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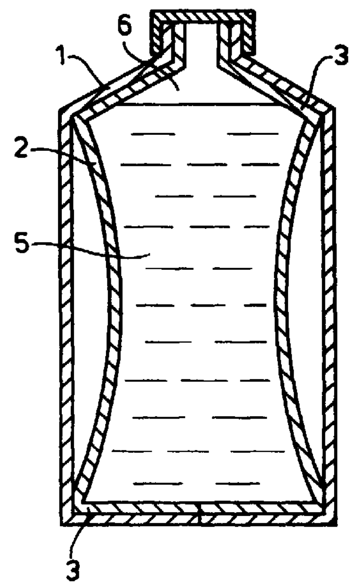
(54) Multilayer pressure resistant container

(57) The invention relates to a pressure resistant container formed from at least two layers including an outer layer (1) and an inner layer (2) which are co-extruded and do not adhere to each other, the inner layer (2) being collapsible, the outer layer (1) being porous.

Fig. 2



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Description

Technical field

The present invention relates to a container made from a co-extruded multilayer parison sustaining its external shape under pressure variation.

Background of the invention

The problem of package deformation is well known in the packaging industry. The package deformation may be in response to pressure differences existing between the inside of an airtight package and the ambient pressure. Such package deformation may be non-recoverable for certain package materials, like some plastics or metals. Thin-walled, partially flexible packages are particularly sensitive to the problem.

There are a number of possible factors which may lead to the existence of the pressure differences between the interior and the exterior of the package mentioned above. The content of the package may, for example, be chemically unstable or may be subject to reaction with gases which may exist in the head space of the package, or alternatively, in certain specific circumstances, may react with the package material itself. Any chemical reactions involving the liquid contents may lead to the absorption of any head space gases thereby causing under-pressure in the package.

Pressure differences between the pressure inside the container and the ambient atmospheric pressure may also occur when the temperature during the filling and sealing of the container is significantly different from external temperature during shipment, transportation and storage. Another possibility of a pressure difference may be caused by a different ambient pressure at the filling of the container from another ambient pressure at a different geographical location, for example when hermetically sealed bottles are filled in a mountain area and moved to the sea level.

The pressure difference between the interior and the exterior of a container may result into a collapsing of the container itself. EP-0 182 094 describes a container which can sustain such pressure differences, by having an inner collapsible layer and an outer rigid layer, whereby the space between the layer is in contact with the outside through an open seam at the bottom of the bottle. Similarly, the bottles disclosed in US-5447678 and US-5567377 are made of a collapsible inner layer and a rigid outer layer which do not adhere to each other, whereby the space between the layers is can be filled with air through a hole or through non-welded seams.

The present invention relates to a container formed from at least two layers including an outer layer and an inner layer, the inner and the outer layers are co-extruded and do not adhere to each other, the inner layer being collapsible.

Existing containers of the sort require specific processes because a hole or a non-welded seam must be provided so that air could access the space between the inner and outer layer in order to allow the inner layer to separate itself from the outer layer, in such a manner that only the inner layer collapses in case of a pressure difference. Such an access may be adequate for rapid pressure changes which can occur when using a pump to extract the bottle content. However, not all pressure changes are rapid, and pressure changes due for example to a difference in atmospheric pressure are much slower changes. Furthermore, non-welded seams or through holes are damaging to the appearance of the product, and might even give the impression that the container is damaged because the outer layer is not integral.

It is therefore an object of the present invention to provide a pressure resistant container which has an integral outer layer.

Summary of the invention

The present invention provides a container in a manner to satisfy the aforementioned need.

The container of the invention is characterised in that the outer layer is porous.

Detailed description of the invention

Figure 1 is a schematic cross sectional view of an embodiment of a container according to the present invention where the inner and outer layers are not separated.

Figure 2 is a schematic cross sectional view of an embodiment of a container according to the present invention where the inner and outer layers are separated.

The present invention relates to a container. Different kinds of containers are encompassed by the invention. The container of the invention normally contains a flowable material (5) and a head space (6), and is usually air tight.

Indeed, such a container can be subject to pressure variation due to a reaction of the gas of the head space (6) with the content, which is particularly the case when the container is containing surfactants, or due to a variation of the atmospheric pressure. These pressure variations can produce a lower inner pressure or a higher inner pressure. In case of a lower inner pressure, the container tends to collapse, and in case of a higher inner pressure the container tends to bulge. Such containers comprise bottles, bags or boxes. The flowable material (5) contained encompasses materials which are flowable under gravity or may be pumped. Such materials include liquids, pastes, gels, emulsions or powders.

