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(19) **United States**(12) **Patent Application Publication****Savage et al.**(10) **Pub. No.: US 2006/0110077 A1**(43) **Pub. Date: May 25, 2006**(54) **OXYGEN IMPERMEABLE BAG-IN-BOX
CONTAINER AND METHOD OF MAKING****Publication Classification**(51) **Int. Cl.****B65D 33/16** (2006.01)(52) **U.S. Cl.** **383/66; 383/80; 383/906**(75) Inventors: **Chester Savage**, Irvine, CA (US);
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ABSTRACT

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A bag-in-box container includes a box defining a cavity receiving a bag. The bag includes walls formed of plastic sheet material forming a variable-volume chamber, and a fitting carried on one of the walls provides a passage communicating with the variable-volume chamber. The fitting is formed of material which is essentially impermeable to oxygen. A method of sealingly attaching the fitting to a wall of the bag without the use of heat sealing or adhesives is disclosed.

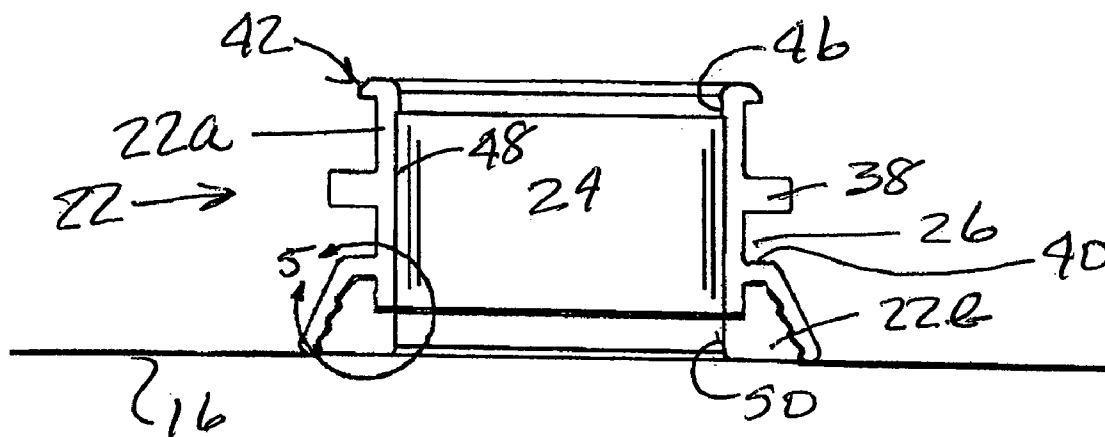


FIG. 1

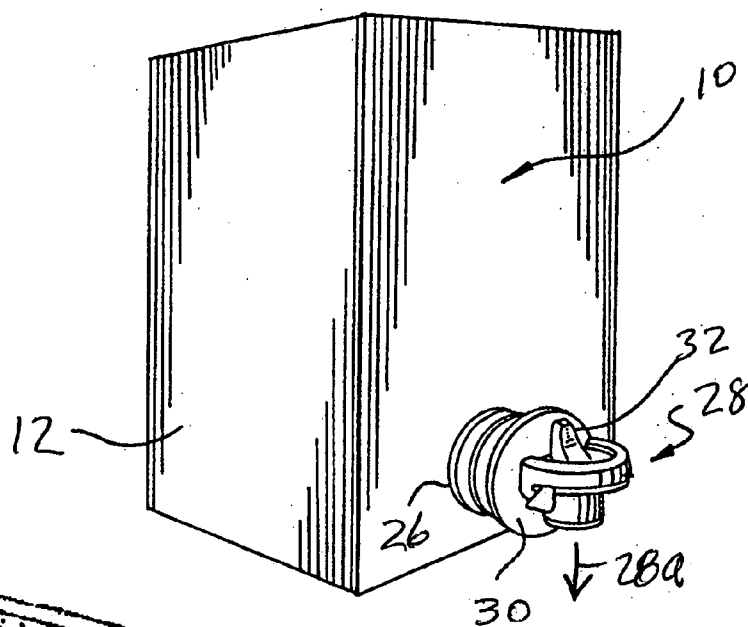
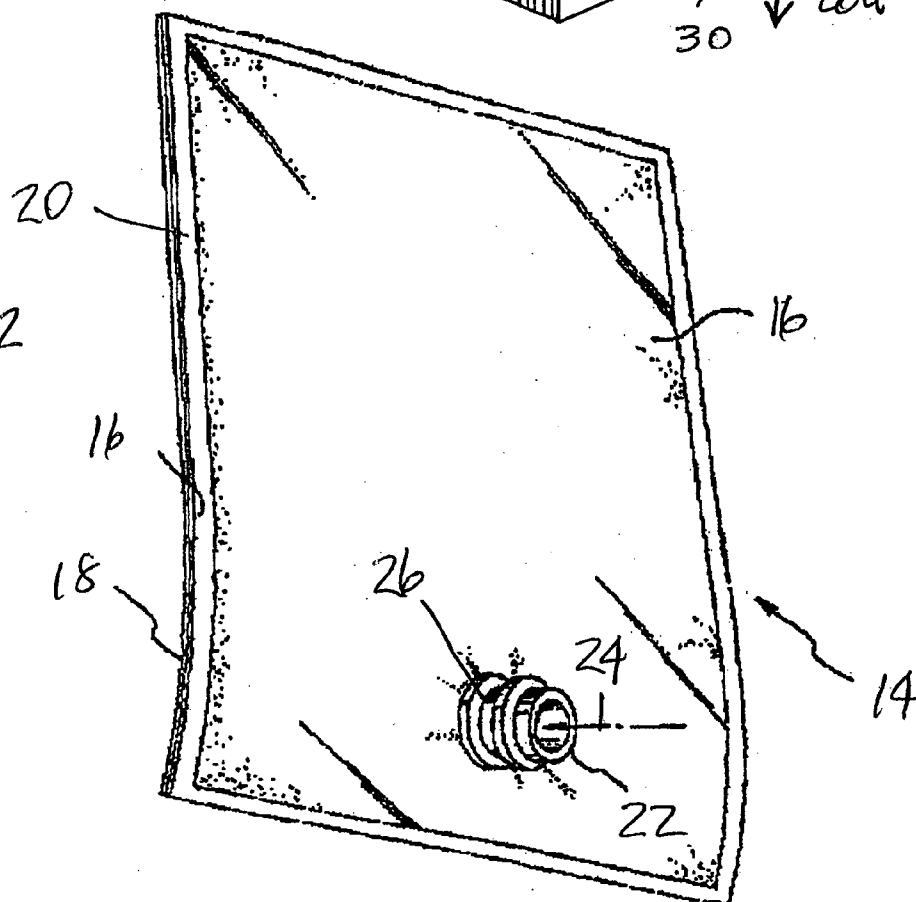
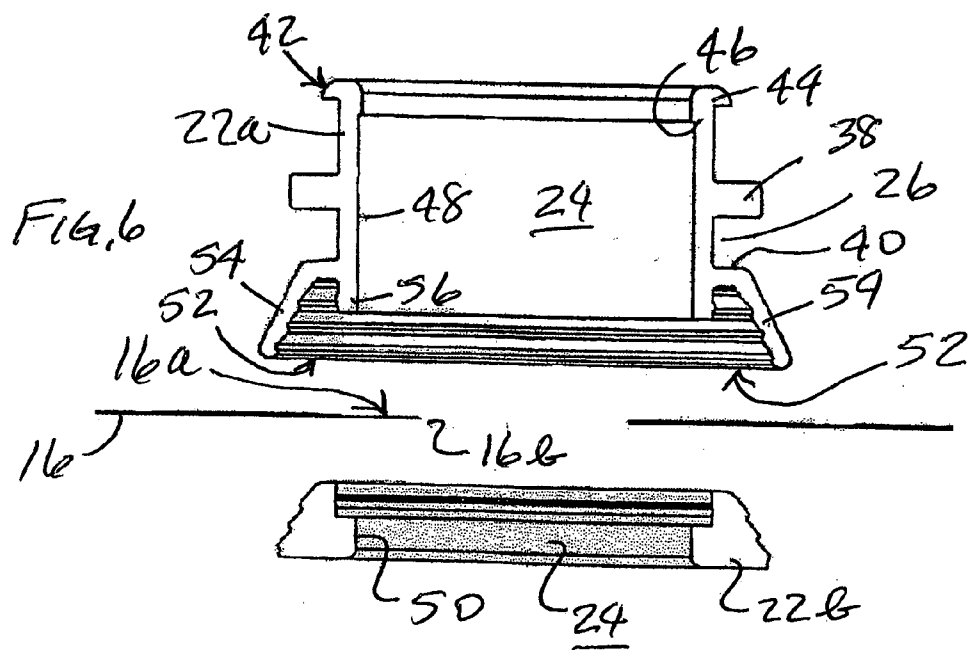
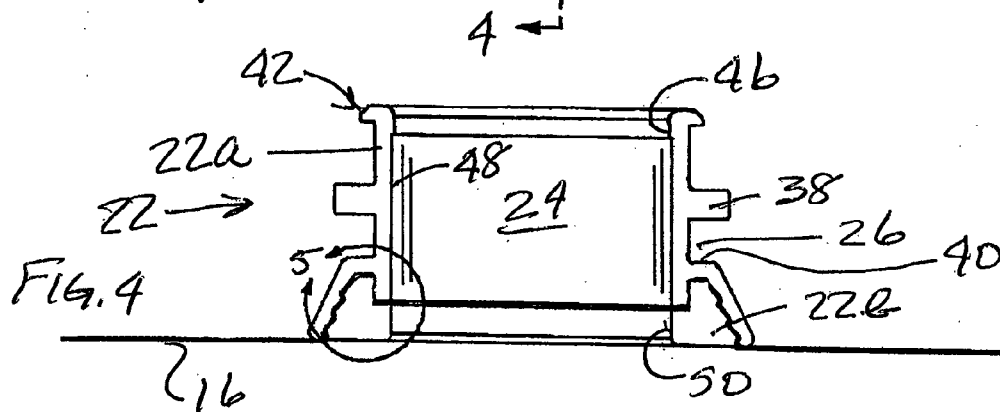
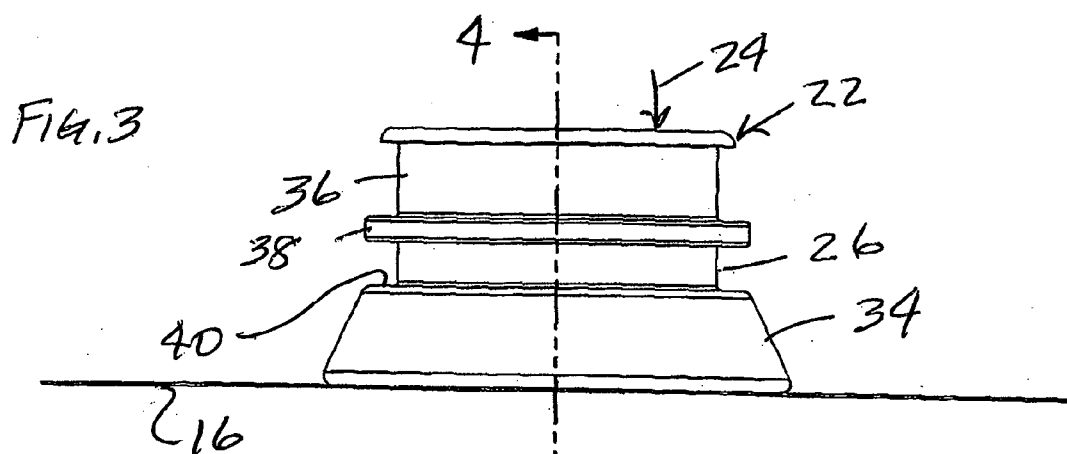
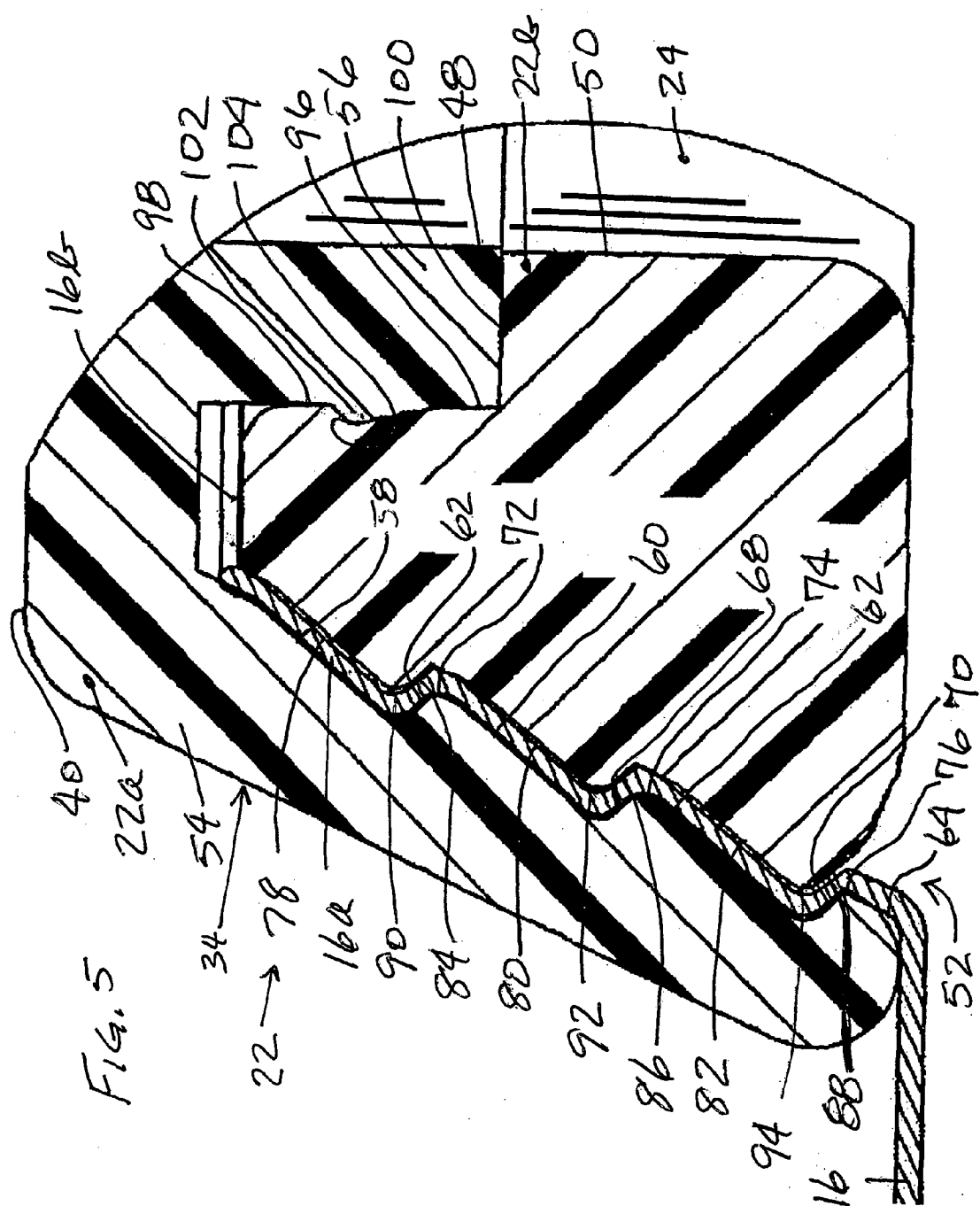


