Aug. 1, 1967 W. L. CALVERT 3,333,392

PACKAGING CONTAINER

Filed March 19, 1965 4 Sheets-Sheet 1

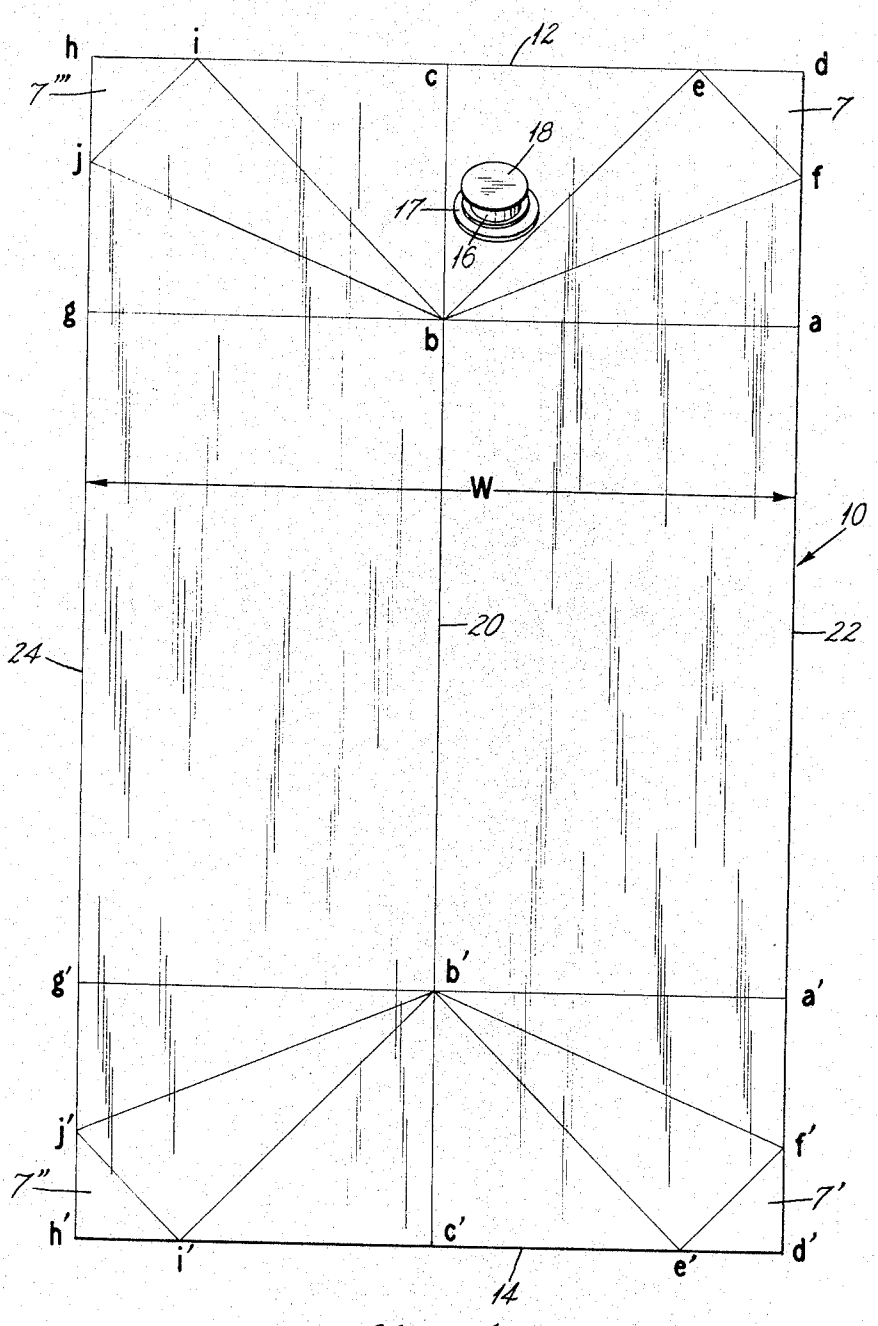


Fig. 1.

