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Kerr

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[54] **READILY RE-CLOSEABLE AND RE-USABLE CONTAINER OF THE LID AND OPENHEAD DRUM TYPE**

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Related U.S. Application Data

[63] Continuation of Ser. No. 279,461, Aug. 10, 1972, now abandoned.

[52] **U.S. Cl.**..... **220/320,** 220/256, 220/358, 292/256.67

[51] **Int. Cl.**.. **B65d 45/32,** B65d 41/00, B65d 51/18

[58] **Field of Search**..... 220/55 AN, 42 A, 60 R, 220/29, 42 C, 320, 256, 358; 206/508; 292/256.6, 256.67

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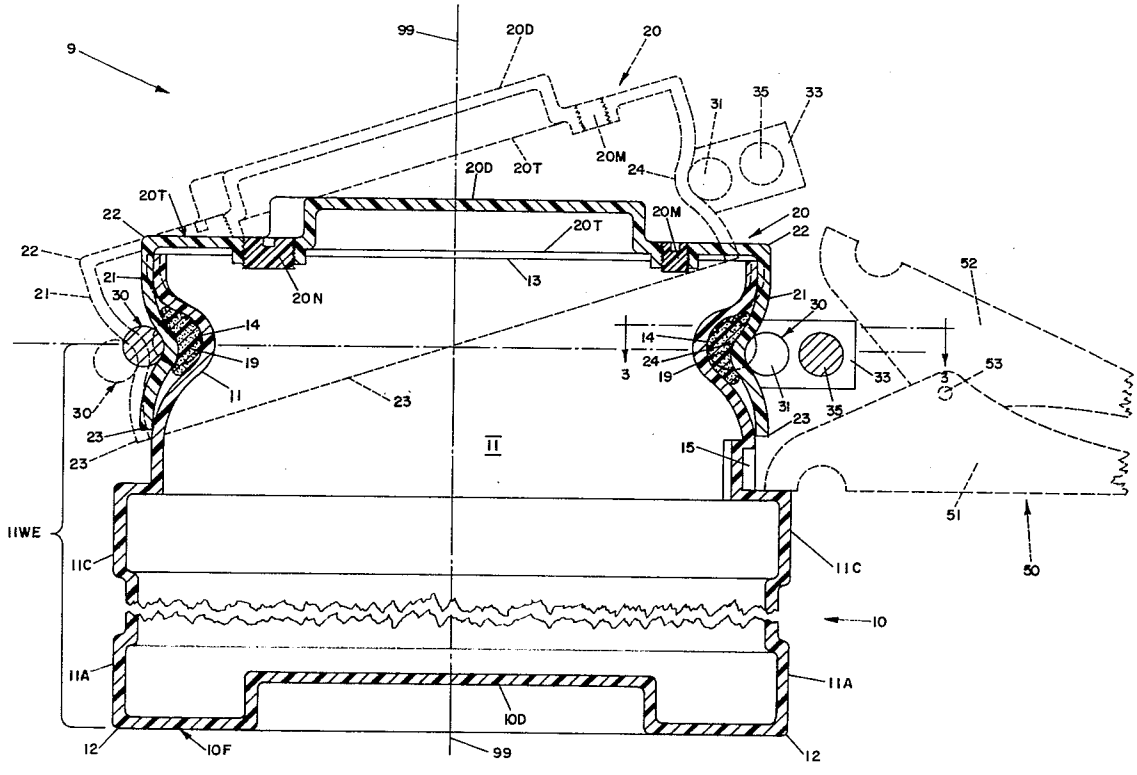
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[57] **ABSTRACT**

There is described a securely re-closeable plural-trips container of the type comprising an open-head (i.e. wide mouth) drum and separable lid; thus, bulk materials cargo can be readily charged into and discharged from a container which is readily internally cleaned or treated between successive cargo trips. The container closure lid portion comprises a broadly transversely extending roof-panel positionable at the open-head drum mouth together with an annularly connected deeply depending skirt that is frictionally resiliently engageable and disengageable with upper external annular portions of the drum. In cross-sectional contour the lid skirt desireably includes an inwardly extending rib for engagement with a resiliently compressible gasket located at a narrowed waist of the drum, the lid at all times preferably carrying a tightenable girth-band for controllably inwardly constricting the lid skirt.

