

Aug. 10, 1965

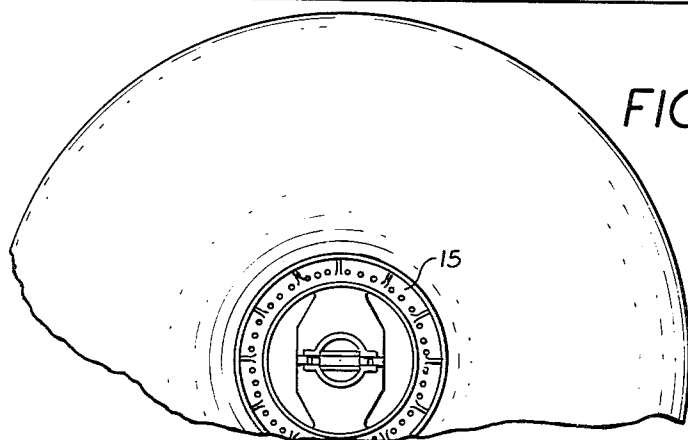
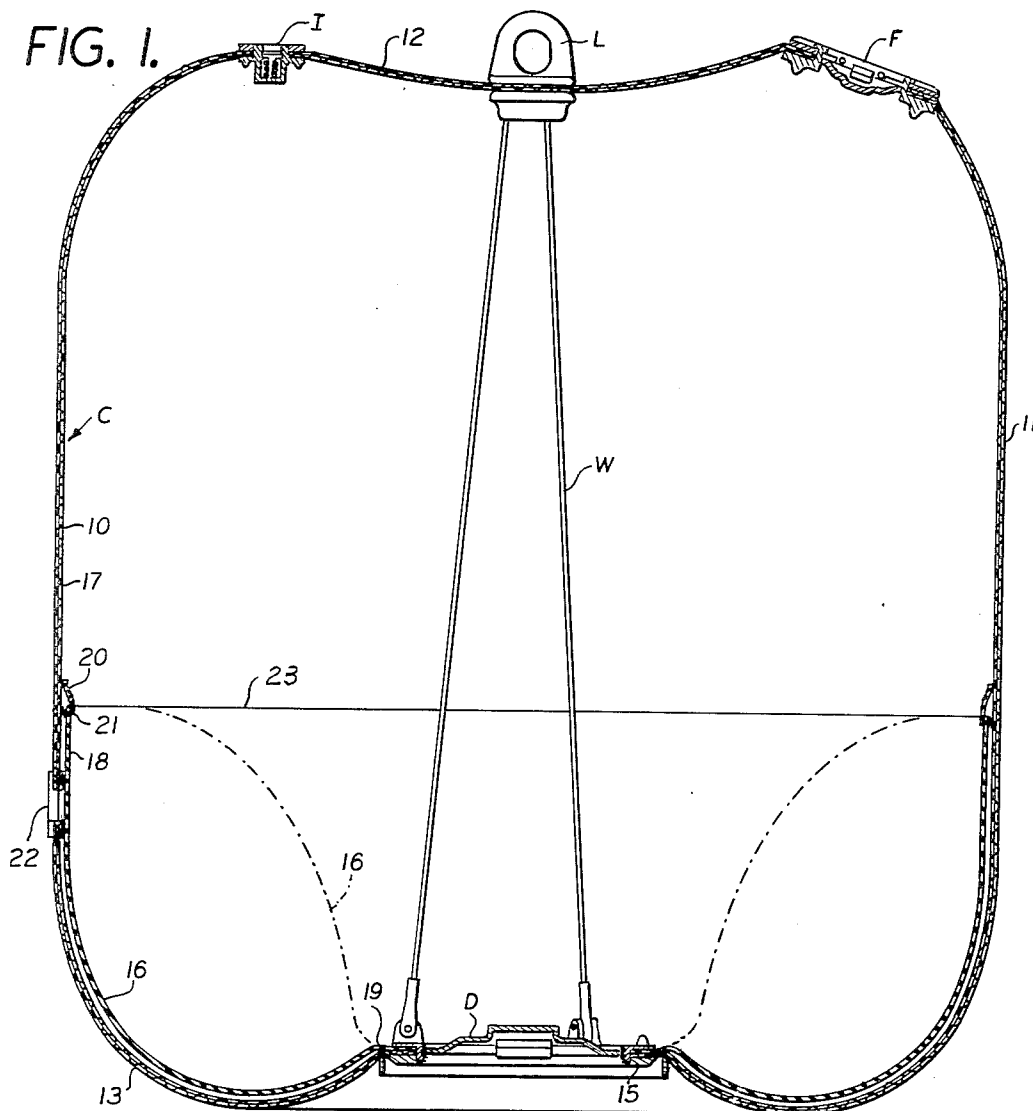
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3,199,726