FIG. 2







OXYGEN IMPERMEABLE BAG-IN-BOX CONTAINER AND METHOD OF MAKING

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a bag-in-box container, for receiving, transporting, and dispensing liquids, such as wine, for example. More particularly, the present invention relates to such a bag-in-box container, which has a bag portion essentially impermeable to oxygen. Because oxygen permeation into the contents of conventional bag-in-box containers is undesirable, shortens the shelf life of the container contents, and generally contributes to deterioration and loss of quality of the contents of such conventional containers, the present invention offers a significant improvement. A method of making such a bag and the bag-in-box container is presented also.

[0003] 2. Related Technology

[0004] There are many applications in which liquids are received into, transported, and later dispensed from containers. In the case of wine, for example, the glass bottle with a natural or, more recently, an artificial cork, is well known.

[0005] Another common application is known in the commercial consumer market in which wine is packaged in a box-like container made of paper board and having a collapsible inner bag which serves to hold the wine. A tap is attached to the bag by use of a fitting that is sealingly attached to the bag and also sealingly interfaces with the body of the tap. Wine is filled into the bag, and then the cap is added and the filled bag is transported entirely within the box, which serves to protect the bag, and later also serves to hold the bag with the tap protruding through a prepared opening of the box for dispensing the wine.

[0006] Conventional bag-in-box containers generally include a bag which is formed of a thin, flexible plastic sheet material comprising a multi-layer laminate of fine-dimension layers, at least one of which is resistant to permeation by oxygen. The essentially impermeable layer may be made of a metal, such as aluminum, for example. Or, the essentially impermeable layer may be made of polyester.

[0007] However, in order to attach a tap to such a bag, the plastic sheet material includes a facial layer than may be bonded, and the bag is provided with a fitting that may be bonded to the one facial layer of the laminated plastic bag. The spout for closing the fitting, and for dispensing the liquid contents of the bag sealingly engages with the fitting.

[0008] In order to be made of a material which will bond to the facial layer of the bag, the bag fitting conventionally must be made of a material which is also undesirably oxygen impermeable. The oxygen permeability of the material from which the fitting is made is not a criteria for selecting the material, but instead is an undesirable consequence of the need to select a material that can be bonded to the facial layer of the laminated plastic sheet material. Frequently, the bag fitting and the facial layer are conventionally formed from polyethylene. Because the conventional bag fittings allow a certain amount of oxygen permeation or penetration, the contents of the filled and closed bags are conventionally deteriorated somewhat, with the degree or extent of dete-

rioration depending on the length of storage time, as well as such factors as ambient temperature in the area of storage.

[0009] An alternative type of bag-in-box container uses a bag in which the fitting is adhesively sealed to a bag wall. This type of bag offers speed of manufacture, but generally does not offer a hermetic type of seal between the bag and fitting.

SUMMARY OF THE INVENTION

[0010] In view of the foregoing an object of the present invention is to overcome one or more of the drawbacks of conventional bag-in-box containers.

[0011] Particularly, it is an object for this invention to provide a bag for such a bag-in-box container, which includes a bag fitting formed of material that is substantially impermeable to oxygen.

[0012] Another object for this invention is to provide a bag for such a bag-in-box container in which the bag need not be bonded to the fitting, but in which the fitting is mechanically and sealingly attached to a wall of the bag.

[0013] Still another object for this invention is to provide a fitting for such a bag-in-box container in which the fitting is made of material which is essentially oxygen impermeable.

[0014] Thus, according to one particularly preferred embodiment, the present invention provides bag-in-box container comprising: a bag defining a variable-volume chamber and including a fitting defining a passage opening to the variable-volume chamber; a cap sealingly engaging the fitting and closing the passage; a box defining a cavity receiving the bag; and the fitting being formed of a material which is essentially impermeable to oxygen and sealingly attaching to the bag.

[0015] Particularly, it is to be appreciated that an advantage according to the one preferred exemplary embodiment of this invention is that the bag fitting sealingly attaches to a wall of the bag mechanically and permanently, without the use of bonding between polymers. Accordingly, the bag fitting forms a mechanical attachment and seal to a wall of the bag, and may be formed of any material that is desired, because polymer bonding of the bag and fitting are not necessary.

