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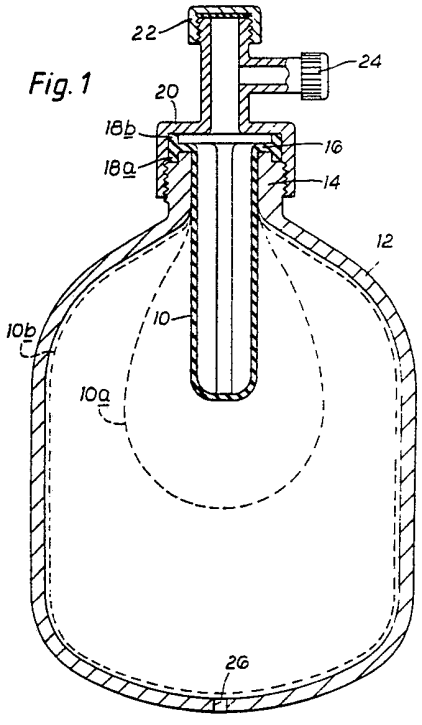
(54) Liquid container

(57) In a container comprising a bag 10, in the form of a closed tube of elastomeric material, disposed within a rigid or semi-rigid outer casing 12, the bag 10 is formed with corrugated walling. This has manufacturing advantages as it reduces the diameter of the unexpanded bag. Moreover, as the bag 10 is filled and expands within the casing 12 the corrugations provide channels for escape of air from the intervening spacing via an opening 26 or other venting means e.g. in the cap. Upon subsequent discharge, the bag contracts by its own inherence resilience to expel liquids, and the corrugated walling ensures minimum unexpelled residue once it has returned to its initial volume.

Fig. 1



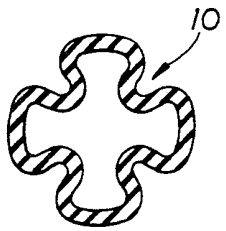
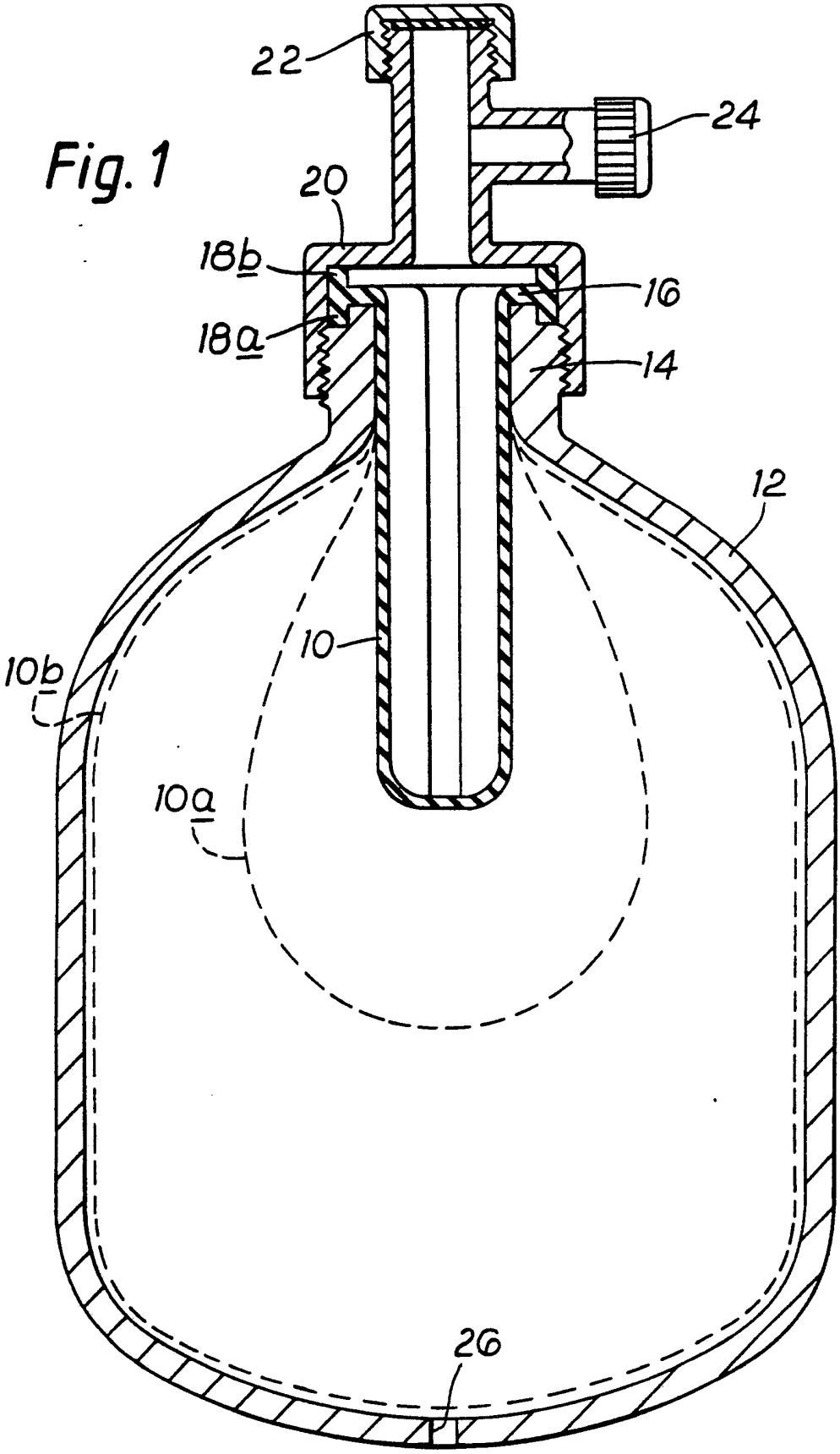