The present invention relates to a container formed from a co-extrusion process. Co-extrusion is commonly used for making containers. This process involves extrusion of a multilayer parson blown in a molded cavity to take the shape of the final container. This process has the advantage of being a very widely used, standard and economical process. For the container of the invention, two layers are sufficient, but more layers can be used. However, it is important that at least two adjacent layers are not adhering to each other, meaning that these layers should be made of incompatible thermoplastic materials. As a consequence, these layers can be separated from each other once the container is formed. However, it may be useful that these layers be glued to each other at some points of the structure of the container, in order to improve rigidity of the assembly. This can be done for example as described in US-5435452 whereby these layers are adhered to each other at at least part of the body of the bottle. The layers forming the bottle may be joined to the opening of the container, for example at the mouth of a bottle. The two non-adherent layers are the inner layer (2) and the outer layer (1). In order to fulfill the requirements of the invention, the inner layer (2) should be collapsible. Indeed, the inner layer (2) should be able to adapt its shape to pressure variations in the bottle, particularly in case of a lower inner pressure. However, the outer layer (1) should preferably be made of a rigid material, so that it could for example sustain a higher inner pressure. It should also be noted that the separation of the outer and of the inner layer (2) will be facilitated if the inner is collapsible and if the outer is rigid. Separation would also be facilitated if the inner material shrinks more than the outer material. A stretchable material would also be very appropriate for making the inner layer (2), particularly if the permeation of the outer layer is slow (2). Example of materials with appropriate rigidity can include Poly-Propylene or Poly-Ethlene-Therephtalate for the outer bottle, and for example Low Density Poly-Ethylene for the inner bottle. Other materials with suitable characteristics can also be used. In particular, the container may comprise supplementary layers. However, because the porosity of the outer layer (1) is important, it should not be covered with a non porous material.

As a main requirement for the container of the invention, the outer layer (1) should be porous. The outer and the inner layer (2) will be able to separate only if the interstitial space which is consequently between the two layers formed can be filled, for example with air. In order to achieve this, the outer layer (1) has to be porous. Alternative solutions are proposed in the prior art, but they all involve special manufacturing processes according to which a hole is made, or a seam is not welded. By porous material, it is meant that it should let gas through. A convenient way to measure porosity is given by the oxygen transmission rate of the material. It is not necessary that this transmission rate be very high because some pressure variations are slow, such as the atmospheric pressure variation, so that a low transmission rate can be sufficient. Low transmission rates for the outer layer (1) to be porous would be of about 50 cm^3/day/atmosphere/m^2. In some cases, where the pressure variation is rapid, like when a pump is used for extracting the content of the container, a higher oxygen transmission rate of the material should be higher, of the order of 10 000 cm^3/day/atmosphere/m^2 for example. Such porosity values can be achieved by materials comprising micro-holes. These can be obtained by using recycled material containing impurities, for example, which is also very satisfactory for environmental reasons. The material be made of up to 100% of post consumer recycled material, preferably between 10 to 50% by weight, most preferably between 20 to 30% by weight. Consequently, the material forming the outer layer (1) should have an oxygen transmission rate comprised between 10 cm^3/day/atmosphere/m^2 and 50 000 cm^3/day/atmosphere/m^2, preferably between 100 cm^3/day/atmosphere/m^2 and 30 000 cm^3/day/atmosphere/m^2, most preferably between 1000 and 20 000 cm^3/day/atmosphere/m^2 and even more preferably between 5000 and 10 000 cm^3/day/atmosphere/m^2.

The structure of the container can be such that the inner layer (2) is held by top and bottom pinching (3). Other structural modifications can be used for reinforcing the structure, such as the means described in EP-751071. The aim is to avoid structure distortion which can be due to higher inner pressure or to stacking of the containers.

Figure 1 presents a container according to the present invention in which the layers are not separated. It should be noted that the inner and outer layer forming the body of the container have a sealed end (4) at the bottom of the container.

Figure 2 presents the container of Figure one where the inner layer (2) is partially collapsed, whereas the outer layer (1) stays rigid. In this case, collapsing could have occurred because of a chemical reaction between a gas comprised in the head space (6) and the content or with a compound of the packaging materials. Collapsing could also be due to a higher atmospheric pressure in Figure 2 than in Figure 1. In this example, the inner layer (2) is pinched (3) at the top and bottom ends of the bottle.

