Aug. 12, 1969 R. P. PLANT 3,460,718

SHIPPING CONTAINER

Filed Sept. 9, 1968 4 Sheets-Sheet 1

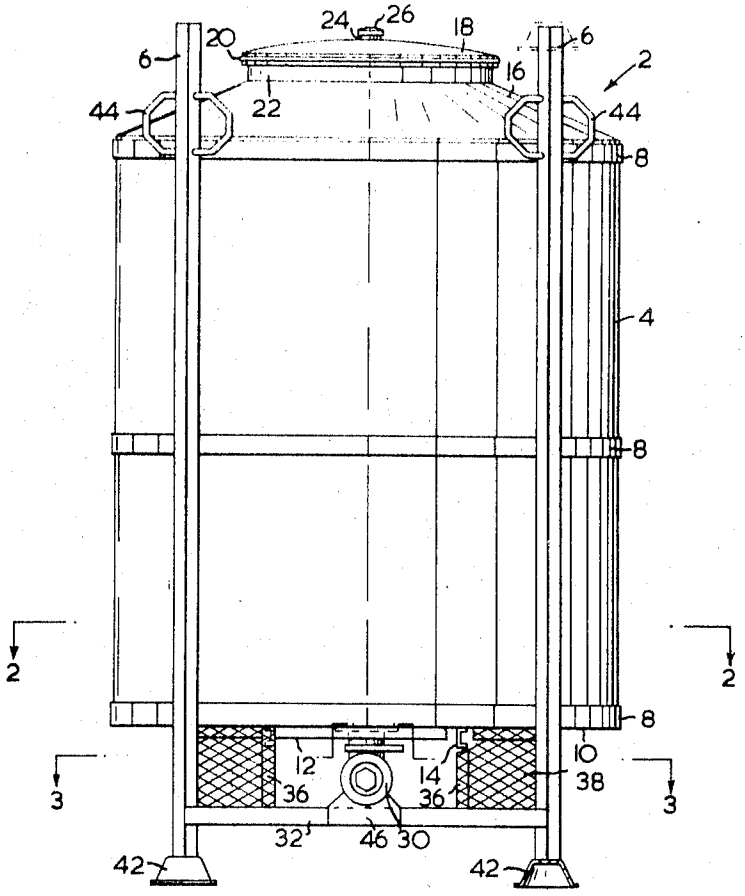

FIG. 1

Aug. 12, 1969 R. P. PLANT 3,460,718

SHIPPING CONTAINER

Filed Sept. 9, 1968 4 Sheets-Sheet 2

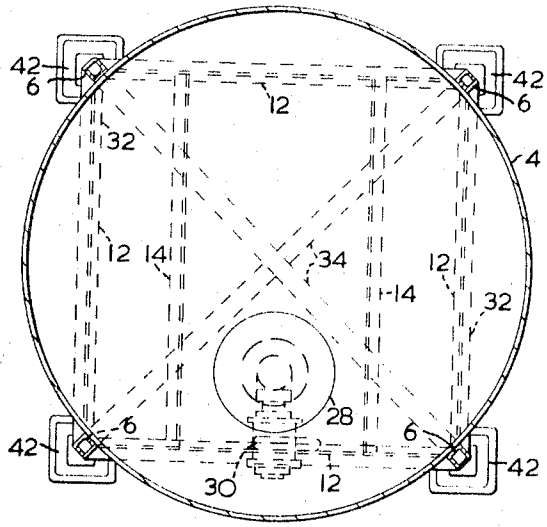

FIG.2

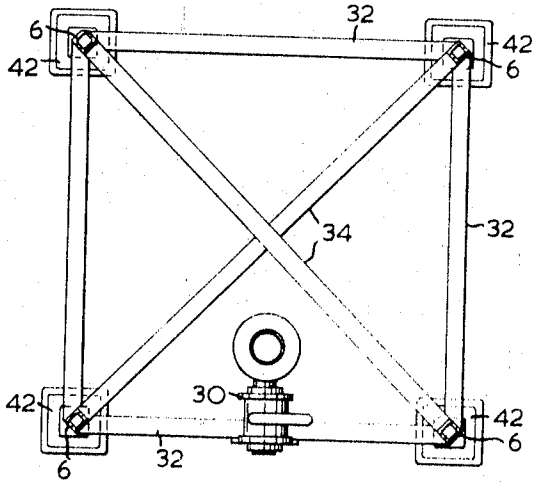

FIG.3

Aug. 12, 1969 R. P. PLANT 3,460,718

SHIPPING CONTAINER