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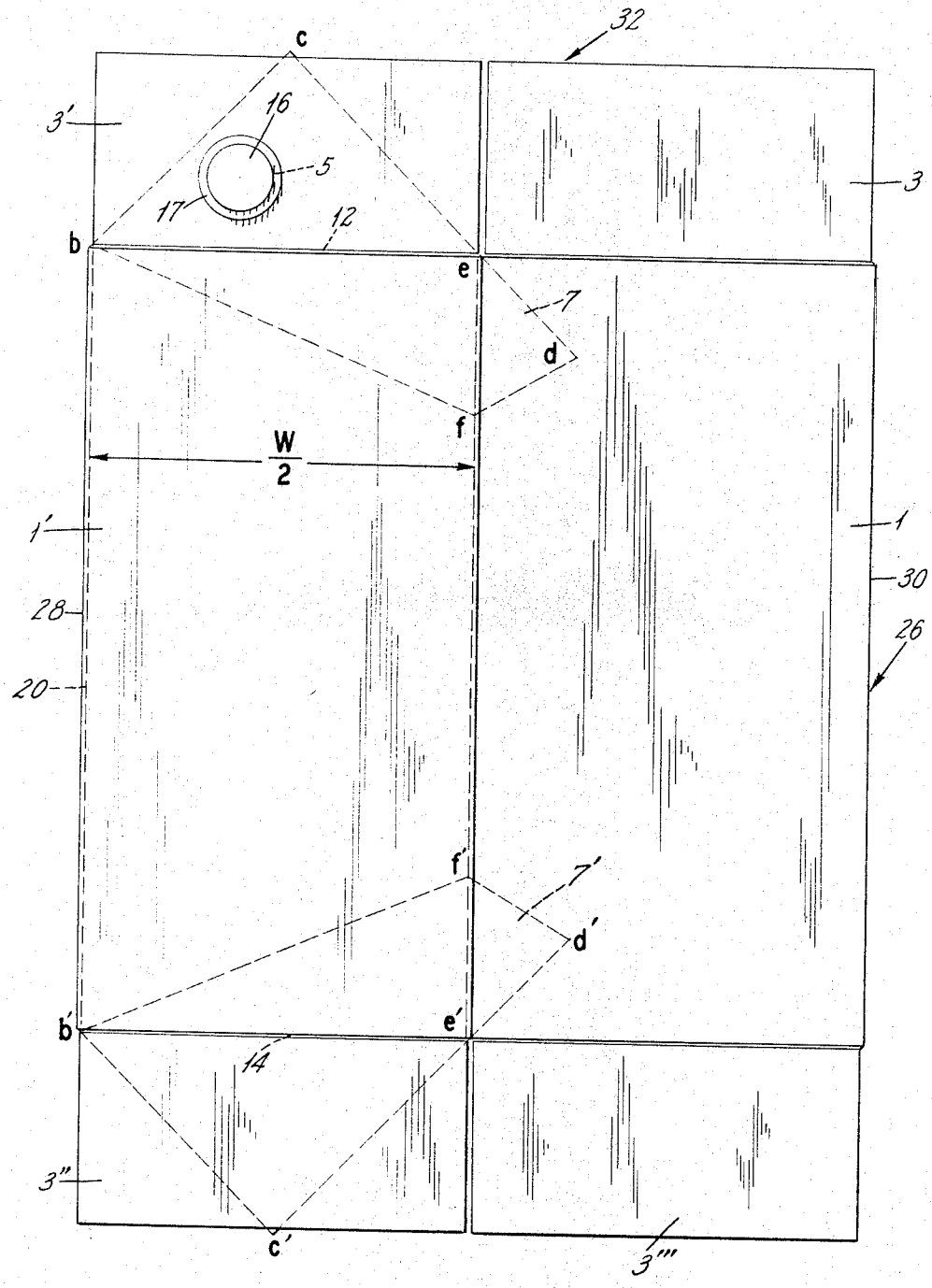


Fig. 2.

