July 17, 1962 L. R. EADES 3,044,515

SELF-ERECTING COLLAPSIBLE CONTAINERS

Filed April 27, 1959 2 Sheets-Sheet 1

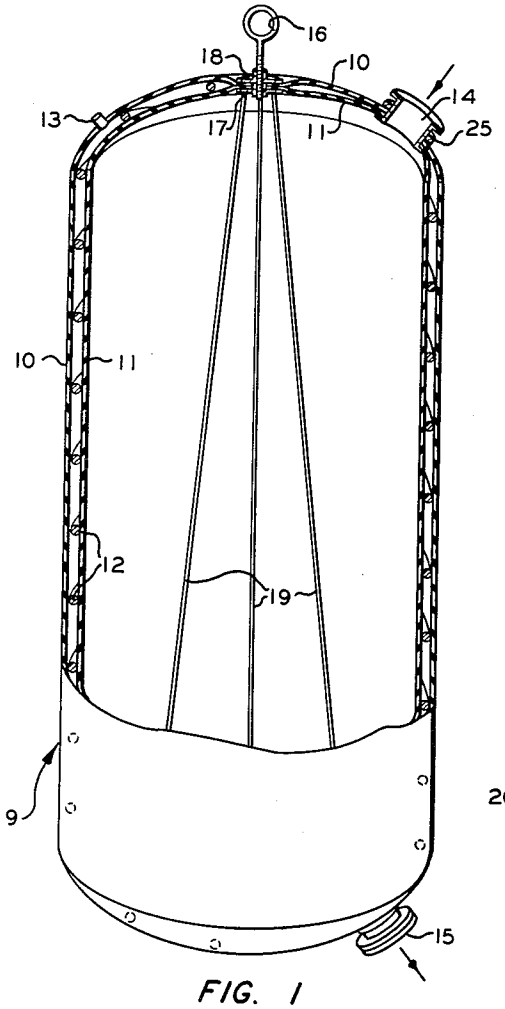


FIG. 1

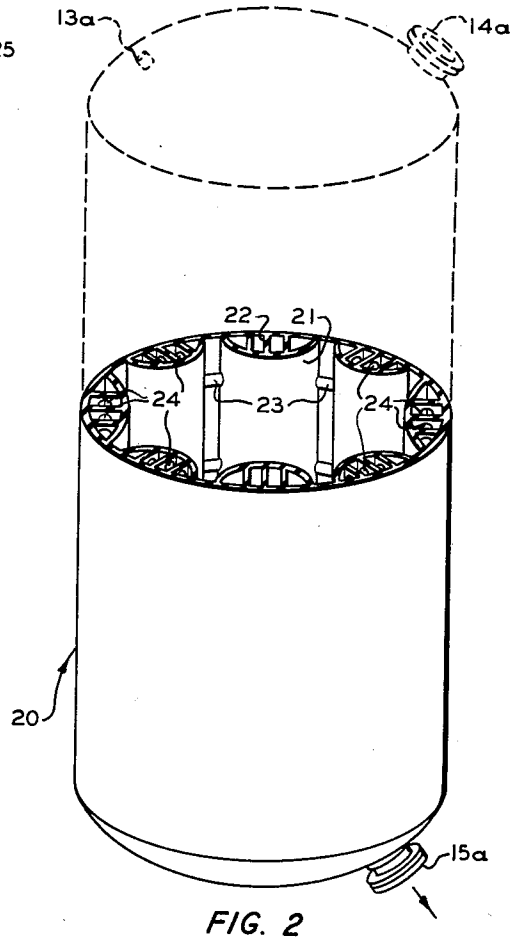


FIG. 2

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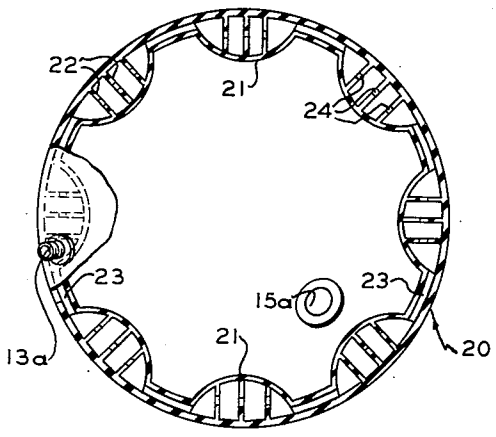


