

Feb. 3, 1959

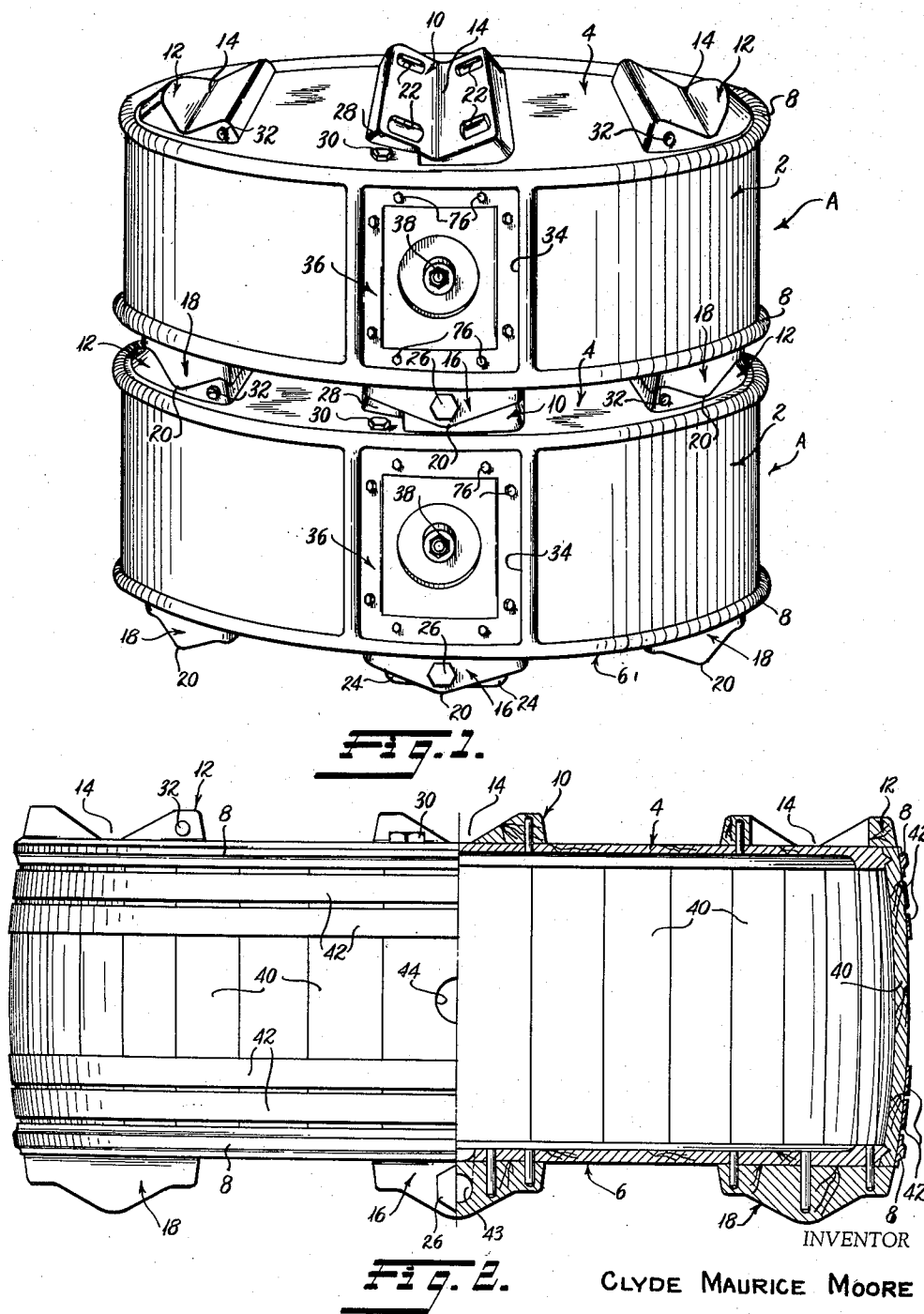
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2,872,079

NESTED SHIPPING DRUMS WITH BUILT-IN PALLET

Filed Jan. 17, 1955

4 Sheets-Sheet 1



BY

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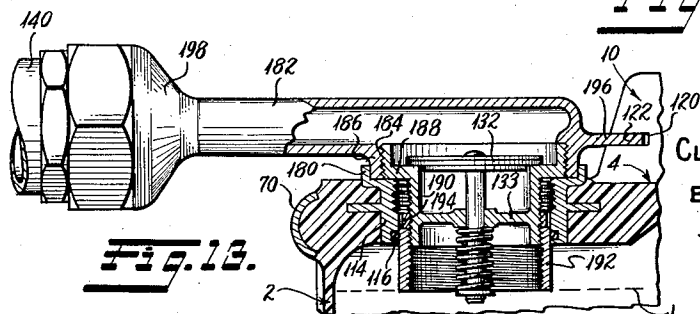
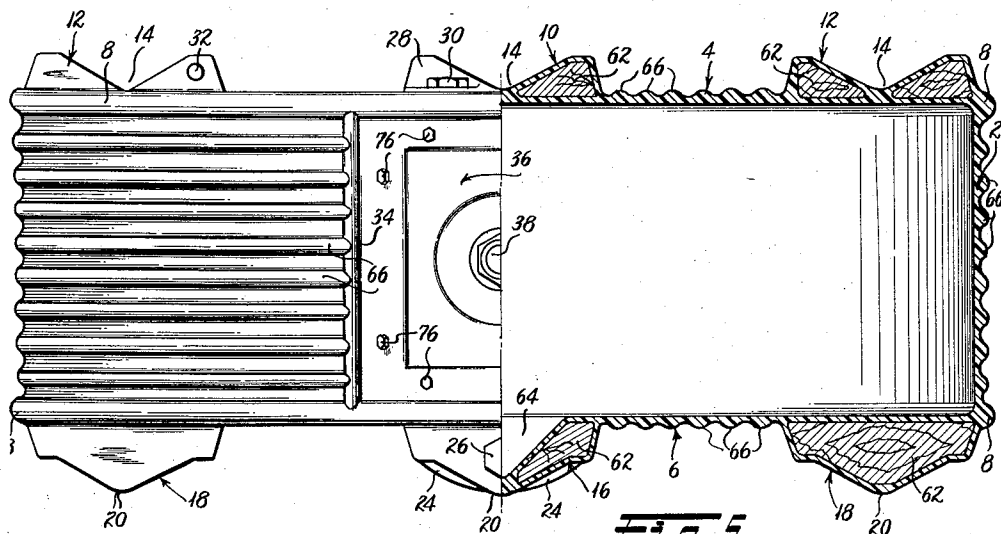
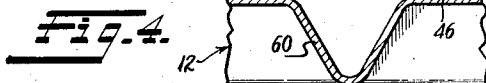
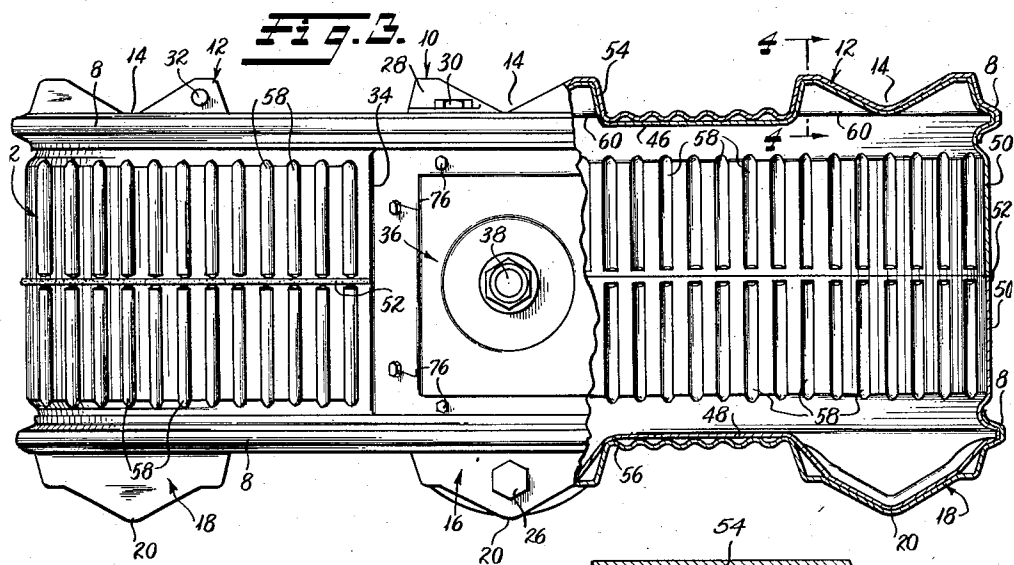
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NESTED SHIPPING DRUMS WITH BUILT-IN PALLET

