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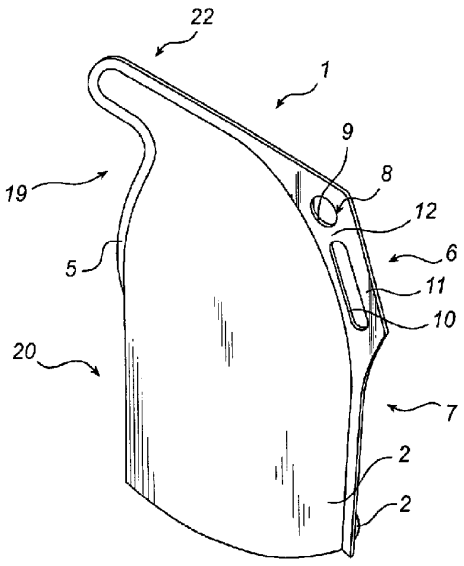

(57) Abstract: A container for liquid contents, comprising a compartment (4) which is defined by flexible walls (2, 3) and whose volume depends on the relative position of the walls (2, 3), a flexible duct means (22), which forms a connection between said compartment (4) and the surroundings. The duct means is bringable to an open state and to a closed state. The compartment (4) has a bottom region (21), in which the liquid contents are essentially collected as the container assumes an upright position. Said walls (2, 3) are, by being actuated by said contents when collected in said bottom region (21), adapted to assume a relative position acting for an increase in volume of the compartment (4), which increase in volume is counteracted by a negative pressure generated in the compartment (4). The duct means (22) is adapted to be brought to said closed state in response to the negative pressure generated in the compartment (4), and is extended from the compartment at an angle to a longitudinal axis of the container.

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CONTAINER

Field of the Invention

The present invention relates to a container for liquid contents and, more specifically, such a container comprising a compartment which is defined by flexible walls and whose volume depends on the relative position of the walls, and a duct means which forms a connection between said compartment and the surroundings.

Background Art

The following discussion of documents, acts, materials, devices, articles and the like is included in this specification solely for the purpose of providing a context for the present invention. It is not suggested or represented that any of these matters formed part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

Known to the applicant is a container of a collapsible type and which comprises three walls, viz. two opposite side walls and a bottom wall. The walls which are made of a plastic material are flexible and interconnected to form a compartment whose volume depends on the relative position of the walls. The container has a duct means which either may consist of a tubular piece introduced between the side walls or is formed integrally with the side walls.

A frequent problem associated with this type of container relates to the provision of durable resealability of the container, i.e. to ensure that it remains sealed for a reasonable period when stored, for instance, in a refrigerator. The container is opened, for example, by cutting open the duct means, after which the liquid product held in the container can be poured. However, it is desirable to be able to durably reseal the duct means since the product may otherwise be affected by the ambient air. This durable resealability is achieved with the aid of openable and closable connecting means, such as a screw cap, which are connected to the duct means, or with the aid of pinching means applied over the duct means.

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These methods of providing durable resealability of a container, however, are complicated. There is thus a need for a container which allows easier durable resealing.

Summary of the Invention

A first object of the present invention thus is to provide an improved container of the type described by way of introduction.

Another object is to provide such a container allowing improved durable resealability.

According to the present invention there is provided a container for liquid contents, including a compartment which is defined by flexible walls and whose volume depends on the relative position of the walls, a flexible duct means which forms a connection between said compartment and the surroundings, the duct means adapted to be brought to an open state and to a closed state, and the compartment having a bottom region, in which the liquid contents are essentially collected as the container assumes an upright position, wherein

said walls, by being actuated by said contents when collected in said bottom region, are adapted to assume a relative position acting for an increase in volume of the compartment, which increase in volume is counteracted by a negative pressure generated in the compartment, and

said duct means is adapted to be brought to said closed state in response to the negative pressure generated in the compartment, and

said duct means is extended from the compartment at an angle to a longitudinal axis of the container in such a way that pressure caused by the contents and acting on the walls of the container is prevented from propagating to the duct means.