FIG. 3

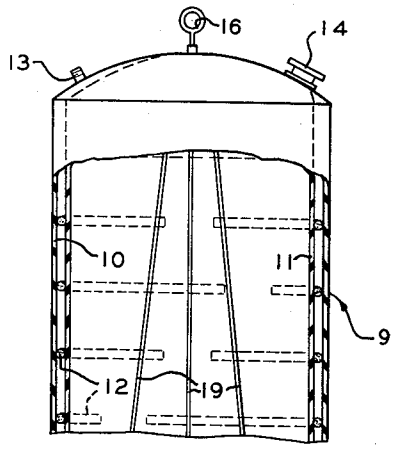


FIG. 4

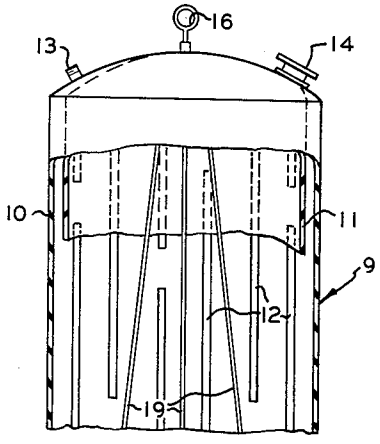


FIG. 5

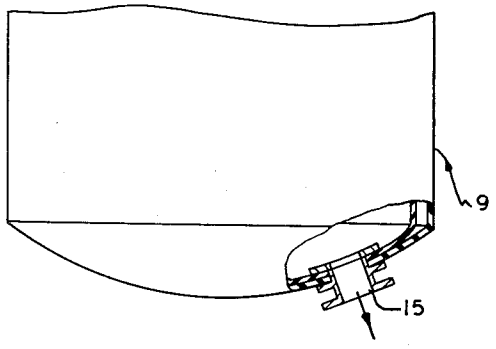


FIG. 6

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SELF-ERECTING COLLAPSIBLE CONTAINERS

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4 Claims. (Cl. 150—1)

This invention relates to collapsible containers and particularly to collapsible containers of large size. In one aspect this invention relates to a method and a means for expanding or erecting a large collapsible container without increasing the pressure in the interior of the chamber above the ambient pressure. In another aspect the invention relates to a large collapsible container which can be filled with a finely divided solid material without necessity of inflating the interior of the container.

Large collapsible containers made of rubber or fabric are used for shipment of bulk materials. These containers can be cylindrical or cubical in shape and are usually lifted by means of cables or chains which encircle the bottom of the container so as to distribute the load upon lifting a filled container. The empty containers are usually returned to the point of origin and reused. These containers display particular utility for the transportation of carbon black, particularly pelleted carbon black, and are used where carbon black is to be transported by railway car, barge or by truck. One particular disadvantage in the use of such containers is the difficulties encountered in filling the containers with bulk material, particularly particulate material of low density such as loose carbon black. The containers collapse under their own weight and when an empty container is lifted by the lifting cables, the sides collapse upon each other and the density of a material such as carbon black is not sufficiently great to force the sides apart; consequently, it is necessary to inflate the containers with gas pressure and to pump the particulate material into the container against the inflating gas pressure. This difficulty has limited the use of such containers for the shipment and transportation of pelleted carbon black and has substantially eliminated any consideration of utilizing such containers for the transportation of loose carbon black.

It is therefore a principal object of this invention to provide a self-erecting, collapsible container. It is also an object of this invention to provide a method for filling a collapsible container with bulk material without the necessity of inflating the interior of the container. Another object of this invention is in the provision of a collapsible container having compartmented walls which can be inflated so as to cause the container to assume an erect position. A further object of this invention is the provision of a collapsible carbon black container which can be filled with carbon black at ambient pressure. Other advantages and features of this invention will become apparent to one skilled in the art upon studying this disclosure including the appended drawing wherein:

FIGURE 1 is a view, partly in cross section, of a container constructed according to my invention.