6 Claims, 6 Drawing Figures



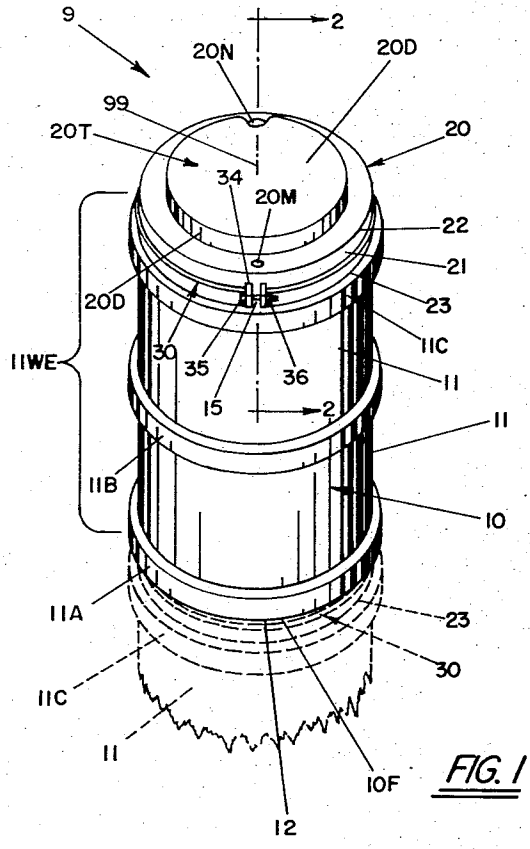


FIG. 1

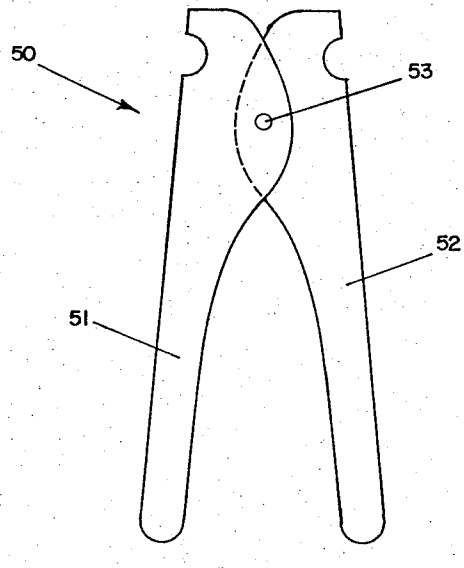


