May 19, 1970 J. C. DAWSON ETAL 3,512,676

CONTAINER END STRUCTURE

Filed Aug. 7, 1967 2 Sheets-Sheet 1

FIG. 1

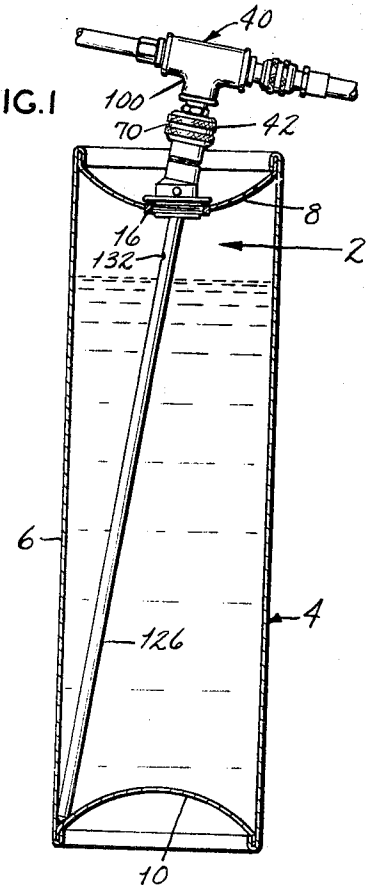


FIG. 4

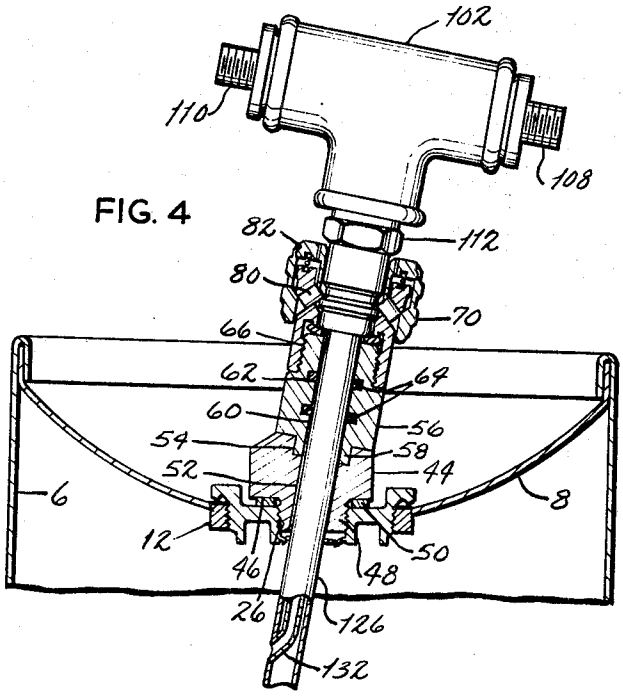


FIG. 3

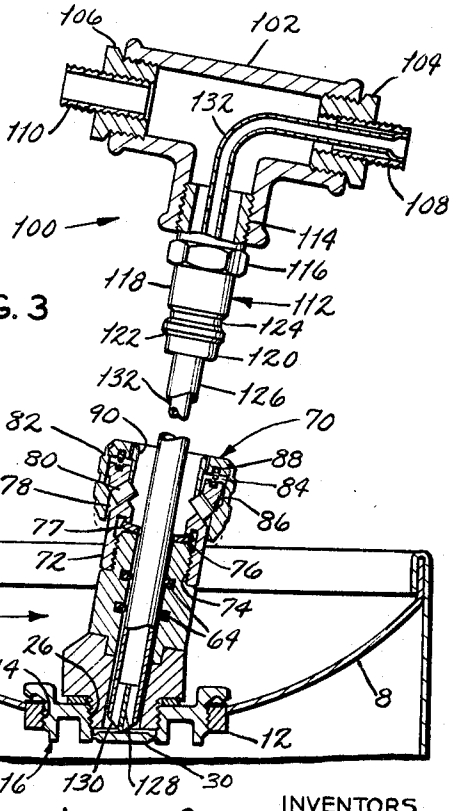
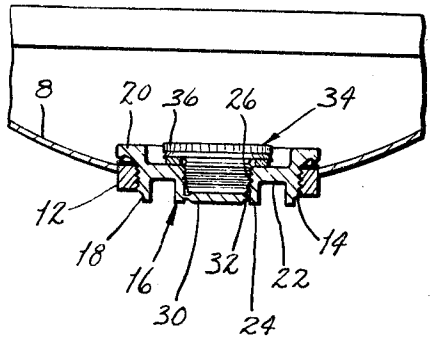