Fig. 4

GB 2 209 056 A

Fig. 1



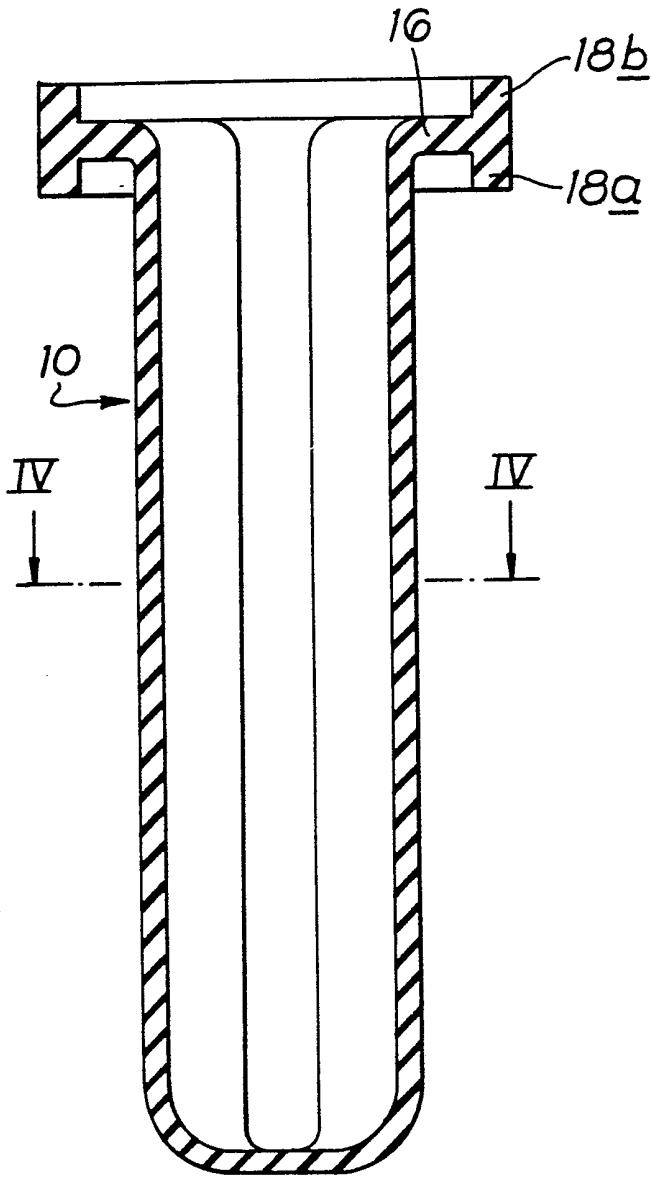


Fig. 2

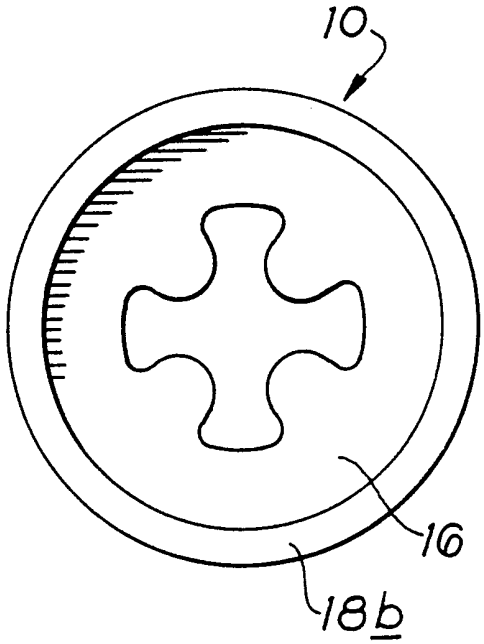


Fig. 3

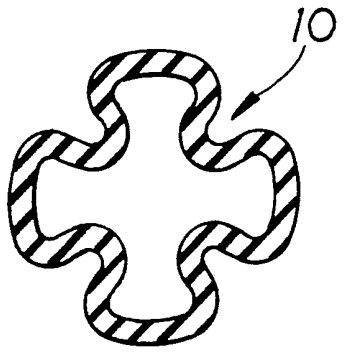


Fig. 4

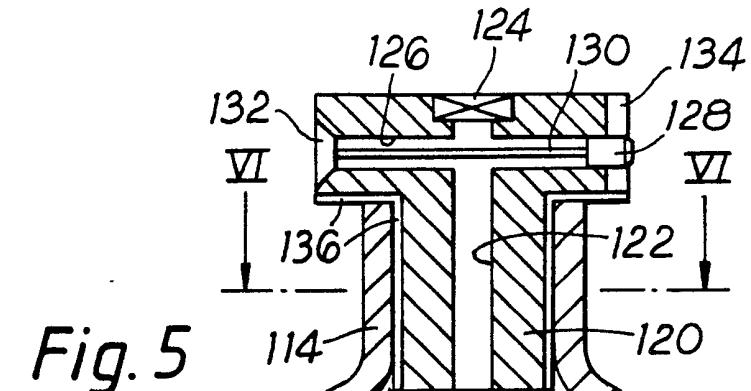
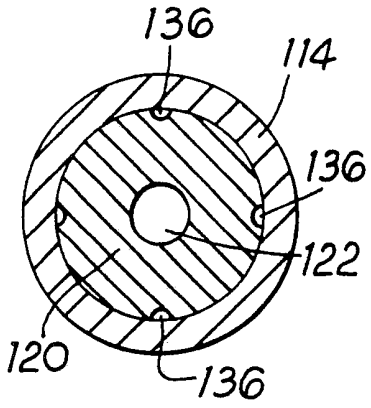