Filed Sept. 9, 1968 4 Sheets-Sheet 3

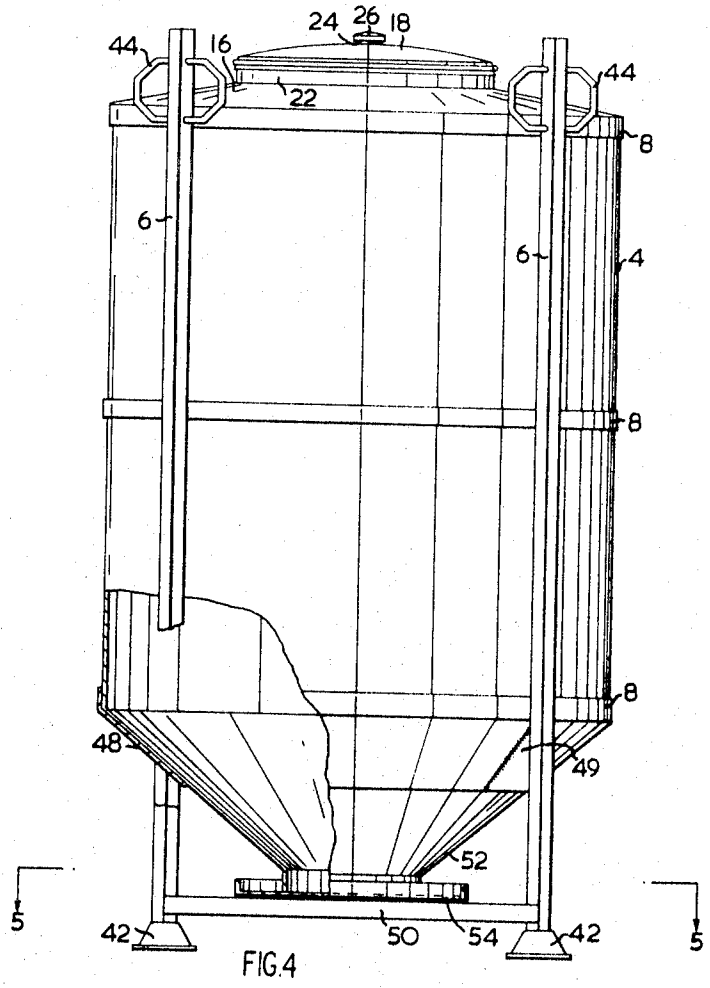

FIG.4

Aug. 12, 1969 R. P. PLANT 3,460,718

SHIPPING CONTAINER

Filed Sept. 9, 1968 4 Sheets-Sheet 4

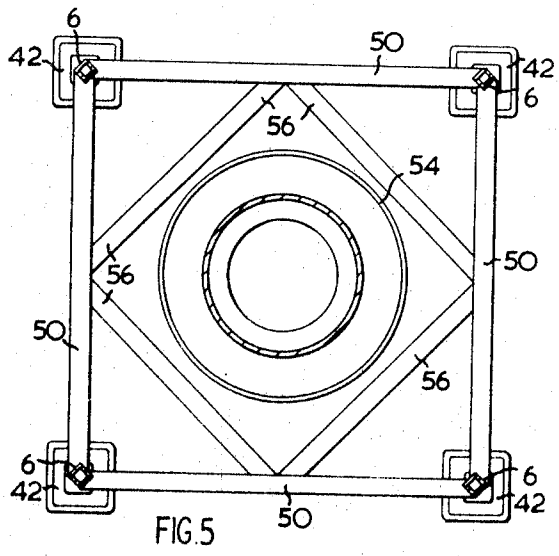

FIG. 5

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3,460,718

SHIPPING CONTAINER

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Int. Cl. B67d 5/60, 21/00, 7/42
U.S. Cl. 222—143 10 Claims