This results in a durably self-sealing container. The container comprises walls which, by being actuated by the liquid contents, may assume different positions affecting the volume of the compartment. It will be ensured that the walls assume a position acting for an increase in volume of the compartment as the container assumes an upright position. Thus a negative pressure is generated in the compartment, said negative pressure counteracting the increase in volume and besides causing the duct means to be closed. The extent of the duct means from the compartment at an angle to a longitudinal axis of the container prevents the pressure which the contents exert on the side walls of the container from propagating to the duct means.

When handling the inventive container, the duct means will thus be closed when a pouring motion is terminated and the container is made to assume its upright position once more. Thus the need for mechanical durable sealing measures in the form of e.g. screw caps or clips is eliminated.

According to a preferred embodiment, the inventive container comprises two opposite side walls which are joined along a common connecting portion and which in a non-actuated state strive to abut flush with each other. Preferably the duct means is formed integrally with said side walls and is advantageously formed of two projecting wall portions, abutting flush with each other, of the side walls, said wall portions being joined with each other along their edges.

According to another preferred embodiment of the present invention, the duct means has inner surfaces which face each other and are made to abut each other in a sealing manner when the duct means is closed in response to the negative pressure generated in the compartment. Said surfaces advantageously have a high degree of flatness, which contributes to ensuring an air-tight

durable seal of the duct means in response to a negative pressure generated in the compartment.

The container is preferably made of a material containing a filler of mineral material and a binder of polyolefin material. The filler is advantageously chalk (calcium carbonate).

According to yet another preferred embodiment of the present invention, a carrying means is arranged on a first side of the container. The carrying means is advantageously arranged in said connecting portion.

According to another preferred embodiment of the present invention, the duct means is arranged in an outlet area located on a second side of the container and at a distance from said bottom region. Said second side is advantageously opposite to said first side.

According to one more preferred embodiment of the present invention, the duct means extends perpendicular to a longitudinal axis of the container.

The duct means is preferably sealed in an unopened state of the container and is operable by cutting or like operation.

Preferred embodiments of the present invention will now be described by way of example with reference to the accompanying drawings.

Brief Description of the Drawings

Figs 1a and 1b are perspective views of a preferred embodiment of an inventive container in a filled and non-opened state.

Fig. 2 is a top plan view of the container shown in Figs 1a and 1b, some parts being removed to illustrate the construction of the container.

Figs 3a and 3b are perspective views of the container shown in Figs 1a and 1b in a filled and opened state.

Fig. 4 is a cross-sectional view along line A-A in Fig. 3a.

Fig. 5 is a perspective view of the container shown in Figs 3a and 3b during a pouring motion.

Fig. 6 is a cross-sectional view along line B-B in Fig. 5.

Figs 7a-7c are perspective views showing the handling of the container shown in Figs 3a and 3b for pouring some of the contents held in the container.

Fig. 8 is a top plan view of a second embodiment of an inventive container with a duct means extended from the compartment at an acute angle to a longitudinal axis of the container.

Description of Embodiments

Figs 1a and 1b, to which reference is now made, illustrate a preferred embodiment of an inventive container 1 in an unopened state and filled with liquid contents. The container 1 is particularly suitable for liquid food products such as milk, fruit juice, water or wine.

The container 1 is of a collapsible type, i.e. compressible or foldable, and comprises to this end three flexible walls, two of which are opposite side walls 2 and one is a bottom wall 3.

The walls 2, 3 can be made of a plastic material or preferably of a material containing a filler of mineral material and a binder of polyolefin material. The filler is advantageously chalk. The walls 2, 3 are further interconnected to form a compartment 4 whose volume depends on the relative position of the walls 2, 3 and which is clearly shown in Fig. 2. The two side walls 2 are joined by welding along a connecting portion 5.

The flexible walls 2, 3 are formed in such manner and have such rigidity that said side walls 2 in a non-actuated state, which corresponds to the empty state of the container 1, strive to abut flush with each other. If the walls contain a mineral-based filler, such as chalk, said rigidity is essentially obtained by means of the

filler. When the inventive container 1 is filled with liquid contents, the contents will actuate the walls 2, 3 to such a degree that they assume a relative position in which the compartment 4 defines a volume that is necessary to hold the contents.