126
124
130
134
132
128
VI
VI
136
122
114
120

Fig. 5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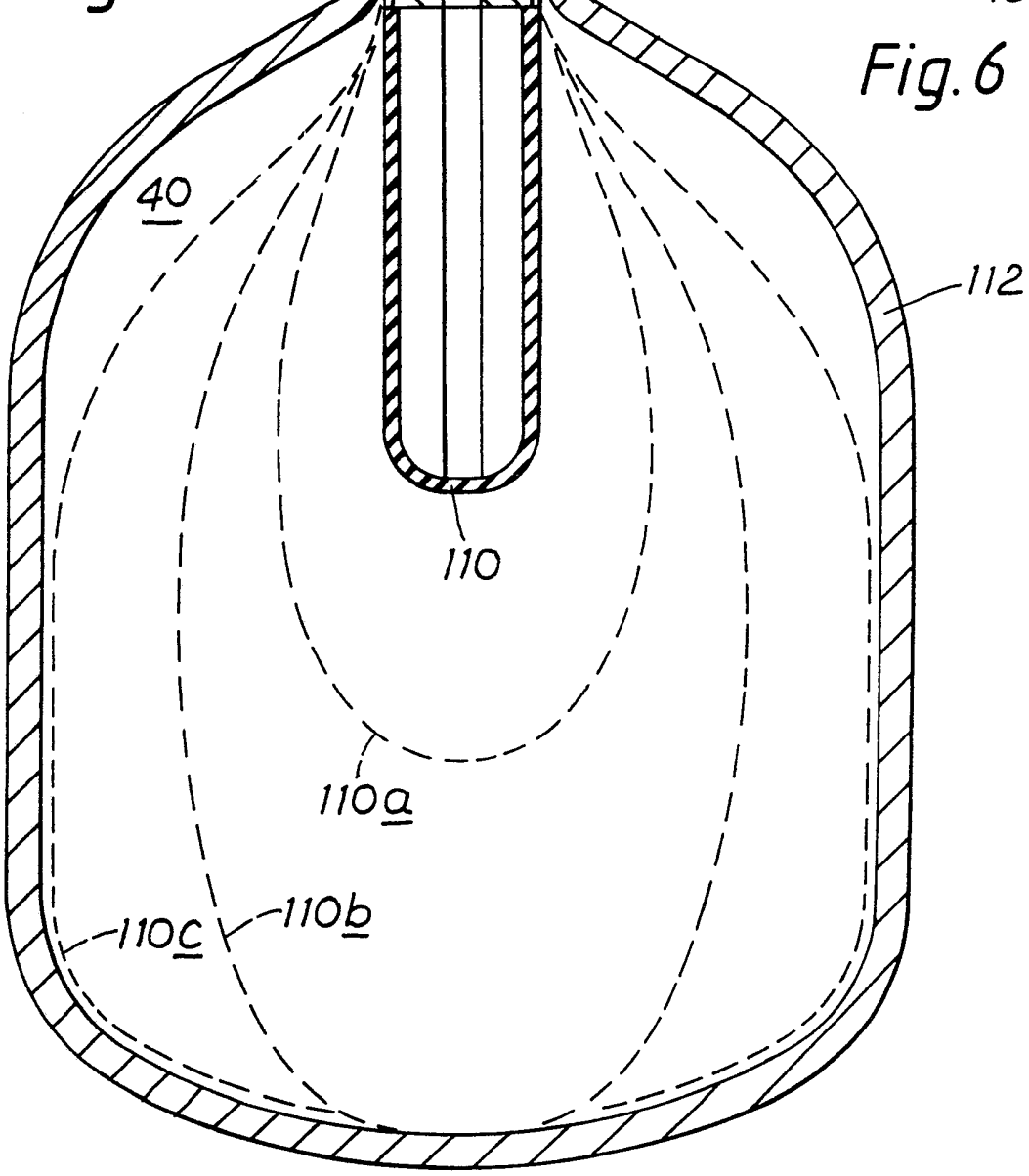
136