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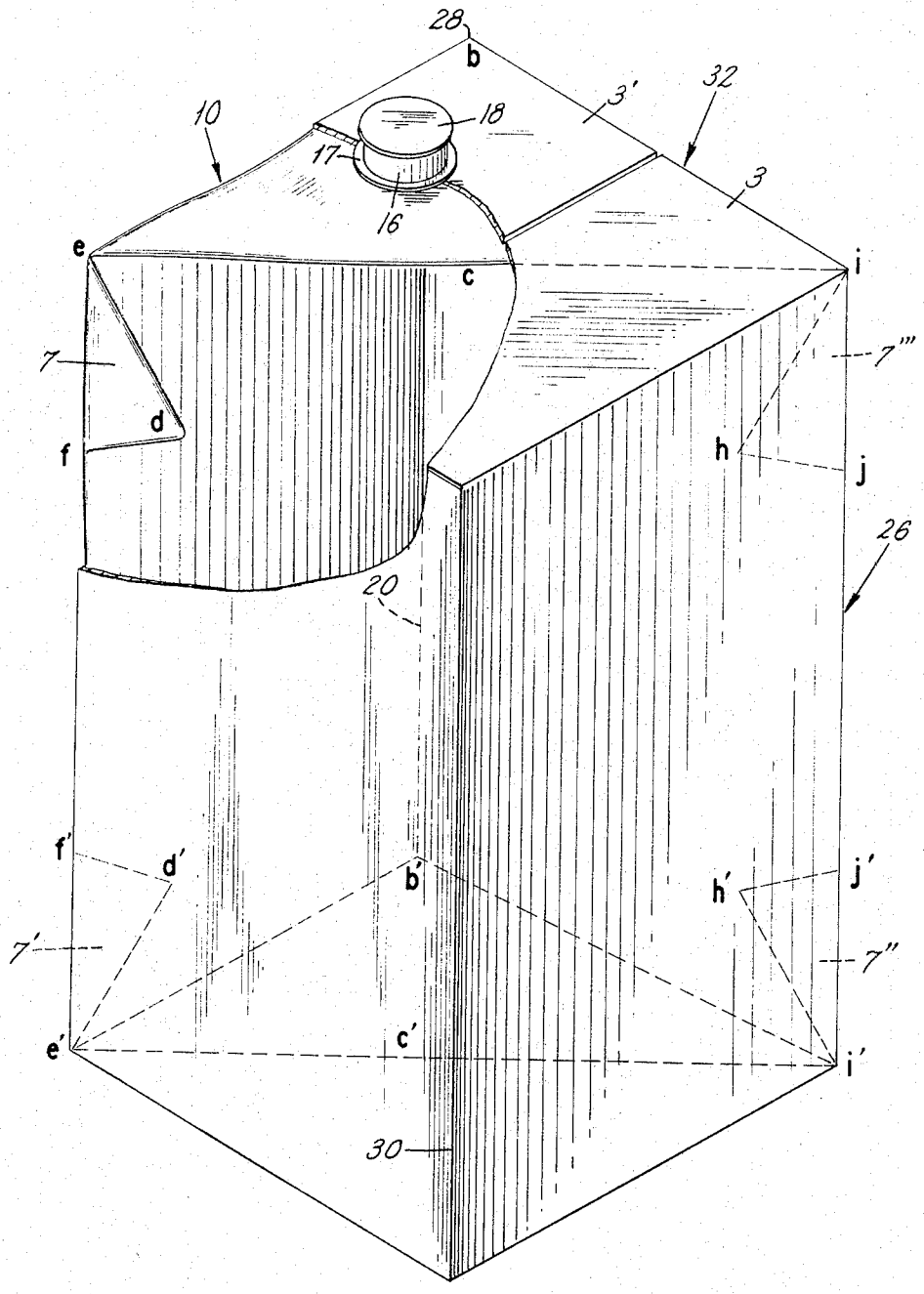


Fig. 3.

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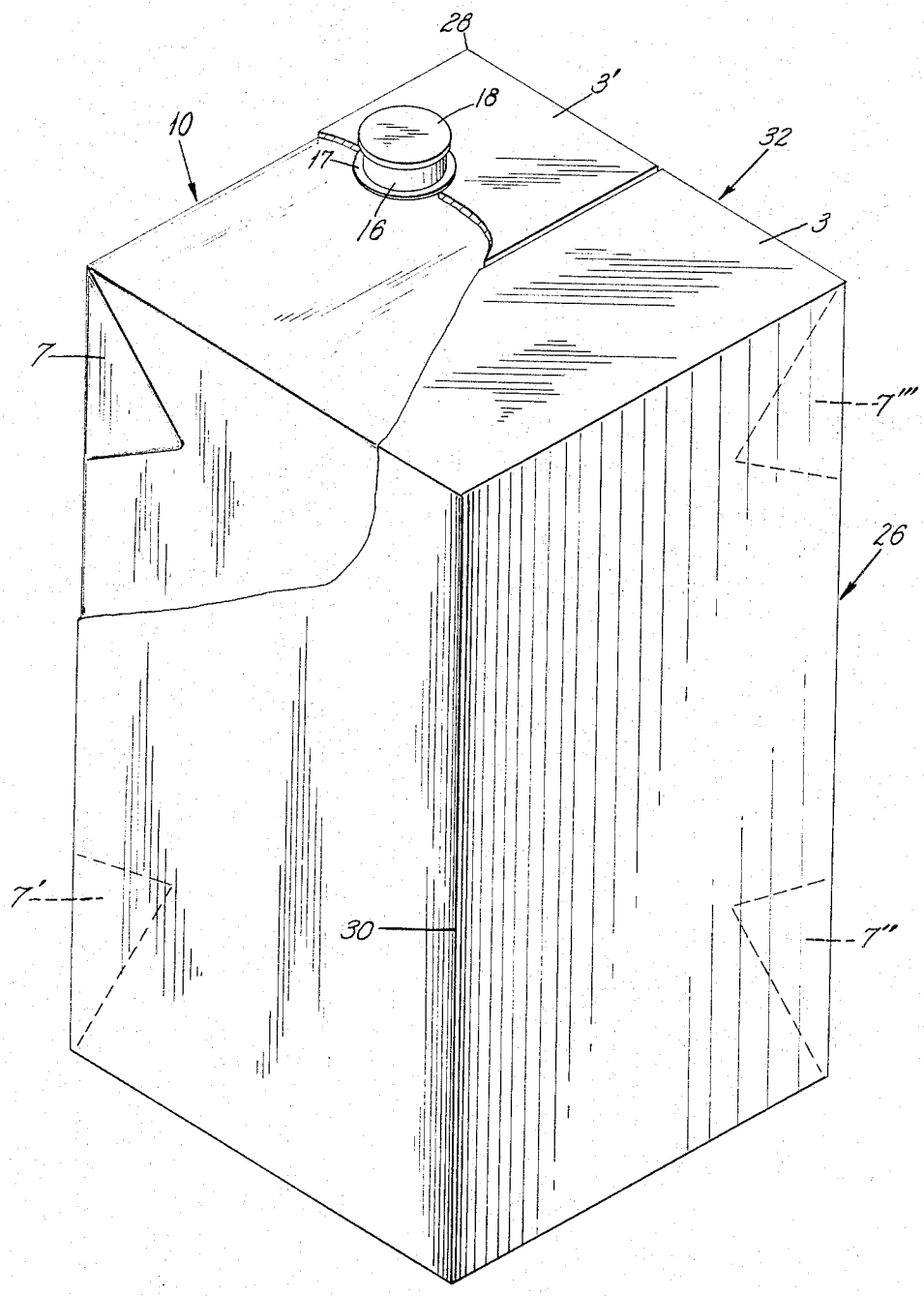