ABSTRACT OF THE DISCLOSURE

A corrosion resistant shipping container assembly comprising a cylindrical tank of impact resistant plastic and a supporting framework of four long steel struts running up the side of the cylinder and a platform for it to sit on. A steel band runs round the cylinder to locate the struts as the base is provided with hollow pyramids to give a stacking facility with a built in self guiding feature.

This invention relates to containers for shipping free flowing materials such as liquids or granular solids.

Previously, such materials have been shipped in steel barrels, or for larger quantities in small tanks or drums; still larger quantities are shipped in tank cars. Where contamination or corrosion is a problem, the solution has been to use aluminum or stainless steel; an alternative is ordinary steel either with a completely flexible liner or coated with epoxy resin.

Aluminum and stainless steel constructions are, of course, expensive, both in raw material cost and the relative difficulty of joining or working. Flexible liners are usually of the expendible or throwaway type and add nothing to the strength of the combination being in the nature of a thin plastic bag. Resin coatings suffer from the additional disadvantage that a dent of the steel casing may cause the coating to chip internally.

More recently, plastic tanks have been used. These are generally rectangular and require pallets of some sort to enable them to be handled, the larger plastic tanks requiring reinforcement of the sides to prevent their bulging. The pallets are not, of course, standard wood pallets as the tanks usually require special arrangements for bottom emptying. Such arrangements are awkward. The side wall reinforcement of larger tanks is sometimes used to form a metal cage around the plastic tank.

I have found that the disadvantages of the prior art may be overcome by providing an essentially cylindrical rigid impact resistant plastic tank with a framework comprising a series of rigid beams parallel to the cylinder axis and supporting cross members to enable a full tank to be handled easily. Such an assembly is relatively inexpensive and a conventional quick acting valve can be used easily and the frame is lightweight. As a further feature the assembly of tank and frames can be made to stack one above the other to eliminate the shelving required for pallet mounted tanks; and this stacking can be made self locating. Further economies in manufacture are achieved by making the main frame members of square section steel tubing achieving the multidirectional stiffness of round tubing with the easy straight line junctions of angle and channel sections.

The invention can best be understood in relation to the drawings in which:

FIGURE 1 is an elevation of an embodiment of the invention suitable for liquids,

FIGURE 2 is a view of the assembly on the section 2—2 of FIGURE 1,

FIGURE 3 is a view of the assembly on the section 3—3,

FIGURE 4 is an elevation of an embodiment suitable for granular materials or liquids, and

FIGURE 5 is a view of the framework on the section 4—4.

The shipping assembly illustrated at 2 on FIGURE 1 comprises generally a tank 4 of rigid impact resistant plastic and a supporting framework which includes four beams 6, equally spaced about and welded to three circumferential bands 8 and a thin bottom support plate 10 having cross members 12, 14 beneath it to take the weight of the tank when full.

The tank 4 is typically a single piece of moulded low density polyethylene, and has a thickness which depends on the size of the tank, the density of the material to be transported and the strength of the tank material. The tank is not, of course, limited to polyethylene but other impact resistant plastics, such as polypropylene or nylon may be suitable. The choice for any specific application is within the ability of one skilled in the art.

The thickness of the tank is essentially such that the tank alone (that is without the framework) when full will contain liquids of at least 1.70 specific gravity without any risk of breakage and indeed without any substantial deformation of shape. The figure 1.7 is chosen as this is about the heaviest liquids which are bulk shipped; these are often heavier than water and include such liquids as glue, liquid chocolate and 50% sulphuric acid.

