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(54) Title: COLLAPSIBLE PLASTIC BOTTLE FOR WATER DISPENSERS

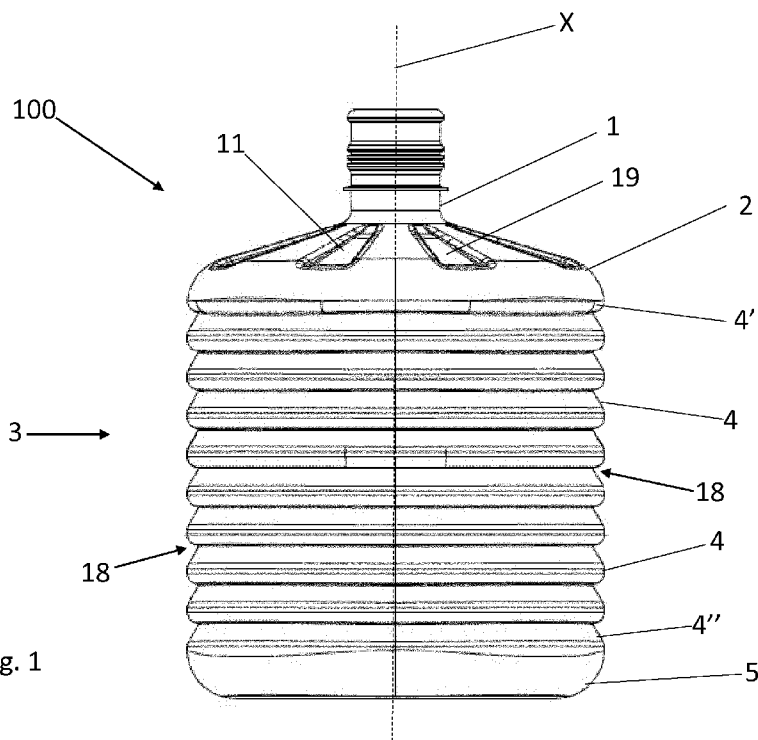


Fig. 1

(57) Abstract: A large, thin-walled, self-collapsible container (100) made of PET for water dispensers comprises a neck (1), having an opening, a shoulder (2), a bottom (5), and a central body (3) between said shoulder and said bottom. A series of parallel ribs (4) are located on the external surface of said central body (3) allowing said container (100) to collapse in a controlled manner as the water is dispensed.



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COLLAPSIBLE PLASTIC BOTTLE FOR WATER DISPENSERS

Field of the invention

The present invention relates to a large size thermoplastic container for containing
5 and distributing liquids, in particular potable liquid products.

State of the Art

Most liquids, in particular potable liquids or beverages, such as water, are typically preserved and distributed in plastic containers.

For packing and distributing water in facilities, such as offices, public buildings,
10 lounges and private homes, large size containers or bottles are used, which have capacities generally from 5 liters to 25 liters, and may be either disposable or reusable after suitable treatment.

Typically, the large bottles, in particular the 10 liter to 19 liter bottles, are used with specific dispensers, e.g. water dispensers, which can also cool the content of the
15 bottle.

Nowadays, cool water dispensers are familiar items in offices and factories and provide a convenient, readily available source of drinking water. Water dispensers generally utilize replaceable water containers made of thermoplastic materials, such as polyethylene terephthalate (PET), polycarbonate (PC), polystyrene (PS),
20 etc.

Returnable containers for water dispensers are exposed to mechanical damage during the various storage, handling and installation and removal operations, and thus a suitable wall thickness is required.

Relatively thick walls are also necessary because the container must be able to
25 sustain the external pressure while it is being emptied, before air enters into the container to replace the dispensed liquid. This problem is particularly related to containers made of PET. Furthermore, returnable containers must be properly washed before they can be used again. For these reasons, returnable containers are rather expensive, heavy, difficult to handle, and involve sanitary problems.
30 Therefore, it is not always economical to make returnable containers having thick, robust walls.