Fig. 6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110
110a
110b
110c

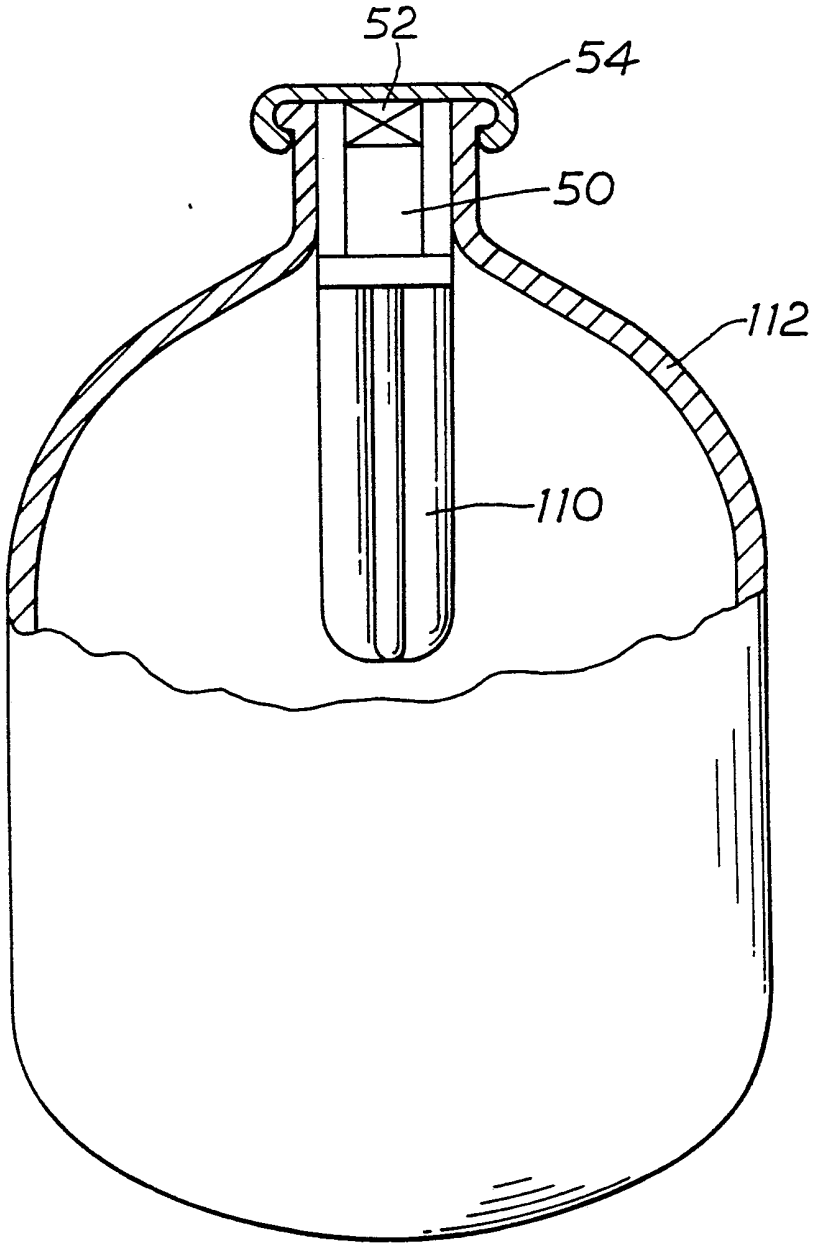

Fig. 7

LIQUID CONTAINER

This invention relates to a container which is particularly suitable for a carbonated beverage, but which may be used for any liquid.

Fluid containers in the form of a bag of elastomeric material disposed inside a rigid or semi-rigid outer casing have been previously proposed, usually in the context of the inherent elasticity of the bag material enabling automatic discharge of the contents of the bag without the need for a separate propellant mechanism, as in an aerosol. However, provided that the elastomeric material is of a food grade which will not impart any taste or taint to the product held therein, such a container is also particularly useful for carbonated beverages as the inherent elasticity of the bag precludes formation of a head space so that the liquid does not go "flat" during storage of after a portion has been dispensed. Moreover, the resilience of the bag may be such that upon opening of an outlet the liquid is discharged with a force sufficient to assist head formation, which is an advantage in the case of beer, for example.

Relevant prior disclosures include GB 1463336 (Alza

Corporation) and WO 87/01099 (Splicerite Ltd.)

The object of the present invention is to provide a modified construction of such a container which will reduce its cost of manufacture and transportation, make it more reliable in use and enable economic sterilization thereof.

Pursuant hereto, the invention provides a container comprising a bag of elastomeric material disposed within a rigid or semi-rigid casing, the interior of the bag being in communication with an inlet/outlet opening in the casing and the bag being capable of expansion within the confines of the casing upon filling with liquid and of contraction by its own inherent resilience to discharge liquid via the opening, characterised in that the bag is in the form of a closed tube of corrugated walling extending from an annular mouth or rim which is in communication with the opening in the casing.