FIG. 4

FIG. 3

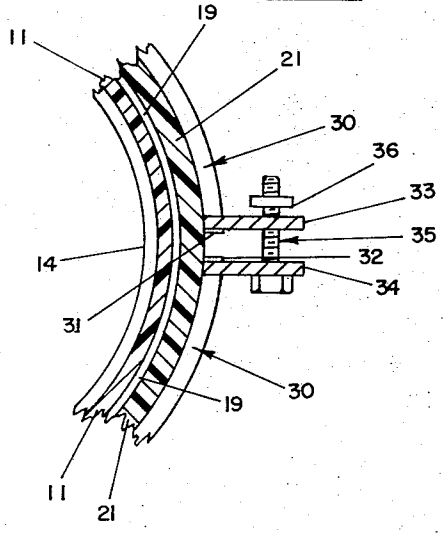
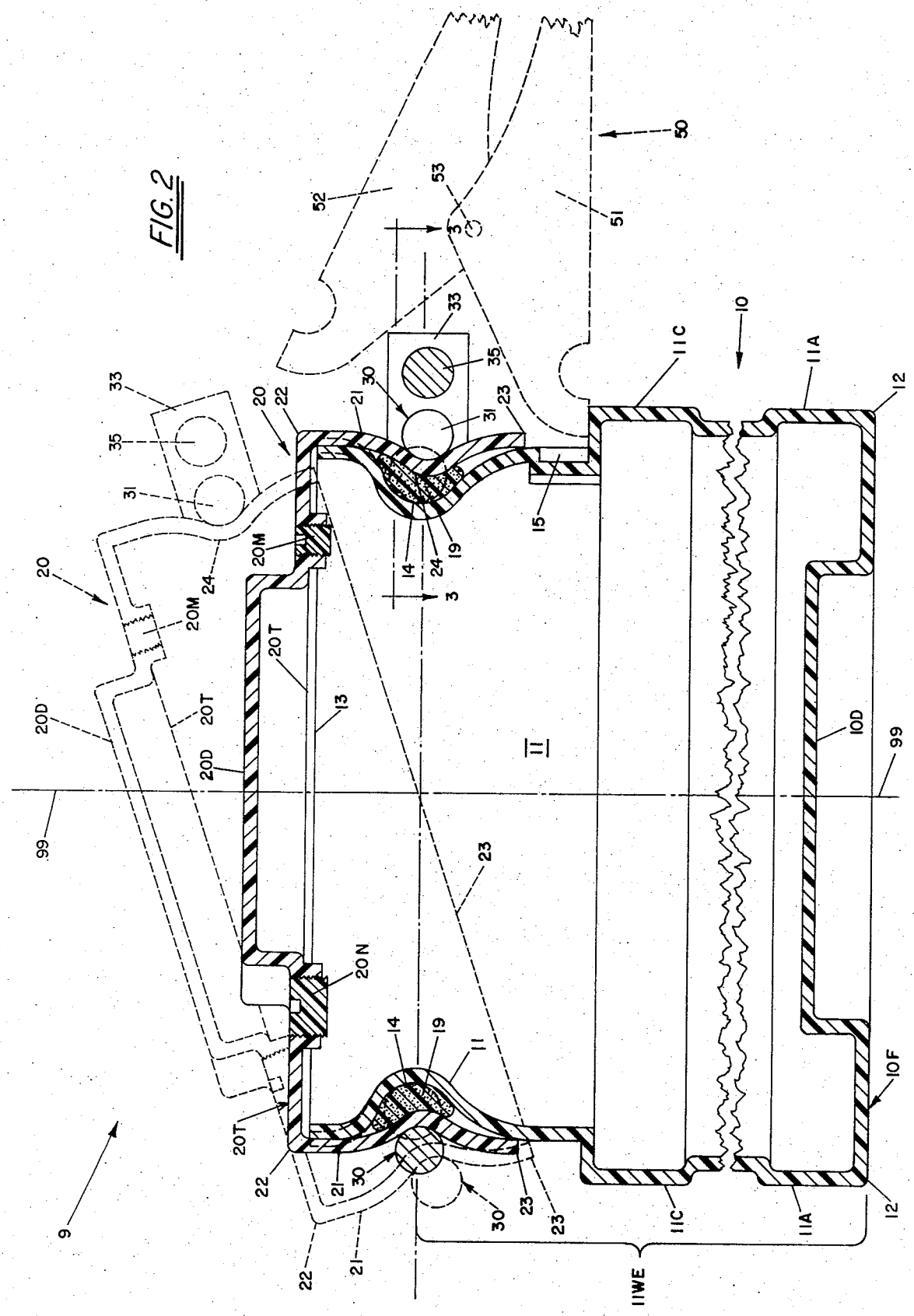