Disposable containers are also used as alternatives to reusable containers and manufacturers have a strong interest in reducing the weight of containers of this type, which are usually transported on pallets, in order to reduce the consumption of thermoplastic material, principally PET, which is chosen because of its high strength. However, designing and manufacturing effective disposable bottles with thin walls is not straightforward for large containers with capacity of more than 5 liters (L). Indeed, one of the main issues to be dealt with in designing these containers is the drop in internal pressure which occurs when the liquid flows out of the container whilst the dispenser is being operated, which could lead to an uncontrolled collapse as the container cannot resist atmospheric pressure, even for the short time needed for the air to enter into the container and fill the void left by the dispensed liquid. Typically, in these operative conditions, these containers must resist a maximum vacuum pressure in the range from 50 to 75 mbar. Resistance to this vacuum pressure is affected by various factors, such as the number and the shape of the ribs, the distribution of material, or the weight, shape, and general design of the container. The result of an uncontrolled collapse of the container can be very unappealing and cause rejection by the market. Furthermore, such large containers are disadvantageously bulky and cumbersome, even when emptied.

US 2011/0036806 discloses a small sized bottle, i.e. having a capacity of up to 2 liters, designed to collapse after being emptied in response to an axial crushing force, in particular by applying an axial compressive force and an axial rotation. In other words, the bottle is collapsed by twisting and pushing the bottle along its axis. The collapse is promoted by a concertina portion provided with a number of collapse initiators which are circumferentially staggered. This bottle is not adapted to be used with a liquid dispenser and said forces are different from the atmospheric pressure.

WO 2010007744 discloses a bottle for water dispensers which can reduce its volume due to a concertina portion between a top and bottom portion. Such document does not disclose a specific design for the concertina portion, but it teaches that the height of the bottom portion has to be 60-80% of the height of the concertina portion. However, such bottle still leaves room for further

improvements. For example, it has been noted that the concertina portion does not allow for a gradual and controlled collapse of the bottle and the bottle tends to assume its original shape mainly due to the memory of the material.

The need is therefore felt for a disposable thermoplastic container which is light and has thin walls, like those which can be achieved by using PET or another thermoplastic material having the same features, which does not suffer from the aforesaid disadvantages and which collapses during emptying in a controlled manner.

Brief description of the invention

It is thus an object of the present invention to provide a light thermoplastic container, in particular a large PET bottle, especially of capacity of more than 5 liters, which overcomes the problems associated with the drop of internal pressure, or vacuum pressure, during the dispensing of the liquid, and which reduces its external shape and overall volume in a gradual, regular and substantially permanent manner.

These objects are achieved by means of a self-collapsible container according to claim 1, made of PET, adapted to be filled with a liquid and to be and to be used in an upside-down position with a potable liquid dispenser, having a capacity of at least 5 liters, defining a longitudinal axis X and comprising:

- a) a neck with an opening for pouring the liquid,
- b) a shoulder,
- c) a bottom,
- d) a central body, between said shoulder and said bottom,

wherein the central body is provided with a plurality of adjacent ribs substantially parallel to a plane perpendicular to said longitudinal axis, each of said ribs having

- a first flank proximal to the neck, with a first straight portion,
- a second flank distal to the neck, with a second straight portion,
- a crest between the first and second flank with a first rounded portion,
- a concave root portion joining two adjacent ribs,

wherein the first straight portion of a rib and the second straight portion of the adjacent rib facing the first straight portion form a first angle C comprised between 70° and 90°;

the concave root portion has a first radius of curvature B comprised between 0,2 and a 1 mm;

the maximum dimension P, measured along a line perpendicularly crossing the longitudinal axis X, between the crest and the concave root portion, is comprised
5 between 5 mm and 8 mm;

the second straight portion is shorter than the first straight portion 6;

and wherein a line Y perpendicular to the longitudinal axis X and passing through the concave root portion divides the first angle C into a second angle C1 defined by the second straight portion and the line Y, and a third angle C2 defined by the
10 first straight portion and said line Y, the second angle C1 being smaller than the third angle C2,

whereby during use, as the liquid flows out of the container by means of the dispenser, the container gradually collapses axially reducing its volume with respect to its original shape, the collapsing occurring as result of the force
15 generated by atmospheric pressure due to the difference between external and internal pressure.