FIG. 2



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May 19, 1970 J. C. DAWSON ETAL 3,512,676

CONTAINER END STRUCTURE

Filed Aug. 7, 1967 2 Sheets-Sheet 2

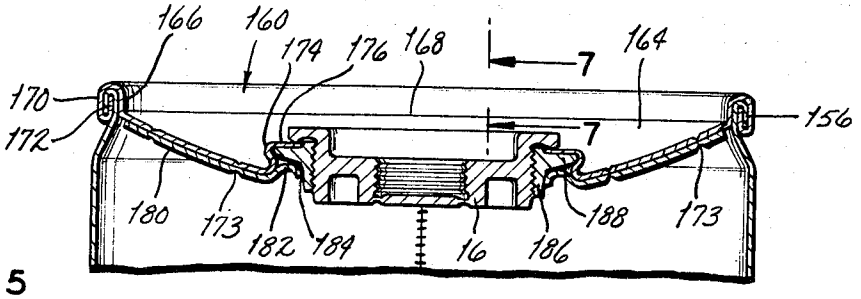


FIG. 5

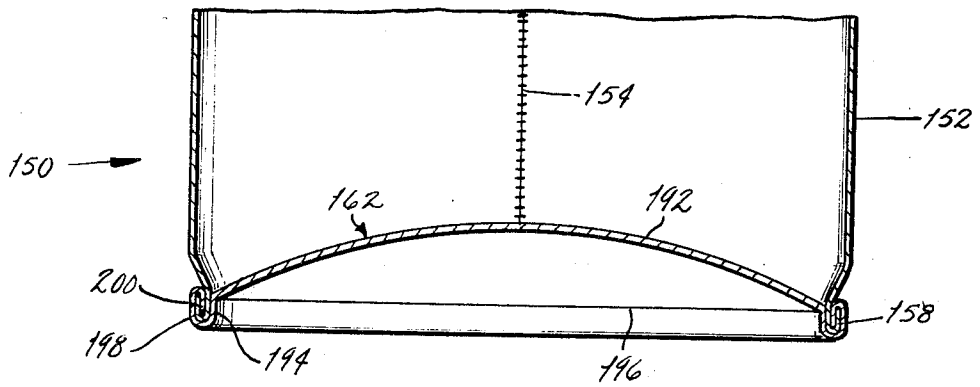


FIG. 6

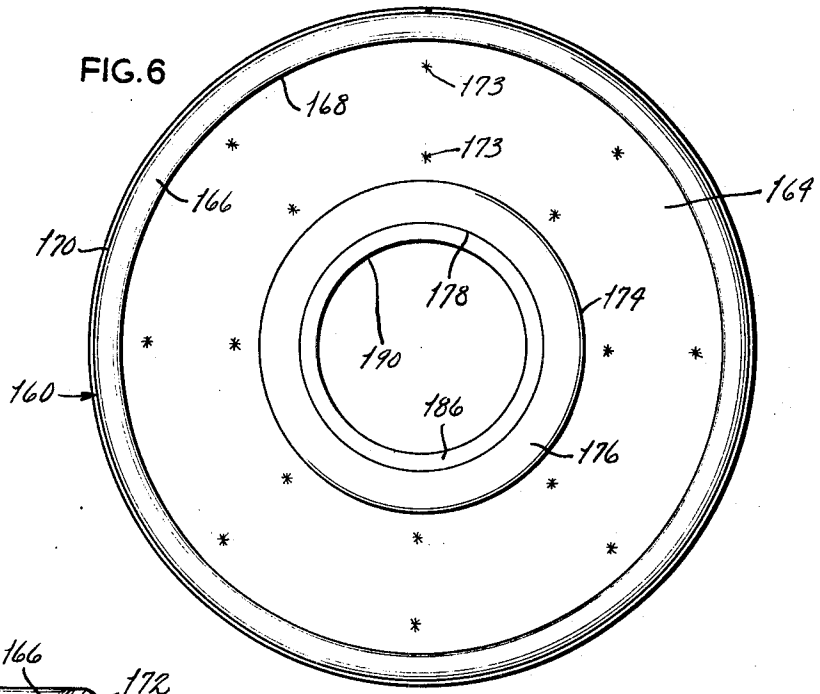
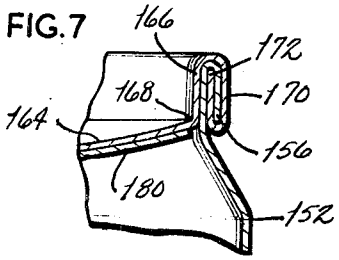


