United States Patent

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[54] **COLLAPSIBLE CONTAINER**
7 Claims, 8 Drawing Figs.

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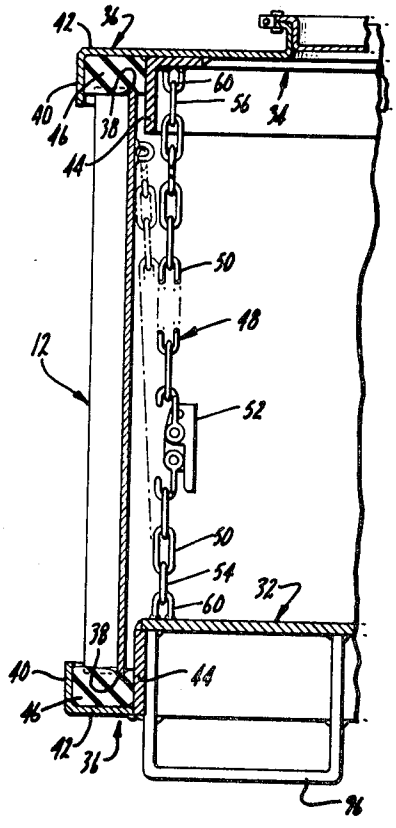
ABSTRACT: A collapsible container for storing and transporting relatively large quantities of packaged bulk material embodying sidewalls fabricated of a relatively rigid material having a hinge arrangement between adjacent walls formed of an elongate strip of relatively bendable and fluid-impervious material so that the walls may be maneuvered to an open position when the container is assembled to receive material and to a flattened position, with at least portions of adjacent sidewalls in contact with each other, when the container is emptied and disassembled. In addition, at least one end closure is provided having a receptacle attached to and circumscribing the end closure designed to receive the end edges of the walls in pressurable contact when the container is assembled thereby to form a relatively fluidtight seal therebetween, such pressurable contact being provided by a plurality of elongate ties secured to the container and the end closure with an integral camming device operable to increase and decrease the effective length of the ties.



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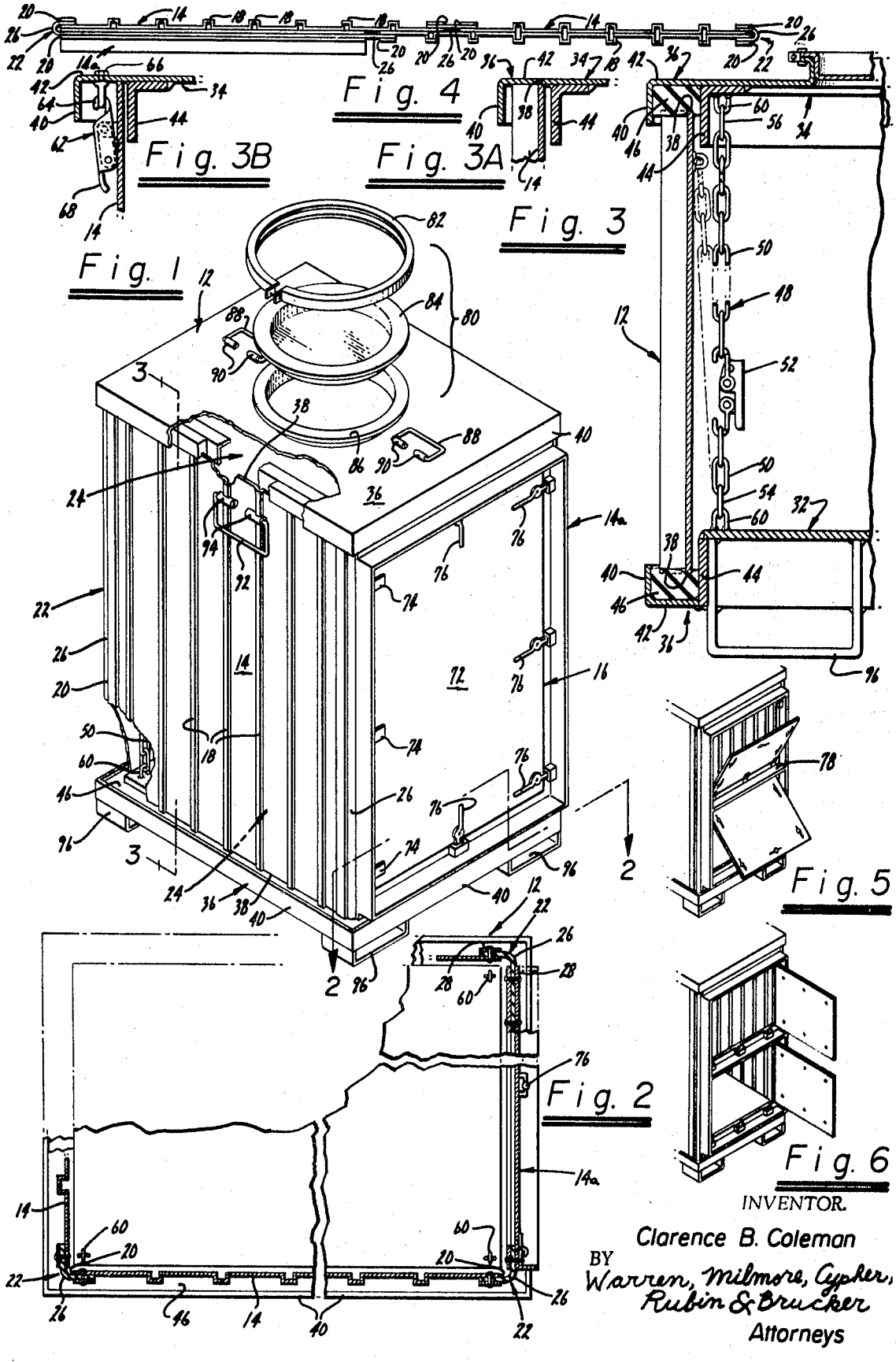

