United States Patent

[11] 3,603,476

[72] Inventor **Mattheus J. M. Coppens**
Erikalaan, Belgium

[21] Appl. No. **843,678**
[22] Filed **July 22, 1969**
[45] Patented **Sept. 7, 1971**

[73] Assignee **Inland Steel Company**
Chicago, Ill.

[54] **RECONDITIONABLE CONTAINERS**
13 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **220/67**
[51] **Int. Cl.** **B65d 7/42**
[50] **Field of Search** ..... 220/67, 55, 46 R, 5 R; 292/256.65, 256.67, 256.69; 29/401

[56] **References Cited**

UNITED STATES PATENTS

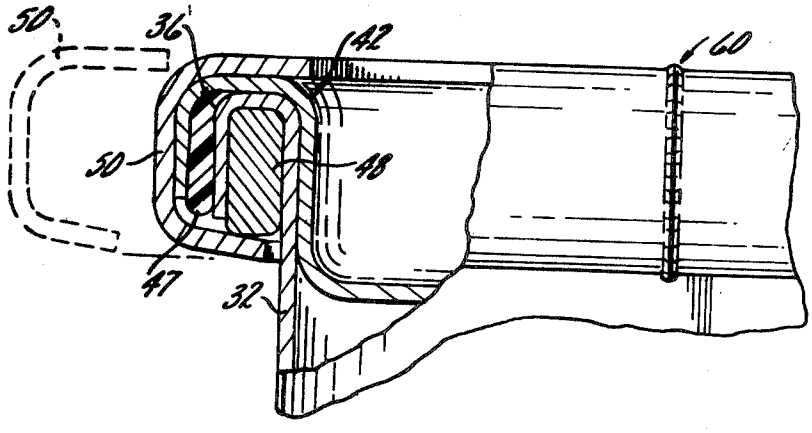
1,306,809	6/1919	Graham	220/67
1,711,176	4/1929	Moore	220/46
2,152,634	4/1939	Cornell	220/55 UX
2,257,697	9/1941	McClary	220/67
2,335,174	11/1943	Crawford	220/67 X
3,505,722	4/1970	Ullman	220/67 X

FOREIGN PATENTS

1,014,928	6/1952	France	220/55

Primary Examiner—Joseph R. Leclair
Assistant Examiner—James R. Garrett
Attorney—Wolfe, Hubbard, Leydig, Voit & Osann

ABSTRACT: An improved multitrip metallic shipping container which permits repetitive use of the metallic container components while at the same time permitting unimpeded access into the interior of the container and into the normally inaccessible chime portions thereof for cleaning, dedenting and related container reconditioning purposes, and to methods of assembly and disassembly thereof. The positioning of a resilient sealing means, such as a gasket, relative to the cylinder body and a drum head provides a construction with improved resistance to leakage and deformation.



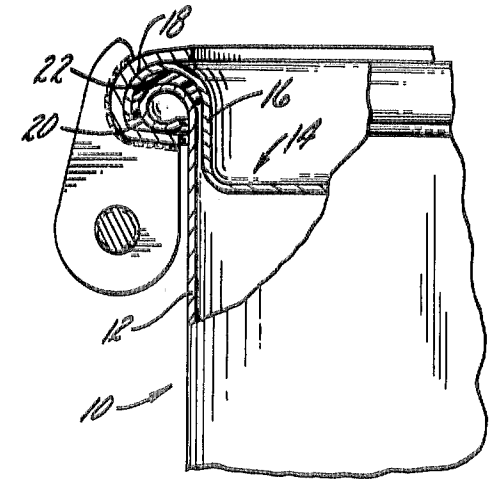


Fig. 1.
(PRIOR ART)

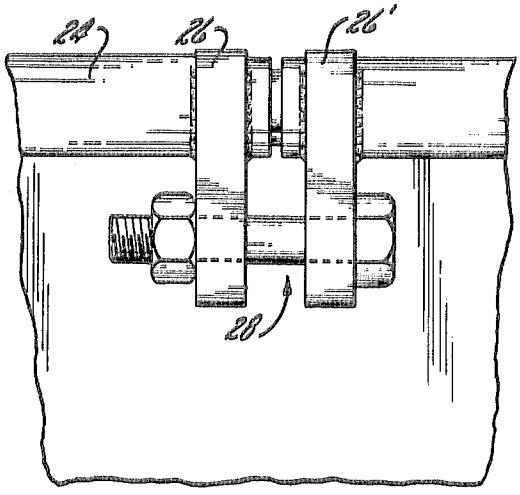


Fig. 2.
(PRIOR ART)

Fig. 3.