Claims

1. A <u>container</u> formed from at least two layers including an outer layer (1) and an inner layer (2), the inner and the outer (1) layers are co-extruded and do not adhere to each other, the inner layer (2) being collapsible, characterised in that the outer layer (1) is porous.

2. A container as in claim 1, whereby the outer layer (1) has a porosity defined by an oxygen transmission rate comprised between 10 cm^3/day/atmosphere/m^2 and 50 000 cm^3/day/atmosphere/m^2.

3. A container as in claim 1, whereby the outer layer (1) is rigid.

4. A container as in claim 1, whereby the outer layer (1) is made of a material comprising recycled materials containing impurities.

5. A container as in claim 1, whereby the outer layer (1) is made of a material comprising micro-holes.

6. A container as in claim 1, whereby the container is a bottle.

7. A container as in claim 1, whereby the inner layer (2) is at least partially held by pinching (3).

8. A container as in claim 1, whereby the container comprises a head space (6).

9. A container as in claim 1, whereby the container contains flowable material (5).

10. A container as in claim 1, whereby the container contains surfactants in a proportion of from 5 to 50 %, preferably of from 10 to 30% by weight.

Fig. 1

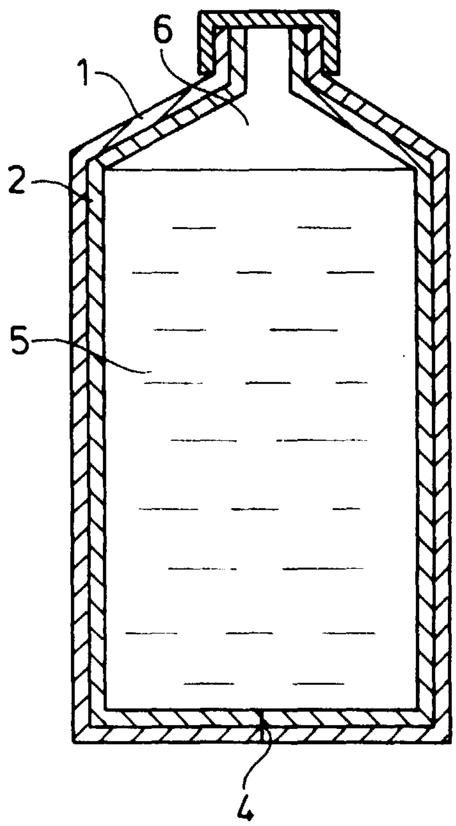
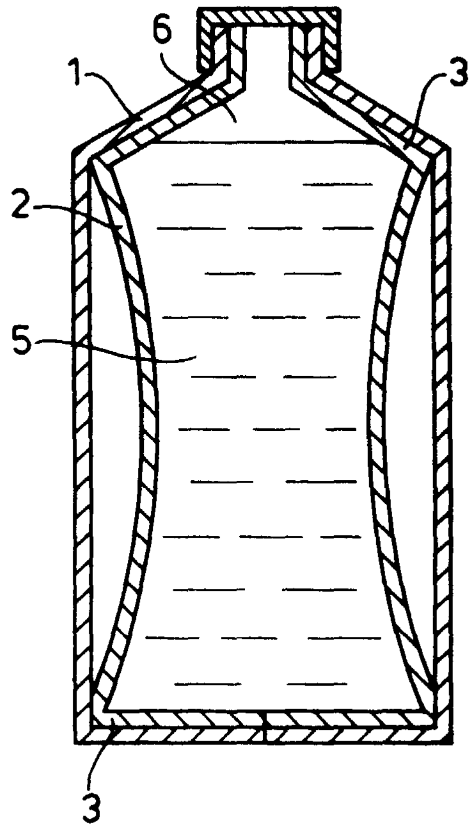


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2295

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 40 23 718 A (KULLBERG JUN.) * column 2, line 63 - column 3, line 1 * * figures * ---	1,3,6,8,9	B65D23/02
A	US 4 979 631 A (CONTINENTAL PET TECHNOLOGIES) * column 4, line 12 * ---	1,3,5,6,8,9	
A	WO 93 17919 A (THE PROCTER & GAMBLE CO.) * page 1, paragraph 2 * -----	1,4,6,8,9	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B65D
B05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 December 1997	Martin, A

CATEGORY OF CITED DOCUMENTS

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