The container 1 is, as mentioned above, of a collapsing type, which means that the volume defined by the compartment 4 decreases as the container 1 is emptied of its contents.

A carrying means 6 is arranged in the connecting portion 5 at a first side of the container 1 and comprises in the shown embodiment an opening area 8 with a first, essentially round opening 9 and a second, essentially elongate opening 10. As a result, the carrying means 6 forms a handle 11 which makes it possible for a user to lift the container 1 using four fingers, while at the same time a load-absorbing portion 12 is formed between the openings 9, 10, preventing the handle 11 from being folded or deformed in some other way in the handling of the container 1. The two openings 9, 10 of the handle 11 extend at an angle of about 25° to a vertical line through the container 1. Tests have demonstrated that an angle in the range 20-30° results in good user-friendliness in the handling of the container 1.

Fig. 2, to which reference is now also made, is a top plan view of the container 1 illustrated in Figs 1a and 1b, the nearest side wall 2 being removed. Now it is possible to see the inside of a rear side wall 2, a bottom wall 3 and the design of the connecting portion 5, along which the two side walls 2 are connected with each other. In the bottom area 13 of the container 1, the side walls 2 are connected with the bottom wall 3, on the one hand via a lower connecting portion 14 along which each side wall 2 is connected with the bottom wall 3 and, on the other hand, via two lateral connecting portions 5 along which all three walls 2, 3 are connected with each other in a common welded joint. The compartment 4 of the

container 1 is thus defined by the side walls 2 and the bottom wall 3. The connecting portion 5 forms boundary lines 16 facing the compartment 4.

The compartment 4 comprises a bottom area 13 as mentioned above, a central area 17 in which boundary lines 16, facing the compartment 4, of the connecting portions 5 are parallel, and an upper arched area 18, in which the boundary lines 16 extend essentially arcuately towards each other, however, not in an outlet area 19 at a second side 20 of the container 1, which outlet area 19 will be described in more detail below. This design makes it possible for the container 1 to stand in a stable manner independently of the extent to which it is filled.

When the container 1 assumes the upright position shown in Fig. 1, the major part of the liquid contents is collected in a bottom region 21 of the container 1, said bottom region 1 being formed of the bottom area 13 and the central area 17.

The inventive container 1 also has a duct means 22, which is arranged at a distance from the bottom region 21 in said outlet area 19. Thus the duct means 22 is arranged on the second side 20 of the container 1, which is opposite to said first side 7, on which the carrying means 6 is arranged.

The duct means 22 is formed integrally with the side walls 2. More specifically, the duct means 22 is formed of a wall portion 23 of each side wall 2. Each wall portion 23 extends at an angle to a longitudinal axis of the container and thus forms a laterally extending projection of each side wall 2, and the wall portions 23 are connected with each other along their lateral edges, which are thus included in said connecting portion 5. The interconnected wall portions 23 thus forms said duct means 22 which at a first end 24 communicates with the compartments 4 of the container 1 and at a second end 25 is sealed by said connecting portion 5. Since said wall portions, and thus also the duct means, extend from the

compartment 4 at an angle to a longitudinal axis of the container 1, it is ensured that the pressure caused by the liquid contents and acting on the walls of the container is not propagated to the duct means. In the embodiment shown in Fig. 2, the duct means has an essentially perpendicular extent to said longitudinal axis. It is noteworthy that the duct means 22 consists of two wall portions 23, which are sealed along their edges and which are flexible and each have an inner surface 26, which inner surfaces in a state without actuation by said contents abut flush with each other.

To open the inventive container 1, the second end 25 of the duct means 22 is removed by cutting or like operation. Of course, such cutting can be made to form an opening with an optional angle. A thus opened container 1 is illustrated in Figs 3a and 3b.