FIG. 2


50
52
53
51
3
33
35
31
30
20
22
21
23
11C
10
11A
12
15
24
19
14
20M
20T
13
20D
99
10D
II
20N
11
10F
9
11WE

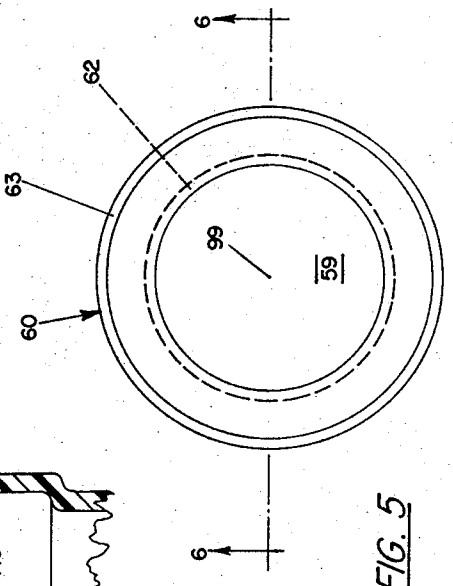

6
62
63
99
59
60
6

FIG. 5

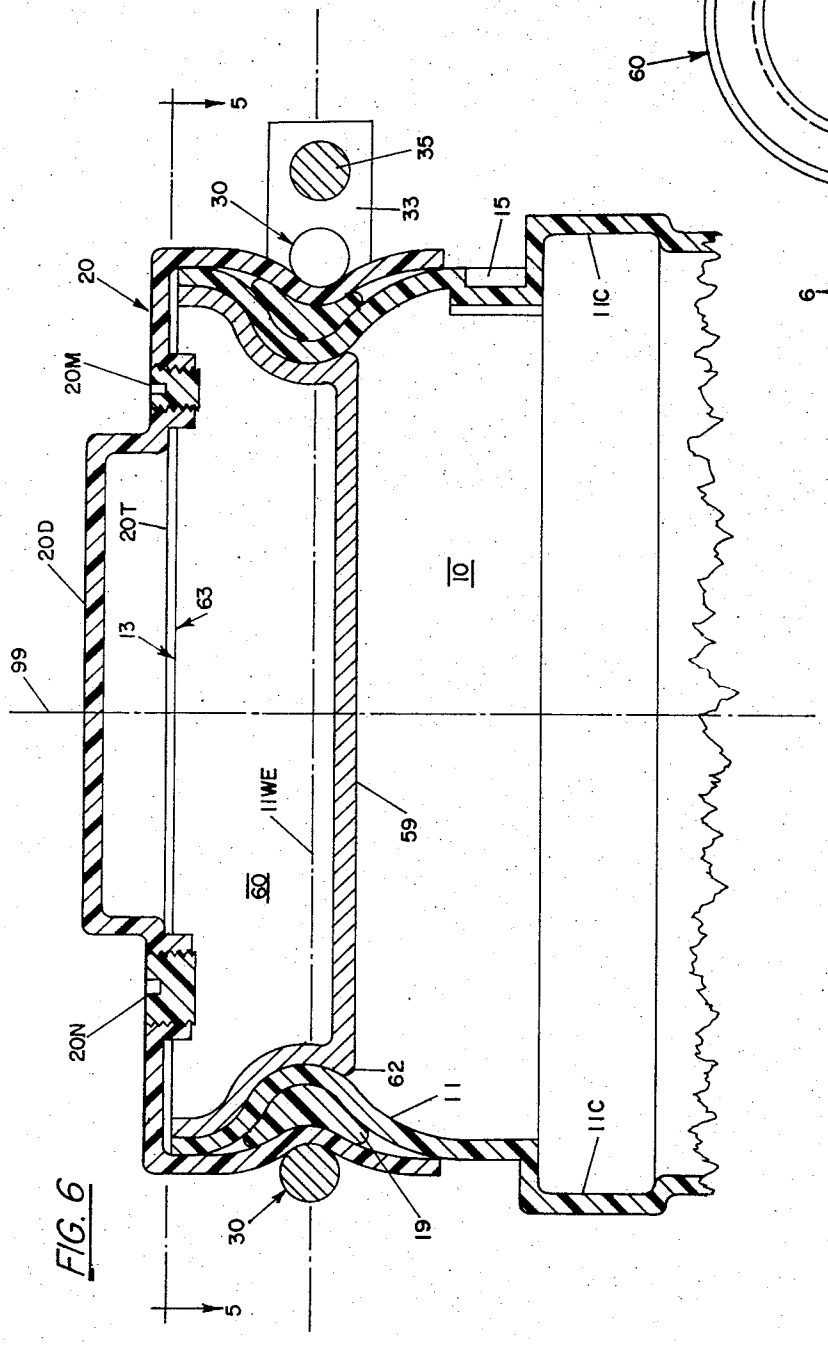

5
35
30
33
15
20
11C
20M
20D
20T
63
13
99
10
11WE
59
60
20N
62
11
19
30
11C
5

FIG. 6

READILY RE-CLOSEABLE AND RE-USABLE CONTAINER OF THE LID AND OPENHEAD DRUM TYPE

This is a continuation of application Ser. No. 279,461, filed Aug. 10, 1972, now abandoned.

Containers of the re-closeable drum variety are generally understood to mean an uprightable sturdy and re-useable container tubularly surrounding a vertical-axis and including an annularly connected floor-panel transversely horizontally intersecting the vertical-axis whereby the floor-panel and the said upwardly extending tubular portion together define the container's cargo storage volume; such re-useable drum containers necessarily include a permanent opening of some fixed-area which is re-closeable after each cargo trip. Sturdy and readily cleanable structural materials such as ferrous metals, treated wood, and tempered glass have been employed for plural-trips drum containers, depending upon the cargo classes to be carried therewithin. The drum containers prior art teaches two basic types of re-closeable permanent openings for the drum. In the first or so-called "bung" type, the drum opening fixed-area is relatively small and usually bears a ratio of less than one-tenth with respect to the drum's tubularly-defined average transverse-area; repeated re-closing is effected with a plug-like closure that is wedgedly or threadedly engaged with the drum opening. In the second or so-called "open-head" type drum, the drum opening comprises substantially the entire tube upper extremity, and accordingly, the fixed-area thereof bears a ratio approaching unity with respect to the drum's average cross-sectional transverse-area. For open-head type drums, repeated reclosing is usually effected with a plate-like lid closure that is peripherally annularly beaded so as to frictionally engage both the internal and the external annular surfaces of the drum at the tubular upper extremity thereof; a constrictable removable girth-band is applied peripherally along the lid closure to provide a better protective seal for the internal cargo especially for prolonged storage and/or relatively abusive transit of the container.