The corrugation of the walling of the bag has numerous advantages. It enables reduction of the diameter of the unexpanded bag, compared to a smooth walled tube of the same capacity, of up to 25% or thereabouts, e.g. from 50 to 36mm or less. This means that a considerably larger number of bags can be moulded in a given area of a

moulding platten during the manufacturing process. Moreover, the reduction in bag diameter enables a corresponding reduction in the diameter of the casing opening and of the disposer or cap.

The casing is advantageously in the form of a large plastics bottle made by blow-moulding of a "preform" and it is the preform, which includes the neck of the bottle, which can be reduced in size as a consequence of the size reduction of the bag. In practice, the preform neck could be of such a size that standard blow-moulding equipment can be used to expand the preform to form the full-size bottle. A similar advantage to that just mentioned in relation to the bag is also obtained in that with a smaller preform (designed to fit standard equipment as just mentioned) a larger number of preforms can be moulded from a given area of platten, and less material used.

Prior to assembly of the container, the reduced diameter bags, possibly already secured to closure means or tap assemblies, can be packed into a smaller volume, or more bags can be packed into the same volume, thus reducing packaging and transportation costs.

A further advantage in view of the reduced internal space in the unexpanded bag, is that collapse of the bag

at the initial stage of filling (when oxygen is expelled to avoid spoilage in the case of a liquid food product, particularly beer or wine) is facilitated. Also, upon liquid discharge, a smaller residual volume of liquid remains inside the bag, and this is obviously in the eventual customer's favour.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic longitudinal cross-section of a first practical embodiment of the container of the invention;

Fig. 2 is an enlarged cross-section of the bag of the container shown in Fig. 1,

Fig. 3 is a plan view of the bag shown in Fig. 2, and

Fig. 4 is a cross-section of the bag along the line IV-IV in Fig. 2.