When the inventive container 1 assumes said upright position, the liquid contents are thus collected essentially in the bottom region 21 of the compartment 4, as illustrated in Fig. 4, which is a cross-sectional view of the container 1 shown in Fig. 3a. It will be appreciated that it is possible for some of the contents to be held in the arched area 18 of the container 1 when the container 1 has not yet been emptied of its contents. The contents will act on the side walls 2 in the bottom region 21 to such an extent that the side walls are moved away from each other and consequently assume a relative position acting to increase the volume of the compartment. The arched area 18 of the compartment 4 will, however, not hold any contents - or, as mentioned above, only a small part of the contents - whereby the side walls 2 in this area strive to abut against each other, which in turn results in an increase in volume of the compartment 4. However, the increase in volume is greater than the decrease in volume, which results in the forming of a negative pressure in the compartment 4, which counteracts the increase in volume.

Fig. 5 shows an inventive container 1 which is subjected to a pouring motion, and Fig. 6 is a cross-sectional view of the container 1 illustrated in Fig. 5. The container 1 is moved from an upright position to a forwardly inclined position, and Fig. 6 shows how some of the contents has been brought to the arched area 18 of the compartment 4, whereby the resulting increase in volume in this area 18 is to some extent compensated for by a decrease in volume in the bottom region 21. The relative change in volume is adjusted in such manner that the negative pressure prevailing in the compartment 4 ceases.

Figs 7a-7c illustrate how the above-described inventive container 1 is handled for pouring liquid contents, such as milk, held in the container 1.

Fig. 7a illustrates the opened container 1 in an upright position on a base. The liquid contents are collected in said bottom region 21.

Fig. 7b shows the container 1 in a lifted state while performing a pouring motion, whereby some of the contents held in the container 1 is brought from the bottom region 21 to the arched region 18 and the associated outlet area 19. The liquid contents will be passed to the duct means 22 and thereby exert a pressure which makes the wall portions 23 of the duct means 22 and their inner surfaces 26 separate to allow pouring some of the contents into a glass 27. As some of the contents is moved from the bottom region 21 to the arched region 18 and the outlet region 19, the pressure exerted by said contents on the side walls 2 in the bottom region 21 will decrease, thus making the side walls strive to be moved towards each other, resulting in a decrease in volume of the compartment 4. This decrease in volume is relatively greater than the increase in volume taking place in said arched area 18, which results in the negative pressure prevailing in the compartment ceasing.

Having completed the pouring motion, the contents will of course no longer exert any pressure on the wall portions of the duct means, the inner surfaces 26 of the wall portions thus once more assuming the state in which they abut flush with each other.

In Fig. 7c the container 1 has once more been brought to the upright position. The contents will again be collected in said bottom region 21, which means that the contents will once more exert pressure on said side walls 2, thus resulting in an increase in volume of the compartment 4.

This increase in volume implies that a negative pressure counteracting the increase in volume is once more generated in the compartment 4. This negative pressure contracts the side walls 2 in the part of the compartment 4 that does not contain liquid contents, which part thus forms the arched area 18 of the container and may also comprise a greater or smaller part of the bottom region depending on the degree of filling of the container, and thus ensures that said side walls 2 in said part of the compartment 4 are retained in the state in which they abut each other.

The duct means 22 is adapted to be closed in response to a negative pressure generated in the compartment 4. In the embodiment shown, this means that the inner surfaces 26, abutting flush with each other, of the wall portions 23 of the duct means 22 will be pressed against one another and thus form an air-tight seal. The extent of the duct means at an angle to the longitudinal axis of the container ensures that the pressure exerted by the liquid contents on the walls of the container cannot be propagated to the duct means, which will thus not be subjected to pressure acting to open the same. As a result, a durable seal of the container 1 is obtained, which prevents ambient air from entering the compartment 4 of the container and affecting the contents thereof.

The inventive container 1 is thus durably self-sealing, which means that the need for mechanical durable sealing measures, such as sealing by means of a cap or clip, is eliminated.

For repeated pouring of the contents, it is only necessary to lift the container 1 and perform a repeated pouring motion, whereby the negative pressure ceases. The pressure exerted by the contents when performing a pouring motion then causes, as described above, a separation of the wall portions 23 of the duct means 22, thereby allowing once more the contents to be poured.