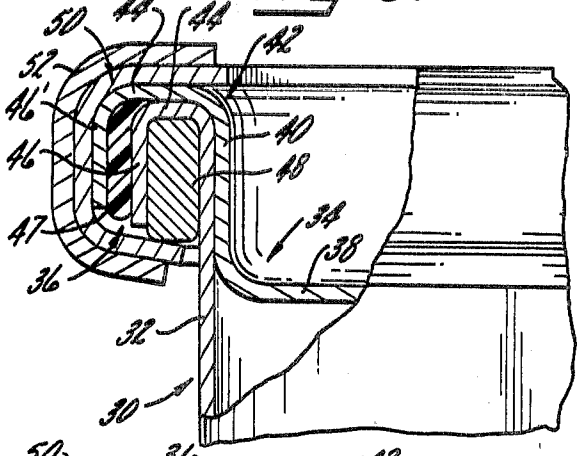
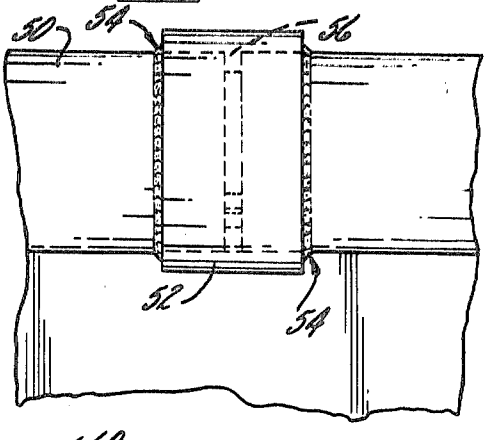


Fig. 4.



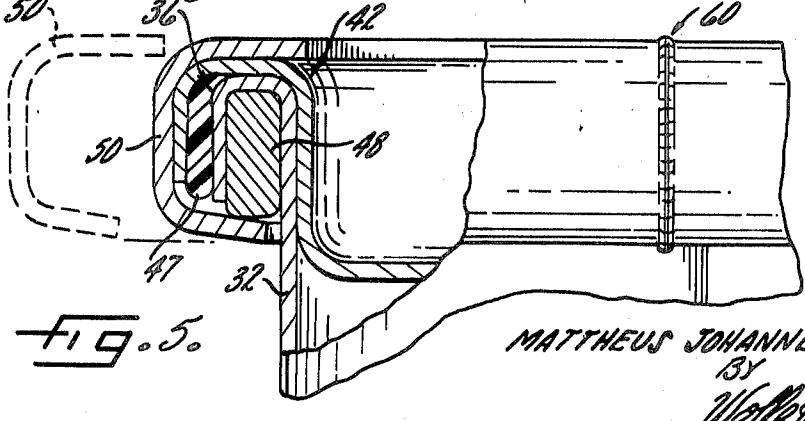


Fig. 5.

INVENTOR,
MATTHEUS JOHANNES MARTINUS COPPENS
BY
Wolfe, Hubbard, Voit & Osann
ATTORNEYS.

RECONDITIONABLE CONTAINERS

RELATED APPLICATIONS

Ullman, "Reconditionable Container," Ser. No. 649,714, filed June 28, 1967 now U.S. Pat. No. 3,505,722.

The present invention relates to shipping containers and, more particularly, to multitrip metallic shipping containers of the cylindrical or drumlike type, generally having capacity on the order of from 5 to 55 gallons, and which are commonly shipped without an overpack, and to methods of assembly and disassembly thereof. In its principal aspect, the invention is concerned with improved methods of assembly and disassembly of metallic shipping containers, and with the containers produced thereby, whereby the repetitive removable and/or replacement of at least one end, which is otherwise permanently affixed to the container body is made feasible by splitting a metallic ring member so as to permit unimpeded access to the container interior for all reconditioning purposes, yet wherein the same metallic container components may be reused many times without sacrifice to container performance or integrity.

Metallic shipping containers are widely used for packaging, storage and transport of materials such as, merely by way of example, crude oil products, food products, liquid chemicals, paints and other liquid, semiliquid, pulverous or granular materials. In use, these containers may become damaged, dented or otherwise deformed. The contents are also frequently of the character which, once removed from the container, leave a residue that cannot satisfactorily be removed on attempting to use the bung hole or similar orifice of unlimited size for access to and cleaning of the container interior. Therefore, a larger opening must be made which permits the insertion of suitable tools or devices for removing dents and otherwise reshaping the container walls where necessary. To this end, it is known to cut an empty "tight-head" container into two halves or to cut the container ends, clean and reshape the parts and again put the parts together. These processes, in addition to being complicated, time consuming and expensive operations, may considerably reduce the capacity of the container when repeated several times. Moreover, such known reconditioning processes are still substantially incapable of coping with the problem of contamination in the chime crevices of a container even after the container has been cut apart. And, of course, such known reconditioning processes will not permit of dedenting or similar reshaping processes in the chime region.