Fig. 4

Fig. 3B

Fig. 3A

Fig. 3

Fig. 1

Fig. 5

Fig. 2

Fig. 6

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COLLAPSIBLE CONTAINER

The use of large bins or containers for storing and transporting relatively large quantities of a variety of packaged and bulk materials has, in recent years, been sought in the material handling and shipping industry. Such containers are especially advantageous for shipment of loose granular materials; and, in general such containers may reduce loss due to the elements, mishandling, vandalism, and the like. In order to operate efficiently and economically, such containers should have a relatively high cubic content; and the edge dimensions thereof are often at least several feet. Shipping containers of such size, however, impose a number of problems that have not been entirely successfully resolved by the prior art devices with which I am familiar.

For example, a container may be shipped with a payload contained therein in one direction of a voyage; but, because of the absence or nature of the cargo available for the return trip, the same container may return empty while occupying the same space that it had when full. Moreover, after the container has been used, it may be necessary to transship to another loading point before reuse, wherein freight rates of transshipment determined by cubic displacement represents a loss because of the unused space occupied by the relatively large empty containers. For these and other reasons, the industry has long sought various collapsible containers for such use. However, the development of such containers that are structurally rugged enough to resist the loads imposed by relatively large quantities of packaged and bulk material, while at the same time composed of disassembleable components which may be joined together in a relatively fluidtight manner in order to assure safe protection of the cargoes, has not been entirely satisfactory. Generally, such assemblies are composed of many separate pieces which may not lend themselves to form relatively tight connections; impose higher initial production costs; require additional labor of assembly when erected to receive material; and often, because of the multiple components, may not be compactly stored.

It is an object of this invention to provide a collapsible container for storing and transporting relatively large quantities of packaged and bulk material which is of rugged construction and yet when disassembled comprises at most only three major components that occupy a volume which is substantially less than that of the erected container.

Another object of my invention is to provide a collapsible container whose sidewalls form an integral structure that may be flattened when disassembled without separating the sidewalls from each other for compact storage.

A further object of my invention is to provide a collapsible container having a minimum number of separable components, thereby reducing the total initial cost of the assembly and the amount of labor and handling necessary to place the container in condition to receive material.

Other objects, features, and advantages of my invention will be apparent to one of ordinary skill in the art upon a reading of the specification which follows and by reference to the accompanying drawing.