[0016] Other objects, features, and advantages of the present invention will become apparent to those skilled in the art from a consideration of the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0017] **FIG. 1** is a perspective view of an exemplary bag-in-box container, having the liquid-dispensing tap in a position protruding outwardly through a specially prepared opening of the box and locked into this position for dispensing of liquid from the tap;

[0018] **FIG. 2** is a perspective view of the bag within the bag-in-box container of **FIG. 1**, except that the bag as seen in **FIG. 2** is without the tap, and is empty and not full of liquid;

[0019] FIG. 3 is a side elevation view of the bag fitting portion of the bag seen in FIG. 2, along with a portion of the bag wall to which this fitting is sealingly attached;

[0020] FIG. 4 is a side elevation view taken at line 4-4 of FIG. 3;

[0021] FIG. 5 is a greatly enlarged cross-sectional view of an encircled portion of FIG. 4; and

[0022] FIG. 6 is an illustration of a set in the method of attaching the bag fitting to a wall of the bag, and is seen in cross sectional side elevation view with the component parts positioned preparatory to assembly.

DETAILED DESCRIPTION OF AN EXEMPLARY PREFERRED EMBODIMENT OF THE INVENTION

[0023] Viewing first FIGS. 1 and 2 in conjunction with one another for illustrations of a bag-in-box container 10 embodying the present invention, it is seen that this container 10 includes an outer shape-retaining box 12 of corrugated paperboard and an inner flexible bag 14, which is fabricated partly of laminated plastic sheet material. As FIG. 2 illustrates, the bag 14 includes a pair of generally flat and congruent walls 16 and 18, which are formed of laminated plastic sheet material, and which are sealingly secured to one another at a peripheral seal area 20. Attached to one wall 16 of the bag 14, this bag carries a bag fitting 22 which defines a passage 24 opening into the interior of the bag 14 (i.e., that is, the passage 24 opens into the variable-volume space between the walls 16 and 18).

[0024] While the bag fitting 22 will be further explained below, it is sufficient at this point to note on FIGS. 1 and 2 that the bag fitting 22 defines an outwardly opening groove 26 which is engageable with a wall of the box 12 in order to retain the fitting 22 and a cap/tap 28 is sealingly carried on this fitting at a position external to the box 12 in order to allow dispensing of liquid from within the bag via the cap/tap 28. Noting on FIG. 1, that the cap/tap 28 includes a flange portion 30 and a tap handle portion 32, it will be understood that a user of the bag-in-box container 10 may dispense liquid from within the bag 14 via the cap/tap 28 by manually pinching the tap handle portion 32 toward the flange 30 (as is illustrated by arrow 28a).

[0025] Referring more particularly now to FIGS. 3, 4, and 5 in conjunction with one another, it is seen that the bag fitting 22 includes a generally conical base portion 34 from which extends a neck portion 36 outwardly of the bag 14 and wall 16. This neck portion 36 carries a collar portion 38 which is spaced from the base portion 34 so as to cooperate with a shoulder part 40 on the base portion in order to define the groove 26. A termination portion 42 of the neck portion includes features such as an outwardly extending lip 44 and an inwardly extending ring or rib 46 (best seen in FIG. 4) for allowing the cap/tap 28 to be sealingly attached to the bag fitting 22.

[0026] As is best appreciated viewing FIGS. 4 and 5 in conjunction with one another, the passage 24 through the bag fitting 22 is cooperatively defined by a bore portion 48 defined by an outer portion 22a of the fitting 22, and by an aligned bore portion 50 of an inner portion 22b of this fitting 22. The outer (22a) and inner (22b) portions of the fitting 22 also cooperatively and sealingly capture a peripheral portion

16a of the wall 16 about a circular opening or hole 16b defined by this wall (best seen in FIG. 6) in order to attach the fitting 22 sealingly to the wall 16.

[0027] Turning to FIGS. 5 and 6 in conjunction with one another, it is seen that the base portion 34 of the fitting portion 22a inwardly defines an annular recess 52. This recess 52 is defined cooperatively by an outer generally conical wall portion 54, which outwardly defines the base portion 34, and by an opposed inwardly disposed annular wall portion 56, which itself inwardly defines a portion of the bore 48. Received into this recess, as is seen best in FIG. 5, is an inner peripheral portion 16a of the wall 16 about the opening 16b, and the annular inner fitting portion 22b. While additional details of both the outer and inner fitting portions 22a and 22b will be explained below, it is important to understand at this point that the fitting portions are a permanent “snap” fit together, and that they cooperatively capture the portion 16a of wall 16 sealingly in recess 52.

[0028] Considering now FIGS. 5 and 6 in detail, it is seen that the wall portion 54 inwardly defines four convergent conical surface sections 58, 60, 62, and 64, interdigitated (or alternated axially) with three divergent conical surface sections 66, 68, and 70. The wall sections just identified cooperatively define three successive and axially spaced apart annular rings or “shoulders” 72, 74, and 76 circumscribing the recess 52. In this case, the terms, “convergent” and “divergent” are considered with respect to the direction of entry of the fitting portion 22b into the recess 52 of the fitting portion 22a, as can be readily understood from a consideration of FIG. 6. The term “axial” as used herein refers to the axis of the passage 24, and of bore portions 48 and 50, cooperatively defining this passage.