FIG. 7



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United States Patent Office 3,512,676 Patented May 19, 1970

3,512,676

CONTAINER END STRUCTURE

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Filed Aug. 7, 1967, Ser. No. 658,827
Int. Cl. B65d 7/42
U.S. Cl. 220—67 7 Claims

ABSTRACT OF THE DISCLOSURE

A dispensing device for use with canisters and including a plastic bung threaded into a bunghole in the canister. The bung is provided with a threaded bore having a fracturable diaphragm extending across the lower margins thereof. A plug is fitted into the bore to rigidify the bung and protect the diaphragm. When the contents are to be withdrawn from the canister, the plug is removed and replaced by an adapter having a canted internal bore. A quick-connect coupling is carried by the adapter for retentively engaging a standpipe assembly having a collector tube provided with knife edges at its end for fracturing the diaphragm when the collector tube is inserted through the adapter. The standpipe assemby also includes a feed tube which opens in to the upper portion of the canister so that a pressurized gas can be introduced into the canister to force liquid out through the collector tube. A canister having end walls each including an inwardly curved portion which integrally merges into an annular inner wall section along a circular crease. The crease and inner wall section are presented against the side wall of the canister. The inner wall section merges into an outer wall section which, in turn, merges into a locking lip which engages and interlocks with an end lip on the side wall of the canister. The top wall of the canister is buttressed with a reinforcing plate which along with the concave portion embraces a collar forming a bunghole.

This invention relates to dispensing devices and containers and, more particularly, to a dispensing device for removing fluent contents contained within a canister which is adapted to withstand internal pressures of substantial magnitudes.

Canisters are used extensively to contain liquid and semi-liquid substances and are generally employed because they are relatively easy to handle, store, and transport. Some canisters are provided with spigots so that they can be easily tapped. While this is a desirable convenience, the inclusion of the spigot as part of the canister is expensive, adds weight to the unit, and eliminates the possibility of the canister being used on an expendable basis. Canisters with mere bungholes can at times be used on an expendable basis, but such canisters are often difficult to tap and the lack of any suitable tapping arrangement may contribute to loss of fluid through spillage and evaporation.

Moreover, the end walls of conventional canisters are generally flat and are connected to the side walls along roller and overlapped seams. When such canisters are subjected to internal pressures of substantial magnitude, these end walls tend to bow outwardly into a convex configuration and in so doing weaken the seams by either partially or fully unrolling the overlapped portions thereof. This causes a loss in pressure at the seams. The relatively high degree of flexing caused by alternate inflation and deflation of such canisters causes seal failure at the seams and in more severe cases induces metal fatigue and resultant cracks along those seams. The collars forming bungholes of canisters are generally held in the end walls merely by rolling the metal of the end wall over and around a laterally projecting flange on the collar. When such a canister is subjected to elevated internal pressures the collar and bung are forced outwardly causing the metal to unroll at this point. This results in seal failure and consequent loss of pressure within the canister.

