provided with a groove, whereby adjoining wall sections can be complementally engaged to form a vertical tank; and a plurality of reinforcing bands composed of sections fastened to said wall sections and engageable with each other to form a continuous reinforcing band about said tank.

6. A tank of the character described, which includes: a plurality of vertically extending curved wall sections, each of which comprises inner and outer wall sheets spaced apart by vertically extending spacer strips along their vertical edges, one of said vertically extending spacer strips being provided with a tongue and the other of said vertically extending spacer strips being provided with a groove, whereby adjoining wall

sections can be complementally engaged to form a vertical tank; and a plurality of horizontally disposed bands encircling said tank to reinforce said curved sections.

5 7. A tank of the character described, which includes: a plurality of vertically extending curved wall sections, each of which comprises inner and outer wall sheets spaced apart by vertical spacer strips provided with complemental
10 means on their vertical edges adapted for engagement, whereby adjoining wall sections can be complementally engaged to form a vertical tank; and a plurality of reinforcing bands composed of sections fastened to said wall sections
15 and engageable with each other to form a continuous reinforcing band about said tank.

8. A tank of the character described, which includes: a plurality of vertically extending curved wall sections, each of which comprises
20 inner and outer wall sheets spaced apart by vertical spacer strips provided with complemental means on their vertical edges adapted for engagement, whereby adjoining wall sections can be complementally engaged to form a vertical
25 tank; and a plurality of horizontally disposed bands encircling said tank to reinforce said curved sections.

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