FIGURE 2 is a modification of the invention.

FIGURE 3 is a plan view, partly in section, of the modification of the invention of FIGURE 2.

FIGURE 4 is a modification of the container of FIGURE 1.

FIGURE 5 is another modification of the container of FIGURE 1, and

FIGURE 6 is a detail of the discharge connection of the container of FIGURE 1.

Broadly, the invention contemplates constructing a collapsible container wherein at least a portion of the wall structure is of double wall construction so that the walls of the container contain compartments which can

be inflated with air or other gas so as to provide a degree of rigidity to the container walls sufficient to maintain the container in an erect position even when empty. The double wall construction also provides an additional measure of protection to the particulate material being carried insofar as two walls would require rupturing before leakage or contamination of the materials occurred. A container of about 400 cubic feet of space will accommodate about 3 to 4 tons of carbon black.

Referring now to the drawing, and particularly to FIGURE 1, there is shown a container **9** constructed with an outer wall **10**, an inner wall **11**, and containing a reinforcing cord **12** secured in the annulus between walls **10** and **11** to provide reinforcement for the structure. The reinforcing cord **12** is shown as a spiral encircling the walls of the container; however, such reinforcing cord could also be a plurality of horizontal or vertical cords or ribs encircling the container. If a plurality of cords are employed, so that a plurality of chambers are formed, the cords should be discontinuous so as to provide communication among the chambers. The annulus between the walls **10** and **11** can be filled with gas or emptied of gas through valve **13**, which can be a conventional valve such as those used for the inflation of automobile tires or rubber life rafts. The material inlet **14** is a flange connection which is secured to walls **10** and **11** of container **9** so as to form a closable opening therethrough. The material discharge **15** is a flanged connection similar to material inlet **14**. Sealing ring **25** can be threaded onto the neck of the flange **14** so as to provide a tight seal with the walls **10** and **11** of the container **9** or ring **25** can be bolted to the flange **14** or otherwise secured to flange **14**.

A lifting eye **16** can be secured to the top of the container by clamps **17** and **18** which can be tightened upon the fabric walls **10** and **11** of the container by means of threads on the shaft of lifting eye **16**, or by other means. Additional support can be supplied to the bottom of the container by means of cables **19** which are secured to the bottom of the container and to the clamp member **17**.

Referring now to FIGURE 2, container **20** is similar to container **9** except that instead of double wall construction, as in container **9**, container **20** has therein a plurality of air chambers indicated as **21** containing therein reinforcing ribs **22** and connected together by tubes indicated at **23**. Perforations **24** in the reinforcing ribs **22** allow passage of gas so that all of the inflatable chambers indicated as **21** are interconnected and can be filled by a common valve. Inflating valve **13***a*, material inlet **14***a* and material discharge **15***a* can be the same as those of container **9** of FIGURE 1.

The reinforcing cord **12** of FIGURE 1 and the reinforcing ribs **22** of FIGURE 2 prevent ballooning of the inflated air space and provide added rigidity to the container when the inflatable compartments are inflated with a gas.

The self-erecting, collapsible containers of this invention can be constructed of any impervious, pliable material such as rubber, rubber impregnated fabric, or flexible synthetic materials such as polyethylene film, polyvinylchloride film, and the like. The reinforcing cord **12** of FIGURE 1 will preferably be made of material similar to that of the container so that the cord can be secured to the walls **10** and **11** by welding or by vulcanization. The cord **12** should be continuous so as to provide a continuous air chamber between wall **10** and wall **11** or means provided for communication among the various chambers if a plurality of cords are employed which result in a plurality of air chambers.