Practical experiments have demonstrated that the durable self-sealing capacity of the container 1 is essentially independent of the degree of filling of the container.

The present invention thus concerns a durably self-sealing container 1. More specifically, the container 1 comprises a duct means 22 which is openable for example, by cutting. Moreover the container 1 has flexible walls 2, 3, which during handling of the container 1 are actuated by liquid contents held in the container 1, in such manner that the volume of a compartment 4 defined by the walls 2, 3 decreases when performing a pouring motion and increases when bringing the container 1 to an upright position. Said increase in volume results in generation of a negative pressure in the compartment 4, which negative pressure counteracts the increase in volume and ensures that the open duct means 22 is sealed. The lateral extent of the duct means 22, i.e. the fact the duct means is extended at an angle to a longitudinal axis of the container, ensures that the pressure exerted by the contents on the walls of the container does not propagate to the duct means. As a result, a durable seal is ensured, which prevents air from entering the compartment 4 of the container 1 via the duct means 22 and affecting the contents thereof.

To ensure an air-tight sealing of the duct means 22 in response to a negative pressure generated in the compartment, the inner surfaces 26 of the duct means 22 have a high degree of flatness.

Fig. 8 shows another embodiment of a container 1 according to the present invention with a duct means 22 extended from the compartment 4 at an angle of less than 90° to a longitudinal axis of the container 1.

It will be appreciated that the present invention is not restricted to the shown embodiment of the inventive container 1; for instance, the duct means can be integrated in the container 1, i.e. it does not have to project from the container 1 but only from the compartment 4. Several modifications and variations are thus feasible and the invention is consequently defined exclusively by the appended claims.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A container for liquid contents, including a compartment which is defined by flexible walls and whose volume depends on the relative position of the walls, a flexible duct means which forms a connection between said compartment and the surroundings, the duct means adapted to be brought to an open state and to a closed state, and the compartment having a bottom region, in which the liquid contents are essentially collected as the container assumes an upright position, wherein

said walls, by being actuated by said contents when collected in said bottom region, are adapted to assume a relative position acting for an increase in volume of the compartment, which increase in volume is counteracted by a negative pressure generated in the compartment, and

said duct means is adapted to be brought to said closed state in response to the negative pressure generated in the compartment, and

said duct means is extended from the compartment at an angle to a longitudinal axis of the container in such a way that pressure caused by the contents and acting on the walls of the container is prevented from propagating to the duct means.

2. The container as claimed in claim 1, in which said walls include two opposite side walls which are joined along a common connecting portion and which in a non-actuated state strive to abut flush with each other.

3. The container as claimed in claim 2, in which the duct means is formed integrally with said side walls.

4. The container as claimed in claim 3, in which the duct means is formed of two projecting wall portions of the side walls, abutting flush with each other, said wall portions being joined with each other along their edges.

5. The container as claimed in any one of the preceding claims, in which the duct means has inner surfaces which face each other and are made to abut

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each other in a sealing manner when the duct means is closed in response to the negative pressure generated in the compartment.

6. The container as claimed in claim 5, in which said surfaces have a high degree of flatness.

7. The container as claimed in any one of the preceding claims, wherein the container is made of a material containing a filler of mineral material and a binder of polyolefin material.

8. The container as claimed in claim 7, in which the mineral material is chalk (calcium carbonate).

9. The container as claimed in any one of the preceding claims, in which a carrying means is arranged on a first side of the container.

10. The container as claimed in claim 8, when dependent on claim 2, in which the carrying means is arranged in said connecting portion.

11. The container as claimed in any one of the preceding claims, in which the duct means is arranged in an outlet area located on a second side of the container and at a distance from said bottom region.

12. The container as claimed in claim 11, when dependent on claim 9 or 10, in which said second side is opposite to said first side.

13. The container as claimed in any one of the preceding claims, in which the duct means is sealed in an unopened state of the container and is openable by cutting or like operation.

14. A container substantially as hereinbefore described with reference to any one of the embodiments illustrated in the accompanying drawings.