Turning now to the drawings:

FIG. 1 is a perspective view of a collapsible container embodying my invention, with portions broken away to show certain interior details, and with another portion thereof shown in exploded view for sake of clarity;

FIG. 2 is a partial sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a partial sectional elevation taken along line 3—3 of FIG. 1;

FIG. 3A shows an alternative embodiment of a portion of my invention in structure corresponding to that shown directly adjacent to it in FIG. 3;

FIG. 3B shows an alternative embodiment of another portion of my invention in structure corresponding to that shown in FIG. 3A;

FIG. 4 shows a portion of a collapsible container embodying my invention and in the flattened position;

FIG. 5 is a portion of a perspective view showing one arrangement of a collapsible container which may embody my invention; and

FIG. 6 is another arrangement for a collapsible container which may embody my invention.

A completely assembled collapsible container 12 embodying my invention is shown in FIGS. 1, 2, and 3 of the accompanying drawing for storing and transporting relatively large quantities of packaged and bulk material (not shown), including sidewalls 14 and 14*a*, the latter being of modified construction to accommodate door assembly 16. The walls are fabricated of a relatively rigid material, preferably heavy-gauge sheet steel, which may be further reinforced as by integrally impressed ribs 18. Each of adjacent walls 14 and 14*a* have adjacent side edges 20 (FIGS. 2 and 4), each adjacent pair of which are secured to a different hinge 22, thus forming a unitary side enclosure having opposite end openings 24. I have found that a particularly satisfactory hinge is provided by utilizing an elongate strip 26 fabricated of a relatively bendable and fluid-impervious material, such as rubber reinforced with fabric, or the like. Such strip is fastened to each of the sidewalls by bands 28 which in turn are held in place by suitable fasteners 30, such as rivets, metal screws, or the like. By the foregoing, I achieve one of the important features of my invention; that is, by such bendable hinge means the walls of the container may be moved to an open position, such as shown in all of the figures except FIG. 4, when the container is assembled to receive material therein, and to a flattened position (FIG. 4), wherein at least portions of adjacent sidewalls 14, 14*a* are brought into contact with each other when the container is disassembled. In this way, the container sides may be removed from the structure as a whole, maintained as a unit, and collapsed to a flattened condition for storage when not in use and during transshipment.

To complete the container structure, I provide at least one end closure 32 of a type adapted to form the bottom of the container, and, in the usual case, a second enclosure 34 suitable to form the top of an all-enclosed container. Each such end closure is provided with guide 36 adapted to receive and contact end edges 38 of the walls which bound and define opposite end openings 24 when the container is in its assembled condition. More specifically, in the embodiment shown in FIG. 3, each of guides 36 is shaped to form a gasket-receiving receptacle circumscribing and attached to the main portion of the end closure, including outside lip or flange 40, web 42, and inner flange 44, which may be formed by the leg of an angle or plate member suitably secured, as by welding, to the main body of the end closure itself. Within the gasket receptacle thus formed, I may provide a gasket 46 which may be fabricated of a relatively resilient, fluid-impervious material to form a relatively fluidtight seal between the end edges of the sidewalls and the guide when the end edges are urged into pressure contact therewith by a tensioning device explained herein below.

In FIG. 3A, I show another embodiment of that portion of the invention just described above, but without gasket 46. That is, end closure 34 in FIG. 3A is provided with guide 36 to receive end edges 38 in bearing contact against web 42 between outside lip or flange 40 and inner flange 44. I have found that, even without the gasket 46, which may be preferred in certain applications wherein a particularly fluidtight connection between the sidewall and the guides is required, the arrangement shown in FIG. 3A operates satisfactorily.

As indicated above, a feature of my invention is that the end edges of the sidewalls are urged into pressure contact with the guides of the end closures to form a relatively tight and easily disassembleable connection. This is accomplished by means of a tensioning device, such as elongate tie 48, which may be provided at each of the corners of the container, or at more frequent suitable intervals if necessary. Each such tie may be fabricated of a series of chain links 50 having a camming device, such as load binder 52, interposed between any two of

the links and operable to increase and decrease the distance from one end 54 to the other end 56 of the chain when in an outstretched position. Such change in length is accomplished by movement of a conventional camming lever as indicated by operational arrow 58 and the designation "open" and "close," designated on the drawing. The elongate tie may be disengaged from each of the end closures as by the use of conventional separable links 54, 56, which may be disengaged from permanent securing loops 60 secured to the inner confronting faces of end closures 32, 34.