[0029] Also, and similarly, the fitting portion 22b on its radially outer surface defines three convergent conical surface portions 78, 80, and 82, which are interdigitated with three divergent conical surface portions 84, 86, and 88. The convergent and divergent surface portions on fitting member 22b cooperatively define three annular ribs or “crests” 90, 92, and 94 about the fitting member 22b on its radially outer surface. As is seen in FIG. 5, when the fitting portions 22a and 22b are engaged with the wall 16 at opening 16b, and the fitting portion 22b is forced into recess 52 (as is indicated by force and movement arrows on FIG. 6), the peripheral wall portion 16a is captured about the fitting portion 22b, and is forced into the recess 52 along with the fitting portion 22b. Consequently, the edge of the wall 16 at opening 16b is sealingly protected from exposure to the ambient, and from exposure to any product or material placed into the bag 14. It will be understood that the ribs 90, 92, and 94 of the fitting portion 22b are forced inwardly (that is, axially) of the recess 52 past the corresponding rings 72, 74, and 76 of the fitting portion 22a. Once each rib axially passes its corresponding ring, the fitting portion 22b is permanently and sealingly captured within recess 52 of fitting portion 22a.

[0030] Consequently, the fitting portions 22a and 22b form an axially spaced or disposed series of tapered surface seatings each capturing the wall member 16 at portion 16a between confronting tapered (i.e., conical) surfaces of the fitting portions 22a and 22b. Considered differently, the wall portion 16a is engaged sealingly on tapering surfaces both inwardly and outwardly and in a “pinch” applied across the thickness of this wall portion 16a by the opposed tapered

conical surfaces of the fitting portions **22a** and **22b** adjacent to the ribs and rings of these fitting portions. The result is a triple redundant sealing engagement (i.e., formed by three spaced apart sealing engagements on the inside of portion **16a** of wall **16**, and three corresponding sealing engagement on the outside of this wall) of the fitting **22** with the wall **16** at the peripheral portion **16a** surrounding opening **16b**.

[0031] Further to the above, it will be seen viewing **FIG. 5**, that the fitting portion **22b** defines a stepped through bore **96**, a part of which defines the bore **50** and respective part of passage **24**. On the other hand, the bore **96** includes a larger diameter portion **98**. The bore portions **50** and **98** cooperatively define a shoulder **100** on the fitting portion **22b**. As is seen in **FIG. 5**, the annular wall portion **56** is received into the bore portion **98**, and abuts against the shoulder **100**. Further, the wall portion **56** defines a radially outwardly extending rib **102**. This rib **102** is sealingly captured by a corresponding radially inwardly opening groove **104** defined on the bore portion **98** of the fitting portion **22b**. It will be appreciated the cooperation of rib **102** in groove **104** also assists in retaining the fitting portion **22b** permanently in the recess **52** of fitting portion **22a**. Also, the cooperation of the rib **102** and groove **104** defines another sealing engagement of the fitting portions **22a** and **22b**. That is, the fitting portions **22a** and **22b** sealingly cooperate with one another via the interposed wall portion **16a**, and also sealingly cooperate with one another directly at the rib **102** and groove **104**. Stated differently, it is seen that the fitting portion **22b** is sealingly and captured and retained both radially inwardly and radially outwardly by the fitting portion **22a**. That is, the wall portion **54** captures the fitting portion **22b** radially outwardly, and the wall portion **56** captures the fitting portion **22b** radially inwardly and engages at rib **102** with the groove **104**.

[0032] In view of the above, it is to be appreciated that the fitting **22** is permanently attached to wall **16** of the bag **14** before the walls **16** and **18** are sealingly attached to one another to form the completed bag **22**, as is seen in **FIG. 2**. Later, after filling of the bag **22**, the cap/tap **28** is sealingly attached, and the contents of the closed bag **22** are protected from the environment. During shipping, handling, and storage of the bag **22**, tap is disposed inside of the box **12**, and this box greatly protects the plastic bag **14** from damage. Because the plastic sheet material from which walls **16** and **18** are formed is resistant to or essentially impermeable to penetration by oxygen, the contents of the filled and closed bag **14** are essentially protected against oxygen deterioration since oxygen cannot enter via the walls of the bag. Similarly, because the fitting **22** may be fabricated of plastic materials which are resistant to or essentially impermeable to oxygen penetration, the contents of the filled and closed bag **14** are also essentially protected against oxygen deterioration because oxygen cannot enter via the fitting **22**. The cap/tap **28** is conventionally made of materials preventing oxygen penetration, so it follows that the contents of the filled and closed bag **14** are entirely protected against oxygen penetration from the atmosphere, and will not be deteriorated because of oxygenation regardless of how long the filled bag **14** is stored.