DATED: 14 December 2004
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Eco Lean Research & Development A/S

David B Fitzpatrick

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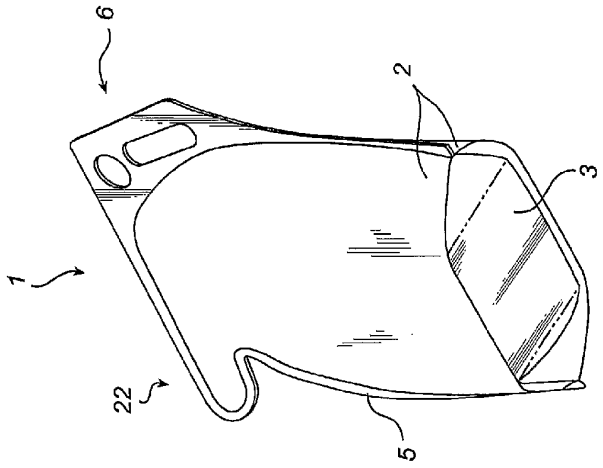

Fig. 1b

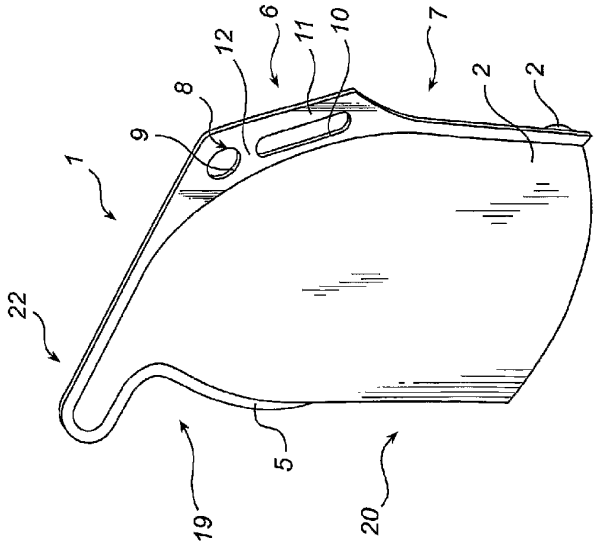

