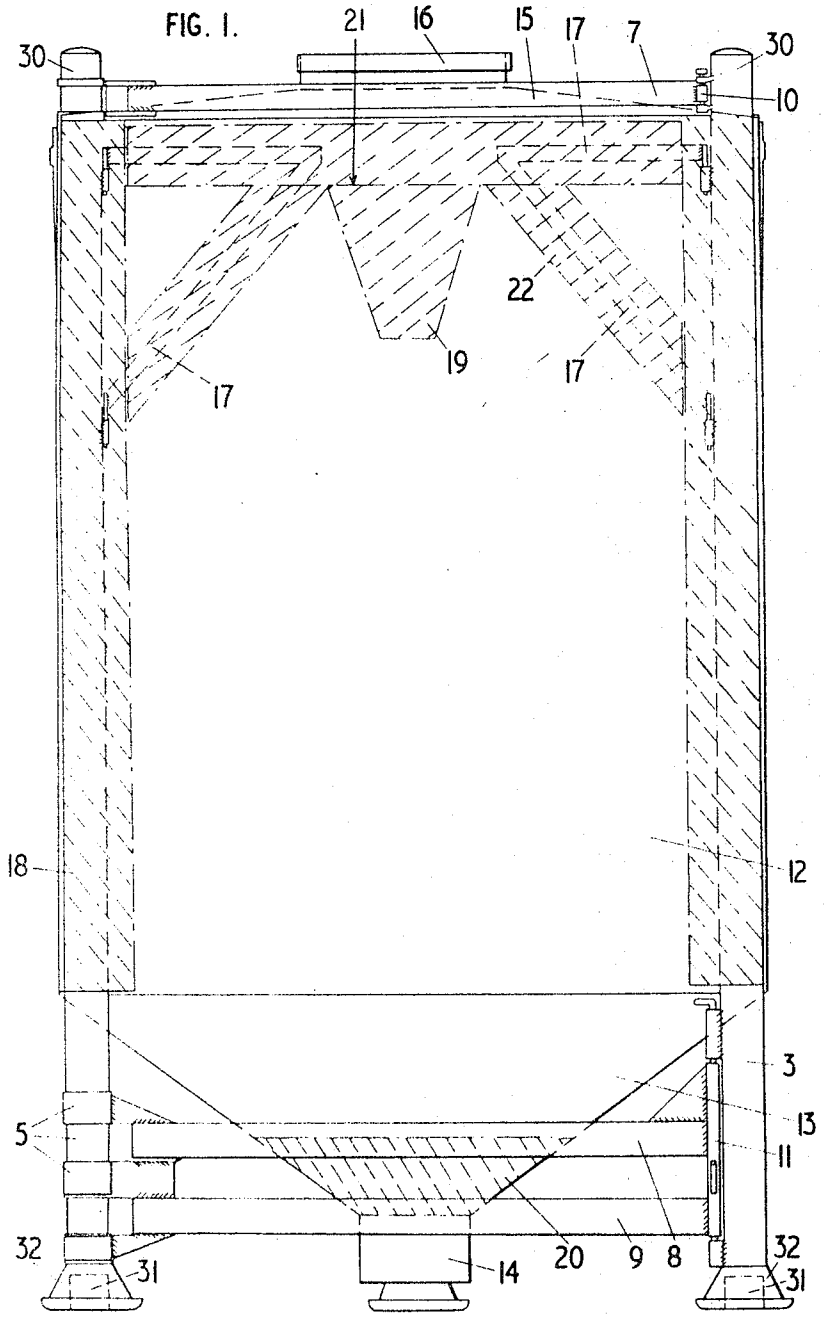
Sept. 2, 1969 R. M. FORMAN 3,464,594

FLEXIBLE CONTAINERS ATTACHED TO A COLLAPSIBLE SUPPORTING FRAME

Filed June 2, 1967 3 Sheets-Sheet 1

FIG. 1.