There are advantages and disadvantages associated with the bung type and the open-head type re-closeable drums. For the bung type the main advantage is that it is a comparatively simple task to effect a secure and high-integrity removable closure for the relatively small drum opening. However, the bung type is adaptable mainly for low-viscosity liquids, small bungs being highly impractical for viscous liquids and tightly-packed solids and for heterogeneous mixtures of liquids and large solids (i.e. pickles in brine, etc.). Moreover, the relatively small drum opening makes it difficult and oftentimes impossible to clean or to protectively line the drum's internal surfaces, and in the case of metallic drums to remove dents and other minor structural damage. On the other hand, open-head type drums generally do not suffer from most deficiencies generally attendant with the bung type. For example, open-head drums are not restricted by the cargo's flowability characteristics, they are readily internally provided with removable plastic bags or other chemically inert lining appropriate to the cargo to be charged therewithin, and they are readily amenable to the removal of dents and other superficial structural damage. However, the main disadvantage associated with open-head type drums is the difficulty in providing a secure and high-integrity

removable closure for the relatively large mouth opening thereof. Oftentimes during transit and other materials handling type operations the plate-like closure lid accidentally becomes loosened such that oxidizeable or hydrolizeable cargo becomes deteriorated in quality; sometimes the lid becomes completely disengaged whereby cargo is spilled resulting in financial loss and even in injury to personnel or premises if the cargo be corrosive or inflammable chemicals. Moreover, attempts to employ resinous structural materials for open-head type drums have been frustrated because of the failure to provide even marginally secure lid closures for the large opening thereof.

It is accordingly the general object of the present invention to provide a plural-trips container of the type comprising a wide-mouth or open-head drum and having an unusually secure and high-integrity lid closure that can be used for several container trips.

It is another object of the present invention to provide a securely recloseable plural-trips container of the open-head type that is highly resistant in cargo-loaded form to abusive transit and other materials handling operations whereby the cargo is unusually well protected from leakage and spillage.

It is a further object to provide a reusable closure for open-head drums that provides a high-integrity and reliable seal for long periods storage of oxidizeable and hydrolizeable chemicals.

It is yet another object to provide a reusable closure that is exceedingly simple to apply and remove from open-head type drums and that is adaptable for use even for drums fabricated of resinous structural materials.

It is a further object to provide a readily re-closeable and re-usable container of the lid and open-head drum type that is amenable to fabrication of resinous structural materials wherein the broadly transversely extending separable lid might be additionally provided with threaded bungs whereby the drum container functions as a "combined bung and openhead" type.

With the above and other objects and advantages in view which will become more apparent as this description proceeds, the readily re-closeable open-head type drum container of the present invention comprises as the closure lid portion thereof a transversely extending roof-panel together with an annularly connected deeply depending tubular skirt that is resiliently frictionally (and non-threadably) engageable and disengageable with upper annular portions of the drum, the lid skirt flange internal side desireably including an annular rib extending matably toward a narrowed waist or nip for the drum and preferably a resiliently compressible intervening gasket whereby a tightenable girth-band might be especially advantageously employed for controllably inwardly constricting the lid annular skirt in sealing engagement with the drum.

In the drawing, wherein like characters refer to like parts in the several views, and in which:

FIG. 1 is a perspective view of a representative form of the open-head type drum container of the present invention, the depending skirt lid closure being shown in secure removable condition therewith.

FIG. 2 is a sectional elevational view taken along line 2—2 of FIG. 1, phantom line indicating the lid closure immediately prior to engagement and immediately after disengagement.

FIG. 3 is a detail sectional plan view taken along line 3—3 of FIG. 2.

FIG. 4 is a top plan view of a reverse-scissors leverage tool which might be employed for facilitating removal or disengagement of the container lid closure portion.

Referring initially briefly to FIGS. 1 and 2, representative embodiment 9 of the readily re-closeable and reusable container of the present invention generally comprises a stably uprightable open-head drum 10 comprising a tubular housing 11 surrounding a vertical-axis 99 and extending loftily upwardly from an annularly connected (at 12) floor-panel 10F that transversely intersects said vertical-axis whereby drum 10 has an annular upper open-end 13. The external side of drum tubular housing 11 at a drum waist-elevation 11WE located nearer to upper open-end 13 than to floor-panel 10F is provided with a cross-sectionally narrowed waist 14. Removably engaged lid closure 20 for the annular upper open-end 13 of open-head drum 10 comprises a roof-panel 20T transversely intersecting vertical-axis 99 together with a depending skirt 21 surrounding vertical-axis 99 and annularly connected (at 22) to roof-panel 20T whereby downward skirt 21 has an annular lower open-end 23 located in elevation well below drum upper open-end 13 and below drum narrowed waist 14. The internal side of lid skirt 21, which surrounds and is frictionally engaged with the drum tubular upper portion, is cross-sectionally provided with an annular rib 24 located substantially at elevation 11WE and extending inwardly toward drum waist 14. A resiliently compressible annular gasket 19 surrounding vertical-axis 99 and located substantially at elevation 11WE is adapted to provide a better seal between lid 20 (at 24) and open-head drum 10 (at 14). In this vein, a tightenably constrictable girth-band 30, located at elevation 11WE and frictionally surroundably engaged with lid skirt 21, might be employed to constrict skirt 21 inwardly toward the drum tubular upper portion, whereby skirt rib 24 coincidentally inwardly compresses gasket 19. When the girth-band is loosened slightly, yet remaining frictionally engaged with skirt 21, lid 20 might be disengaged from the drum tubular upper portion.