[0033] Those skilled in the art will understand that the preceding exemplary embodiment of the present invention provides the foundation for numerous alternatives and modifications thereto. For example, it is apparent that the com-

ponent parts **22a** and **22b** of the fitting **22** can be, but need not be, made of the same material. That is, these components may be made of materials which have the same or differing coefficients of friction with the wall **16**. The use of materials with relatively high coefficients of friction may perhaps offer another way of increasing the interbonding of the bag wall **16** with the fitting **22** during the force fitting of the components **22a** and **22b** together. On the other hand, selection of materials with a relatively low coefficient of friction may increase the speed of assembly of the components **22a** and **22b** with the wall **16a** of the bag **16**. In each case, the sealing engagement of the fitting **22** with the wall **16a** of bag **16** is not dependent upon either heat sealing nor adhesive sealing. Rather, a plurality of interference fit features and mechanical interlocking of the fitting components and the bag wall is effective to achieve a sealing permanent attachment of the fitting **22** and wall **16a**. Accordingly, these other alternatives and modifications are also within the scope of the present invention. And, it follows that the present invention is not limited precisely to or only to that embodiment shown and described herein. Rather, the spirit and scope of the appended claims define the scope of the present invention.

We claim:

1. A bag container comprising:

a bag having a wall defining a variable-volume chamber and including a fitting defining a passage opening to said variable-volume chamber;

said fitting sealingly engaging with said wall and being formed of a material which is essentially impermeable to oxygen.

2. The bag container of claim 1 wherein said fitting includes a pair of cooperative component parts, and said cooperative component parts each sealingly engaging said wall adjacent to a hole in said wall through which passes said passage.

3. The bag container of claim 2 wherein said pair of cooperative component parts cooperatively define at least one interference fit arranged both inwardly and outwardly of said wall and circumscribing said hole.

4. The bag container of claim 2 wherein said at least one interference fit is arranged across a thickness of said wall, and said pair of cooperative component parts cooperatively sealingly pinch said wall at said at least one interference fit.

5. The bag container of claim 2 wherein said pair of components define a plurality of axially arrayed interference fit features each cooperatively and sealingly engaging said wall.

6. The bag container of claim 2 wherein said pair of components each sealingly engage with one another both radially inwardly and radially outwardly of said wall.

7. The bag container of claim 6 wherein said pair of components each define a respective axially arrayed plurality of respective axially spaced tapered surfaces each cooperatively capturing the wall portion therebetween.

8. A method of sealingly attaching a fitting to a fine-dimension flexible wall of a bag container, which bag container includes at least one flexible wall circumscribing and defining a variable volume chamber, said method including steps of:

providing a pair of fitting parts cooperatively defining a passage for communicating to said variable-volume chamber;

providing said at least one flexible wall with a hole opening to said variable-volume chamber, and disposing said pair of fitting parts one on each opposite side of said at least one flexible wall at said hole;

defining on each of said pair of fitting parts at least one interference fit feature sealingly cooperable with the at least one interference fit feature of the other of said pair of fitting parts and with a portion of said at least one flexible wall when interposed between said pair of fitting parts; and

arranged said pair of fitting parts across a thickness of said wall about said hole and forcefully engaging said pair of fitting parts with said wall and with one another, whereby said pair of cooperative fitting parts sealingly pinch said wall at said at least one interference fit.

9. The method of claim 8 further including the steps of:

providing for an outer one of said pair of fitting parts to define a conical wall surface, and configuring said conical wall surface to inwardly define a recess and plural convergent conical female surface sections;

interdigitated said plural convergent conical surface sections with a multitude of cooperative divergent conical female surface sections

utilizing the cooperative plural convergent conical surface sections and multitude of divergent conical surface sections to cooperatively define a number of successive and axially spaced apart annular female rings circumscribing the recess;

configuring an inner one of said pair of fitting parts to define a radially outer conical male surface defining plural convergent conical male surface portions;

interdigitated the plural convergent conical male surface portions with a multitude of divergent conical male surface portions;

utilizing convergent and divergent male surface portions on said inner fitting part to cooperatively define a number of annular ribs about said other fitting part; and

engaging the outer and inner fitting parts with said wall at the hole and forcing a peripheral portion of said wall into said recess and about said inner fitting part, so that each rib is forced axially past a corresponding ring and sealingly pinches said wall between said inner and said outer fitting parts.

10. An oxygen impermeable flexible bag container including an essentially oxygen impermeable flexible bag wall bounding a variable-volume chamber, and an essentially oxygen impermeable bag fitting sealingly attaching to said bag wall and defining a passage communicating with said variable-volume chamber, said bag container comprising;

a flexible and essentially oxygen impermeable wall circumscribing and defining a variable volume chamber,

an essentially oxygen impermeable fitting for sealingly attaching to said wall and defining a passage for communicating between said variable-volume chamber and ambient;

said flexible wall defining a hole opening to said variable-volume chamber, and including a peripheral portion circumscribing said hole;

said fitting including a pair of fitting parts disposed on opposite side of said wall and each sealingly engaging said peripheral portion;

each of said pair of fitting parts defining respective interference fit features sealingly cooperable with said peripheral wall portion and with a corresponding interference fit feature of the other of said pair of fitting parts.