The self-erecting, collapsible containers of this invention are preferably made of nylon fabric impregnated with synthetic rubber such as a polymer of 2-chloro-1,3-

butadiene available from Du Pont Company under the name of "neoprene"; isobutylene containing a small amount of isoprene and known as butyl rubber; chlorosulfonated polyethylene available from Du Pont Company under the name of "Hypalon"; and other synthetic rubbers having characteristics similar to those named. These synthetic rubbers are resistant to weather checking, abrasion, and ozone attack and fabrics impregnated with such synthetic rubbers can be repeatedly flexed without permanently bending the fibers of the fabric.

The containers of this invention can be caused to assume an erect position by inflating the inflatable compartment and the pressure required will be determined by the size and weight of the container and the cross sectional area of the inflatable compartment therein. The required pressure will usually be from about 2 to about 10 pounds per square inch. When in an erect position, the container can be filled by merely pouring the bulk material into the container and the requirement for pumping the material or forcing the material into the container by pressure is eliminated. It is a feature of my invention that the containers can be utilized without additional loading equipment in most cases. The containers can be inflated in place in a railroad gondola car or truck and gravity loaded, using existing hopper car facilities. The unloading operation can be similarly simplified. The collapsible feature allows the pressurized compartments or double wall to be deflated either after loading or after unloading.

Reasonable variations and modifications are possible within the scope of this disclosure without departing from the spirit and scope of the invention.

That which is claimed is:

1. A self-erecting, collapsible container for storing and transporting particulate material comprising a double-walled, closed, cylindrical bag of gas-impervious, pliable material wherein the inner wall is completely sealed from the interior of the bag; a gas-impervious pliable cord spacer means positioned in the space between the outer wall and inner wall of the double-walled container and secured to the outer wall and the inner wall so as to maintain the space between the walls substantially the same as the diameter of the cord and to form therein a continuous chamber; a particulate material inlet in the upper portion of said bag; a particulate material outlet in the lower portion of said bag; and a valve means secured directly to the outer wall of said double-walled bag and communicating directly with the exterior of the bag and the space between the walls of the bag for introducing gas to said space to provide sufficient rigidity to said cylindrical walls to cause the bag to stand erect.

2. A self-erecting, collapsible container for storing and transporting particulate material comprising a double-walled, closed, cylindrical bag of gas-impervious, pliable material; a material inlet in the top portion of said bag; a material discharge in the bottom portion of said bag; pliable spacer means positioned in the space between the walls of said double-walled bag and secured to said walls comprising a continuous cord encircling the inner cylindrical bag of the container in the form of a spiral so as to form a continuous space between the walls of the double-walled bag; and valve means secured directly to the outer wall of said double-walled bag and communicating directly with the exterior of the bag and the space between the walls of the bag for introducing gas to said space so as to provide sufficient rigidity to said cylindrical walls to cause the bag to stand erect.

3. A self-erecting, collapsible container for storing and transporting particulate material comprising a double-walled, closed, cylindrical bag of gas-impervious, pliable material; a material inlet in the top portion of said bag; a material discharge in the bottom portion of said bag; pliable spacer means positioned in the space between the walls of said double-walled bag and secured to said walls comprising a plurality of substantially parallel discontinuous cords encircling the inner bag circumferentially so as to form a continuous space between the walls of said double-walled bag; and valve means secured directly to the outer wall of said double-walled bag and communicating directly with the exterior of the bag and the space between the walls of the bag for introducing gas to said space so as to provide sufficient rigidity to said cylindrical walls to cause the bag to stand erect.

4. A self-erecting, collapsible container for storing and transporting particulate material comprising a double-walled, closed, cylindrical bag of gas-impervious, pliable material; a material inlet in the top portion of said bag; a material discharge in the bottom portion of said bag; pliable spacer means positioned in the space between the walls of said double-walled bag and secured to said walls comprising a plurality of substantially parallel discontinuous cords positioned longitudinally with respect to the cylindrical bag so as to form a continuous space between the walls of said double-walled bag; and valve means secured directly to the outer wall of said double-walled bag and communicating directly with the exterior of the bag and the space between the walls of the bag for introducing gas to said space so as to provide sufficient rigidity to said cylindrical walls to cause the bag to stand erect.

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