It is also known to unfold the folded chime portions of a "-tight-head" drum so as to permit removal of the head enclosure components. However, this procedure has not proved satisfactory for a number of reasons. For example, the chime portions of a conventional "tight-head" drum are normally formed by folding overlapping portions of a drum body, head and reinforcing members over upon themselves through at least one, and normally more than one, complete angle of 180°. As a consequence, considerable plastic deformation of the metallic components occurs in the region of the folds even during the initial drum-forming operation, which deformation tends to weaken the metal in that area. Thus, when one attempts to unfold the construction by again bending the metal components through angles of 180° in the opposite direction, the material is further weakened and, indeed, excessively stretched. Even were it feasible to do this repetitively on a multitrip bases, the resulting product is not precisely the same each time.

Recognizing the many difficulties presented by the foregoing processes, it has further been proposed that the chime or similar closure components can be partially unfolded, and a portion thereof cut off. After reconditioning the parts are then welded in place during reassembly. Again, however, this procedure is time consuming and expensive and does not, in any event, result in a container which is the same as the original container.

The related application, hereinbefore identified, describes a reusable multitrip "tight-head" shipping container including an endless connecting ring that surrounds the peripheral edge of the head and the body end of the container so as to rigidly secure the head to the body in a liquidtight relation. The connecting ring is plastically expandable to permit the disassembly of the head from the body to facilitate reconditioning of the container and is plastically shrinkable after reassembly of the head and body to again secure them in a liquidtight relation.

It is the general aim of the present invention to provide a multitrip shipping container, and methods of assembly and disassembly thereof, wherein all parts of the container may be readily assembled and held under a predetermined force to provide a construction with improved resistance to deformation yet which may be readily disassembled and reconditioned to provide a container identical in construction, capacity, form and appearance with the container as originally manufactured.

A further object is the provision of a multitrip shipping container which includes a chime or closure assembly with improved resistance to leaks caused by severe impacts. A related and more specific object is to provide a closure assembly with a resilient sealing means positioned to minimize the deformation of the portions of the body and head of a container caused by severe impacts and the like.

An associated object is to provide a multitrip shipping container which may be easily disassembled and later reassembled in such a manner as to facilitate more effective and economical cleaning and/or reconditioning of the container parts.

Other objects and advantages of the invention will become apparent as the following description proceeds, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an enlarged fragmentary section of a prior art closure assembly used in connection with "open head" drums;

FIG. 2 is an enlarged fragmentary front elevation view of the closure assembly illustrated in FIG. 1 and showing the prior art method of joining together the closure connecting ring;

FIG. 3 is an enlarged fragmentary section, taken along a vertical radial plane on the closure member in the area where a bridging portion is holding the split ring together, of a formed joint, commonly referred to as the chime, between the drumhead and body of the container embodying the features of the present invention, and showing the split ring member of the chime in its assembled position and further illustrating the positioning of the resilient sealing means in relation to the other components of the assembly;

FIG. 4 is an enlarged fragmentary front elevation view of the chime as shown in FIG. 3 and illustrating the means for joining together the split ring member in accordance with the present invention; and

FIG. 5 is an enlarged fragmentary vertical section similar to FIG. 3, but here depicting a slightly different means for joining together the split ring member.

While the invention is susceptible of various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed, but, on the contrary, the invention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the invention. For example, while the present invention is advantageously utilized in connection with "tight-head" drums, it should be similarly appreciated that the invention may also be applied to "open head" drums of a modified construction.

Referring now to the drawings, there is shown in FIGS. 1 and 2 a typical prior art method used in "open head" drums for securing the head to the body by split closure rings that can be tightened by a clamping mechanism such as a bolt As shown, a container 10 having a cylindrical body 12 is adapted to be closed by a drum head or lid 14. The lid 14 is cup-shaped

and has a cylindrical sidewall **16** terminating in a curved flange **18**. The cylindrical drum body **12** also terminates in a curved flange **20**. A resilient gasket **22** is positioned between the lid flange **18** and body flange **20**.

To hold the assembly of the drumhead, the body and the gasket together, a split clamping ring **24** having clamps **26, 26'** welded thereto is laid around the assembly. Bolt **28** maintains this assembly in position. Typically, the closing and opening can be done by hand.