The tank top comprises a reducing section 16 with a lid 18 having a ring 20 around its periphery with a tightening bolt to constrict the lid edge about a slight outward flaring (not shown) of the neck 22. A small filling spout 24 is moulded into the lid 18 and has a cover 26 which may be loosely fitting to vent the tank. The tank bottom is, in this embodiment for transporting liquid, substantially flat so as to rest on support plate 10. The emptying orifice will be described below.

The framework comprising members 6, 8, 10, 12 and 14 are preferably made of rolled steel sections which are welded together and the assembly is painted or may be zinc plated or otherwise treated to inhibit atmospheric corrosion.

In particular, I prefer to make the beams 6, of square section structural tubing, both because they are stiff or rigid (that is they offer a resistance to bending) and afford an ease of joining (due to flat surfaces) resulting in an inexpensive structure. Thus, the square section gives the advantages of a circular section with those of a channel or angle section and closing the top end minimizes the tendency for internal rusting.

The bands 8 function mainly to locate the upper ends of the beams 6 and also to rigidify them as struts so as to inhibit buckling when the assemblies are stacked one upon another besides serving the obvious purpose of locating the tank. It will be evident to those skilled in the art that the number of bands is not critical, so long as one is well spaced from cross members 12, 14; another is advisable to locate the tank lower circumference. Support cross members 12 which support the weight of the tank are preferably channel sections and welded at their ends to the beams 6. Cross members 14 prevent undue distortion of plate 10 and assist tank weight distribution and are welded at their ends to members 12. FIGURE 1 has members 12 broken away to show member 14 clearly behind them.

Plate 10 incorporates a hole 28 through which the emptying neck of the tank protrudes as an external thread so that polyvinyl chloride valve 30 may be coupled to it through a polyvinyl chloride elbow and fittings. A second set of square frame members 32 and diagonal cross bracing members 34 are welded to the beams 6 at some convenient height below members 12, 14 and vertical braces

36 between the two sets provide a structural rigidity. A wire grill 38 is placed about the interspace to prevent damage to the valve by ensuring that the assembly is lifted by fork lift truck tines entering between any pair of beams 6 below members 32, 34. However, if in use the fork prong axis will always be parallel to the valve axis, the lower square and diagonal members, 32, 34 and grill 38 may be omitted. Sometimes also the tank is emptied by suction or a vacuum line inserted in the tank top, making a valve unnecessary. However, an additional feature of the lower frame is that a plate 46 may be added to assist in supporting the body of the valve 30.

Feet 42 in the form of a hollow square pyramid frustum are welded to beams 6. These facilitate stacking by giving a self locating feature. It will be evident that the beams 6 must project above the tank top to use this feature and that once these upward projections have entered the feet pyramids which they do easily, the operator of the truck or crane need no longer be concerned with location.

Semi-octagonal rings 44 of ½-inch diameter steel are welded to the beams 6 to enable the assembly to be lifted by a crane and spreader bar.

The embodiment of FIGURE 4 differs from that of FIGURE 1 only in the lower end support. A conical tank end 52 is supported in a frusto-conical sheet metal form 48 which is rigid enough because of its shape to support weight of the full tank without undue deformation. Gusset plates 49 attach the sheet metal form 48 to beams 6.

Thus, it will be seen that members 12, 14 required to support the full tank with flat ends are no longer required. However, a valve has not been shown as a companion flange may be used to close the bottom end of the tank in conjunction with flange 54. In this embodiment cross members 50 are bridged by members 56 to provide a large bearing area in case the lift truck fork tines do not reach fully across the tank base.

Although the construction shown has four vertical beams, it will be obvious to those skilled in the art that more than four may be used or even as few as three. However, I consider that the heavier and bigger sections required to make the three beam frame stackable are such as to offer less economies in manufacture; the junction lines are awkward to make if square section is used and the lesser stability is undesirable.

However, it will be obvious to those skilled in the art that various changes and modifications may be made in the preferred embodiment disclosed without departing from the invention.