COLLAPSIBLE CONTAINER AND METHOD OF EMPTYING THE SAME

Filed Nov. 12, 1963

2 Sheets-Sheet 1



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FIG. 3.

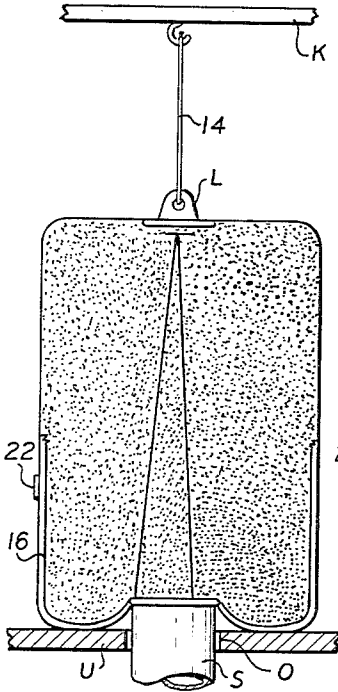


FIG. 4.

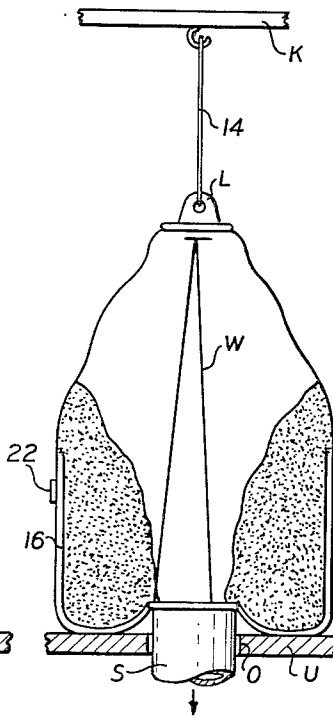


FIG. 5.

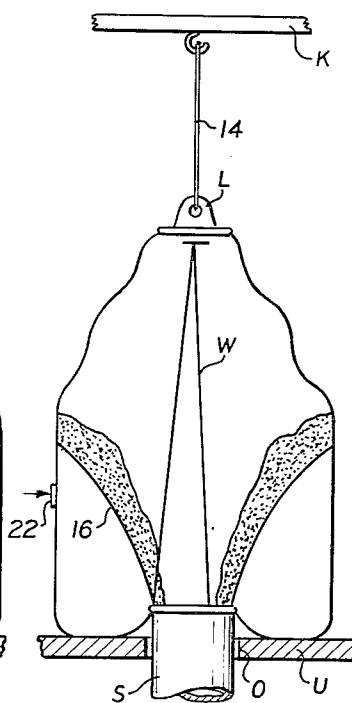


FIG. 6.