FLEXIBLE CONTAINERS ATTACHED TO A COLLAPSIBLE SUPPORTING FRAME

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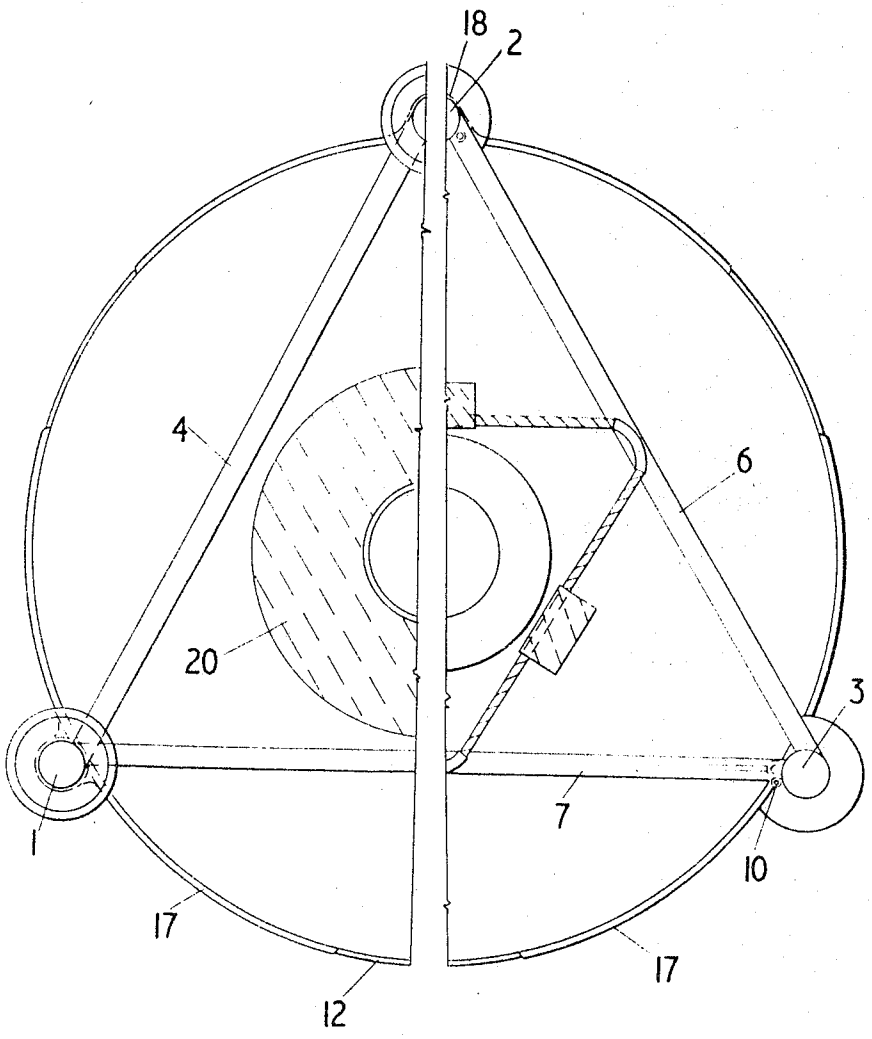
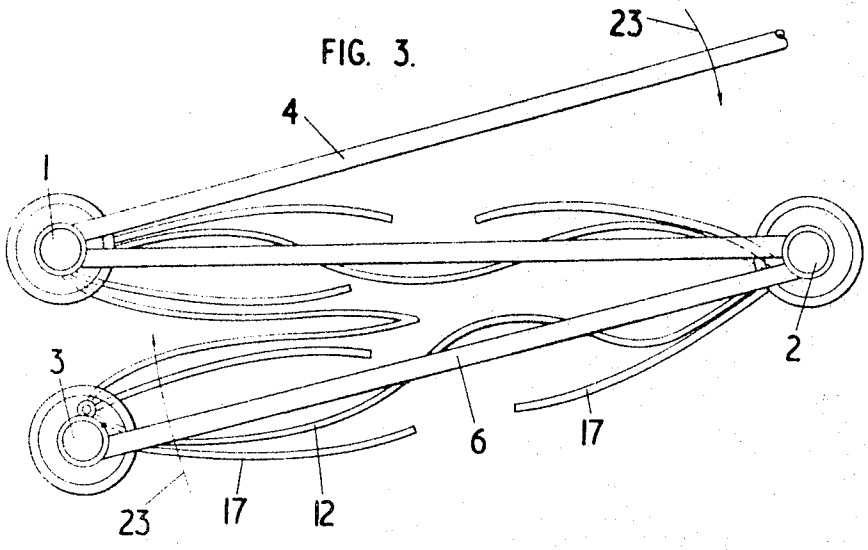


FIG. 2 FIG. 2A

FLEXIBLE CONTAINERS ATTACHED TO A COLLAPSIBLE SUPPORTING FRAME

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FIG. 3.



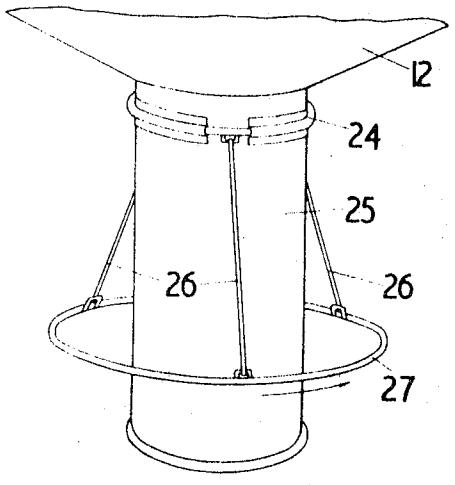


FIG. 4.