While the construction of FIGS. **1** and **2** is generally suitable for "open head" drums, severe impacts tend to deform the flanges and allow the lid to separate from the body. The positioning of the gasket similarly tends to cause leakage and separation of the assembly components upon severe impact. Also, since the clamping ring is designed to be closed and opened by hand, the bolt used does not provide sufficient force to clamp the portions of the assembly together so as to minimize the separation of the assembly due to an impact. Moreover, it is difficult to maintain the tolerances of the flanges so as to achieve the best fit.

Turning to FIGS. **3** and **4**, there is shown an exemplary embodiment of an end closure assembly that minimizes the hereinbefore described problems in accordance with the present invention. A container **30** includes a cylindrical body **32** adapted to be closed by a drumhead **34** and terminating in an outwardly extending flange **36**. It should be appreciated that the other end of the container (not shown) may be closed in the same manner to form a liquidtight container unit. The container **10** preferably is made from sheet steel, although it is apparent that other materials could be used as well. The drumhead **34** is cup-shaped having a generally flat surface **38** set within the drum body **32** and a cylindrical sidewall **40** terminating in an outwardly extending flange **42**.

In accordance with one aspect of the present invention, the flanges of the container body and the drumhead are complementally formed so as to provide substantial contact therebetween and minimize the closure leakage that may result when the container is subjected to severe impacts. Thus, as is illustrated in FIG. **3**, the flanges **36** and **42** each have, respectively, outwardly extending connecting portions **44, 44'** and downwardly extending extremities **46, 46'**. The flanges have essentially complementally dimensioned rectangular cross sections with at least part of the connecting portions **44, 44'** being in contact with each other. A resilient sealing means **47**, such as, for example, a conventional gasket, is positioned and clamped between the downwardly extending extremities **46, 46'**. In this fashion, the positioning of the sealing means will not have the tendency of separating the container body from the drumhead.

To provide additional reinforcement, a reinforcing member **48** is employed. The reinforcing member may be a substantially solid steel ring having a rectangular cross section similar to the shape of the body flange **44**. The reinforcing member supports the shape of the flange and provides increased strength so as to reduce the amount of deformation due to severe impacts. Also, the reinforcing member provides a precise method for forming the rectangular profile of the body flange **44**.

To hold the assembly together, a split ring member is employed which provides a sufficient clamping force to hold the assembly under the desired force while also being capable of easily being separated for disassembling the assembly and making the interior portions of the container fully accessible for cleaning and reconditioning thereof. To this end, and as illustrated in FIGS. **3** and **4**, there is provided a split ring member **50** which encircles the drumhead flange **42** and holds the assembly under the desired predetermined force. A bridging member **52** is welded to the split ring member **50** as indicated at **54** in turn hold the ring member together. In the assembled position and as best shown in FIG. **4**, the ring member **50** has a gap as indicated at **56**. The closure assembly may be readily separated by grinding off or otherwise destroying one or both of the welds and thereby facilitating disassembly of the constituent elements.

After the drumhead and resilient sealing means are in position, the split ring member may be placed under any desired compressive force by any conventional clamping mechanism. For example, an annular series of spaced clamping segments each mounted for radial movement can be employed. The clamping segments should have a forming area with a configuration complementary to the shape of the ring member. The segments are serially actuated by means such as, for example, conventional hydraulic rams to clamp the ring member against the remainder of the assembly by, in effect, walking the ring member around the drumhead flange. When the ring member is in position a bridging portion is welded to the ring member to hold the assembly under the desired clamping force so that even severe impacts do not separate the components of the assembly. The clamping force that is used may be varied as desired but should be sufficient to hold the assembly together.

Referring next to FIG. **5**, there has been illustrated an improved construction which is essentially identical to that depicted in FIG. **3** but wherein the split ring member is welded together prior to assembly. In this embodiment, while a bridging portion could be included, no bridging portion is needed. The ring member is placed in its assembly position from the open position indicated in phantom by plastically shrinking as set froth in the hereinbefore described Ullman application. Alternatively, the ring member could be placed in position by, in effect, changing the geometry of part of the member. To this reforming the member is formed with its inwardly extending extremity on the bottom being bent outwardly. The member is slipped over the drumhead flange and the extremity turned inwardly until the ring member is in its assembly position. Split ring member **50** is its radially as indicated at **60**. The assembly may be readily disassembled by merely separating the ring member at the weld.

The reconditioning process will generally include first separating the closure ring to thereby permit disassembly of the various elements. The closure ring can then be reformed by any suitable means which will result in the ring being expanded slightly. For example, the reforming can be carried out by straightening the ring to lengthen it slightly. It is then welded again, the other elements placed in position and the closure ring slipped on. The reconditioning is completed by then shrinking or otherwise placing the ring into its assembly condition.