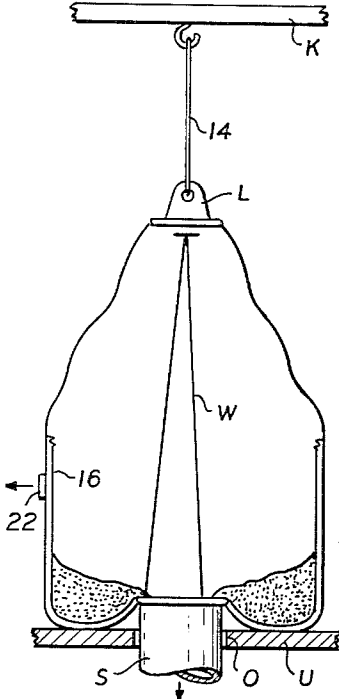
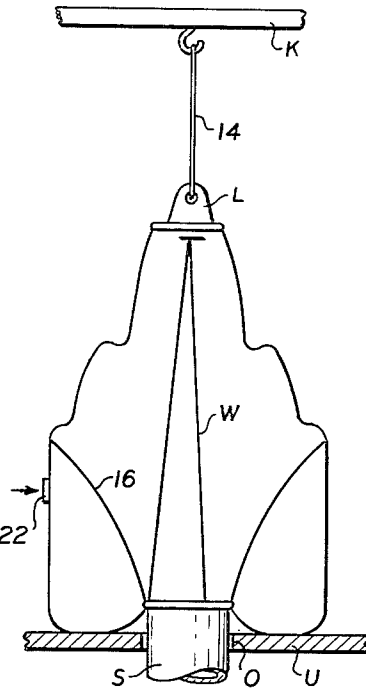


FIG. 7.



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COLLAPSIBLE CONTAINER AND METHOD OF EMPTYING THE SAME

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5 Claims. (Cl. 222-1)

This invention relates to collapsible shipping containers of the type having a discharge opening centrally located in one end thereof and, more particularly, to such containers as disclosed in U.S. Patent No. 2,612,924.

In the past, collapsible containers of this type have been emptied by means of a frusto-conical, cradle-like device, the arms of which press against the sides of the containers surrounding the discharge opening, thus forcing out the product. Such a device is shown in U.S. Patent No. 2,858,051. Apparatus as disclosed therein, however, is relatively expensive to construct and install and has, thus, limited the use of such containers, especially for the transportation and storage of high density, comminuted or powdered solid material.

It is, therefore, an object of the present invention to provide a container of this type that will be self-unloading, requiring no special attachments or apparatus. It is a further object of the present invention to devise such a container that will utilize present conveying equipment with little or no modification. It is a still further object of the present invention to provide an improved container that will require no appreciable modification in existing plant facilities. A final object of the present invention is to provide a container that will unload directly into processing equipment, thereby greatly simplifying the handling of any bulk material, especially those of high density.

In accordance with these objects, a collapsible fluid-tight shipping container as disclosed in the above-mentioned U.S. Patent No. 2,612,924, which may be made of coated cord fabric and has a cylindrical body and two rounded heads, the lower of which has a discharge opening centrally located therein, the container also having a central tie connection within itself between the heads and a removable closure fitting for the discharge opening, is improved as follows:

An annular bladder layer is attached to the inner wall of the container, the outer edge of the bladder layer being attached to the cylindrical body portion of the container, the inner edge of the bladder layer being attached to the lower head of the container at the discharge opening therein. Also provided is means for introducing gas under pressure between the bladder layer and the inner wall of the container, thereby to inflate the bladder in a manner to be hereinafter described. The inflation is accomplished by means of a fitting mounted in the cylindrical body portion of the container below the line of attachment of the outer edge of the bladder layer thereto.

After a container of the improved type is filled with comminuted or powdered solid material, as, for example, by the method disclosed in U.S. Patent No. 2,811,178, it is emptied in the following manner. The container is placed on an unloading stand having an opening therein in register with the discharge opening in the lower head. A cable is attached from an adjustable overhead support to the eye fitting of the container (see Patent No. 2,858,051) and the tension in the cable is adjusted so that the

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weight of the filled container is supported both by the unloading stand and by the cable. The closure fitting in the lower head is removed, thus allowing the lading to drain from the container by gravity until the flow of material stops.

The bladder layer is then inflated with gas to a pressure above atmospheric, thereby to expand the bladder and cause the flow of material to resume. The pressure is maintained in the bladder until such resumed flow stops. The pressure is then released in the bladder by deflating the same or by pressurizing the container proper with the bladder valve open. The process of inflating and deflating the bladder is repeated until the material ceases to flow. For certain types of lading, e.g., Portland cement, the deflation of the bladder is followed by applying vacuum pressure to the inflation fitting.