Among the several objects of the present invention may be noted the provision of a liquid dispensing device which permits use of canisters on an expendable or disposable basis; the provision of a liquid dispensing device which seals canisters for storage and transportation purposes and includes means for tapping the canister at the point of use with a minimum amount of inconvenience and spillage; the provision of a canister having end walls which will not distort and the seams of which will not leak when the canister is subjected to internal pressures of substantial magnitude; and the provision of a dispensing device and of a canister, which are rugged in construction, light in weight, and easy to manufacture. Other objects and features will be in part apparent and in part pointed out hereinafter.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a side elevational view of a dispensing device of the present invention installed in a canister, the canister being shown in section;

FIG. 2 is a sectional view of a bung forming part of the present invention;

FIG. 3 is a sectional view showing the standpipe being inserted through the adapter;

FIG. 4 is a sectional view showing the standpipe retentively engaged by the adapter;

FIG. 5 is a sectional view of a canister forming part of the present invention;

FIG. 6 is a top view of the canister; and

FIG. 7 is a fragmentary sectional view taken along line 7—7 of FIG. 5.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now to the drawings, **2** designates a dispensing device for use on a conventional canister **4** having a cylindrical side wall **6** which is sealed at its ends by inwardly curved top and bottom walls **8**, **10**. Top wall **8** is centrally provided with a collar **12** which is internally threaded in the formation of a threaded aperture or bunghole **14**.

Threaded into bunghole **14** and forming part of dispensing device **2** is bung **16** preferably molded from plastic and including an externally threaded annular side wall **18** which is integrally provided with an outwardly projecting flange **20** adapted to overlie collar **12**. Side wall **18** merges into an inwardly extending web **22** which merges into a central sleeve-like portion **24** having inwardly presented threads defining an upwardly opening threaded bore **26**. Formed integral with and extending across the lower end of sleeve-like portion **24** is a diaphragm **30** which is separated from sleeve-like portion **24** by a circular line of weakness **32**. Threaded into bore **26** is a plug **34** also preferably molded from plastic and including an outwardly projecting flange **36** which bears against the upper surface of web **22**. Plug **34** not only rigidifies bung **16**, but also protects relatively weak diaphragm **30** during shipment and storage of canister **4**. Plug **34** is provided with an upwardly opening slot (not shown) so that it can be easily unscrewed and removed from bung **16**.

Provided separately for the purpose of withdrawing the contents from canister **4** is a tap **40** including an adapter **42** which attaches to bung **16**. Adapter **42** includes a base **44** provided with a shoulder **46** and having a diametrally reduced threaded end portion or boss **48** projecting therefrom. End portion **48** is sized for engagement with the threads of bore **26** in bung **16**, and carries an

elastomeric washer **50**. When end portion **48** is threaded into bore **26** as illustrated in FIG. 3, washer **50** will be interposed between shoulder **46** and web **22** to form a fluid-tight seal. Base **44** is internally provided with a slightly canted bore **52** which opens upwardly into a cylindrical recess **54** located concentric thereto. Rigidly affixed to base **44** is a pedestal **56** having an axially projecting cylindrical boss **58** which fits snugly within recess **54**. Pedestal **56** is centrally provided with an axial bore **60** which registers with and forms a continuation of canted bore **52** in base **44**. Opening into bore **60** are annular grooves **62** having elastomeric O-ring seals **64** fitted therein. At its upper end pedestal **56** is provided with a diametrally reduced threaded nose portion **66** which fits into and engages the threads of a conventional quick-connect coupling **70**.

Since coupling **70** is conventional, it is sufficient to note that it includes a barrel **72** which is internally threaded at one end for reception of nose portion **66** on pedestal **56** (FIG. 3). Internally barrel **72** is provided with a diametrally reduced bore **74** which downwardly terminates at a shoulder **76** located in spaced relation from the end of nose portion **66** on pedestal **56**. Fitted into this space is an elastomeric washer **77**. Barrel **72** is further provided with a plurality of circumferentially spaced slightly canted lateral bores **78** having cylindrical locking elements **80** slidably fitted therein. Slidably mounted on the upper end of barrel **72** for axial movement is an actuating sleeve **82** having a trepanned groove **84** which receives the extreme upper end of barrel **72** located beyond bores **78**. Sleeve **82** is further provided with an inclined camming surface **86** which engages the outwardly presented ends of locking elements **80** when sleeve **82** is moved upwardly so as to urge locking elements **80** toward the interior of barrel **72**. Interposed between the base of trepanned groove **84** and the upper end of barrel **72** is a spring **88** which biases actuating sleeve **82** upwardly on barrel **72**. The portion of sleeve **82** which extends into the interior of barrel **72** forms an outwardly opening sleeve bore **90**, and at its extreme inner end this portion engages the opposite or inner ends of locking elements **80** so as to force them outwardly when sleeve **82** is moved downwardly.