Preferably, the capacity of a container of the invention is in the ranges from 5 liters to 25 liters, for example from 10 liters to 19 liters.

Preferably, the radius of curvature A is comprised between 4 mm and 8 mm, more
20 preferably between 5 mm and 7 mm.

Preferably, the radius of curvature B is comprised between 0,4 mm and 0,6 mm.

Preferably, the angle C is comprised between 72° and 80°, or between 72° and 76°

Preferably, the ratio C2/C1, i.e. between the third angle C2 and the second angle C1, is between 2,5 and 5,5, more preferably between 3,5 and 4,5, for example
25 about 4.

Preferably, the length of proximal, or first, straight portion is at least four or at least five or at least six times greater than the length of the distal, or second straight portion; Best results are obtained when the length of the proximal straight portion is at least five times, preferably about six times, the length of the distal straight
30 portion.

Preferably, the maximum dimension P is comprised between 6 mm and 7 mm.

Preferably, the crest further comprises a third straight portion, adjacent to the first rounded portion, and a second rounded portion, between the third straight portion and the second flank.

5 Preferably, from 85 to 95 % of the longitudinal height of the central body is provided with ribs.

Preferably, the ratio Weight/Volume of the container without taking into account the weight of the neck, is between 6,5 and 9, where the weight is in grams and the volume is in liters. This means that the walls are very thin.

10 Preferably, the wall thickness of the central body is between 0,10 and 0,20 mm, although it can be lower than 0,10 mm. Such a thin wall thickness contributes to allow a controlled, gradual collapse effect as liquid is emptied from the container.

The wall thickness can be substantially constant, or can vary from 0,10 to 0,20 mm going from the rib adjacent to the shoulder to the rib adjacent to the base. Such increase in wall thickness can be gradual or not. For example, the half of the
15 central body proximal to the neck can have a wall thickness which is 50-60% of the wall thickness of the half of the central body distal from the neck, e.g. 0,10 and 0,20 mm, respectively.

Preferably, the central body is the lightest portion of the container, and preferably also the largest.

20 The present invention overcomes the problems of the prior art by taking advantage of the vacuum pressure itself. Indeed, it is designed not to resist said pressure, but to collapse in a controlled, gradual manner during the drop of internal pressure caused by the dispensing of the liquid therein contained. In other words, when the water flows out of a container according to the invention, the latter collapses in a
25 controlled manner. Advantageously, upon depletion, the container shrinks to an external volume which is less than 20-25% of its original volume, i.e. when it was substantially full of water.

In particular, the container of the invention collapses vertically along its longitudinal axis as the water flows out, thus reducing its height by virtue of the particular
30 design of the ribs which allow the container to collapse in a controlled manner. The volume reduction of the container is advantageously permanent, since the container can recover its original shape only if an external pulling, i.e. traction force

is applied. In other words, the possible recovery is not because of the shape-memory of the thermoplastic material. This permanent deformation is mainly due to the particular design of the ribs, which can get stuck into each other, and is not possible with the prior art containers with a concertina portion.

- 5 In particular when mounted in an upside down position on a conventional water dispenser, i.e. with the neck pointing downwards, in order to compensate for the variation of internal pressure in the container due to the portion of liquid dispensed from the container, the container will gradually collapse, the collapsing occurring as result of the force generated by atmospheric pressure due to the difference
10 between external and internal pressure, thus reducing only the upper portion void of the liquid, and therefore only the longitudinal height of the container, in a controlled manner, while the part of the container proximal to the neck, which still contains the liquid, maintains its shape.