While the depending skirt lid concept of the present invention is adapted for secure, though removable, engagement with the upper tubular portion of various hollow storage drums, it is especially admirably adaptable for so-called open-head type drums. In open-head type drums, the drum upper open-end is quite large in area and bears a ratio of at least three-fourths (and closer to "one") as compared to the average cross-sectional open area defined by the drum upright tubular housing. Moreover, the upright tubular housing upper portion is of substantially regular transverse cross-sectional shape and size whereby the drum upper-end is free of pronounced inwardly extending horizontal lips or flanges which would make it difficult to clean, line, or to treat the drum internal surfaces. In this vein, the thin-walled upper portion of tubular housing 11 simply terminates at 13 to provide a thin-walled annulus upper open-end or open-head for drum 10. The drum housing upper portion including at the upper open-end 13 is desireably manually inwardly resiliently deformable (as indicated in solid line in FIG. 2) and for such purpose resinous structural materials are preferably employed. Herein, the entire drum 10 including tubular housing 11 is provided of a resinous structural material, and in this regard and as is well known in the prior art the molded resinous tubular housing 11 including vertically spaced thicker webs (11A, 11B, and 11C) which serve to strengthen the drum under cargo-loaded conditions. As will be pointed out later in greater detail, the lid roof-panel 20T desireably includes an upwardly extending circular boss 20D. In this vein, the drum floor-panel 12 desirably includes an upwardly extending circular recess 12D for mating engagement with the circular boss 20D of the another vertically aligned container 9 stackably positioned immediately therebelow, as indicated in phantom line in FIG. 1.

As has been previously alluded to, the external side of the drum tubular housing upper portion is provided with a cross-sectionally narrowed waist 14 located at a waist-elevation 11WE that is nearer to drum upper open-end 13 than to floor-panel 12 and herein above uppermost drum web 11C. The tubular resinous housing upper portion between web 11C and upper open-end 13 is of regular wall thickness and of regular circular cross-sectional shape about vertical-axis 99, upper open-end 13 being cross-sectionally larger than is waist 14. The drum upper portion between elevation 11WE and uppermost web 11c has a single internally thickened area which is provided with an externally accessible notched portion 15 adapted to provide a bearing point for leverage tool 50. A ring gasket 19 is located on the drum external side at elevation 11WE within drum narrowed waist 14. While the resiliently compressible gasket might be adherently joined to the drum, the resiliently stretchy ring gasket 19 herein is simply stretched around circular waist 14 and frictionally held thereat by its unrelieved stress.

Horizontal roof-panel 20T of lid closure 20, including its herein circular annular juncture 22 with depending skirt 21, is located immediately adjacently above the drum upper open-end 13. As had been previously mentioned, roof-panel 20T might structurally include an upwardly extending annular boss 20D surrounding vertical-axis 99 which boss 20d strengthens roof-panel 20T ancillary to vertical stacking of loaded containers 9. Herein, roof-panel 20T is provided with a pair of threaded vertical bores therethrough for threaded engagement with plugs 20M and 20N; thus the contents of container 9 might be vented, or liquid or other readily flowable cargoes might be optionally charged or discharged at said plugs. Herein, circular boss 20D has a slightly diminished radius at the larger plug 20N to provide sufficient room therefor between it and the lid circular periphery 22. The lid depending skirt including at the lower open-end 23 is desireably manually outwardly resiliently deformable (as indicated in solid line in FIG. 2) and for this purpose resinous structural materials are preferably employed. Herein, the entire lid 20 including roof-panel 20T and depending skirt is provided of a suitable resinous structural material. As had been previously mentioned, the internal side of the lid skirt is provided with a cross-sectionally narrowed annular rib 24 located substantially at elevation 11WE between roof-panel 20T and skirt lower open-end 23; the inwardly extending annular rib 24 deforms resiliently compressible gasket 19 when lid 20 is engaged with drum 10. Skirt 21 herein is of regular wall thickness and of regular cross-sectional shape about vertical-axis 99, lower open-end 23 being cross-sectionally larger than is rib 24. As is indicated in phantom line in FIG. 2, the skirt lower open-end 23 is fabricated

slightly dimensionally smaller than is the geometrically similar drum upper open-end **13.** Thus, manually initiated resilient distortions of lid skirt **21** and the drum upper portion **13** (and in opposite radial directions from vertical-axis **99**) will allow skirt rib **24** to vertically pass by the drum flared upper open-end **23** so that lid **20** can be snapped into engagement or disengagement with drum **10.** In this vein, as indicated in phantom line in FIG. **2,** a non-horizontal or tilted condition for lid **20** facilitates incremental resilient deformations along the drum circumferential periphery **13** ancillary to engagement of said skirted lid.