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4 Sheets-Sheet 2



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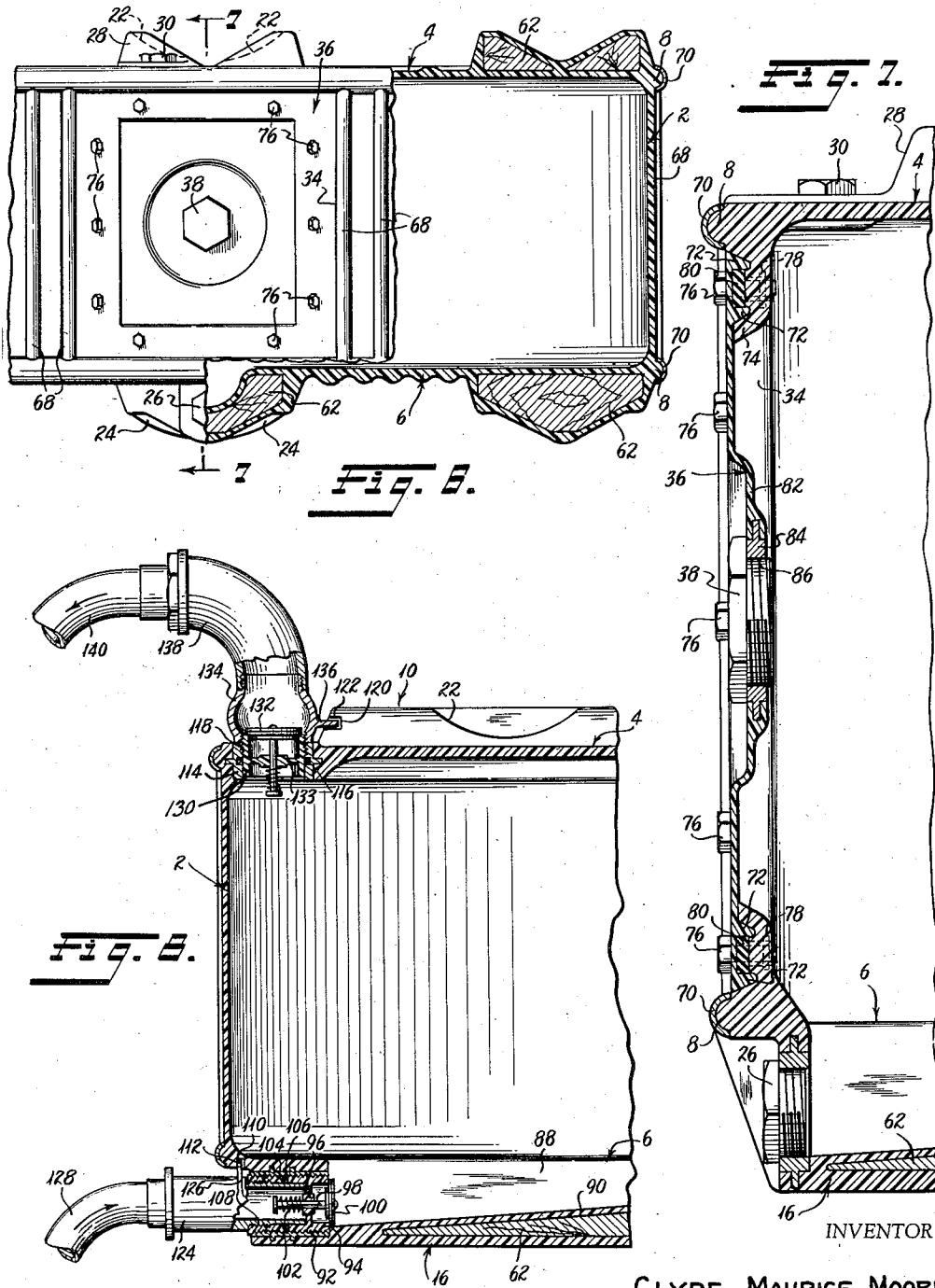
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4 Sheets-Sheet 3