Fig. 5 is a schematic longitudinal cross-section of a second practical embodiment of the container of the invention;

Fig. 6 is a transverse cross-section of the container of Fig. 5 along the line VI-VI in Fig. 5; and

Fig. 7 is a schematic partial cross-section of a third practical embodiment of the container of the invention.

With reference to Fig. 1, a container in accordance

with the invention comprises an elastomeric bag 10 disposed within an outer casing 12. The casing 12 consists of a plastics bottle formed by blow-moulding and it has an annular neck 14 defining an inlet/outlet opening of the container.

The bag 10 may be approximately 15cm long and about 35mm in diameter in the unexpanded (relaxed) condition. It is made from a food grade elastomeric material which is substantially impermeable to both oxygen and carbon dioxide and thus is suitable for use with carbonated beverages, such as beer, sparkling wine and soft drinks.

The bag 10 is capable of expanding from its relaxed condition, shown in Figs. 2 to 4 and in Fig. 1 in solid lines, to several times, e.g. twenty to one hundred times, its initial volume upon filling with liquid. In this respect the partially filled and fully filled conditions of the bag 10 are shown in Fig. 1 broken lines and labelled 10a and 10b respectively.

The bag 10 is tubular in form prior to filling, having a closed lower end and an open upper end which is provided with an outwardly extending rim 16 terminating in downwardly extending lip 18a and an upwardly lip 18b. The main tubular body of the unexpanded bag 10 has corrugated walling, that is to say undulating walling

wherein ridges on the exterior correspond to recesses on the interior, so that in cross-section this portion of the bag 10 has a lobed appearance, as is apparent in Figs. 3 and 4. In this particular example a series of only four ridges and recesses are provided around the circumference of the tube. In other embodiments fewer or many more may be provided.

In the assembled condition of the container, the rim 16 and the downward lip 18a of the bag 10 are seated over the edge of the bottle neck 14 and they are sealingly trapped there by placement of a cap 20 thereover. In this respect the exterior of the neck 14 and the inside wall of the cap 20 are screw-threaded so that the cap 20 is screwed onto the neck 14 to trap the lips 18a/18b and rim 16 of the bag 10 therebetween.

The cap 20 is shown only schematically in Fig. 1 as its precise construction is immaterial to the present invention. As illustrated is may conventiently be tap-like in form and may include separate inlet means 22 for filling the container and outlet means 24 for dispensing liquid therefrom. In this respect, although not illustrated, the inlet means 22, which serves as a filling port, may incorporate a non-return valve, whilst the outlet means 24 may incorporate an on/off controlling device.

In an alternative cap design (not shown) a single port may serve as both inlet and outlet. Moreover, it may be provided with a non-return valve, such as a flap valve, which is openable to allow discharge only upon attachment of an additional tap fitment incorporating, for example, a plunger for opening said valve. The use of a separate tap fitment has the advantage that before it is attached at the ultimate point of use the inlet/outlet port can be sealed off by a membrane which confirms that the container has not been opened, and also for transport and storage of filled containers there are no projecting tap fitments which could be broken off. The disadvantage of course is that the fitment has to be separately provided to the customer.

The bottle 12 has a small opening 26 formed therein to enable air to flow out of the space between the bag 10 and the bottle 12 as the bag 10 is filled with liquid and subsequently to permit ingress of air as the bag 10 is emptied. Although this opening 26 is shown at the base it could in fact be positioned anywhere on the bottle.

Such opening may be dispensed with altogether if alternative means of venting and allowing ingress of air to the space between the bag and bottle are provided, e.g. in the cap 20. This has been proposed in GB 88

00881 (Splicerite Ltd.)

The various components, namely the bag 10 the bottle 12 and the cap 20, are separately manufactured by moulding techniques. As the bag 10 has corrugated walling it is smaller in diameter and has a smaller rim 16 than a smooth-walled bag of the same capacity. Although the actual amount of material used to form such a bag is not significantly reduced compared to a smooth-walled bag of the same capacity, a larger number of such bags can be moulded in a given area of moulding platten, and, as that is the most expensive part involved in production of the bag, production cost can thereby be significantly reduced. Furthermore, as the rim 16 is reduced in size both the cap 20 and a preform for the bottle 14 are correspondingly reduced in size resulting in similar savings in production of same by moulding. It should also be noted that with a smaller bottle neck and cap diameter the stresses exerted on the cap by internal pressure of the filled container are reduced so the cap is better able to withstand same without distortion.