11. The flexible bag container of claim 10 wherein an outer one of said pair of fitting parts defines a conical wall surface inwardly define a recess and plural convergent conical female surface sections disposed along said recess; and a multitude of cooperative divergent conical female surface sections interdigitated with said plural convergent conical female surface sections, and said convergent and divergent conical female surface sections cooperatively defining a number of successive and axially spaced apart annular female rings circumscribing said recess;

said inner one of said pair of fitting parts defining a radially outer conical male surface defining plural convergent conical male surface portions; a multitude of divergent conical male surface portions interdigitating with said plural convergent conical male surface portions; and

said convergent and divergent male surface portions on said inner fitting part cooperatively defining a number of annular ribs about said inner fitting part; whereby said pair of fitting parts engage with said wall at the hole and forcibly dispose a peripheral portion of said wall into said recess and about said inner fitting part, so that each rib is forced axially past a corresponding ring and sealingly pinches said wall between said inner and said outer fitting parts.

12. The flexible bag container of claim 10 wherein an outer one of said pair of fitting parts defines an axially extending annular inner wall portion inwardly defining a portion of said passage, and said inner fitting part defining a stepped through bore, a smaller diameter portion of which also inwardly defines a corresponding portion of said passage, said inner fitting part including a larger diameter bore portion which is received into said recess of said outer fitting portion and is disposed radially outwardly of said axially extending annular inner wall portion of said outer fitting part.

13. The flexible bag container of claim 12 wherein inner fitting part on said larger diameter bore portion defines one of a radially inwardly disposed groove and ring, and said axially extending annular inner wall portion defining the other one of a radially outwardly disposed groove and ring, whereby, said ring and groove on said larger diameter bore portion of said inner fitting part and on said axially extending annular inner wall portion of said inner fitting part engage one another.

14. The flexible 12 bag container of claim 13 wherein said outer fitting part captures said inner fitting part both radially inwardly of said conical wall surface, and radially outwardly of said axially extending annular inner wall portion.

15. An essentially oxygen impermeable flexible bag container including an essentially oxygen impermeable flexible bag wall bounding a variable-volume chamber, and an essentially oxygen impermeable bag fitting sealingly attach-

ing to said bag wall and defining a passage communicating with said variable-volume chamber, said bag container comprising;

a flexible essentially oxygen impermeable wall circumscribing and defining a variable volume chamber, said wall including a peripheral portion circumscribing a hole communicating between said variable-volume chamber and ambient;

an essentially oxygen impermeable fitting for sealingly attaching to said wall and defining a passage for communicating between said variable-volume chamber and ambient;

said fitting including a pair of fitting parts disposed on opposite side of said wall and each sealingly engaging said peripheral portion; and said peripheral wall portion extending axially between said pair of fitting parts and outwardly of said passage.

16. An essentially oxygen impermeable bag container comprising:

a bag having an essentially oxygen impermeable wall defining a variable-volume chamber and including a fitting defining a passage opening to said variable-volume chamber;

said fitting including a pair of fitting parts, one of said pair of fitting parts being disposed inside of said wall and the other of said fitting parts being disposed outside of said wall, and said pair of fitting parts sealingly engaging with said wall, and at least one of said pair of fitting parts being formed of a material which is essentially impermeable to oxygen.

17. The bag container of claim 16 wherein each of said pair of fitting parts cooperatively and sealingly engage said wall at a peripheral portion circumscribing a hole in said wall through which communicates said passage.

18. The bag container of claim 16 wherein said pair of fitting parts cooperatively define at least one tapered interference fit arranged both inwardly and outwardly of said wall peripheral portion and circumscribing said hole.

19. The bag container of claim 16 wherein said pair of fitting parts are in forceful permanent interference fit engagement with one another and with said wall peripheral portion to sealingly engage said wall.

20. A fitting structure for sealingly attaching to a fine-dimension flexible wall of a bag container without heat sealing or adhesive, said fitting structure comprising:

a pair of fitting parts cooperatively defining a passage for communicating to said bag container;

each of said pair of fitting parts defining a respective one of at least one pair of interference fit features sealingly cooperable with one another and with said flexible wall of said bag container.

21. The fitting structure of claim 20 wherein said at least one pair of interference fit features includes one of said pair of fitting parts defining a wall surface circumscribing a recess, and said wall surface inwardly defining at least one convergent female surface section leading to at least one divergent female surface section; said convergent and divergent female surface sections intersecting to form a shoulder circumscribing said recess; and

the other of said pair of fitting parts defining an outwardly disposed wall surface for being received into said recess, said other fitting part similarly outwardly defining at least one convergent male surface portion leading to at least one divergent male surface portion; said convergent and divergent conical male surface portions intersecting to form a rib circumscribing said wall surface of said other fitting part; and

said rib and said shoulder cooperatively forming an interference fit with said flexible wall interposed therebetween.

22. The fitting structure of claim 21 wherein each of said pair of fitting parts defines plural pairs of interference fit features arranged axially along said recess.

23. The fitting structure of claim 21 wherein said one fitting part defines a radially inner wall portion inwardly bounding said passage and outwardly bounding said recess, and said one fitting part also defines a radially outer wall portion outwardly bounding said recess; said other fitting portion being received into said recess between said inner wall portion and said outer wall portion.

24. The fitting structure of claim 23 wherein said pair of fitting parts define a cavity disposed in said recess and radially between said inner wall portion and said outer wall portion, and said pair of fitting parts cooperatively sealingly trapping an end edge of said flexible wall at a hole thereof about said passage and in said cavity.

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