A tightenably constrictable girth band **30** effectively surrounding vertical-axis **99** is desireably employed to maintain an inward pressure on lid skirt rib **24** and in tight sealing engagement with drum **10** (as at intervening gasket **19**) whenever the container is loaded with cargo. Girth band **30** is preferably of a flexible or non-kinking structural material whereby a high-integrity continuous inward annular pressure is applied therewith. For example, multi-strands cable, or the flexible unitary rod, might be advantageously employed. The circularly cross-sectional flexible metallic rod-like cable **30** shown in the drawing provides a circular arc of about 358° with respect to vertical-axis **99** whereby said girth band **30** has two separated adjacent ends **31** and **32.** Surrounding the respective cable ends and attached to each are plates **33** and **34.** A threaded bolt **35** is threadedly engaged with both plates **33** and **34** whereby boly **35** provides means for controllably tightening and loosening of girth-band **30.** The girth band is preferably at all times frictionally engaged with the external side of skirt **21** i.e. at the skirt groove resulting from the annular rib **24** of regular thickness skirt **21.** In this vein, for permanent frictional engagement of girth-band **30** with skirt **21,** there are means to limit the maximum diameter for girth-band **30,** as by providing an enlarged integral portion **36** for threaded bolt **35.** Prepataory to engaging or disengaging lid **20,** threaded bolt **35** is used to slightly enlarge the diameter of girth-band **30;** yet, band **30** remains frictionally engaged with the disengaged lid as seen in phantom line in FIG. **2.** Threaded bolt **35** is adjusted to tighten band **30** when lid **20** is engaged with the drum upper portion so as to provide a high integrity seal e.g. against intervening gasket **19.**

While a great number of thermoplastic resinous materials might be employed for the manually resiliently deformable lid skirt and the drum housing upper portion, polyolefin blends (such as mixtures of polyethylene and polypropylene) are preferred. For example, for a 15 gallons polyolefin container weighing about 7 pounds tare, an average circular diameter of 15½ inches, and overall height of 22½ inches, the drum and skirt wall thickness is uniformly about 0.120 inches. For a 55 gallons polyolefin container weighing about 30 pounds tare, an average circular diameter of 22½ inches, and overall height of 36½ inches, the drum and skirt wall thickness is uniformly about 0.250 inches. Such uniform wall thickness for lid skirt and drum might be provided with rotational casting fabrication techniques. Moreover, the entire lid and drum can be castably fabricated in one operation; the lid skirt is subsequently severed from the drum tubular housing upper portion of the rotational molded structure.

The reverse-scissors leverage tool **50** of FIG. **4** might be employed to facilitate disengagement of lid **20** from drum **10.** Tool **50** comprises a pair of elongate legs **51** and **52** pivotably connected at **53** nearer legs' forward ends which have concave configuration. For the engaged lid condition (with band **30** slightly loosened), the fore end of leg **51** is placed into drum notched portion **15** and the fore end of other leg **52** is placed at the underside of slightly loosened bolt **35.** Then, when the operator manually presses the rearward ends of legs **51** and **52** together, the second leg **52** causes girth-band **30** and lid **20** to become together disengaged from drum **10,** as indicated in phantom line in FIG. **2.** With the lid disengaged, the drum cargo can be discharged, the open-head drum **10** (including at upper-end **13**) can be readily cleaned or otherwise treated, and the lid closure **20** can be thereafter readily re-engaged.

FIG. **5** is a top plan view (taken along line **5—5** of FIG. **6**) of a preferred embodiment annular brace **60.** As is alluded to in FIG. **6** (which is based upon FIG. **2** and taken in the **6—6** direction of FIG. **5**), the annular brace means (**60**) is removably, though frictionally securely, inserted into the upper portion **11** of the container tubular drum portion **10.** The annular brace means is especially appropriate for volumetrically larger containers, such as 55 gallons; in such situations, during rough and abusive handling of the weighty cargo-laden container, cargo leakage sometimes occurs via open-end **13** and along the lid skirt internal side. However, it has been found that the tightly removably inserted rigid annular brace along the internal side of the drum upper portion (substantially at waist-elevation "**11**WE") will minimize any cargo leakage problems from abusively handled large containers. The external contour of the annular brace **60** is desireably geometrically similar to (so as to continuously frictionally engage) the internal contour of the drum housing upper portion **11.** Herein, the annular upper-edge **63** of brace **60** (which surrounds vertical-axis **99**) is substantially co-planar with drum upper open-end **13,** and the lower-edge **62** is somewhat below waist-elevation "**11**WE". There is desireably a transversely extending fortifier member attached to the brace sectorial portions to ensure its geometric rigidity against drum upper portion **11** under use conditions. Preferably, the fortifier member is an imperforate horizontal plate **59** and continuously annularly attached thereto, as along **62.**

From the foregoing, the construction and operation of the readily re-closeable and re-usable container of the open-head drum and skirted lid type will be readily understood and further explanation is believed to be unnecessary. However, since numerous changes and modifications will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly, all suitable equivalents might be resorted to, and as falling within the scope of the appended claims.