The components 10, 12, 20 are then assembled to the form shown in Fig. 1 as previously described.

In use the bag 10 is collapsed by application of a

vacuum to remove all air and then it is expanded, either directly by being filled with a carbonated liquid beverage via the inlet means 22 in the cap 20, or by supplying carbon dioxide to the interior of the bag, followed by filling with the beverage whilst bleeding off the carbon dioxide. As the bag 10 expands inside the bottle 12 it forces air out of the opening 26 (or any alternative venting means). During expansion, the corrugated configuration of the bag walling gradually evens out. Finally, when the bag 10 is expanded and filled to the maximum capacity of the container, its walling is pressed into intimate contact with the entire internal surface of the bottle 12 and no irregularaties of configuration in its walling remain. Such intimate contact between the filled bag 10 and the inside of the bottle 12 is extremely important to ensure that oxygen does not penetrate through the bag material and initiate spoilage of the contained liquid beverage during its intended shelf life of some 20 weeks or thereabouts. In this respect, it is not possible to guarantee the bag material as absolutely impermeable to oxygen, so the oxygen barrier is constituted by the plastics bottle and oxygen will not be able to penetrate the bag 10 so long as its walling is firmly pressed against the bottle interior.

Where an opening 26 is provided its presence is not

likely to have any significant practical effect if ingress of oxygen into the bag 10 provided that the remainder of the bag is pressed firmly against the wall of the bottle. However, it may be convenient to cover such opening 26 by a foil membrane (not shown) after the container has been filled, which membrane will be punctured automatically by the negative pressure created inside the bottle when discharge of liquid from the bag 10 is initiated by opening of the outlet means 24 to allow contraction of the bag 10.

As will be evident, the expanded bag material is held under tension during storage, and its inherent resilience automatically causes the bag 10 to contract and expel liquid upon opening of the outlet means 24. As the bag 10 contracts, air enters the bottle 12 through the opening 26 or other air ingress means). As the period over which the bag 10 is expected to be emptied of beverage by the ultimate customer is merely a few days at most, penetration of oxygen into the bag contents during this period will be insufficient to cause spoilage.

In addition to the above-discussed manufacturing advantages of an elastomeric bag having corrugated walling, it results in a smaller residue of contained liquid upon collapse of the bag to its unexpanded

construction compared to a smooth walled bag of the same capacity. Moreover, during the filling operation, the smaller internal volume of the bag makes it easier to collapse to expel air and the ridged outer surface of the bag, which remains apparent to some extent until only shortly before the bag is filled to maximum extent, provide channels to enable air to escape via the opening 26, or via other venting means, i.e. provided in the cap.

The container illustrated in Figs. 5 and 6 composes an elastomeric bag 110 disposed within a plastics bottle 112. These are, in many respects, very similar to those constituting the container shown in Fig. 1, particularly with regard to the materials of which they are made, their dimensions, and method of production, and the corrugated walling and expandibility of the bag. The general mode of use of this modified container is also the same as the previously described embodiment. To avoid unnecessary repetition, therefore, only the differences compared to the Fig. 1 embodiment will be referred to in any detail.

Three partially filled/partially expanded conditions of the bag 110 are shown in Fig. 5 in broken lines and are labelled, in sequence of fill 110a, 110b and 110c. Compared to the first embodiment, the lobed bag 110 does

not have an outwardly extending rim at its open end. Instead, its open end margin is indirectly connected, to the stopper or cap 120 which is securely fitted in the neck 114 of the bottle 112.

The cap 120 is made of plastics and embodies both valve means whereby the bag 110 may be filled and valve means whereby liquid may be dispensed from the bag 10. It consists of a lower plug-like cylindrical portion which fits into the bottle neck 114 and an upper portion which is of larger diameter and remains seated across the mouth of the bottle 112. A main throughbore 122 is provided centrally through both portions and a one way flap valve 124 is positioned at its upper end and is capable of closing off said bore 122. An outlet passageway 126, which communicates with the bore 122 extends transversely thereof through the upper portion of the cap 120. A push button 128 at one end of this outlet passageway 126 is connected via a shaft 130 to a valve body 132 at the other end. The push button 128 is shrouded by a projection rim 34 which at least partially encircles the button 128 and prevents it being inadvertently depressed.