Adapter **42** receives and retentively engages a standpipe assembly **100** which also forms a part of tap **40**. Standpipe assembly **100** includes a T-fitting **102** having opposed bushings **104**, **106**, threaded into the two axially aligned branches thereof. Bushings **104**, **106**, are provided with outwardly extending threaded nipples **108**, **110**, respectively, which form inlet and outlet ports. The remaining or intermediate branch of T-fitting **102** is fitted with a tubular mating coupler element **112** adapted for insertion in and engagement by quick-connect coupling **70** (FIG. 4).

Mating coupler element **112** integrally includes a threaded end portion **114**, an enlarged hexagonal portion **116**, a cylindrical stem **118**, and a diametrally reduced nose **120**. Stem **118** outwardly terminates at a beveled shoulder **122** and slightly inwardly therefrom is provided with an annular groove **124**, defined on its sides by outwardly beveled faces. Stem **118** is sized for slidable insertion into sleeve bore **90**, while groove **84** is positioned thereon for registration with and reception of locking elements **80** to prevent outward withdrawal of coupler element **112** when actuating sleeve **82** is in its upper position. When stem **118** is so engaged by locking elements **80**, nose **120** will project through diametrally reduced bore **74** in barrel **72** and will bear against the upper face of washer **77**, forcing it against the end of nose portion **66** of pedestal **56** to form a fluid-tight seal between coupler element **112** and adapter **42**.

Fitted securely within stem **118** of coupler element **112** and projecting axially beyond nose **120** is a collector tube **126** which slidably fits through the aligned bores **52**, **60**, in adapter **42**. Collector tube **126** is of sufficient length to extend to the bottom of canister **4** when standpipe assembly **100** is retentively engaged by quick-connect coupling **70**. The cant of bores **52**, **60**, is such that collector tube **126** when fully inserted terminates in close proximity to the corner juncture formed by the intersection of side wall **6** and bottom wall **10** of canister **4**. At its extreme lower end collector tube **126** is provided with crossed cutting blades **128** having forwardly presented knife edges **130** which converge to form a point at their juncture. Extending from nipple **108** through T-fitting **102**, coupler element **112**, and the upper portion of collector tube **126** is a feed tube **132**, the lower end of which opens outwardly through the wall of collector tube **126** in close proximity to top wall **8** of canister **4**. The juncture formed by the intersection of feed tube **132** and collector tube **126** is sealed by solder or other suitable sealing means so that it is fluid-tight. The opposite or upper end of feed tube **132** is connected to nipple **108** so as to receive the entire flow of fluid entering nipple **108**.

In use, canister **4** is filled with a desired fluid, such as a fumigant, by pouring or otherwise inserting it through bunghole **14**. When canister **4** is sufficiently filled, bung **16** with plug **34** fitted into it is threaded into bunghole **14** so as to seal the canister and prevent evaporation or spilling of the material contained therein. In this condition canister **4** can be stored or shipped to the user.

The user can withdraw the contents of the canister merely by removing plug **34** from bung **16** and replacing it with adapter **42**. Thereafter the user inserts collector tube **126** through aligned bores **90**, **60**, **52**, of adapter **42**. When blades **128** encounter diaphragm **30**, as illustrated in FIG. 3, knife edges **130** will cut through diaphragm **30** or cause it to break away from sleeve-like portion **24** along line of weakness **32**, allowing tube **126** to pass freely into the interior of canister **4**. As collector tube **126** is passed through adapter **42** O-ring seals **64** will embrace the surface thereof and prevent loss of the fluid. Eventually stem **118** on mating coupler element **112** will fit into sleeve bore **90** of actuating sleeve **82**, at which time beveled shoulder **122** will engage the inwardly presented end faces of locking elements **80** and force locking elements **80** outwardly through their bores **78**. Locking elements **80** will cam actuating sleeve **82** downwardly against the bias of spring **88**. Further advancement of mating coupling element **112** will cause locking elements **80** to ride over the ridge-like portion of stem **118** located between shoulder **122** and groove **124** until the end of nose **120** sealingwise engages elastomeric washer **77**. At this point groove **124** will register with locking elements **80** and the latter will be forced into the former by spring **88** acting through inclined camming surface **86** of sleeve **82**. Quick-connect coupling **70** now retentively engages mating coupler element **112** and prevents withdrawal of standpipe assembly **100** from canister **4**. When standpipe **100** is fully inserted within adapter **42**, the extreme end of collector tube **126** will be located within canister **4** close to the corner margin formed by the intersection of bottom wall **10** and side wall **6**, while the lower terminal end of feed tube **132** will be located close to top wall **8**.