Fig. 1a

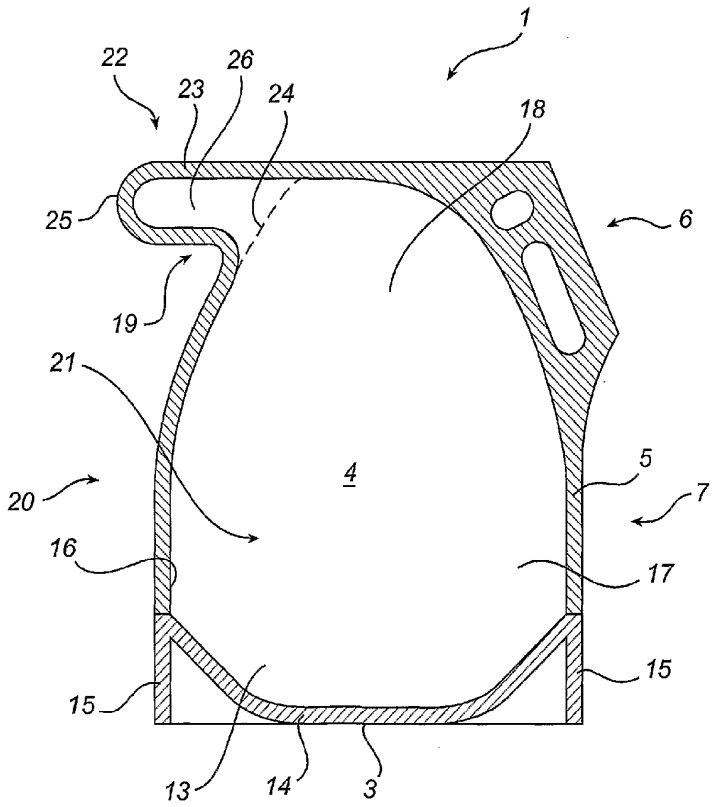

Fig. 2

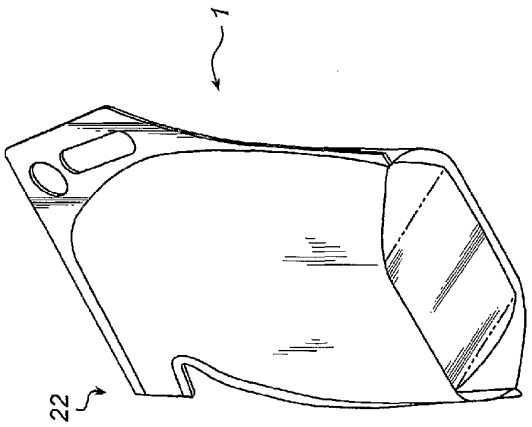

Fig. 3b

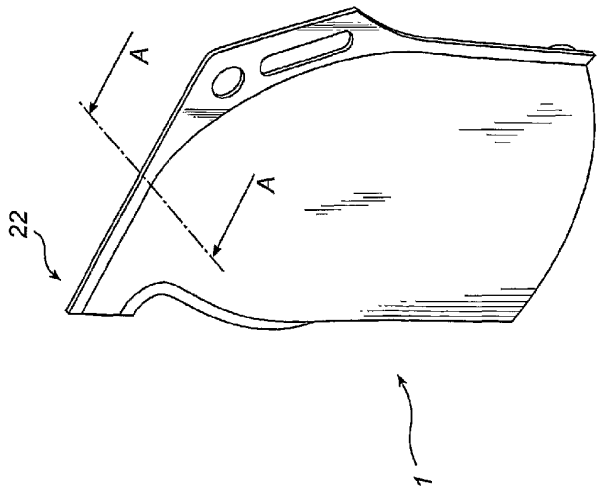

Fig. 3a

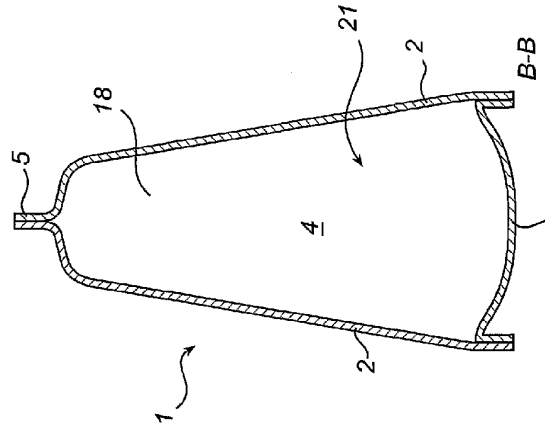

Fig. 6

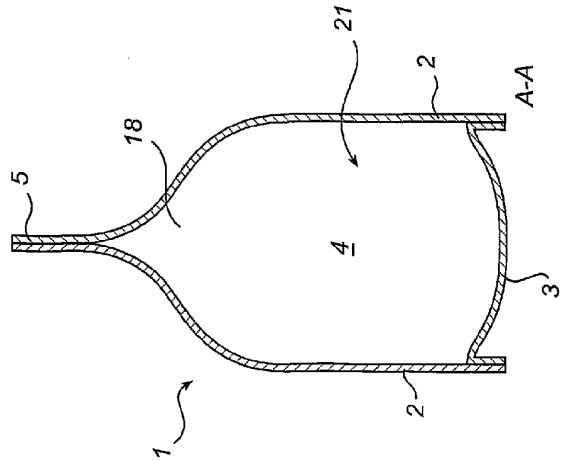