It will be appreciated from the foregoing that the container of the present invention may be conveniently disassembled, reconditioned and reassembled on numerous occasions without replacing the component parts. The disassembly is conveniently carried out by merely splitting the ring member along the weld area. AFter removing the welding material, the component parts may again be assembled and reused. The novel placement of the resilient sealing means provides a closure with improved resistance to leakage due to severe impacts. These features all combine to provide a closure assembly or chime with increased strength and resistance to deformation.

I claim as my invention:

1. The method of forming a reusable, multitrip shipping container comprising the steps of forming a cylindrical drum body with an inverted U-shaped peripheral flange adjacent one end thereof, applying a drumhead having a complementally inverted U-shaped flange to said one end of the body to close the same in a liquidtight overlapping relation therewith, positioning a resilient sealing means between the downwardly extending extremities of said body and head inverted U-shaped peripheral flanges, positioning an annular reinforcing member within the inverted U-shaped drum body flange, placing a split metallic ring member surrounding the overlapping complementally inverted U-shaped peripheral flanges of the head and body, clamping said ring member against said peripheral flange of the head with a predetermined force to enclose the overlapping flanges, seal means and reinforcing member and welding portions adjacent the free ends of said split ring member together to form an integral ring while holding said closure member under said predetermined force.

2. The method of claim 1 wherein a substantially identical drumhead and closure arrangement is applied to the opposite end of the cylindrical drum body.

3. The method of claim 1 wherein the ends of the ring member are welded together by employing a separate bridging element.

4. The method of disassembling and reassembling a multitrip shipping container of the type having at least one drumhead applied to a drum body in liquidtight relation therewith by complementally inverted U-shaped flanges and resilient sealing means interposed between the downwardly extending extremities of said head and body flanges and at least one metallic ring member surrounding the head flange peripherally and having a weld junction radially thereof so as to form a ring holding the drumhead to the body, comprising separating the weld junction of the ring into a split form to release the drumhead from the drum body separating the U-shaped flanges of the head and body members, reconditioning the disassembled container components, reapplying the drumhead to the drum body, reinserting the resilient sealing means between the flange extremities, reclamping the split metallic ring member against the peripheral outer extremity of the flange of the head with a predetermined force and rewelding the split ring member together to form a shipping container identical in all respects to the original said multitrip shipping container.

5. A multitrip shipping container of the type which may be repeatedly used comprising, in combination, a cylindrical drum body having an inverted U-shaped peripheral flange adjacent one end thereof, at least one drumhead having a complementally inverted U-shaped peripheral flange for closing said one end of said body in a liquidtight overlapping relation therewith, a resilient annular sealing means interposed between the downwardly extending outer extremities of said inverted U-shaped flanges, a ring member surrounding the outer extremity of the flange of said head and holding said head flange and said body flange in a liquidtight relation under a predetermined force said ring member having a weld junction radially thereof to form an integral ring permitting the disassembly of said head from said body by severence of the welded portion to facilitate reconditioning of said container.

6. The shipping container of claim 5 wherein the opposite end of said drum body is closed by a substantially identical closure arrangement.

7. The shipping container of claim 5 wherein a bridging element spans the split in the ring member and is welded to the ring member to form said integral ring.

8. The shipping container of claim 5 wherein the closure structure is formed with a reinforcing ring positioned within the inverted U-shaped portion of said drum body peripheral flange.

9. A multitrip shipping container of the type which may be repeatedly used comprising, in combination, a cylindrical drum body having a flange including an outwardly extending connecting member and a generally downwardly extending extremity, a reinforcing member having a shape complemental to said flange and positioned within said flange, at least one drumhead closing an end of said body and having a flange including an outwardly extending connecting portion and a downwardly extending extremity, the drumhead flange being dimensioned to maintain at least a part of said connecting portions of the respective flanges of said body and drumhead in face-to-face contact and to provide an annular space between the extremities, a resilient sealing means positioned in said space and an integrally joined ring member surrounding the drumhead flange, sealing means and reinforcing member and rigidly holding the drum head and the body in a liquidtight relation.

10. The shipping container of claim 9 wherein the cross section of the flanges and the reinforcing member are substantially rectangular.

11. The shipping container of claim 9 wherein the length of the connecting portions is relatively small in relation to the length of the extremities.

12. The shipping container of claim 9 wherein the ring member is transversely split and is welded together.

13. The shipping container of claim 9 wherein said reinforcing member is substantially solid.