United States Patent Office 3,464,594 Patented Sept. 2, 1969

3,464,594

FLEXIBLE CONTAINERS ATTACHED TO A COLLAPSIBLE SUPPORTING FRAME

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Filed June 2, 1967, Ser. No. 643,150
Claims priority, application Great Britain, June 6, 1966, 25,144/66
Int. Cl. B67d 5/64
U.S. Cl. 222—185 12 Claims

ABSTRACT OF THE DISCLOSURE

A bulk container which includes a flexible bag and an external framework for supporting the bag in an opened condition. The framework is arranged to be collapsed by folding portions of it together, the bag then being maintained also in a collapsed condition.

This invention relates to containers for materials such as powders, granular materials, and liquids in bulk, particularly intended for use in transporting these materials, and it is an object of the present invention to provide an improved bulk container which may be readily collapsed when empty to reduce the space taken up by the container when being transported for refilling.

The present invention consists in a bulk container comprising a flexible bag and a collapsible framework for supporting the bag, the framework including a plurality of normally upstanding posts, portions disposed between the posts, and means interconnecting the posts and the portions for rotatably mounting the portions about the posts for folding the framework from an opened condition to a collapsed condition.

Preferably, the bag bears against the posts when filled so as to be supported at a number of regions spaced around the exterior of the bag from top to bottom. The bag may be attached to the framework over the regions.

Furthermore, it is preferred that the bag is at least slightly elastic so that when the bag is filled, a force is exerted against its walls stressing its material between the regions causing circumferential stretching and when the bag is emptied these stresses are relaxed to thereby facilitate the discharge of contents.

In the accompanying drawings:

FIGURE 1 is a diagrammatic side view of a bulk container according to the present invention;

FIGURES 2 and 2*a* are fragmentary plan views of the container of FIGURE 1;

FIGURE 3 is a plan view showing the container in partially collapsed condition; and

FIGURE 4 is a detail showing an outlet valve.

In carrying the invention into effect according to one convenient mode by way of example, a bulk container consists essentially of a flexible bag or envelope and a supporting framework for it.

The supporting framework includes three tubular metal posts, **1**, **2** and **3**. Posts **1** and **2** are linked together by three horizontal bars, one bar **4** joining the tops of the posts and the other two (not shown) joining their bottoms. Each end of the bars is joined to one or more collars **5** fitted on the adjacent post to permit rotational movement about the axis of the post. Posts **2** and **3** are similarly linked by three bars of which only the top one **6** can be seen, and posts **3** and **1** are linked by bars **7**, **8** and **9**. These bars can be released from posts **3** by undoing catches **10** and **11**.

The posts and bars thus form a framework, triangular in plan in opened condition, in which is supported a flexible bag **12** by means of sleeve **18** secured to the bag

a post passing through each sleeve. The bag may be formed for example of rubber sheet material, or other suitable material, or alternatively to provide strength and flexibility it may be a laminate consisting of a woven or knitted material, such as nylon or Dacron, with a layer or coating on one or both surfaces of rubber, or plastics or other suitable material. For an envelope formed of a laminate or neoprene and nylon having a height of 46", a wall thickness of 15 to 20 thousandths of an inch has been found suitable.

The envelope is attached to the framework at a number of regions, defined by sleeves **18**, spaced around the exterior of the envelope and extending from top to bottom of the envelope. When filled, the envelope bears against and is supported by engagement with the normally upstanding posts.

In its opened out condition, as shown in FIGURES 1 and 2, the envelope **12** is circular in plan and has a conical lower portion **13** with a closure **14** for an outlet and a slightly domed upper portion **15** with a lid **16** for an inlet.

To support the bag **12** in its opened condition against substantial distortion when filled, each post is provided with a pair of arms **17** pivotally mounted on the post, and the bag is reinforced as at areas **19**, **20**, **21** and **22**, area **19** being between the ends of adjacent arms **17**.

The spacing between the bars **8** and **9** may be such as to permit the passage between them of the forks of a fork lift but to prevent tilting of the framework once on the forks. In this way, the filled containers may be readily transported. Filled containers may be stacked one on top of another with the bottom ends of the posts of the upper container engaging the top ends of the posts of the lower container, and if desired the bottom and/or top ends may be suitably shaped to co-operate with each other, for example as shown in FIG. 1 in which the upper ends **30** of the posts are accommodated in recesses **31** formed in the bases **32** of the posts positioned immediately above.