Fig. 4.

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3,333,392

PACKAGING CONTAINER

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Filed Mar. 19, 1965, Ser. No. 441,245
17 Claims. (Cl. 53—29)

This invention relates to packaging containers and more particularly to a container having an outer protective enclosure and which is suitable for receiving, storing, and dispensing flowable materials.

In the packaging of perishable food items such as milk efforts have been made and continue to be made to provide a container which is low-cost and which will not fail under normal handling conditions. Rigid plastic containers, while strong, are relatively expensive. The less expensive plastic film bags, constructed by forming transverse heat-sealed seams at the opposite ends of lay-flat plastic tubing, inflate to a pillow shape which is awkward to handle and doesn't readily stand upright. Attempts have been made to overcome problems of this kind by placing the pillow shape bag within an enclosure such as a flat-ended cardboard box. However, conformity of the bag to the box is very poor, resulting in a series of wrinkles and overstressed areas which contribute to early breakage.

Further, the lack of conformity of the shape of the bag to the shape of the box and inadequate means for orienting the bag with respect to the box also complicate the filling operation because one must continuously adjust the orientation of the bag within the box while it is being filled. Of course, the bag can be placed in the box after filling but this is an additional handling step which is cumbersome and adds to the costs.

The orientation problem has been partly met by gluing the empty bag to the interior walls of a collapsed flat box. However, poor conformity still exists and it is necessary to vent the bag and allow it to inflate as the box is erected. A bag which must be vented is most undesirable for perishables such as milk since the interior of the bag would be contaminated by air before the filling operation.

Accordingly, it is an object of this invention to provide a container which is low-cost and which can be placed within an outer enclosure without experiencing the aforementioned difficulties.

The present invention provides a bag adapted to be collapsed and erected into a container for receiving, storing, and dispensing flowable materials which bag comprises a tube folded in a novel manner and having a conduit attached to one wall thereof and at least two terminal edges sealed. The tube in the collapsed state has a longitudinal fold line substantially midway between the terminal edges. However, in the erected state as well as in the collapsed state the tube has fold areas near each of the terminal edges. The fold areas are mirror images of each other and each of the fold areas is divided by the longitudinal fold line into two portions. The two portions are mirror images of each other and have a plurality of fold lines, the fold lines being represented by the following formulae:

ba no greater than ½ W
be equal to *ab*
ef equal to *af*
cd parallel to *ab*
bc parallel to *ad*

wherein:

W is the flat width of the tube;
ab is a fold line extending normally from a longitudinal edge of the tube to the longitudinal fold line;
cd is a portion of one terminal edge extending normally from the longitudinal fold line to the longitudinal edge of the tube;
ad is a portion of the longitudinal edge extending normally between *ab* and *cd*;
bc is a portion of the longitudinal fold line extending normally between *ab* and *cd*;
be is a fold line extending obliquely from the extremity of *bc* and to a point *e* on *cd*;
af is a portion of the longitudinal edge extending upwardly from *ab* to point *f*;
ef is a fold line between points *e* and *f*, and
bd is a fold line extending obliquely from the extremity of *bc* to point *f* on *ad*.