I claim:

1. An assembly for shipping free flowing materials comprising the combination of:
- an impact resistant plastic tank having a cylindrical side wall of essentially circular horizontal cross section and a lower end wall;
- a close fitting rigid framework around the cylindrical side wall and supporting the lower end wall, said framework comprising:
  - a series of elongated beams equally spaced about and adjacent the cylindrical side wall, each beam being parallel to the cylinder axis and extending above the upper end of the cylindrical side wall,
  - a plurality of rigid cross members rigidly attached to said beams above the lower ends thereof so as to form a rigid lifting platform at right angles to the cylindrical tank axis,
  - a member of hard sheet material supporting the tank above the plurality of rigid cross members,
  - an inextensible circular band rigidly attached to said elongated beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another and to rigidify the assembly, and

- a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end.

2. An assembly for shipping free flowing material comprising the combination of:
- an impact resistant plastic tank having a cylindrical side wall of essentially circular horizontal cross section and a lower end wall;
- a close fitting rigid framework around the cylindrical side wall and supporting the lower end wall, said framework comprising:
  - four elongated square section beams equally spaced about and adjacent said cylindrical side wall, each beam being parallel to the cylinder axis and extending above the upper end of the cylindrical side wall,
  - a plurality of rigid cross members rigidly attached to said beams above the lower ends thereof so as to form a rigid lifting platform right angles to the cylindrical tank axis,
  - a member of hard sheet material supporting the tank above the plurality of rigid cross members,
  - an inextensible circular band rigidly attached to said elongated beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another and to rigidify the assembly, and
- a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end.

3. An assembly for shipping free flowing materials comprising the combination of:
- an impact resistant plastic tank having a cylindrical side wall of essentially circular horizontal cross section and a lower end wall;
- a close fitting rigid framework around the cylindrical side wall and supporting the lower end wall, said framework comprising:
  - four elongated tubular beams, the beams being equally spaced about and adjacent the cylindrical side wall parallel to the cylinder axis and extending above the upper end of the cylindrical side wall, each beam being closed at the top,
  - a plurality of rigid cross members rigidly attached to said beams above the lower ends thereof so as to form a rigid lifting platform at right angles to the cylindrical tank axis,
  - a member of hard sheet material supporting the tank above the plurality of rigid cross members,
  - an inextensible circular band rigidly attached to said elongated beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another and to rigidify the assembly, and
- a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end.

4. An assembly for shipping free flowing materials comprising the combination of:
- an impact resistant plastic tank having a cylindrical side wall of essentially circular horizontal cross section and a lower end wall;
- a close fitting rigid framework around the cylindrical side wall and supporting the lower end wall, said framework comprising:
  - four elongated tubular square section beams equally spaced around and adjacent the cylindrical side wall, one side face of each beam being substantially tangential to the cylindrical side wall, each beam being parallel to the cylinder axis and extending above the upper end of the cylindrical side wall,
  - a plurality of rigid cross members rigidly attached to said beams above the lower ends thereof so as to form a rigid lifting platform at right angles to the cylindrical tank axis,

a member of hard sheet material supporting the tank above the plurality of rigid cross members,

an inextensible circular band rigidly attached to said elongated beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another and to rigidify the assembly, and

a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end.

5. An assembly for shipping free flowing materials comprising the combination of:

an impact plastic resistant tank having a cylindrical side wall of essentially circular horizontal cross section and a lower substantially flat end wall, the flat end wall having a tank emptying pipe,

a close fitting rigid framework around the cylindrical side wall and supporting the flat lower end wall, said framework comprising:

four elongated tubular beams equally spaced around and adjacent to the cylindrical side wall, each beam being parallel to the cylinder axis and extending beyond the upper and lower edges of the side wall, each beam being closed at the top,

a first plurality of rigid cross members rigidly attached to said elongated beams in a plane above the lower ends of said beams,

a planar hard sheet material member above the plurality of rigid cross members and supported thereby to form a support for the tank lower end wall,

said planar sheet material having a hole therethrough to receive the tank emptying pipe,

a second plurality of rigid cross members rigidly attached to said elongated beams to form a lifting platform in a plane above the lower ends of said beams but below the plane of the first plurality of cross members so as to provide a space therebetween,

an inextensible circular band rigidly attached to said beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another,

a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end, and

a valve means attached to said tank emptying pipe and located between said first and second pluralities of rigid cross members and a grill extending between said first and second pluralities of rigid cross members to prevent damage to said valve means.