In the event my invention may be desired for use in an embodiment comprising an open-top bin structure, the aforedescribed container may be utilized omitting top closure 34, in which case elongate tie 48 may be secured within the container to a permanent securing loop attached to the sidewall itself, such assembly being indicated by the phantom lines in FIG. 3.

Although I have shown and described above a tensioning device including an elongate chain and camming device secured inside the end closure itself, it is understood that such assembly may be placed on the outside of the container in order to provide a greater degree of unfettered space on the inside. Alternatively, and in some cases preferably, the tensioning device may be combined with the sidewall itself. Such combination may be understood by reference to FIG. 3B wherein I show a portion of a container assembly similar to that shown in FIG. 3A, except that the upper portion of sidewall 14 has attached thereto camming lock 62, including hook portion 64 adapted to receive in the cradle portion thereof the T-shaped end of special connecting bolt 66 secured to closure 34. Camming lock 62 is of the type that, when handle 68 is moved in the direction of arrow 70, hook 64 releases from bolt 66; and, when handle 68 is moved in the direction opposite to arrow 70, hook 64 engages the T-shaped end of bolt 66 and tensions the shank portion thereof thereby drawing guide web 42 into pressurable contact with the sidewall edges.

As shown in FIG. 1, the container is provided with a door assembly 16, which includes door plate 72, hinges 74, and camming locks 76 for securing the door in the closed position. With this type of arrangement, complete access may be had to the inside of the collapsible container when in the erected condition. Such an arrangement is generally preferable for containers adapted to handle various types of packaged materials. In FIG. 5, I show a similar arrangement, except that two doors are provided, each of which hinge about a central crossbeam 78 and provide for access to different portions of the container. Such an arrangement is sometimes preferred to facilitate discharge of loose, granular, bulk material through the lower of the two doors. In FIG. 6, I show an arrangement similar to that shown in FIG. 5, except that the hinge line is about a vertical side edge member, so that the doors swing outwardly in a more conventional manner.

It is also possible to provide top closure 36 with a barrel opening assembly 80, including closure rim 82, lid 84, and closure flange 86 which defines the opening into the container itself. Such opening assembly is usually desired for top loading of various types of bulk material.

Handling cleats 88 are provided on top closure 34 and are suitably secured thereto as by brackets 90. By means of such cleats, the relatively large and heavy sheet steel and reinforced end closures may be relatively easily handled by means of a forklift truck, or the like, so as to facilitate assembly of a collapsible container embodying my invention. Similarly, sidewalls 14 are provided with cleats 92, suitably secured thereto by means of brackets 94. Finally, I provide the bottom closure 32 with brackets 96, fastened thereto as by bolting or welding, and shaped to receive the arms of a forklift truck so that the entire container may be transported in assembled condition with relative ease and convenience.

The aforementioned handling devices are of particular consequence in my invention because the collapsible container described herein is of a size and construction to accommodate relatively heavy and bulky packaged and bulk materials. Accordingly, the components thereof, such as the sidewalls, end closures, and the like, are fabricated of relatively heavy materials, such as sheet steel and the like, and reinforced to resist the relatively high loads which may be imposed upon the sides and bottoms thereof in the particular application of my invention.

It is a particular advantage of my invention that the collapsible container embodied herein disassembles into but two or at most three major components, i.e., top and bottom closures and sidewall assembly, yet is capable of sustaining relatively heavy loads when fully assembled as shown in FIG. 1. Moreover, due to the relatively rugged construction and use of rigid materials, the container may be handled either by forklift engagement with bottom brackets 96, or, alternatively, by engagement with handling cleats 88 located at the top closure.