Preferably, the collapsing occurs only as result of the force generated by
15 atmospheric pressure due to the difference between external and internal pressure.

Advantageously, the collapsing of the container is gradual, or sequential, i.e. the collapsing starts at the rib which is adjacent to the bottom, then occurs at the adjacent one, and so forth, the motion becoming continuous as the water is
20 dispensed, and this movement will continue until the collapsing of the rib adjacent to the shoulder.

A self-collapsible container according to the invention is lighter, and has thinner walls than the typical non-collapsible container which has to resist the vacuum pressure. As a non limitative example, the weight of a 12 liters bottle can be of 135
25 g or less, where such weight takes into account the weight of the neck. The collapsible containers according to the invention are light in weight particularly due to their design which allows the use of thin walls while achieving excellent operational performances. Advantageously, these containers can be placed in cardboard boxes to be transported. Furthermore, being light in weight, these
30 containers allow a high cost reduction of the polymeric material: at least 50% less polymer is used than in the designs of containers with walls made to resist vacuum pressure. Another advantage of a light-weight-self-collapsible container is the

reduction in energy consumption and the lower amount of plastic which needs to be recycled, thus reducing its impact on environment.

Advantageously, the use of thermoplastic materials such as PET allows to obtain peripheral walls which are thinner than those reachable by most other plastic materials.

Therefore, the self-collapsible container of the invention is preferably made of PET and is particularly suitable for potable liquids or beverages. Furthermore, it is particularly suitable for water dispensers..

The ribs of a container of the embodiments illustrated in the following description have the same shape, i.e. the same profile on their projection on a plane coplanar with the longitudinal axis of the container. The only exceptions are the rib adjacent to the shoulder and the rib adjacent to the bottom, as described below.

The shape of the ribs can be the same or vary from one embodiment to another.

Furthermore, in other embodiments not illustrated, all the ribs, i.e. also the rib adjacent to the shoulder and the rib adjacent to the bottom, can have identical shape, without departing from the scope of the invention.

Preferably, but not necessarily, the shoulder is provided with a plurality of grooves. These grooves, seen from a top view, have substantially radial extension, and extend inward in a direction along the longitudinal axis X towards the bottom of the container.

Advantageously, these grooves permit to use less material while preserving structural stiffness of the container.

According to an embodiment, the envelope of the crests and roots of the ribs is cylindrical. The shoulder, central body, and bottom can have a circular, substantially square or polygonal cross section on planes orthogonal to the longitudinal axis, or combination thereof, for example, but not exclusively, square with rounded angles bottom and central body, and substantially circular shoulder.

Preferably, when the cross section is substantially square, or square with rounded, the wall thickness at the corners, or angles, of each rib, is greater than the remainder of the rib.

According to another embodiment, the envelope of the crests and roots of the ribs is frustoconical or frustopyramidal. Advantageously, this configuration facilitates

the collapse of the container in a controlled manner because the larger surface area of the bottom, which is the highest point of the container mounted on a water dispenser will collapse more easily onto the successive rib, thus facilitating the collapse of each rib onto the adjacent lower one.

- 5 The shoulder, central body, and bottom can have a circular, substantially square or polygonal cross section on planes orthogonal to the longitudinal axis, or combination thereof, for example, but not exclusively, square with rounded angles bottom and central body, and substantially circular shoulder.