To withdraw fluid from canister **4**, a source of compressed gas such as a tank of pressurized air is connected to standpipe **100** at nipple **108** by means of a flexible air hose (not shown) or any other suitable conduit. The pressurized gas enters canister **4** through feed tube **132** and exerts a force on the upper surface of the fluid. This forces the fluid to rise in collector tube **126** and flow out of standpipe **100** through nipple **100**. A suitable discharge conduit should be connected to nippe **110** so that the fluid will be conveyed to the desired location.

When the fluid in canister **4** is consumed, standpipe **100** is removed by pressing actuating sleeve **28** downwardly with one hand and simultaneously pulling on T-fitting **102** with the other hand. As sleeve **82** is moved downwardly, locking elements **80** are forced out of groove **124** in coupler element **112**, thereby freeing standpipe **100** for withdrawal from canister **4**. Then adapter **42** is

threaded out of bung **16** and both it and standpipe **100** can subsequently be used for tapping another canister **4**.

A number of canisters **4** can be connected in series by means of dispensing devices **2**. In such a case, nipple **110** of one standpipe **100** is connected to nipple **108** of another standpipe **100**, etc., with the source of compressed gas connected only to the nipple **108** of the standpipe **100** located on the canister first in the series. That canister will empty first with the others emptying in turn.

It is desirable to also use a quick-connect coupling on nipple **108** so that the hose connected to the source of compressed gas can be readily attached and detached from standpipe **100**. This permits easy manipulation of standpipe **100**.

Standpipe **100** can be inserted through adapter **42** while canister **4** is under pressure. This is possible because elastomeric O-ring seals **64** embrace the surface of collector tube **126** before blades **128** encounter and fracture diaphragm **30**.

Inasmuch as canister **4** does not include any expensive components such as spigots it can be discarded when emptied. By the use of a plastic bung the weight of canister **4** is reduced to a minimum for shipping and storage purposes. The present dispensing device has been found particularly suitable for storage, transportation, and application of liquid and gelled fumigants.

Dispensing device **2** can also be used with an improved canister for storing fluids under high pressure, which also forms part of the present invention. The canister comprises a cylindrical shell terminating at each end in circumferential lips which extend radially outwardly from the shell and then axially in spaced relationship to the shell in a direction towards the opposite end. The canister is closed with inwardly curved end walls which terminate as inner wall sections, the outer surfaces of which are in contact with portions of the inner surface of the shell at the ends thereof. Outer wall sections contiguous with the inner wall sections extend outwardly radially and then axially of the shell, the inner surfaces of which are in contact with the outer surfaces of the circumferental lips, which outer wall sections then turn over the ends of the circumferential lips in locking relationship therewith and extend within the space between the circumferential lips and the shell to form a fluid type relationship between the circumferential lips and the outer wall sections of the end walls.

With particular reference to FIGS. 5, 6 and 7, canister **150** includes a side wall **152** formed from sheet steel or other suitable metal which has been rolled into a cylindrical configuration and welded together in the formation of a longitudinally extending lineal seam **154**. The circular ends of side wall **152** are contoured slightly inwardly and are then turned outwardly and back toward the inwardly contoured portion in the provision of upper and lower circumferential end lips **156**, **158**. Fitted across the ends of side wall **152** are top and bottom walls **160** and **162** respectively.