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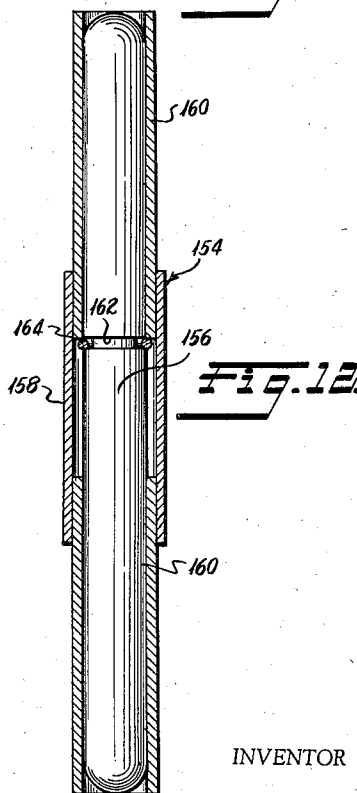
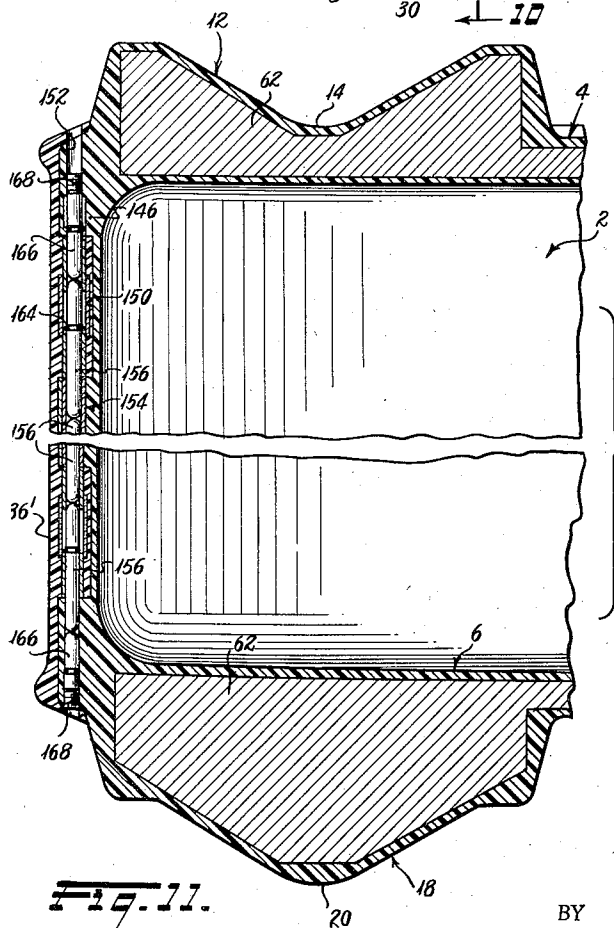
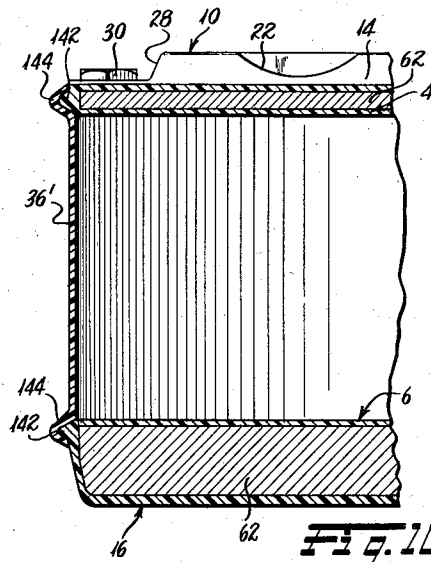
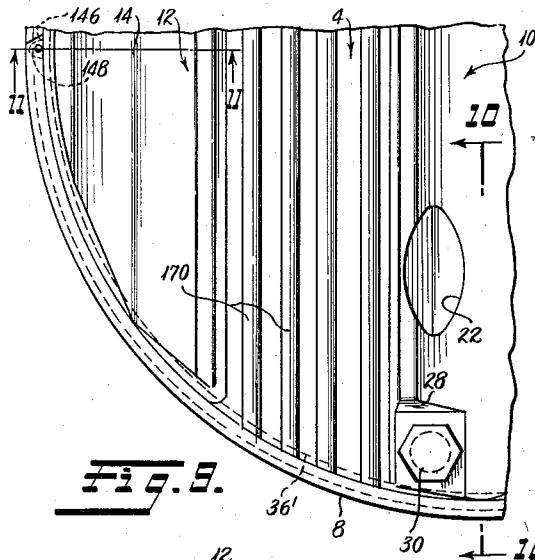
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NESTED SHIPPING DRUMS WITH BUILT-IN PALLET

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4 Sheets-Sheet 4



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2,872,079

NESTED SHIPPING DRUMS WITH BUILT-IN PALLET

Clyde Maurice Moore, Richmond, Va.

Application January 17, 1955, Serial No. 482,146

19 Claims. (Cl. 222—143)

This application is directed to an improvement on the structure shown in the copending application of Clyde Maurice Moore, Serial No. 177,106, filed August 1, 1950, for Demountable Structure, now Patent No. 2,761,582, dated Sept. 4, 1956.

The invention relates to shipping drums, and particularly to shipping drums of such size and configuration that they may be readily handled by one person, may be interlockingly stacked and selectively drained or filled while so stacked. The shipping drum of the present invention is further characterized by features whereby a single drum or a plurality of drums may be handled, transported, stacked or unstacked either manually or by conventional fork lift trucks without the use of pallets or other auxiliary equipment.

In general, the shipping drum of the present invention comprises a cylindrical drum having a diameter substantially greater than its axial length so that one or even two such drums may be easily rolled or otherwise manipulated by one person. The drum is also provided with spaced ribs across its end walls, so shaped that certain ribs of one mate with certain ribs of another to hold the end walls sufficiently separated to receive the lifting fingers of a fork truck, between ribs, thus providing for handling directly by fork trucks either from a supporting floor or from a position in a stack of drums. At least one of the ribs on the bottom wall of each drum is provided with a passageway, opening through an end of that rib and communicating with the interior of the drum so that material may be withdrawn from or introduced into any selected drum in a stack of nested drums. The passageway referred to also provides for "bottom filling" of the drums, as will be described in detail herein. Further novel features reside in the provision of a vent opening and closure in such position that it is always accessible, even when the drums are stacked, and yet so located as to not interfere with nested stacking or handling of the drums by a fork truck. The drum of the present invention is also preferably provided with a removable dump panel in its peripheral wall to facilitate rapid emptying of either solid, granular, or liquid materials.

It is therefore an object of this invention to provide a novel shipping drum that is readily and easily handled or stacked, singly or in multiple, by manual handling or by fork lift truck.

Still another object of this invention is to provide a shipping drum of the type referred to wherein provision is made for filling or draining one or a plurality of such drums while in nested and stacked relationship.

A further object of this invention is to provide a shipping drum so configured and dimensioned as to offer maximum resistance to denting or deformation.

A still further object of this invention is to provide a shipping drum having a dump panel therein to permit extremely rapid and complete emptying of solid, granular or liquid contents and to facilitate cleaning of the interior of the drum for reuse.

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An additional object of this invention is to provide a shipping drum having novel and desirable features and capable of being formed from any suitable material.

Another object of the invention is to provide a shipping drum having the novel characteristics set forth above and which is readily adaptable to the highly desirable method of "bottom filling."

Additional objects and advantages will become apparent to those skilled in the art as the detailed description proceeds in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of a pair of nested drums embodying the present invention and showing the salient features common to the various modifications;

Fig. 2 is a view, partly in elevation and partly in diametric section, of one embodiment of the invention;

Fig. 3 is a view, similar to Fig. 2, but showing another embodiment;

Fig. 4 is a fragmentary sectional view, on an enlarged scale, taken substantially along the line 4—4 of Fig. 3;

Figs. 5 and 6 are views, similar to Fig. 2, of additional embodiments;

Fig. 7 is a fragmentary sectional view on an enlarged scale, taken substantially along the line 7—7 of Fig. 6;

Fig. 8 is a fragmentary vertical sectional view, through a drum embodying the present invention, illustrating features adaptable to all embodiments;

Fig. 9 is a fragmentary top plan view of a further embodiment of the invention;

Fig. 10 is a sectional view taken substantially along the line 10—10 of Fig. 9;

Fig. 11 is a sectional view, on an enlarged scale and with parts broken away, taken substantially along the line 11—11 of Fig. 9;

Fig. 12 is an axial sectional view, on a further enlarged scale, of one unit of the joint locking means of Fig. 11; and

Fig. 13 is a fragmentary vertical sectional view through a modified form of vent fitting for use with shipping drums embodying the present invention.