To collapse the container when empty, the catches **10** and **11** are released, bars **7**, **8** and **9** are rotated (clockwise as seen in FIGURE 2) towards bar **4** and the two bars beneath it, and posts **1** and **3** are moved towards each other. During this process the cross-section of the envelope will be flattened and the arms **7** may be folded flat.

FIGURE 3 shows the container in partially collapsed condition i.e. of Z-shaped configuration in plan, but it will be appreciated that both the framework and the envelope may be further flattened by further relative movement in the direction of arrows **23**.

In this way, when the container is empty after having been used for delivering material in bulk and must be transported back for refilling, the container may be readily collapsed to reduce its volume during transport to an absolute minimum.

Preferably, the bag has at least a slight elasticity since it has been found that this facilitates discharge of the contents, when used in combination with the manner of support against vertical posts described above, particularly with certain powdered materials which tend to form compacted masses. With this arrangement, when the bag or envelope is filled a load is exerted upon its walls stressing its material between the vertical regions causing circumferential stretching. When the bag is subsequently emptied, these stresses are relaxed to cause turbulence and/or an upsetting of compacted masses of the contents which may for example cause bridging, thereby facilitating discharge of the contents.

In an alternative arrangement, not shown, the arms **17** may be eliminated and replaced by tapes or strips secured to the envelope **12** to provide the desired reinforcement,

the tapes extending diagonally downwards from adjacent the top of each post so as to be of generally V-shaped configuration between each adjacent pair of posts.

The inlet at the top of the envelope may be provided with a flared extension to serve as a funnel and a drawstring may be provided to regulate flow from the funnel into the enclosure.

The outlet may be extended downwardly and enlarged if desired, and it may also be provided with a drawstring to regulate the size of the outlet orifice.

To control inlet and outlet flow, the bag may be provided at top and bottom with clamps in the form of two arms pivotally connected at one end which can be clamped together with a portion of the inlet or outlet trapped between them.

Alternatively, FIGURE 4 shows an outlet valve which includes an inner ring **24** fixed to a flexible discharge neck **25** and connected by cords or tapes **26** to an outer ring **27** of larger diameter. The neck **25** may be closed by turning the outer ring **27** so as to wind the cords or tapes **26** in helical fashion around the neck **25**, thus tightening and finally closing the outlet, suitable means being provided, not shown, for locking the outer ring **27** in this position.

I claim:

1. A bulk container comprising a flexible bag having an inlet and an outlet and a collapsible framework for supporting the bag within the structure of the framework, said framework including a plurality of normally upstanding posts, members disposed between the posts, means rotatably mounting the ends of each member to its respective posts to allow a relative rotational movement between the posts and the member whereby the framework may be folded from an opened condition to a collapsed condition, releasable means associated with each member and associated posts to lock the framework in the opened condition, and means on the flexible bag to attach the bag to the posts.

2. A bulk container as claimed in claim **1** wherein the outlet is provided with a flexible discharge neck having an outlet valve including a ring fixed to the neck and a ring of larger diameter connected to the fixed ring by a flexible securing means.

3. A bulk container as claimed in claim **1** wherein the rotatable mounting means includes collars joined to the ends of each member and fitted on the respective post for rotational movement thereabout.

4. A bulk container as claimed in claim **1**, wherein the framework includes means for stacking another such framework thereon.

5. A bulk container as claimed in claim **4**, wherein the lower end of each post has means for co-operating with the upper end of a post of said another such container.

6. A bulk container as claimed in claim **1**, wherein the attaching means are spaced around the exterior of the bag so that the bag bears against the posts when filled so as to be supported at a number of regions spaced around the exterior of the bag.

7. A bulk container as claimed in claim **6**, wherein the bag is at least slightly elastic so that when the bag is filled, a force is exerted against its walls stressing its material between the attaching means causing circumferential stretching and when the bag is emptied these stresses are relaxed to thereby facilitate the discharge of contents through the outlet.

8. A bulk container as claimed in claim **1** wherein each attaching means is defined by a sleeve secured to the bag through which passes the corresponding posts.

9. A bulk container as claimed in claim **1** wherein between each pair of adjacent posts a pair of normally horizontal bars are provided adjacent the lower end of the framework with a clearance means for receiving the forks of a fork lift truck.

10. A bulk container as claimed in claim **9** wherein three normally upstanding posts are provided.

11. A bulk container as claimed in claim **10** wherein the framework is of flattened Z-shaped configuration in plan when in collapsed condition.

12. A bulk container as claimed in claim **11**, wherein each post carries a pair of pivotally mounted arms for supporting the bag in its opened condition to prevent substantial distortion when filled.

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