A further aspect of the present invention includes a package adapted to be collapsed and erected into a container for receiving, storing and dispensing flowable materials which package comprises a relatively rigid enclosure having an aperture in one wall thereof and a tube confined therein having a plurality of fold lines. The tube has at least two terminal edges sealed, a conduit attached to one wall thereof and passing through the aperture of the enclosure, and a longitudinal edge thereof secured to an inner longitudinal edge of the enclosure whereby the bag in the collapsed state can be inflated in one continuous operation subsequently to and independently of the erection of the enclosure from the collapsed state thereby conforming to the internal space of the enclosure.

In another aspect of the present invention there is provided a method of folding a bag so that it can be confined within a collapsed enclosure whereby the bag upon being filled with product will conform to the internal space of the enclosure upon the prior inflation of the enclosure which folding method comprises the steps of: folding a first longitudinal fold line substantially midway between the terminal edges of a tube having at least two terminal edges sealed and a conduit attached to one wall thereof, whereby the longitudinal edges of the tube are super-imposed; folding a second fold line parallel to a terminal edge thereby intersecting the first fold line and a longitudinal edge of the tube and wherein the second fold line is no greater than ½ the flat width of the tube; folding a third fold line obliquely and equal to the second fold line and originating from the point of intersection of the first fold line with the second fold line and intersecting the terminal edges of the tube; folding a fourth fold line bisecting the angle formed by the second fold line and intersecting the longitudinal edge of the tube; folding a fifth fold line between the points of intersection of the third fold line with the terminal edge and the fourth fold line with the longitudinal edge wherein the fifth fold line is equal to the portion of the longitudinal edge lying between the second fold line and the fourth fold line, and superimposing the third fold line on the second fold line.

In a still further aspect of the present invention there is provided a method of avoiding contamination of the interior of a bag during the filling operation when the bag is confined in an enclosure which method comprises: folding each end portion of a tube having at least two terminal edges sealed and a conduit attached to one wall thereof which folding method comprises folding a first longitudinal fold line substantially midway between the terminal edges of the tube whereby the longitudinal edges of the tube are superimposed; folding a second fold line parallel to the terminal edge thereby intersecting the first fold line and a longitudinal edge of the tube wherein the second fold line is no greater than ½ the flat width of the tube; folding a third fold line obliquely and equal to the second fold line and originating from the point of intersection of the first fold line with the second fold line and intersecting the terminal edges;

folding a fourth fold line bisecting the angle formed by the second fold line and the third fold line and intersecting the longitudinal edge; folding a fifth fold line between the points of intersection of the third fold line with the terminal edge and the fourth fold line with the longitudinal edge wherein the fifth fold line is equal in length to the portion of the longitudinal edge lying between the second fold line and the fourth fold line, and superimposing the third fold line on the second fold line; confining the bag within a collapsed relatively rigid enclosure having an aperture in one wall thereof and securing a longitudinal edge thereof to an inner longitudinal edge of said enclosure; extending the conduit of the bag through the aperture of the enclosure; manually erecting the enclosure in one continuous operation, and filling the bag with product in one continuous operation subsequently to and independently of the erection of the enclosure whereby the bag remains in an essentially sterile state until filled with product.

In the drawing:

FIG. 1 is an elevational view of a collapsed bag in one aspect of the invention, illustrating the lines along which the bag is to be folded.

FIG. 2 is a side elevational view of a collapsed package embodying the invention, illustrating the collapsed bag in phantom of FIG. 1 in folded position within a collapsed enclosure.

FIG. 3 is an isometric view of the package of FIG. 2 partially broken away illustrating the enclosure after erection and the position of the collapsed bag before inflation.

FIG. 4 is an isometric view of the package of FIG. 2 partially broken away illustrating the position of the bag in the enclosure after both have been erected.