As stated, Fig. 1 shows a pair of shipping drums embodying the salient features of the present invention, which are in general, common to the various modifications and is intended as a more or less diagrammatic showing of the invention. The drums A are shown as being identical in construction and each includes a generally cylindrical side wall structure 2, of a diameter considerably greater than its axial length, and generally circular top and bottom end walls 4 and 6 secured to the ends of the side wall structure. Each end wall terminates at its edges in roller rings 8 projecting slightly outwardly of the side wall structure 2. The top end walls are provided with central diametrically extending ribs 10 and further ribs 12 spaced from but parallel to the ribs 10. Each of the ribs on the top end walls 4 is formed with a longitudinal concave channel 14 in its crest portion with the bottom of the concavity very close to the plane of the top end wall 4.

Each of the bottom end walls 6 is provided with a central rib 16 and side ribs 18 axially opposite the ribs 10 and 12, respectively, on the top end wall 4. Each of the ribs on the bottom end walls is formed with a convex crest portion 20 complementary in shape to the concave channels 14 so that the ribs on the bottom end walls may nest in the channels of the top wall ribs, as shown, when one drum is stacked upon another.

The inner face of the channels 14 of at least one of the ribs on the top wall is provided with depressions 22 in position to matingly receive generally bulbous projections 24 on corresponding ribs on the bottom wall when

the drums are stacked in nested relation as shown in Fig. 1. The depressions 22 and projections 24 interact to prevent relative sliding of stacked drums in the direction of the ribs and to hold the drums in substantially coaxial relation. Clearly the depressions could be provided in the ribs of the bottom wall and the projections placed where the depressions are shown, if desired.

As is clearly evident from Fig. 1, the ribs 16 and 18, being spaced apart, define open-ended channels therebetween and the ends of those channels are always open whether the drum rests directly on a floor or is nested on the top of a similar drum. The ribs 16 and 18 are of such height that the open-ended channels between them may readily receive the usual lifting fingers of conventional fork lift trucks. Thus, the drums may be handled by conventional fork lift trucks without using pallets or other auxiliary equipment, as is necessary with conventional shipping drums. Such a fork lift truck can, therefore, lift the drums, singly or in multiple, from a floor or from a selected position in a stack of drums. Since the concave channels 14 are of the depth described, the distance between the bottom end wall of one drum and the top end wall of a drum upon which it rests is not materially greater than the space between the bottom end wall of the bottom drum and the floor upon which it rests. Thus, the height of a stack of drums is held to a minimum while still providing for the insertion of lifting means between drums anywhere in the stack.

The central bottom ribs 16 are each provided with a longitudinal internal passageway (to be described in detail later) communicating with the interior of the drum and terminating in an opening at the front end of the rib 16. A closure member 26 closes the forward end of the passageway and, as evident from Fig. 1, the closure 26 is readily accessible on each drum of a stack whereby material may be drawn from any drum selectively in a stack of drums without the necessity of having to move any of the drums to do so.

A portion of the central rib 10 on the top wall 4 of each drum is cut away, as indicated at 28, to a position well inside the periphery of the top wall and a vent opening is provided in the top wall, closed by a closure 30. The closure 30 lies entirely within the end outline of the rib 10 so as not to interfere with stacking of the drums or with the insertion of lifting elements as described. Furthermore, the arrangement is such that the vent closures 30 may be selectively removed or replaced in any drum of a stack without having to move the drums thereover. The particular position and arrangement of the drain openings and vent openings not only permits selective withdrawal of material from the drums in the stack but also provides a ready arrangement for highly desirable "bottom filling" of one or a plurality of drums, as will be described in detail hereafter.

If desired, the laterally outermost ribs 12 may be provided with longitudinally extending openings extending through their ends to slidably and telescopically receive rodlike elements 32. The openings in which the elements 32 are slidable may extend the full length of the ribs or may extend therein only to about the center if desired. The rods 32 may be axially pulled outwardly to provide handles for manually lifting and manipulating the drums.

Each drum is further provided with a relatively large opening 34 in its cylindrical side wall structure, the openings 34 extending a substantial distance peripherally of the drum and preferably extending substantially the full height of the side walls. Suitable dump panels 36 are removably secured to the side wall structure to cover and close the openings 34. If desired, the dump panels 36 may be secured to the drum in sealing relation (to be more fully described later) to effectively retain liquid materials. Preferably each dump panel 36 is also provided with a filler opening closed by a suitable threaded closure 38. All portions of the dump panels 36 and closures 38 lie entirely within the cylinder defined by the outer periph-

eries of roller rings 8 so that the drums may be rolled on a supporting surface without danger of any portion of the dump panels or closures 38 engaging that surface to interfere with rolling of the drums.

The provision of dump panels 36 permits easy and rapid cleaning of the interiors of the drums at any time and they further facilitate rapid and complete emptying of any type of material from the drums. In many instances it is desirable to ship or store granular or semi-solid materials, in which case the dump panels 36 offer a ready and convenient means for filling the drums and for emptying them thereafter.

The shipping drums of the present invention lend themselves readily to rapid and complete emptying in a novel and unique manner. A ramp or elevated platform may be provided having an opening therein and a receiver for the material below that opening. Trackways may be provided on the ramp or platform to permit rolling the drums over the opening and guide them thereover. With such an arrangement, a drum may be rolled, by one person, to a position near the opening, its dump panel (or closure 38) removed and the drum then rolled forwardly until the opening 34 is over the material receiving means, at which time all of the material in the drum will readily and rapidly be discharged into the receiver.

Bearing in mind the salient features of the invention as described in connection with Fig. 1, it will be apparent that applicant has provided a novel shipping drum having many advantages over conventional drums and permitting use in a manner not heretofore possible. For instance, one man can readily roll or platform two drums at a time. No stooping is ever required while rolling or platforming large quantities of these drums. Fork trucks, without special attachments, may select and transport specific load quantities of drums for rapid car loading and/or warehousing. The drum of the present invention permits the use of a dumping panel for rapidly and economically unloading large cargoes into prepared funnel racks leading to bulk storage tanks, trailer truck tanks or the like. The shipping drums of the present invention may be stacked during transit and are thereby automatically interlocked against relative movement while being transported. This drum also permits manual stacking, which is impractical if not impossible with drums of conventional design and the present drums are far easier and more economically cleaned by virtue of the dump panels described. Denting and fractures of the cylindrical side walls, the generally conceded weakest part of conventional drums, is reduced to an absolute minimum, thus removing the costly dedenting processes otherwise so commonly necessitated and the drum design makes practical the use of reinforced plastic materials from which to fabricate the drums without requiring unduly thick wall sections to provide the necessary strength.

Furthermore, the use of these drums completely and entirely eliminates the necessity for barrel racks since a wide selection of products, in different drums, may be stacked in a relatively small space, for instance, in a corner of a crowded service station or the like. These drums provide their own "barrel racks."

The provision of the drain channel in the bottom of the drum provides for positive and complete emptying of each drum, even when in stacked position. This is an important feature and is not present in conventional drums. Total emptying of conventional drums has always been a costly and time-consuming operation since it has always been necessary to tilt each drum to even approach complete emptying and even then it is practically impossible to remove the last quart or so of material.

The drum of the present invention also permits bottom filling with liquid materials and permits filling a single drum or a multiplicity of drums from a single supply source.