Brief description of the figures

- 10 Further features and advantages of the invention will be more apparent in light of the detailed description of preferred, but not exclusive, embodiments of a container, preferably, but not exclusively, made of PET, suitable for a water dispenser and having a ribbed profile in section on a plane coplanar with the longitudinal axis of the container, which allow a controlled, gradual collapse as the
15 liquid flows out of the container, illustrated by way of non-limiting example, with the aid of the following figures, in which:

Fig. 1 shows a front view of a water container according to a first embodiment of the invention;

- Fig. 2 shows a cross section profile, on a plane coplanar with the longitudinal axis,
20 of a first detail of the container of Fig. 1;

Figs 3a and 3b show respectively a cross section profile, similar to Fig. 2, of a second and a third detail of the container of Fig. 1;

Figs. 4 shows a top view of the container according to Fig. 1;

- Fig. 5a and 5b show respectively a perspective and top view of a container
25 according to a second embodiment of the invention;

Fig. 6a and 6b show respectively a front and top view of a container according to a third embodiment of the invention;

Fig. 7a and 7b show respectively a front and top view of a container according to a fourth embodiment of the invention;

- 30 Fig. 8a and 8b show respectively a front and top view of a container according to a fifth embodiment of the invention;

Fig. 9a and 9b show respectively a front and top view of a container according to a sixth embodiment of the invention;

The same reference numerals and letters in the figures identify the same elements or components.

5 Description in detail of preferred embodiments of the invention

A self-collapsible container for water dispensers according to the invention is illustrated in Fig. 1. The container 100 defines a longitudinal axis X, and comprises a neck 1 connected to a shoulder 2, which leads to a central body 3, and ends with a bottom 5, with a base defining a base plane.

10 The controlled collapse of the container 100 is due to a plurality of adjacent ribs 4, 4', 4'' made on the central body 3. The ribs adjacent to the shoulder 2 and to the bottom 5 are indicated by reference numeral 4' and 4'' respectively. The shape of the ribs 4, 4', 4'', and the shape of the container, is appropriately designed to allow a gradual, controlled collapse in longitudinal direction only and to have a smaller
15 overall volume after emptying. It is well known to everyone that these containers are mounted on water dispensers with the neck turned downwards and in order to achieve a controlled collapse of the container the water level, while the water is dispensed through the neck substantially by gravity, must always remain as close to the bottom 5 as possible, the collapse starting at the rib 4' adjacent to the
20 bottom 5 and sequentially involving the lower adjacent ribs.

For this purpose, the shape of the profile of the ribs 4, 4', 4'' in a section made on a plane coplanar with the longitudinal axis X is very important.

Fig. 1 shows a container having a preferred shape of the ribs. The geometrical shape of the ribs 4, is shown in details in Fig. 2. All the ribs 4 have the same size
25 and shape.

Referring to the projection on a plane, in particular on a plane coplanar with the longitudinal axis X, starting from its top, i.e. from a point proximal to the neck 1, each rib 4 comprises a proximal, or first, straight portion 6 or flank, a proximal curved or rounded portion 10, a central straight portion 9, a distal curved portion
30 12, a distal, or second, straight portion 7 or flank, and a connection curved portion 8, or concave root. The proximal curved portion 10, central straight portion 9, and distal curved portion 12 define a crest. The proximal straight portion 6 and the

proximal curved portion 10 are proximal to the neck. The distal straight portion 7 and the distal curved portion 12 are distal to the neck. The distal straight portion 7 is shorter than the proximal straight portion 6. The connection curved portion 8 connects the distal straight portion 7 of a first rib with the proximal straight portion 6 of a second rib, adjacent to the first rib, thus defining a peripheral groove 18. In particular, the distal straight portion of the first rib faces the proximal straight portion of the second rib. The proximal curved portion 10 has a radius of curvature indicated by reference letter A, and the connecting curved portion 8 has a radius of curvature indicated by reference letter B. The proximal straight portion 6 is sloped so that its end proximal to the neck is closer to the longitudinal axis X, and the distal straight portion 7 is sloped so that its end distal to the neck is closer to the longitudinal axis X, so that the width of the groove 18 decreases in a direction parallel to the longitudinal axis from the external wall of central body 3 towards the longitudinal axis.

The proximal straight portion 6 of a first rib and the distal straight portion 7 of a second rib, which is adjacent to the first rib, define an angle C, which is the angle of aperture of the peripheral groove 18. In particular, the angle C is defined by the distal straight portion of a first rib and the proximal straight portion of a second rib facing each other. Part of the groove 18 has a V-shaped profile having the apex pointing towards the longitudinal axis X, and being rounded. In particular, the apex is the concave root.