Other objects and advantages of the present invention will become apparent from the following description, when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a cross-sectional longitudinal view of a collapsible shipping container of the type disclosed in the above-mentioned U.S. Patent No. 2,612,924, improved as disclosed herein, the dashed lines showing the bladder layer in the inflated position;

FIG. 2 is a bottom view of the container of FIG. 1, showing the removable closure fitting in place in the discharge opening;

FIG. 3 is a cross-sectional view of the improved container filled with a lading of comminuted solid material and shown supported both by the unloading stand and the overhead cable;

FIG. 4 is a cross-sectional view of the container of FIG. 3 after the closure fitting has been removed and the lading allowed to drain therefrom by gravity until the flow of material has stopped;

FIG. 5 is a cross-sectional view of the subject container after the bladder has been inflated with gas to a pressure above atmospheric, thereby to expand the same and cause the flow of material to resume;

FIG. 6 is a cross-sectional view of the subject container after the pressure in the bladder has been released by deflating the same; and

FIG. 7 is a cross-sectional view of the subject container shown after the bladder has been inflated again, thereby causing the material remaining in the container to be discharged.

Referring to the drawings and in particular to FIG. 1, there is shown a collapsible container of the type disclosed in the above-mentioned U.S. Patent No. 2,612,924 and generally designated by the reference letter C. The container is generally formed of two or more plies 10 of flexible, rubber-coated fabric and when filled has a generally cylindrical body 11 and two rounded heads 12 and 13. The upper head 12 is provided with a centrally located eye fitting L, by which the container may be lifted by suitable means, such as the cable 14 shown in FIGS. 3-7. A filling opening F and an inflating fitting I are also provided in the upper head 12 and a discharge opening D is centrally located in the lower head 13. A standard removable closure fitting 15 is provided for the discharge opening D. A flexible fabric sock or sleeve S is secured to fitting 15 and serves as a spout through which the material may flow from the container. A tie-string or other fastening device is normally provided to close off

sleeve S. When not in use, sleeve S is tucked into the container C and is covered by fitting 15.

A central tie connection consisting of steel reinforcing cables W is also provided as shown in FIG. 1. The cables W are secured to the eye fitting L at the upper head 12 of the container and at spaced points in the lower head 13. Cables W serve to prevent bulging of the container heads 12 and 13 and take the load during lifting of the filled container. The lower head 13 of the container is generally reinforced with additional plies, as is the material in the upper head 13 around the eye fitting L.

In accordance with the invention, an annular bladder layer 16 is attached to the inner surface 17 of the container C. The outer edge 18 of the annular bladder layer 16 is attached to the cylindrical body 11 of the container C and the inner edge 19 of the bladder layer 16 is attached to the lower head 13 adjacent the discharge opening D and may be secured by the closure fitting 15, as shown. For a 125 cubic foot container, for example, the bladder layer 16 may be a fabric reinforced member 0.106 inch thick, with 0.040 inch rubber liner, and is attached to the inner surface 17 by means of hinge strips 20 and 21, as shown. The outer edge 18 is preferably located slightly below the vertical mid-plane of container C.

An inflation fitting 22 with a quick-opening ball valve therein is mounted in the cylindrical body 11 below the line of attachment 23 with the outer edge 18 of the bladder layer 16. Fitting 22 is fixed through the outer two plies 10 of the container so that gas under pressure may be introduced into the bladder, to allow for inflation thereof.

A 125 cubic foot container improved as above described was filled with polyethylene pellets and then placed on an unloading stand U, having an opening O therein in register with the discharge opening D. A cable 14 was attached to the eye fitting L from an adjustable overhead support K. The tension in the cable 14 was adjusted so that the weight of the container was supported both by the unloading stand U and, through the cable 14, by the overhead support K. (See FIG. 3.)

The closure fitting 15 was then removed, allowing the lading to drain from the container by gravity until the flow of material stopped. Approximately 70% of the lading was removed in this initial operation. (See FIG. 4.) Bladder layer 16 was then inflated through the inflation fitting 22 using high volume, low pressure (1.5 to 2.0 p.s.i.g.) air, thereby to expand the bladder, as shown in FIG. 5, and cause the flow of lading to resume. The pressure was maintained in the bladder until the flow of material again stopped. The pressure in the bladder was then released by deflating the same through the quick-opening ball valve in inflation fitting 22. (See FIG. 6.) The bladder 16 was then inflated again, as shown in FIG. 7, causing the material to resume flow. After a total of four inflation-deflation cycles, only 2 pounds, representing $\frac{1}{10}$ of 1%, of the lading remained in the container. This was easily removed by vacuuming through the emptying sleeve S.