Another feature of my invention is that a relatively fluidtight joint is achieved, even at the corners of the sidewalls where such corners engage the end closures. This is accomplished by the cooperation of the edges of the sidewalls being urged into pressurable contact with the guides of the end closures by means of the tensioning devices, all as described hereinabove. This is of particular advantage to protect the cargo against damage by the elements, mishandling and vandalism, particularly when loose grain materials are being transported within the container and a relatively fluidtight joint is desirable. In addition, even the corner regions where the hinged sections of my container enclosure bears against the end closure guides is afforded such relatively fluidtight protection. This is accomplished in my invention by providing elongate strip 26 fabricated of a material, such as reinforced rubber, further selected and characterized as having sufficient stiffness to pressurably contact the floor of guide 36 with relatively little yield.

I claim:

1. In a collapsible container for storing and transporting relatively large quantities of packaged and bulk material comprising in combination:

a plurality of sidewalls fabricated of a relatively rigid material;

hinge means secured to adjacent side edges of said walls to form an enclosure having opposite end openings, said means to permit placement of said walls to an open position when said container is assembled to receive material therein and to a flattened position with at least portions of adjacent ones of said sidewalls in contact with each other when the container is disassembled after material is removed therefrom;

at least one end closure having guide means secured thereto adapted to receive and contact the end edges of said walls defining one of said end openings when said container is assembled; and

tensioning means secured to urge the end edges of said walls into pressure contact with said guide means when said container is assembled, last said means comprising a plurality of elongate ties and separate camming means integral with each one of said ties operable to increase and decrease the distance from one end to the other end of the tie when in outstretched position, one end of each of said ties secured to said end closure and the other end thereof adjacent to the opposite end edges of said walls.

2. The collapsible container in accordance with claim 1 wherein said hinge means comprises an elongate strip fabricated of a relatively bendable and fluid-impervious material; and

means securing a portion of each side of one face of said strip to different adjacent ones of said walls.

3. The container in accordance with claim 1 wherein said guide means is shaped to form a gasket receptacle circumscribing said end closure; and

a gasket disposed within said receptacle to form a relatively fluidtight seal between the end edges of said sidewalls and said guide means when the end edges are urged into pressure contact by said tensioning means.

4. The collapsible container in accordance with claim 1 and further comprising a second end closure having guide means secured thereto adapted to receive and contact the end edges of said walls defining the other of said end openings when said container is assembled; and wherein said other end of said tensioning means is secured to said second end closure; and

means carried by each of said end closures to removably engage different opposite ends of each of said ties interconnecting the end closures.

5. The collapsible container in accordance with claim 2 wherein said elongate strip is fabricated of a material further characterized as having sufficient stiffness to pressurably contact said guide means and form a relatively fluidtight joint.

6. A collapsible container limited to two component sections which when assembled are adapted for storing and transporting relatively large quantities of packaged and bulk material comprising, in combination:

said first component section comprising a plurality of sidewalls fabricated of a relatively rigid material and adapted to resist relatively high material loads imposed thereagainst and hinge means secured to adjacent ones of said walls to form an enclosure having opposite end openings, said means operative to permit said enclosure to be maneuvered to an open position when said container is assembled to receive material and to a flattened position with at least portions of adjacent walls in contact with each other when the container is emptied and disassembled;

said second component section fabricated of relatively rigid material and having guide means secured thereto adapted to receive and contact the edges of said sidewalls and close off one of said openings when said container is assembled; and

means attached to said container and end closure to urge the edges of said walls received by said guide means into pressurable contact therewith, said means and guide means adapted to hold said closure and sidewalls against the load imposed by the deposition and storage of relatively large quantities of material into said container, said means comprising a plurality of elongate ties and separate camming means integral with each one of said ties operable to increase and decrease the distance from one end to the other end of the tie when in outstretched position, one end of each of said ties secured to said end closure and the other end thereof to one of said sidewalls at a point remote from said end closure.

7. The collapsible container in accordance with claim 6 further characterized by being of the type forming a completely enclosed container when assembled and used and limited to three component sections and wherein further said third component section fabricated of relatively rigid material and having a guide means secured thereto adapted to receive and contact the edges of said sidewalls and close off the other of said openings when said container is assembled.

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