Fig. 4

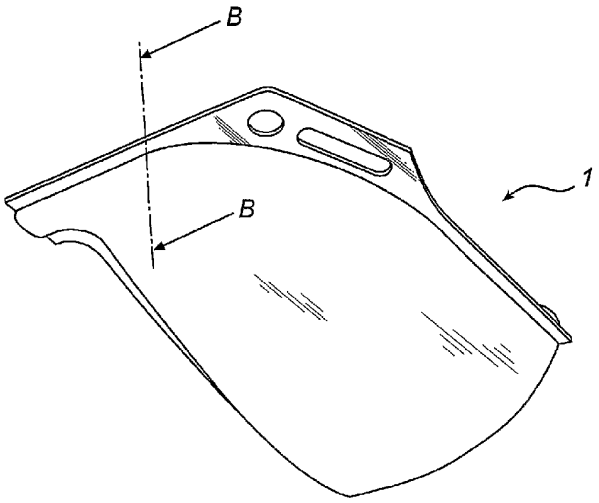

Fig. 5

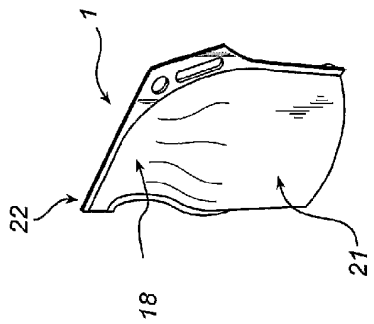

Fig. 7c

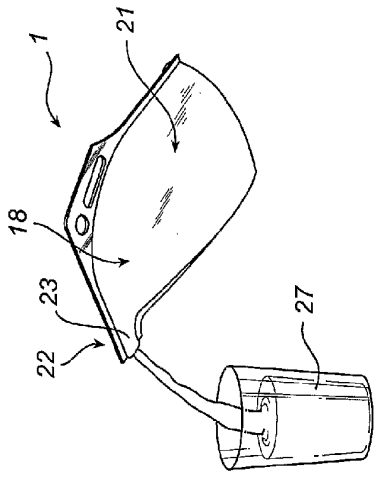

Fig. 7b

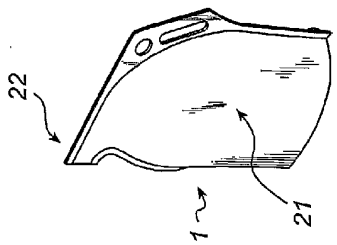

Fig. 7a

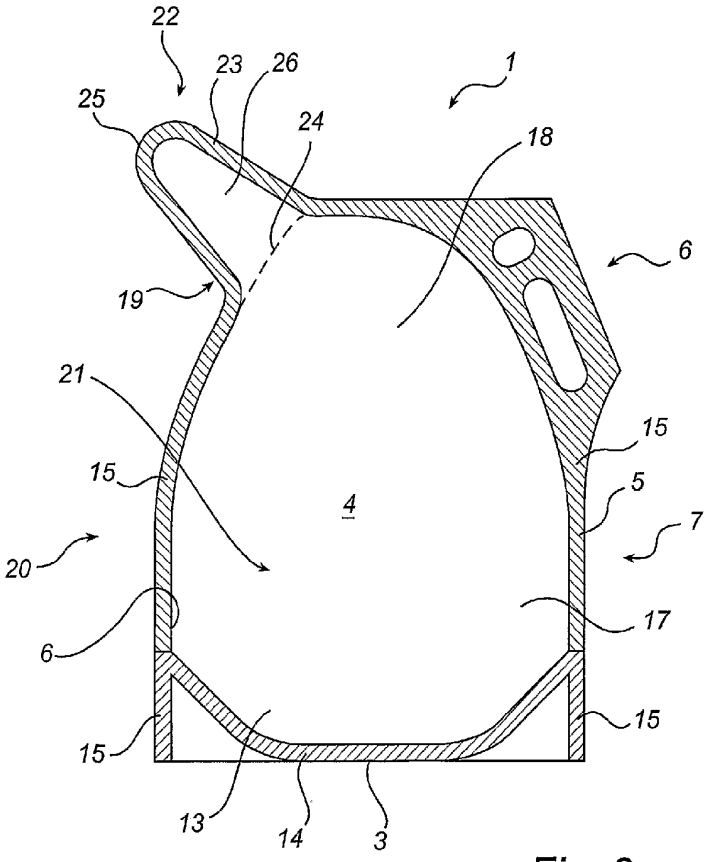

Fig. 8