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Having thus described the general characteristics generally common to the different species of drums embodying the present invention, specific embodiments thereof incorporating those features may be constructed as described hereinafter. In the various views, those features described in connection with Fig. 1 bear the same reference characters throughout the species.

Fig. 2 shows a drum embodying substantially all the salient features described in Fig. 1 wherein the drum is formed of wood panels comprising the top end wall 4 and bottom end wall 6 and staves 40 comprising the cylindrical side wall structure. The staves 40 are held in assembled relation to the end walls by the usual metal hoops 42. In general, the construction of this embodiment is conventional but the drum is further provided with roller rings 8. The top wall 4 is provided with means defining the ribs 10 and 12 having the channels 14 therein and the bottom wall 6 is provided with separate ribs 16 and 18 corresponding to those of Fig. 1. The ribs 10, 12, 16 and 18 are configured to the same general configurations as described in connection with Fig. 1 and function in the same way. The central bottom rib 16 is provided with a longitudinal but upwardly sloping passageway 43 communicating with the interior of the drum through the bottom wall 6 and terminating in a discharge opening at the forward outer end of the rib 16. It is intended that the passageway 43 be closed by a suitable closure corresponding to the closure 26 of Fig. 1. The top wall 4 of this drum is also provided with a vent opening closed by a suitable closure 30 having the same relationship to the remaining parts as described in connection with the closure 30 of Fig. 1. The stave construction of this modification does not permit use of a dump panel as described in connection with Fig. 1 but the cylindrical side wall structure is provided with a suitable discharge of filling opening or bunghole 44 and a suitable closure therefor (not shown).

The elements defining the ribs 10, 12, 16 and 18 of this modification may be separate wood elements doweled or otherwise secured to the top and bottom end walls, respectively. This modification may also be provided with the telescoping handles 32.

It will be evident that the drum shown in Fig. 2 includes most of the advantages and desirable features described in connection with Fig. 1, and many of which will be enlarged upon later.

Fig. 3 shows another modification of the invention wherein the drum is constructed of metal, preferably steel, and comprises top and bottom end wall panels 46 and 48, respectively, of relatively thin sheet material having peripheral axially extending flanges 50 integral therewith. The flanges 50 are arranged in edge-abutting relationship and welded, as at 52, to form a complete drum structure. The top and bottom end walls further include outer layers 54 and 56, respectively, of relatively heavy sheet metal overlying the inner layer 48 and interlocked therewith at the periphery of the end walls and axially inwardly of the roller rings 8. Both the inner and outer layers 48 and 56 of the bottom and 46 and 54 of the top are formed to define the ribs 10, 12, 16 and 18, the rib-forming portions of the inner layers nesting within corresponding portions of the outer layers. Preferably, the portions of the end wall structures defining the bottoms of the open-ended channels between the ribs are corrugated in a longitudinal direction to add rigidity and strength to the structure and the flanges 50 are provided with ribs or beads 58 integrally formed thereon to provide added reinforcement and rigidity to the side wall structure. As shown in Fig. 4, those portions of the inner layer 46 of the end wall panels which define the ribs heretofore referred to are further formed with transverse bead portions 60 for added reinforcement.

This form may be provided with the dump panel 36 heretofore described having a further opening therein with

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the closure 33. The central bottom rib 16 being a hollow integral portion of the drum, lends itself readily to the provision of a discharge opening in the end of a rib as described in connection with Fig. 1 and the hollow interior of that rib constitutes a channel extending across the bottom wall to effect complete draining of the drum. If desired, the inner layer 48 constituting a portion of the bottom wall of this embodiment may be formed as a continuous planar sheet over the ribs 18 but is preferably shaped to conform to the outer layer 56 at the rib 16. By making the inner layer planar over the ribs 18 liquid material cannot then remain in the hollow ribs 18 when the drum is drained through the bottom opening upon removal of closure 26.

The modification illustrated in Fig. 5 shows how readily a drum embodying the present invention may be constructed of molded resinous material wherein the top and bottom end walls are integral with the side wall structure. The drum may be molded in one piece, if desired, employing the dump opening 34 for removal of the molding core, or it may be molded in two semicylindrical sections thereafter suitably mated and joined by cementing, fusion or the like to form an integral drum structure. In constructing such a drum of molded resinous material, it is desirable that the resinous material be provided with fibrous reinforcing materials embedded therein. Such reinforcing material as glass fibers or the like are readily adaptable to this purpose. As shown in the right hand half of Fig. 5, the ribs 10, 12, 16 and 18 are of hollow, generally tubular construction with the inner portions thereof defining planar inner end wall surfaces for the drum. Preferably the ribs 10, 12 and 18 are made hollow to reduce the weight of the drum but may be filled with a lightweight rigid core material 62. Preferably, the core material 62 is of less specific gravity than the resinous material but of sufficient rigidity to materially add to the strength of the structure. Wood or light metal tubes lend themselves readily to this purpose. The central bottom rib 16 does not define a planar portion of the bottom wall 6 but is formed with an internal channel 64 extending substantially diametrically across the bottom wall and constituting a drain channel for the drum. The channel 64 communicates with a suitable opening in the forward end of the rib 16, which may be provided with the closure 26.

In those forms of the invention constructed of molded resinous materials, the top and bottom end walls 4 and 6 and the side wall structure 2 are preferably formed with integral beads or ribs 66 to add strength and rigidity to the drum. The ribs 66 on the side wall structure preferably extend circumferentially around the drum to facilitate molding of the material and withdrawal of the drum from the mold. The endmost beads of the side wall structure are larger than the intermediate beads and themselves define the roller rings 8.

Fig. 6 illustrates a still further form of the modification of the invention wherein the shipping drum is constructed of molded resinous material and is similar in most respects to that described in connection with Fig. 5, corresponding parts bearing the same reference numerals. In this modification, however, the reinforcing ribs 68 of the side wall structure extend axially of the drum between the roller rings 8. In this form the roller rings 8 are covered by a metallic channel-shaped annular element 70 providing a wear-resistant surface for the roller rings.

Fig. 7 is a sectional view on an enlarged scale through the dump panel 36 of Fig. 6. This figure illustrates one manner of securing and sealing the dump panel 36 to the side wall structure of the drum. As shown in Fig. 7, the panel 36 is provided with parallel ribs 72 extending inwardly at its periphery and nestingly received within a channel structure 74 integrally formed with the side wall structure and defining an outwardly facing channel around the periphery of the opening 34. Suitable threaded studs 76 or the like extend through the edge portions of the

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panel 36 into threaded engagement with metallic elements 78 embedded in the side wall structure to thereby clamp the panel to the drum. The space between the ribs 72 and the bottom portion of the channel structure 74 defines an open passageway extending along the joint between the panel and the drum. That passageway is filled with a self-sustaining but deformable resilient material 80 which may be rubber or the like. Upon tightening the studs 76, the resilient material 80 is placed under pressure and effects a complete and perfect seal between the dump panel and the drum side wall structure. This sealed joint merely illustrates one form of seal that may be employed, it being understood that any suitable sealed joint may be incorporated in the dump panel 36 to effect the desired sealing thereof. At its central portion the dump panel 36 is dish or depressed inwardly at 82 and is provided with an embedded metallic insert 84 having a threaded opening 86 therethrough defining a filling or dumping opening. The closure 38 threadedly engages the opening 86 to close the same. Obviously the closure 38 may be removed when desired. As clearly evident from Fig. 7, the dish portion 82 of the panel 36 permits all portions of the closure 38 to lie entirely within the cylinder defined by the outermost surfaces of roller rings 8 whereby the drum may be rolled over a supporting surface without causing the closure 38 to strike that surface to interfere with the rolling action. While the details of the dump panel 36 have been described with particular reference to the drum shown in Fig. 6, it is to be understood that all these features or their equivalents may be incorporated in the dump panels of any of the various modifications described or to be described herein.