In another trial, the same container was filled to capacity with 8,500 pounds of Portland cement and was allowed to compact for five days. The thus-filled container was then placed on the unloading stand U, again so that the weight was supported both by the stand and the cable 14. (See FIG. 3.) After the closure fitting 15 was removed, the lading was allowed to drain by gravity until the flow of cement stopped. (See FIG. 4.) The bladder layer 16 was then inflated as before to expand the same and cause the flow of material to resume. (See FIG. 5.) Pressure was maintained in the bladder until the flow of material again stopped. The pressure in the bladder was then released by deflating the same through the quick-opening ball valve in inflation fitting 22. (See FIG. 6.) Vacuum pressure was then applied to the blad-

dear layer 16 through inflation fitting 22. The inflation-deflation cycle was repeated a total of six times, with vacuum deflation between cycles, and at the end of the last cycle the amount of Portland cement remaining was 28.5 pounds, or $\frac{1}{3}$ of 1% of the initial 8,500 pound load.

The bladder could also be deflated by inflating the entire container through fitting I with the valve in fitting 22 open.

Also, bladder layer 16 may be provided with small air permeable sections therein, so that for some types of lading air can be introduced into the lading to aerate it as said bladder layer is inflated. This will assist the lading to emerge from the container through the discharge opening D.

From the above description it can be seen that I have disclosed an improved container and method of emptying the same. While a certain preferred form of the invention has been shown and described, it is to be understood that this is for the purpose of illustration only and that changes and modifications can be made therein without departing from the spirit and scope of the invention.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. In a collapsible fluid-tight shipping container formed primarily of coated fabric and having a cylindrical body portion and two rounded heads, the lower of said heads having a discharge opening centrally located therein, said container having a central tie connection within itself between said heads and a removable closure fitting for said discharge opening, the improvement comprising:

an annular bladder layer attached to the inner wall of said container,

the outer edge of said bladder layer being attached to said cylindrical body portion of said container,

the inner edge of said bladder layer being attached to said lower head of said container adjacent to said discharge opening therein;

and means for introducing gas under pressure between said bladder layer and said inner wall of said container.

2. The improvement described in claim 1, in which said gas introducing means comprises an inflation fitting mounted in said cylindrical body portion below the line of attachment of said outer edge of said bladder layer thereto.

3. The method of emptying a collapsible fluid-tight shipping container filled with a lading of comminuted solid material;

said container having a cylindrical body portion and two rounded heads, the lower of said heads having a discharge opening centrally located therein, the upper of said heads having an eye fitting centrally located thereon; said container having a removable closure fitting for said discharge opening, a central tie connection between said eye fitting and said lower of said heads, and an annular inflatable bladder layer attached to the inner wall of said container, the outer edge of said bladder layer being attached to said cylindrical body portion of said container, the inner edge of said bladder layer being attached to said lower head of said container adjacent said discharge opening therein; said container having means for introducing gas under pressure between said bladder layer and said inner wall of said container, comprising:

placing said container on an unloading stand having an opening therein in register with said discharge opening;

attaching a cable from an adjustable overhead support to said eye fitting;

adjusting the tension in said cable so that the weight of said container is supported both by said unloading stand and said cable;

removing said closure fitting;

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allowing said lading to drain from said container
by gravity until the flow of material stops;
inflating said bladder layer with gas to a pres-
sure above atmospheric to expand the same and
cause the flow of material to resume;
maintaining said pressure in said bladder layer
until said flow stops;
releasing said pressure in said bladder layer by
deflating the same;
and repeating said inflating and deflating of said
bladder layer until said material ceases to flow.

4. The method of claim 3, further comprising applying
vacuum pressure to said bladder layer each time after
releasing pressure therein.

5. The method of claim 3, in which said bladder layer

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is deflated by opening said gas introducing means and
inflating said container.

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