I claim:

1. A readily re-closeable and re-useable container of the lid and open-head drum type for storing solids, liquids, and other bulk materials therein in readily withdrawable condition, said container comprising:

A. A stably uprightable open-head drum comprising an open-top tubular housing surrounding a vertical-axis and extending upwardly from an annularly connected floor-panel that transversely intersects said vertical-axis whereby the floor-panel and tubular housing together provide an open-head type

drum receptacle, the external side of said drum tubular housing nearer the annular upper open-end than to the floor-panel being provided with a cross-sectionally narrowed waist that completely surrounds said vertical-axis, the drum below the narrowed waist being provided with an externally accessible notched portion adapted to provide a bearing point for one leg of a reverse-scissors type bearing tool;

B. A removably engaged lid closure for the open-head drum annular upper open-end, said lid closure including a transversely extending roof-panel together with a depending skirt annularly connected to the roof-panel, said depending skirt including an annular lower open-end and also including thereabove an inwardly extending annular rib located within and frictionally engaged with the drum narrowed waist, said depending skirt being additionally provided with an externally grooved portion at co-elevation with said inwardly extending annular rib and

C. A tightenably constrictable horizontal girth band located within the externally grooved portion of the lid skirt, said girth band surrounding the drum vertical-axis and being provided with a horizontal bolt tightener means located spatially radially outwardly offset from said girth band, said frictionally engaged housing and lid skirt being resiliently spreadable away from each other with a said leverage tool engaged within two bearing points comprising said drum notched portion and the tightenable girth band bolt means whereby the lid skirt inward annular rib can pass vertically between the housing narrowed waist and the upper open-end thereof to permit opening of said container.

2. The container of claim **1** wherein the girth band comprises a circular rod-like cable having two spatially separated adjacent ends respectively provided with outwardly radially extending plates, said tightenable bolt means being threadedly engaged with said outwardly radially extending plates and spanning the spatially separated ends of the circular rod-like cable to provide said leverage tool second leg bearing point, there being an enlarged integral portion for the bolt means to provide means for controllably tightening and looseening the said circular girth band.

3. The container of claim **1** wherein there is a resiliently compressible annular gasket located at said narrow waist and surrounding said vertical-axis between the drum housing waist and the lid skirt annular rib; wherein the housing annular upper open-end and the skirt inwardly extending annular rib are of similar geometrical shapes, the circumference of the drum housing annular upper open-end at the drum external side exceeding the circumference of the lid skirt inward annular rib; and wherein the drum housing tubular upper portion between said waist and upper open-end is provided of a resiliently flexible thermoplastic resinous structural materal whereby the drum housing upper portion is inwardly resiliently deformable toward the vertical-axis during engagement and disengagement operations of said skirted lid.

4. The container of claim **3** wherein the drum tubular housing between the narrow waist and the drum annular open-top is of substantially constant thickness and for a horizontal cross-section spaced in regular geometric symmetry about said vertical-axis whereby the lid skirt can be readily engaged and disengaged by inwardly resiliently deforming the housing upper portion; and wherein the lid closure roof-panel is provided with at least one plug removably extending therethrough.

5. The open-head drum and removable lid container of claim **1** wherein the drum housing upper portion including at the drum annular upper open-end and also at the narrowed waist circularly surrounds the vertical-axis; wherein the lid closure depending skirt including at the lower open-end thereof and at the annular inwardly extending rib circularly surrounds the vertical-axis; wherein the diameter of the housing circularly annular open-top at the drum external side exceeds the minimum diameter of the skirt circularly annular rib; wherein the tubular housing throughout the upper portion thereof is provided of a resiliently flexible thermoplastic resinous material whereby said drum upper portion is inwardly resiliently deformable toward the vertical-axis during engagement and dis-engagement of said skirted closure lid; and wherein when the lid is disengaged the diameter of the drum upper open-end slightly exceeds the diameter of the lid skirt lower open-end.

6. The container of claim **1** wherein there is an annular brace functionally surrounding the said vertical-axis, said brace being removably frictionally engaged by the drum housing tubular upper portion at the narrowed waist whereby the annular brace tends to prevent cargo contained within the securely lidded condition container from leaking therefrom whenever the cargo-laden drum is roughly and abusively handled.

* * * * *