6. An assembly for shipping free flowing materials comprising the combination of:

an impact plastic resistant tank having a cylindrical side wall of essentially circular horizontal cross section and a lower substantially flat end wall, the flat end wall having a tank emptying pipe,

a close fitting rigid framework around the cylindrical side wall and supporting the flat lower end wall, said framework comprising:

four elongated tubular square section beams equally spaced around and adjacent to the cylindrical side wall,

one side face of each beam being parallel to the cylindrical side wall, each beam being parallel to the cylinder axis and extending beyond the upper and lower edges of the cylindrical side wall,

a first plurality of rigid cross members rigidly attached to said elongated beams in a plane above the lower ends of said beams,

a planar hard sheet material member above the plurality of rigid cross members and supported

thereby to form a support for the tank lower end wall,

said planar sheet material having a hole therethrough to receive the tank emptying pipe,

a second plurality of rigid cross members rigidly attached to said elongated beams to form a lifting platform in a plane above the lower ends of said beams but below the plane of the first plurality of cross members so as to provide a space therebetween,

an inextensible circular band rigidly attached to said beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another,

a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end, and

a valve means attached to said tank emptying pipe and located between said first and second pluralities of rigid cross members and a grill extending between said first and second pluralities of rigid cross members to prevent damage to said valve means.

7. An assembly for shipping free flowing materials comprising the combination of:

an impact resistant plastic tank having a cylindrical side wall of essentially circular horizontal cross section and a generally frusto-conical lower end wall, and

a rigid framework circumscribing said cylindrical side wall and supporting the lower conical end wall, said framework comprising:

four elongated tubular steel beams each beam being closed at the top, the beams being equally spaced around and adjacent the cylindrical side wall parallel to the cylinder axis and extending above the upper edge of the cylindrical side wall,

a plurality of rigid cross members rigidly attached to said beams above the lower ends thereof so as to form a rigid lifting platform at right angles to the cylindrical tank axis,

a member of sheet steel having a frusto-conical shape corresponding to the frusto-conical lower end wall of the tank so as to form a support therefor, said member being rigidly attached to said elongated steel beams above the plurality of rigid cross members,

an inextensible circular band rigidly attached to said elongated beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another and to rigidify the assembly, and

a downwardly opening hollow divergent foot rigidly attached to each elongated beam at the lower end.

8. An assembly for shipping free flowing materials comprising the combination of:

an impact resistant plastic tank having a cylindrical side wall of essentially circular horizontal cross section and a lower end wall;

a close fitting rigid framework around the cylindrical side wall and supporting the lower end wall, said framework comprising:

four elongated tubular square section beams equally spaced around and adjacent the cylindrical side wall, one side face of each beam being substantially tangential to the cylindrical side wall, each beam being parallel to the cylinder axis and extending above the upper end of the cylindrical side wall,

a plurality of rigid cross members rigidly attached to said beams above the lower ends thereof so as to form a rigid lifting platform at right angles to the cylindrical tank axis,

a member of hard sheet material supporting the

tank above the plurality of rigid cross members, an inextensible circular band rigidly attached to said elongated beams in a plane above and distant from said rigid cross members so as to locate the upper ends of the elongated beams relative to one another and to rigidly the assembly, and

a downwardly opening hollow divergent square section foor rigidly attached to each beam, the square section feet being attached so that a diagonal of each square lies substantially in a radial plane of the cylindrical side wall.

9. An assembly as claimed in claim 1 and further comprising a means projecting from each beam below the top but adjacent the upper end of the cylindrical side wall to accommodate a crane spreader bar.

10. An assembly as claimed in claim 4 and further comprising a means projecting from each beam below the top but adjacent the upper end of the cylindrical side wall to accommodate a crane spreader bar.

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U.S. Cl. X.R.

220—12, 69, 97