Top wall **160** includes an inwardly curved portion **164** which merges into an annular inner wall section **166** along a circular crease **168**. Inner wall section **166** facewise abuts against the extreme end of the inwardly turned portion of side wall **152** and arcuately merges along its top margin into an annular outer wall section **170** which facewise abuts against the outwardly presented surface of end lip **156**. Outer wall section **170** is struck inwardly and upwardly along its lower margin in the provision of an annular locking lip **172** which is interposed between end lip **156** and the inwardly contoured portion of side wall **152**. Outer wall section **170**, end lip **156**, locking lip **172**, the extreme end of the inwardly contoured portion of side wall **152**, and inner wall section **166**, are all rolled together under substantial force, thereby forming a five layer, fluid-tight seal between side wall **152** and top wall wall **160** (FIG. 7).

Inwardly curved portion **164** is centrally provided with a circular boss **174** having a laterally projecting annular lip **176**, the inner margin of which defines an aperture **178**.

Rigidly affixed to the inwardly presented surface of inwardly curved portion **164** by means of two circular rows of spot welds **173**, one of which is located adjacent boss **174**, is a reinforcing plate **180** which is contoured to conform with the shape of inwardly curved portion **164** for a substantial portion of its surface area. Reinforcing plate **180** projects beyond boss **174** in the formation of an inner lip **182** which is located in downwardly spaced relation to laterally projecting lip **176** on boss **174**. The inner margin of lip **176** defines an aperture **184**.

Fitted within apertures **178**, **184**, is a collar **186** having an outwardly projecting annular flange **188** which extends into the interior of boss **174** intermediate lips **176**, **182**. The aperture forming the circular margin of lip **182** engages the outer surface of collar **186** immediately below flange **188**, while the undersurface of lip **176** abuts against the upwardly presented face of flange **188**. Collar **186** is provided with a threaded bore or bunghole **190** which receives bung **16**.

Bottom wall **162** also integrally includes an inwardly curved portion **192**, an annular inner wall section **194**, which is joined to inwardly curved portion **192** at a crease **196**, an annular outer wall section **198**, and an annular locking lip **200**, which engages and interlocks with end lip **158** on side wall **152**. Bottom wall **162** fits across the opposite end of side wall **152** in the manner previously described so that a fluid-tight seam is formed on canister **150**.

When tap **40** is fitted into bung **16** and canister **150** is internally pressurized, an outward axially directed force will be presented against both top and bottom walls **160**, **162**, and this causes concave portions **164**, **192**, to flex slightly outwardly and exert substantiallly radial forces on side wall **152** along their respective creases **168**, **196**. These radially directed forces force inner wall sections **166**, **194**, into tighter abutment with the inwardly contoured ends of side wall **152**. Furthermore, at the seams forming the junctures of side wall **152** and top and bottom walls **160**, **162**, five layers of metal are presented in embracing relation to one another, forming a juncture which is not only capable of withstanding distorting forces of extremely large magnitude, but also a seal which is highly resistant to leakage. Whereas the end seams of conventional canisters tend to unroll when the end walls associated with them are subjected to outwardly directed forces, this problem is not encountered with canister **150** because inwardly curved portions **164**, **192**, when subjected to axial forces bear with greater intensity against side wall **152** along creases **168**, **196**, thereby resisting the tendency of inner wall sections **166**, **194**, to roll outwardly or the inwardly curved portions to distort into a convex configuration. The strength of top and bottom walls **160**, **162**, is thus dependent upon the compressive strength of the material, rather than upon the bending strength of the seam as is the case with conventional canisters having flat or convex end walls.

Aside from reinforcing inwardly curved portion **164** of top wall **160**, lip **182** of reinforcing plate **180** also prevents the side portion of boss **174** from rolling inwardly under flange **188** when canister **150** is subjected to elevated internal pressures. As inwardly curved portion **164** flexes slightly outwardly, the margin of lip **182** will bear with greater intensity against the outer surface of collar **186** below flange **188** and prevent inward movement of boss **174** under flange **188** and collar **186**. Such movement occurs when conventional canisters are subjected to elevated pressures. Since reinforcing plate **180** is welded to inwardly curved portion **164** adjacent the latter's juncture with boss **174**, any tendency for boss **174** to roll in under flange **188** is still further retarded.