Referring now to the drawing, there is shown in FIG. 1 a substantially collapsed thermoplastic bag **10** formed from a thermoplastic tube having two terminal edges **12, 14** heat sealed together. Attached to one wall of the bag **10** is a conduit **16** having a flange **17** heat sealed to the bag **10**. A snap-fit cap **18** acts as a closure means for the conduit **16**. The width W of the bag **10** is, of course, equal to the flat width of the tube from which it is made. The bag **10** has a longitudinal fold line **20** substantially midway between the terminal edges **12, 14** and fold areas divided by *a d h g* and *a' d' h' g'* near the ends of the bag **10**. The fold areas *a d h g* and *a' d' h' g'* are mirror images of each other and are divided by longitudinal fold line **20** into mirror image portions *a b c d, g b c h, a' b' c' d'* and *g' b' c' h'*. Each of the mirror image portions have a plurality of fold lines represented by the following formulae:

ba no greater than ½W
be equal to *ab*
ef equal to *af*
cd parallel to *ab*
bc parallel to *ad*

wherein:

W is the flat width of the tube;
ab is a fold line extending normally from a longitudinal edge of the tube to the longitudinal fold line;
cd is a portion of one terminal edge extending normally from the longitudinal fold line to the longitudinal edge of the tube;
ad is a portion of the longitudinal edge extending normally between *ab* and *cd*;
bc is a portion of the longitudinal fold line extending normally between *ab* and *cd*;
be is a fold line extending obliquely from the extremity of *bc* and to a point *e* on *cd*;
af is a portion of the longitudinal edge extending upwardly from *ab* to point *f*;
ef is a fold line between points *e* and *f*, and
bf is a fold line extending obliquely from the extremity of *bc* to point *f* on *ad*.

Upon folding the bag **10** along the lines described hereinabove a bag configuration as shown in FIG. 2 is attained. Specifically, referring to FIG. 1 again, a longitudinal fold line **20** is folded substantially midway between the terminal edges **12, 14** of the bag **10**, whereby the longitudinal edges **22** and **24** of the bag **10** are superimposed. A second fold line *ab* is folded parallel to a terminal edge *cd* thereby intersecting the fold line **20** and a longitudinal edge **22** of the bag **10**. A third fold line *be* is folded obliquely and equal to the fold line *ab* and originates from the point of intersection of the fold line **20** with the fold line *ab*. A fourth fold line *bf* is folded bisecting the angle lying between fold line *ab* and fold line *be*. A fifth fold line *ef* is folded between the points of intersection of the fold line *be* with the terminal edge *cd* and the fold line *bf* with the longitudinal edge *da* thereby forming four like triangular ears **7** wherein the fifth fold line *ef* is equal in length to the portion *af* of longitudinal edge **22**. Finally the third fold line *be* is superimposed on the fold line *ab* by pulling on the ears **7** towards the body of the bag **10** whereupon the bag **10** takes a shape as shown in FIG. 2.

As shown in FIG. 2 the folded collapsed bag **10** is placed within a relatively rigid enclosure **26** which as shown is a cardboard carton, and will hereinafter be referred to as such, thereby forming a package **32** for receiving, storing, and dispensing flowable materials. The carton **26** comprises four like rectangular panels **1**, each of approximately half the flat width of the bag **10**. Attached to each end of each individual panel **1** is a flap **3** for closing the ends of the erected carton. One of the upper end flaps (**3'**) is provided with a circular aperture **5** for receiving conduit **16** of the bag **10** (hereinbelow).

When the folded collapsed bag **10** is within the carton **26** the longitudinal fold line **20** of the bag **10** which is now a longitudinal edge is secured to an inner longitudinal edge **28** of the carton **26**. This securing step may be accomplished by employing one of any number of adhesives such as glue, tape and the like. Upon securing the bag **10**, the conduit **16** of the bag **10** is pushed through the aperture **5** in the flap **3'**. The diameter of the aperture **5** is slightly less than the diameter of the conduit **16** which serves to retain the conduit in engagement with the aperture when it is pushed through the latter.

When the bag and the carton are assembled as indicated in FIG. 2, the package **32** is ready for use and, being collapsed substantially flat and compactly, can be transported in large number in confined spaces. It can be very quickly erected into the form illustrated in FIG. 3 and FIG. 4 when ready for use. All in fact that is required is that pressure shall be exerted by the hands of a user at the two opposite lateral edges **28, 30** of the collapsed carton **26**. As these edges are pushed towards one another, the four like panels **1** swing apart to open the corresponding corners of the carton (FIG. 3). Thereupon the four like flaps **3** are manually folded inwardly and the jointing edges can be sealed by a suitable adhesive such as tape. However, the bag **10** still remains in a collapsed state with the four like triangular ears **7** substantially following the direction of the four panels **1** upon the inflation of the carton, namely the ears **7** face inwardly towards the bag **10**.

After the carton has been erected, the bag is ready for filling. This is accomplished by forcing flowable material through the conduit **16** of the bag whereupon the bag is filled in one continuous operation subsequently to and independently of the erection of the carton. Upon filling the bag with product, the bag conforms to the internal space of the carton as shown in FIG. 4.