Fig. 8 is a fragmentary sectional view through a drum of the present invention and illustrates features that may be incorporated in any or all of the specific modifications described. While the specific features of Fig. 8 are described in connection with an integrally molded resinous drum, it is to be understood they may be incorporated in the wooden drum of Fig. 2 or the metal drum of Fig. 3 and the details of the drum proper as shown in Fig. 8 are merely illustrative. The bottom rib 16 is provided with a longitudinal passageway or channel 88 having a bottom portion 90 sloping upwardly from the front to the rear thereof and extending substantially diametrically across the drum. The channel or passageway 88 is upwardly open and defines a drain channel in the bottom of the drum. The channel 88 communicates with a passageway extending through the front end of the rib 16 and defined by a metal insert 92 embedded in the material of the rib and provided with internal threads adapted to receive a valve body insert 94. The valve body insert 94 is threaded into the metal insert 92 and constitutes a permanent fixture in the drum even though removable for replacement or repair. The valve body 94 provides guide spider 96 for the stem 98 of a valve 100. A spring 102 normally holds the valve 100 in closed position to prevent flow of material outwardly of the drum. The valve body insert 94 is further provided with an inwardly facing peripheral channel 104 in which an O-ring 106 or equivalent sealing means is mounted. The outermost end portion of the valve body insert 94 is internally threaded, as at 108. The internal threads 108 are for the purpose of threadedly receiving the closure 26 previously described.

A portion of the bottom end wall 6 of the drum outwardly of the end of the rib 16 is provided with a groove 110 defining a transverse abutment surface 112.

The vent opening previously referred to is defined by an embedded insert 114 having an O-ring sealing member 116 mounted in its inner periphery and provided with screw threads 118 at its upper end. The threads 118 threadedly receive the vent closure 30 previously described. The end portion of the rib 10 is provided with a transverse groove 120 having an abutment surface 122 extending transversely to the axis of the vent opening.

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The provision of the valve 100 in the drain opening provides for highly desirable "bottom filling" of one or more drums of the present invention. In filling shipping drums with certain liquid materials it is highly desirable to prevent, as far as possible, undue agitation of the material in the drum during filling and to maintain that material in as nearly a quiescent state as possible. The desirability of maintaining the liquid being introduced into the drum in a quiescent state is well known and offers many advantages. To accomplish such bottom filling, the drum of Fig. 8 may be employed in combination with a filling device comprising a fitting 124 having a tubular end portion telescopically receivable in the valve body insert 94 in sealing relation to the O-ring 106. The fitting 124 is provided with a laterally extending ear 126 receivable in the groove 110 to hold the fitting in the illustrated position. The fitting 124 is mounted on the end of a tube or pipe 128 comprising a supply tube for liquid material to be introduced into the drum under suitable pressure. The ear 126 is of limited circumferential extent and it is obvious that the fitting 124 may be inserted in the valve body insert 94 with the ear 126 extending laterally horizontally and then the fitting may be rotated to position the ear 126 in groove 110, as shown, the abutment surface 112 coacting with the ear 126 to prevent inadvertent removal of fitting 124 during a drum filling operation.

Liquid material under pressure may be introduced through tube 128 and the pressure thereof will cause the valve 100 to open and permit the liquid to flow into the drum. It is obvious that the liquid level in the drum will rise with a substantially quiescent surface until the drum is filled.

Fig. 8 also illustrates one form of vent fitting suitable for use with a drum embodying the present invention. The vent fitting comprises a cylindrical insert 130 having a check valve 132 mounted therein for sliding movement through a spider 133. The fitting 130 is secured to the end portion of an adaptor 134 having a lateral ear 136 thereon. The adaptor 134 is connected to an angle fitting 138 and vent tube 140. The cylindrical fitting 130 may be inserted in the vent opening while the ear 136 extends laterally, then the fitting may be rotated to position the ear 136 in groove 120 to hold the vent fitting in the desired position. As liquid material is introduced into the bottom of the drum, air and vapors thereover force the valve 132 to open and permit the vapors to be discharged through the vent tube 140. These may be directed back to the source of material or otherwise disposed of. The vent opening and the insert 114 preferably extend downwardly below the inner surface of the top wall 4. By this arrangement the liquid level rises up to the bottom of the fitting 114 and air and vapor thereabove is then trapped in the drum and the drum will receive no more liquid. The air and/or vapors trapped above the liquid surface constitute a cushion having well known advantages. The vent tube 140 may be of transparent material and when the drum has been filled up to the level of the bottom edge of insert 114 the introduction of additional liquid through the supply tube 128 will cause the liquid to flow outwardly of the vent opening through tube 140 and the operator may visually determine that the drum has been completely filled.

In the modification of Fig. 13, the drum may be identical to that of Fig. 8 but the imbedded insert 114 is preferably provided with an upstanding flange 180 constituting centering means for the vent fitting 182. The fitting 182 is of relatively flat shape and provided with a downwardly facing opening 184 defined by a flange 186 of a diameter to be readily but fairly snugly received in the centering flange 180. Valve sleeve 188 is threadedly mounted in the opening 184 in fixed position on the fitting 182 and is provided with a downwardly extending cylindrical portion 190 in which spider 133 and valve 132

are located. The cylindrical portion 190 is of less external diameter than the inside of insert 114 and is provided with a threaded outer surface on which liquid level control sleeve 192 is threadably mounted. A threaded ring 194 serves as a locking ring to lock the sleeve 192 in a selected position of adjustment along the cylindrical portion 190. The outer diameter of the sleeve 192 is only slightly less than the inside diameter of the insert 114 and engages the O-ring seal 116, as described in connection with the embodiment of Fig. 8.

The fitting 182 is provided with a laterally extending ear 196 positionable in groove 120 exactly as the ear 136 of Fig. 8. The fitting 182 is further provided with an enlargement 198 at its outer end constituting attachment means for the vent tube 140.

Since the fitting 182 is of such small vertical dimension in the vicinity of the drum, it will be obvious that the fitting may readily be applied to or removed from the vent opening in any drum in a stack of drums without interference from or the necessity of moving the drums above the one selected.

It will be obvious that when the device of Fig. 13 is employed while "bottom filling" a drum with liquid, the liquid will rise only to the level L coincident with the lowermost end of sleeve 192. Thus, by pre-adjusting the position of sleeve 192 on portion 190 the level to which the drum can be filled may be very accurately controlled. Since the valve sleeve 188 always rests on the upper end of insert 114, the sleeve 192 will project exactly the same distance into each of successive drums being filled. The ability to control, in this manner, the level to which drums are filled is a very important advantage of "bottom filling" and eliminates the need for weighing scales or automatic shut-off nozzles. Since the drums of the present invention are of relatively large diameter, a small range of adjustment of sleeve 192 permits a relatively large range of adjustment of the filled capacity of the drum.