It has been experimentally determined that canister **150** can withstand over twice as much internal pressure as canisters constructed in accordance with conventional designs and procedures.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limited sense.

What is claimed is:

1. A canister for storing fluids under high pressure comprising:

(a) a cylindrical shell terminating at each end in a reduced diameter portion and a circumferential lip which extends outwardly radially from the shell portion of reduced diameter and then axially in spaced relationship to the said shell portion in a direction towards the opposite end of the shell,

(b) an inwardly curved end wall closing each end of said shell, each end wall terminating in a connecting portion comprising an axially outwardly extending circumferential inner wall, the outer surface of which is in contact with portions of the inner surface of the shell at the ends thereof and an outer wall contiguous with the said inner wall and extending outwardly radially and then axially inwardly of the shell, the inner surface of which is in contact with the outer surface of the circumferential lip, said outer wall extending radially inwardly over the ends of the circumferential lip in locking relationship therewith and an intermediate wall connected to the axially innermost end of said outer wall and extending within the space between the circumferential lip and the shell end portion to form a fluid type relationship between the circumferential lip and the outer wall section of the end wall connecting portion.

2. A canister according to claim **1** in which the inwardly curved end walls each terminate along a circumferential crease.

3. A canister for storing fluids under high pressure comprising:

(a) a cylindrical shell terminating at each end in a circumferential lip which extend outwardly radially from the shell and then axially in spaced relationship to the shell in a direction towards the opposite end of the shell,

(b) an inwardly curved end wall closing each end of said shell, each end wall terminating in a connecting portion comprising an axially outwardly extending circumferential inner wall, the outer surface of which is in contact with portions of the inner surface of the shell at the end thereof, and outer wall contiguous with the inner wall extending outwardly radially and then axially inwardly of the shell, the inner surface of which is in contact with the outer surface of the circumferential lip, said outer wall extending radially inwardly over the ends of the circumferential lip in locking relationship therewith and an intermediate wall connected to the axially innermost end of said outer wall and extending within the space between the circumferential lip and the shell to form a fluid type relationship between the circumferential lip and the outer wall of the end wall connecting portion,

(c) a first aperture provided in one of the inwardly curved end walls,

(d) a reinforcing plate secured to the iiner face of the inwardly curved end wall containing the first aperture and circumferentially to the aperture of the wall, which reinforcing plate

(i) is contoured to conform with the shape of the end wall along the inner surface thereof,

(ii) is provided with a second aperture in alignment with the first aperture,

(iii) the portion of the reinforcing plate disposed in surrounding relationship to the second aperture being in spaced relationship to the opposing portion of the end wall, and

(e) a collar fitted into the first and second apertures and into the space between the end wall and the reinforcing plate.

4. A canister according to claim **3** in which the inwardly curved end walls each terminate along a circumferential crease.

5. A canister according to claim **3** in which the portion of the collar which extends into the space between the end wall and the reinforcing plate is a flange which projects radially outwardly from the collar, the margin of the second aperture engaging the under surface of the collar flange.

6. A canister according to claim **5** in which the inwardly curved end wall which is provided with the first aperture is further provided with an axially outwardly extending boss which encircles the collar flange, said boss being provided with a radially inwardly extending lip which defines the first aperture, the inwardly extending lip engaging the upper surface of the collar flange.

7. A canister according to claim **6** in which the cylindrical shell terminates at each end in a reduced diameter portion from which the circumferential lips extend.

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J. R. GARRETT, Assistant Examiner

U.S. Cl. X.R.

220—68; 285—201

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,512,676 Dated May 19, 1970

Inventor(s) Joseph Carl Dawson, Jay B. Brown and Euel C. Pryor

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, lines 4 and 5, "assignors to WSR, Inc., a corporation of North Carolina" should be deleted; line 60, "roller" should read --rolled--. Column 2, line 48, "is bung" should read --is a bung--. Column 4, line 66, "nipple 100" should read --nipple 110--; line 67, "nippe" should read --nipple--; line 70, "28" should read --82--. Column 6, line 37, "substantiallly" should read --substantially--. Column 7, line 57, "and" should read --an--. Column 8, line 10, "iiner" should read --inner--.

SIGNED AND SEALED NOV 17 1970

NOV. 17, 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334