While it is preferred that the bag be collapsed substantially flat when it is folded, all that is required is that the air volume within the bag be such that the bag can still be folded as hereinabove described. Thus, by folding the bag as stated, only one edge of the bag has to be secured to an inner edge of the enclosure to firmly secure the bag therein whereby the bag can be

filled with product subsequently to and independently of the inflation of the enclosure. Consequently, the bag remains essentially sterile throughout the filling operation. Furthermore, proper orientation of the bag with respect to the enclosure is assured when the bag is inflated. Maintaining the interior of the bag in an essentially sterile state is of course of particular importance when the package is to be used for perishables such as milk. If the bag is inflated simultaneously with the inflation of the enclosure, air unavoidably enters the bag through the conduit thereby contaminating the interior of the bag.

In the practice of the invention, it is preferred to start with an essentially sterile tube and simply heat seal together the terminal edges of the tube to form the bag. Thus, internal sterility of the bag is achieved. Any thermoplastic material may be used for fabrication of bags and conduits in accordance with the invention and typical choices are thermoplastic compositions such as polyethylene copolymers, polypropylene, copolymers of ethylene and propylene, and mixtures and laminates of such polyolefins may be used also. The bag may also be fabricated from paper products, their choice depending on the nature of the produce one wishes to package.

The enclosure for the bag may be formed from a variety of materials including rigid thermoplastic, paperboard, or thin metal such as aluminum. The enclosure material can be of various thicknesses and weights.

While it is preferred to form the bag from flexible thermoplastic material, the bag may also be formed from rigid thermoplastic material with the portion *a b f* (FIG. 1) being flexible. Such a bag would be self supporting and would not require an outer enclosure. Furthermore, the ear **7** (FIG. 1) can be provided with a spout. When this ear is pulled upward, a natural pouring spout is formed which may effectively be closed by simply pulling down the ear again.

The package may vary in size, including the typical 64-ounce and 32-ounce, their choice depending on requirements.

While the aforementioned package is especially suitable for milk, the package can also be used for shipping, storing and dispensing other flowable materials including fruit juices, syrups, and other liquids, as well as powdered and granular foods.

What is claimed is:

1. A bag adapted to be collapsed and erected into a container for receiving, storing, and dispensing flowable materials which bag comprises: a tube having a conduit attached to one wall thereof and at least two terminal edges sealed, said tube in the collapsed state having a longitudinal fold line substantially midway between said terminal edges, and in the collapsed and erected states having fold areas near each of the terminal edges; said fold areas being mirror images of each other, each of said fold areas being divided by each longitudinal fold line into two portions; said portions being mirror images of each other and having a plurality of fold lines; said fold lines being represented by the following formulae:

ba no greater than ½W
be equal to *ab*
ef equal to *af*
cd parallel to *ab*
bc parallel to *ad*

wherein:

W is the flat width of said tube;
ab is a fold line extending normally from a longitudinal edge of said tube to said longitudinal fold line;
cd is a portion of one terminal edge extending normally from said longitudinal fold line to the longitudinal edge of said tube;
ad is a portion of said longitudinal edge extending normally between *ab* and *cd*;
bc is a portion of said longitudinal fold line extending normally between *ab* and *cd*;
be is a fold line extending obliquely from the extremity of *bc* and to a point *e* on *cd*;
af is a portion of said longitudinal edge extending upwardly from *ab* to point *f*;
ef is a fold line between points *e* and *f*, and
bf is a fold line extending obliquely from the extremity of *bc* to point *f* on *ad*.

2. A bag as defined in claim **1** wherein *ba* is equal to ½W.

3. A bag as defined in claim **1** wherein *bc* is equal to *ce*.

4. A bag as defined in claim **1** wherein said conduit is provided with closure means.

5. A bag as defined in claim **4** in which said bag is thermoplastic polymeric material.

6. A package adapted to be erected into a container for receiving, storing, and dispensing flowable materials which package comprises: a relatively rigid enclosure having an aperture in one wall thereof and a tube confined therein; said tube having at least two terminal edges sealed, a conduit attached to one wall thereof and passing through the aperture of said enclosure, said tube in the collapsed state having a longitudinal fold line substantially midway between said terminal edges and in the collapsed and erected states fold areas near each of the ends of said tube; said fold areas being mirror images of each other, each of said fold areas being divided by said longitudinal fold line into two portions; each of said portions being mirror images of each other and having a plurality of fold lines; said fold areas being mirror images of each other, each of said fold areas being divided by said longitudinal fold line into two portions; said portions being mirror images of each other and having a plurality of fold lines; said fold lines being represented by the following formulae:

ba no greater than ½W
be equal to *ab*
ef equal to *af*
cd parallel to *ab*
bc parallel to *ad*

wherein:

W is the flat width of said tube;
ab is a fold line extending normally from a longitudinal edge of said tube to said longitudinal fold line;
cd is a portion of one terminal edge extending normally from said longitudinal fold line to the longitudinal edge of said tube;
ad is a portion of said longitudinal edge extending normally between *ab* and *cd*;
be is a fold line extending obliquely from the extremity of *bc* and to a point *e* on *cd*;
af is a portion of said longitudinal edge extending upwardly from *ab* to point *f*;
ef is a fold line extending between points *e* and *f*;
bf is a fold line extending obliquely from the extremity of *bc* to point *f*, and

said tube having a longitudinal edge secured to an inner longitudinal edge of said enclosure whereby said bag in the collapsed state can be inflated in one continuous operation subsequently to and independently of the erection of said enclosure from the collapsed state thereby conforming to the internal space of said enclosure.

7. A package as defined in claim **6** in which the fold line *ba* of the tube is equal to ½W.

8. A package as defined in claim **6** wherein the fold line *bc* of the tube is equal to *ce*.

9. A package as defined in claim **6** wherein said conduit is provided with closure means.

10. Method of folding a bag so that it can be confined within a collapsed enclosure whereby the bag upon being filled with product will conform to the internal space

of the enclosure upon the prior inflation of the enclosure which folding method comprises the steps of:

(a) folding a first longitudinal fold line substantially midway between the terminal edges of a tube having at least two terminal edges sealed and a conduit attached to one wall thereof, whereby the longitudinal edges of said tube are superimposed;

(b) folding a second fold line parallel to a terminal edge thereby intersecting said first fold line and a longitudinal edge of said tube wherein said second fold line is no greater than ½ the width of said tube;

(c) folding a third fold line obliquely and equal to said second fold line and originating from the point of intersection of said first fold line with said second fold line and intersecting said terminal edges;

(d) folding a fourth fold line bisecting the angle formed by said second fold line and said third fold line and intersecting said longitudinal edge;

(e) folding a fifth fold line between the points of intersection of said third fold line with said terminal edge and said fourth fold line with said longitudinal edge wherein said fifth fold line is equal in length to the portion of said longitudinal edge lying between said second fold line and said fourth fold line, and

(f) superimposing said third fold line on said second fold line.

11. Method as defined by claim **10** in which said second fold line is equal to ½ the width of said tube.

12. Method as defined by claim **11** in which the portion of said first fold line lying between said second fold line and said terminal edge is equal to the portion of said terminal edge lying between said first fold line and said third fold line.

13. Method of avoiding contamination of the interior of a bag during the filling operation when the bag is confined in an enclosure which method comprises:

(a) folding each end portion of a tube having at least two terminal edges sealed and a conduit attached to one wall thereof which folding method comprises:

(1) folding a first longitudinal fold line substantially midway between the terminal edges of said tube whereby the longitudinal edges of said tube are superimposed;

(2) folding a second fold line parallel to a terminal edge thereby intersecting said first fold line and a longitudinal edge of said tube wherein said second fold line is no greater than ½ the width of said tube;

(3) folding a third fold line obliquely and equal to said second fold line and originating from the point of intersection of said first fold line with said second fold line and intersecting said terminal edges;

(4) folding a fourth fold line bisecting the angle formed by said second fold line and said third fold line and intersecting said longitudinal edge;

(5) folding a fifth fold line between the points of intersection of said third fold line with said terminal edge and said fourth fold line with said longitudinal edge wherein said fifth fold line is equal in length to the portion of said longitudinal edge lying between said second fold line and said fourth fold line, and

(6) superimposing said third fold line on said second fold line,

(b) confining said bag within a collapsed relatively rigid enclosure and securing a longitudinal edge thereof to an inner longitudinal edge of said enclosure;

(c) extending the conduit of said bag through the aperture of said enclosure;

(d) manually erecting said enclosure in one continuous operation, and

(e) filling said bag with product in one continuous operation subsequently to and independently of the erection of said enclosure whereby the bag remains in a essentially sterile state until filled with product.

14. Method as defined by claim **13** in which said second fold line is equal to ½ the width of said tube.

15. Method as defined by claim **13** in which the portion of said first fold line lying between said second fold and said terminal edge is equal to the portion of said terminal edge lying between said first fold line and said third fold line.

16. Method as defined by claim **13** which comprises the steps of providing the tube of said bag with closure means.

17. Method as defined by claim **16** in which said bag comprises thermoplastic polymer material.

References Cited

UNITED STATES PATENTS

3,122,297	2/1964	Sachs	229—14
3,262,628	7/1966	Heisler	229—14

RICHARD H. EANES, JR., *Primary Examiner.*