The structure of Fig. 13 lends itself readily to a further use. When it is desired to accurately proportion different ingredients placed in a drum, the adjustable sleeve 192 can be relatively long to control the level of the first ingredient than replaced by successively shorter tubes for successive ingredients, thus accurately controlling the quantity of each ingredient of the formula.

The features described in connection with Fig. 13 further permit the filling of a multiplicity of drums from a single supply tube 128. A plurality of drums equipped with the structure shown in Fig. 13 may be stacked one upon the other as shown in Fig. 1 and the vent tube 140 may be provided at its other end (not shown) with one of the fittings 124 and connected to the bottom opening of the drum next thereabove in the stack. By this arrangement the bottom drum will be first completely filled to the desired level, then liquid material passing through the vent opening past valve 132 is introduced into the bottom of the drum next thereabove until it is filled and so on until all drums in the stack have been completely filled to the desired level.

Material may be drawn from drums equipped with the features of Figs. 8 or 13 by providing a spigot or the like receivable in the valve body insert 94 and provided with means to engage the valve stem 98 to hold valve 100 open. If desired, material may be withdrawn by merely removing the closure 26 and using any convenient instrument to push valve stem 98 inwardly to open valve 100.

Referring now to Figs. 9 through 12, the drum shown herein includes most of the salient features described in connection with Fig. 1 but is different therefrom in that the dump panel 36' extends substantially one-half way around the drum. The opening covered by the dump panel 36' likewise extends throughout one-half the circumference of the drum and terminates at the ends of a diameter of the drum that is substantially perpendicular

to the ribs 10 and 12. The upper and lower boundaries of the opening covered by the dump panel 36' are defined by the edge portions of the top and bottom walls 4 and 6, respectively. Thus, there are no inwardly projecting portions of the drum at the periphery of the opening covered by the dump panel. The edge portions of the top and bottom end walls 4 and 6 which define the edges of the dump opening are provided with ribs or beads 142. The beads 142 are substantially coextensive with the roller rings 8 but are of less radial extent and the upper and lower curved edge portions of the dump panel 36' are formed with inwardly facing channel portions 144 embracing the beads 142. The outer surfaces of the channel portions 144 are coextensive with the outer surfaces of the roller rings 8 and, in fact, define one-half of each of the roller rings.

The vertical end portions of the dump panel 36' are secured to adjacent portions of the side wall structure of the drum by means of a joint similar to that shown and described in the copending application of Clyde Maurice Moore, Serial No. 234,831, filed July 2, 1951, for "Interlocking Container and Joint," now abandoned. In general, the edge portions of the side wall structure at the ends of the dump opening are provided with outwardly extending ribs 146 receivable in inwardly directed channels 148 at the end edges of the dump panel 36'. Portions of the rib 146 are cut away, as at 150 (Fig. 11) and portions of the channel 148, corresponding to the cut away portions of the rib 146, are provided with an internal inwardly facing rib receivable in the cut away portions 150 to nest therein. Thus, the edges of the panel 36' and corresponding edges of the side wall structure of the drum overlap and interlock with each other. Those overlapped and interlocked portions are provided with axially extending aligned openings defining a continuous passageway 152 through the joint. Those portions of the passageway lying within the edge portions of the panel 36' and those portions constituting part of the side wall structure are each lined with a tubular metal structure 154 having a pin 156 slidable therein. The liners 154 and pins 156 are shown in more detail in Fig. 12 wherein the tubular metal liner is shown as comprising a central tubular portion 158 of relatively large diameter and smaller tubular members 160 telescopically received within the ends of the tube 158 and fixed therein. The pin 156 is of a diameter to slide within the tubes 160 and is of an overall length substantially equal to the overall length of the liner assembly 154, the ends of the pins 156 being rounded as shown. The adjacent ends of the tubes 160 are axially spaced apart and define an annular chamber around the pin 156. The pin 156 is provided with a circumferential groove 162 having a split ring 164 which extends into the chamber between the ends of the tubes 160 to prevent inadvertent withdrawal of the pins 156 from the liner assembly. The annular groove 162 is so positioned that the split ring 164 engages one of the tubes 160 when the pin 156 is entirely contained within the liner assembly, as shown in Fig. 12. It is obvious that the pin 156 may move downwardly through the liner assembly until the ring 164 abuts the upper end of the lower tube 160 and in which position the lowermost end of the pin 156 will project some distance below the liner assembly 154.

Referring again to Fig. 11, the liner assemblies 154 are embedded in their respective structures in axial alignment and with the pins 156 moved downwardly to the extent of their movement they span the joints between adjacent liner assemblies and thus lock the dump panel 36' to the drum side wall structure. The end portions of the passageway 152 receive short actuating pins 166 and threadably receive actuating screws 168 outwardly of the pins 166. The pins 166 are provided with split rings to frictionally retain those pins in their respective openings. As shown in Fig. 11, the dump panel 36' is

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locked to the side wall structure of the drum and to remove the dump panel it is only necessary to unscrew the upper screw 168 a short distance and advance the lower screw 168 to push actuating pins 166, and the pins 156, upwardly until each of the pins 156 is entirely contained within its associated liner structure 154, at which time the abutting ends of the pins 156 lie in the same plane as the joint between the overlapped portions of the drum and dump panel, whereupon the edge of the dump panel may be moved radially outwardly away from the drum and completely removed therefrom. The locking means just described are merely illustrative of one form adaptable to the present invention, it being understood that the ends of the dump panel may be secured to the drum in any other desired manner.

Since the dump opening of this modification extends fully half-way around the drum, the projecting portions of the top and bottom end walls would present weaknesses and be subject to distortion or breakage when the dump panel is removed.

However, since the ribs 10 and 12 and reinforcing beads 170 project outwardly to the free edges of the top and bottom walls, they so stiffen and rigidify those walls that the danger of breakage is minimized. This modification is particularly useful where it is desired to fill the drums with a material which may solidify or at least partially solidify after being introduced into the drum in liquid or semiliquid form. By providing such a dump panel as described above, the solidified material may be readily and rapidly removed from the drum in one piece by merely removing the dump panel and withdrawing the material. Such withdrawal may even be accomplished by gravity upon removing the dump panel and rolling the drum to a position where its dump opening is lowermost.

While a limited number of specific embodiments of the invention have been shown and described herein, it is to be understood that other modifications may be resorted to within the scope of the appended claims.

I claim:

1. A container having a generally cylindrical side wall structure and generally circular top and bottom end walls secured to the ends of said side wall structure, said end walls having spaced ribs thereon and extending thereacross in a direction parallel to a diameter thereof, said ribs defining open-ended spaces therebetween of sufficient depth and width to receive lifting elements inserted beneath said container when said container is positioned on a flat supporting surface with the said ribs of one end wall resting on said surface, the crest portions of the ribs on one of said end wall structures having longitudinal concave channels therein, the crest portions of the ribs on the other end wall being of convex transverse shape substantially complementary to said concave channels whereby a plurality of said containers may be stacked, one upon the other, with said convex rib crests on one of said containers mating with the convex channels of another of said containers and with said open-ended spaces being open for the reception of lifting elements between said containers, the mating surfaces of certain of said rib crests being further provided with mating protuberances and depressions, respectively, arranged to prevent sliding movement of said ribs along said concave channels.