Around the circumference of the plug-like portion of the cap 120 a plurality, in this case four, longitudinal grooves 136 are provided as shown in Fig.

6. These grooves 136 extend also across the underside of the upper portion of the cap 120 and enable venting of the space 40 between the bag 110 and the interior of the bottle 112 as the bag 110 expands as well as ingress of air as it contracts.

In carrying the invention into effect commercially it is envisaged that the bag 110 with its corrugated walling will be produced from synthetic rubber by moulding. The cap 120 will be separately produced from suitable plastics by injection moulding and the mouth of the bag 110 will be connected thereto in airtight manner, as previously described, the join therebetween being smooth and uniform. The combined unit of cap and bag may then be sterilised e.g. by gamma irradiation prior to insertion into the bottle 112.

Prior to insertion of the cap and bag unit into the neck of the bottle 112 and handle/support element may be fitted to the bottle neck 114. This may take the form of an annular collar to which a triangular frame, in the form of respective divergent limbs connected at their outer ends by a cross piece, is attached. The collar will fit around the outside of the bottle neck and when the fully formed bottle is laid on its side the cross piece will lie on the supporting surface with the limbs holding the bottle neck steady and level at an

appropriate height above the surface.

A similar handle/support element may also be provided around the neck of the bottle 12 in the preceding embodiment.

The filling of the container, i.e. the filling of liquied into the bag 110 once located inside the bottle 112 is accomplished as described for the previous embodiment. The bag 110 expands as illustrated so that it firstly contacts the bottom of the bottle 112 opposite the neck 114, and then expands transversely and progessively upwardly towards the neck of the bottle. In this way, air in the initial space 40 between the bag and the bottle is reliable forced upwards and expelled via the grooves 136 around the edge of the cap 120. The corrugation of the bag walling also assists by providing channels for upward escape of air.

In either the first or second container embodiments described above a flat-bottomed base element may advantageously be fitted onto the base of the bottle 12, 112 so that it can be stood upright. As the beverage is likely to be dispensed with the container lying on its side, particularly with the press-button tap arrangement of the second embodiment, the base element may also have a flattened side intended to be

aligned with the cross-piece of a handle element of the type mentioned above for supporting the bottle on its side.

It should be understood that the foregoing is only illustrative and not limitative of the scope of the invention. In other embodiments the cap in particular may be varied. For example, as shown in Fig. 7, the cap may include no outlet valve arrangement, merely a filling bore 50 and flap valve 52. A filled container having this sort of cap could be sold with a simple screw-on or other closure 54 and could be adapted for fitment into a special dispensing assembly which would seal onto the cap and co-operate therewith to enable dispensing of the liquid. With such an arrangement the container once empty would be discarded and replaced by another full one. Obviously such containers would be less expensive to produce than those where an integral dispensing valve arrangement has to be provided in the cap. Also in the form of cap described in detail, a suitable hand/support may be formed integrally therewith.

CLAIMS:

1. A container comprising a bag of elastomeric material disposed within a rigid or semi-rigid casing, the interior of the bag being in communication with an inlet/outlet opening in the casing and the bag being capable of expansion within the confines of the casing upon filling with liquid and of contraction by its own inherent resilience to discharge liquid via the opening, characterised in that the bag is in the form of a closed tube of corrugated walling extending from an annular mouth or rim which is in communication with the opening in the casing.

2. A container as claimed in claim 1 wherein a cap is provided to secure the mouth or rim of the bag to the inler/outlet opening of the outer casing.

3. A container as claimed in claim 2 wherein the outer casing has a neck which defines the inlet/outlet opening and the bag has an annular rim which seats over the neck to provide a seal between the casing and the cap.

4. A container as claimed in claim 1 or 2, wherein the cap has a stopper portion which is insertable into the inlet/outlet opening of the outer casing and the

mouth of the bag is secured to said stopper portion.

5. A container as claimed in any preceding claim wherein the outer casing consists of a plastics bottle formed by blow-moulding from a pre-form.

6. A container as claimed in any preceding claim wherein the bag walling formed with four longitudinally extending lobes and intervening recesses.

7. A container substantially as hereinbefore described with reference to and as illustrated in Fig. 1 or Figs. 5 and 6 or Fig. 7, in combination with Figs. 2 to 4.

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