2. A container as defined in claim 1 wherein each of said end walls is formed of an inner layer of relatively thin sheet metal with a peripheral flange extending axially thereof, said flanges being in edge-abutting relation and welded together to define said side wall structure, and an outer layer of relatively heavy sheet metal over said end walls, said ribs being defined by deformed portions of both layers of said end walls.

3. A container as defined in claim 2 wherein said inner layer is further deformed to define reinforcing beads ex-

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tending transversely within the portions thereof defining said ribs.

4. A container as defined in claim 1 wherein said end walls and side wall structure are integrally molded of resinous material, said end walls having substantially planar inner surfaces and said ribs being hollow integral portions of said end walls with the hollow interiors thereof filled with a lightweight core material.

5. A container as defined in claim 1 wherein the inner surface of said bottom wall is substantially planar, an upwardly open channel extending substantially diametrically of the inner surface of said bottom wall, said channel lying within one of said ribs, and a drain passageway below said substantially planar surface and extending through an end of said one rib into communication with said channel.

6. A container as defined in claim 1 including elongated handle elements telescopically slidable in longitudinal passages extending through the ends of certain of said ribs.

7. A container having a generally cylindrical side wall structure and generally circular top and bottom end walls secured to the ends of said side wall structure, said end walls having spaced ribs thereon and extending thereacross in a direction parallel to a diameter thereof, said ribs defining open-ended spaces therebetween of sufficient depth and width to receive lifting elements inserted beneath said container when said container is positioned on a flat supporting surface with the said ribs of one end wall resting on said surface, the crest portions of the ribs on one of said end wall structures having longitudinal concave channels therein, the crest portions of the ribs on the other end wall being of convex transverse shape substantially complementary to said concave channels whereby a plurality of said containers may be stacked, one upon the other, with said convex rib crests on one of said containers mating with the convex channels of another of said containers and with said open-ended spaces being open for the reception of lifting elements between said containers, the depth of said concave channels being substantially equal to the height of said ribs whereby the height of said open-ended spaces between adjacent stacked containers is not substantially greater than the height of said open-ended spaces between one of said containers and a flat supporting surface.

8. A container as defined in claim 7 wherein said convex rib crests and said concave channels are of generally V-shape and wherein the sides of certain of said channels are provided with depressions receiving generally bulbous projections on the side faces of corresponding convex ribs of an adjacent stacked container to prevent relative sliding movement of said containers in the direction of said ribs.

9. A container having a generally cylindrical side wall structure and generally circular top and bottom end walls secured to the ends of said side wall structure, said end walls having spaced ribs thereon and extending thereacross in a direction parallel to a diameter thereof, said ribs defining open-ended spaces therebetween of sufficient depth and width to receive lifting elements inserted beneath said container when said container is positioned on a flat supporting surface with the said ribs of one end wall resting on said surface, the crest portions of the ribs on one of said end wall structures having longitudinal concave channels therein, the crest portions of the ribs on the other end wall being of convex transverse shape substantially complementary to said concave channels whereby a plurality of said containers may be stacked, one upon the other, with said convex rib crests on one of said containers mating with the convex channels of another of said containers and with said open-ended spaces being open for the reception of lifting elements between said containers, at least one of said ribs having a convex crest being substantially centrally located on the bottom end wall of said container and having a longitudinal passageway therein extending through an end of said rib below said bottom

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wall and communicating with the interior of said container through said bottom wall.

10. A container as defined in claim 9 wherein said at least one rib is a hollow integral portion of said bottom wall and wherein the hollow interior thereof defines an inwardly open channel extending across said bottom wall.

11. A container as defined in claim 10 wherein the bottom of said passageway extends upwardly from said end of said rib.

12. A container as defined in claim 9 wherein said passageway is provided with a check valve therein, adjacent said end of said rib, said check valve being arranged to permit one-way flow of material through said passageway into said container, and means accessible from the outer end of said passageway for opening said valve to permit flow of material outwardly through said passageway.

13. A container as defined in claim 9 wherein said passageway is provided with a check valve therein, adjacent said end of said rib, said check valve being arranged to permit one-way flow of material through said passageway into said container, a portion of said passageway outwardly of said check valve being provided with annular sealing means around its periphery, a portion of said container adjacent said end of said rib being provided with an abutment surface extending transversely of said passageway for releasably holding a filler fitting in said passageway.

14. A container having a generally cylindrical side wall structure and generally circular top and bottom end walls secured to the ends of said side wall structure, said end walls having spaced ribs thereon and extending thereacross in a direction parallel to a diameter thereof, said ribs defining open-ended spaces therebetween of sufficient depth and width to receive lifting elements inserted beneath said container when said container is positioned on a flat supporting surface with the said ribs of one end wall resting on said surface, the crest portions of the ribs on one of said end wall structures having longitudinal concave channels therein, the crest portions of the ribs on the other end wall being of convex transverse shape substantially complementary to said concave channels whereby a plurality of said containers may be stacked, one upon the other, with said convex rib crests on one of said containers mating with the convex channels of another of said containers and with said open-ended spaces being open for the reception of lifting elements between said containers, a portion of at least one of said ribs on said top wall terminating inwardly of the periphery of said top wall, a vent opening through said top wall, and a closure for said vent opening, said vent opening and closure being positioned entirely within the end outline of said one rib.

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15. A container as defined in claim 14 with at least one of said ribs having a convex crest being substantially centrally located on the bottom end wall of said container and having a longitudinal passageway therein extending through an end of said rib below said bottom wall and communicating with the interior of said container through said bottom wall.

16. A container as defined in claim 14 wherein the end portion of said one rib is provided with an abutment surface extending transversely of said passageway for releasably holding a vent fitting in said vent opening.

17. In combination, a closed container for liquids having means defining a filler opening adjacent the bottom thereof, a check valve in said opening permitting one-way flow of liquid into said container, means defining a vent opening in the top of said container, a vent fitting removably secured in said vent opening and provided with a vent tube projecting downwardly into said container a predetermined short distance to position its lower end only slightly below said top to predetermine the extent to which liquid can rise in said container.

18. The combination defined in claim 17 wherein said vent tube is vertically adjustable relative to said vent fitting whereby to permit the lowermost end of said vent tube to be positioned at a preselected level in said container.

19. The combination defined in claim 17 including pressure sealing means between said vent fitting and said vent opening.

References Cited in the file of this patent

UNITED STATES PATENTS

268,732	Salmon	Dec. 5, 1882
1,515,996	Buchanan	Nov. 18, 1924
1,730,142	Henderson	Oct. 1, 1929
1,770,163	McCrery	July 8, 1930
1,773,930	Athon	Aug. 26, 1930
2,047,164	Coleman	July 7, 1936
2,092,926	Lithgow	Sept. 14, 1937
2,147,886	Devine	Feb. 21, 1939
2,172,878	Pfizer	Sept. 12, 1939
2,635,786	Wickson	Apr. 21, 1953
2,652,174	Shea et al.	Sept. 15, 1953
2,695,115	Roop	Nov. 23, 1954

FOREIGN PATENTS

262,108	Germany	July 8, 1913
638,203	Germany	Nov. 11, 1936