Furthermore, a line Y, which is perpendicular to the longitudinal axis X and passes through the point of the connection curved portion 8 which is closest to the longitudinal axis X divides the angle C into two unequal angles C1 and C2. The angle C1 defined by the lower edge, i.e. the distal straight portion 7, of the first rib and the line Y is smaller than the angle C2 defined by the upper edge, i.e. the proximal straight portion 6, of the second rib and the line Y. In other words, the angle C1 is the minor angle and the angle C2 is the major angle.

The depth P of each rib is defined as the dimension, measured along a line orthogonally crossing the longitudinal axis X, between the line parallel to the longitudinal axis X and tangent the farthest point from said axis of the crest, and

the line parallel to the longitudinal axis X and tangent to the closest point from said axis of the concave root 8.

Referring to Fig. 3a, the rib 4' adjacent to the shoulder 2 has a central straight portion 9', which is adjacent to the shoulder 2, a distal curved portion 12', a distal straight portion 7', and a connection curved portion 8' having the same shape of the central straight portion 9, distal curved portion 12, distal straight portion 7, and connection curved portion 8, respectively.

Referring to Fig. 3b, the rib 4'' adjacent to the bottom 5, has a proximal straight portion 6', a proximal curved portion 10', and a central straight portion 9'' having the same shape of the proximal straight portion 6, proximal curved portion 10, and central straight portion 9 respectively, the central straight portion 9'' being adjacent to the bottom 5.

In general, the radius of curvature B of the connection curved portion 8 must be kept small in order to obtain a good self-collapsing of the container 100. There is more freedom for the radius of curvature A, instead.

Preferably, the ranges of the different parameters of the ribs are:

Radius of curvature A: comprised between 4 mm and 8 mm, preferably between 5 mm and 7 mm.

Radius of curvature B: comprised between 0,2 mm and 1 mm, preferably between 0,4 mm and 0,6 mm.

Angle C: comprised between 70° and 90°, preferably between 72° and 80°.

Ratio C2/C1: comprised between 2,5 and 5,5, preferably between 3,5 and 4,5.

Depth P: comprised between 5 mm and 8 mm, preferably between 6 mm and 7 mm.

Preferably, the length of proximal, or first, straight portion 6 is at least four or at least five times than the length of the distal, or second straight portion 7; More preferably, the length of the proximal straight portion 6 is about six times the length of the distal straight portion 7.

Furthermore, the radius of curvature of the distal curved portion 12 is preferably between 5 and 7 mm.

This configuration of the ribs allows the container to collapse in a controlled manner during emptying by effect of the vacuum pressure and without applying

any external additional force. The controlled collapse is also due to the thin wall and the special shape of the ribs, without needing to use any other additional feature to facilitate the start of the collapse. The wall thickness of the central body of the container is preferably between 0,10 and 0,20 mm. The bottom 5, being the highest point of the container mounted on a water dispenser, will collapse onto the successive rib 4", which, in turn, will collapse on the adjacent one, the motion becoming continuous as the water is dispensed, and this movement will continue until the group of collapsed ribs reaches the shoulder 2.

Other important aspects must be considered in designing the container to have the best controlled self-collapsing effect, besides the shape of the ribs. Having defined and keeping constant the geometry of the ribs, another aspect is the geometrical shape of the container.

According to this embodiment, the envelope of the crests and roots of the ribs is cylindrical. Further embodiments are described below, such containers being substantially similar or identical to the container of Fig. 1, except from the envelope of the crests and roots of the ribs and from the cross section.

Fig. 4 shows that the container 100 has shoulder 2, central body 3 and bottom 5 having cross section, orthogonal to the longitudinal axis X, which is square with rounded angles. Furthermore, the shoulder 2 is provided with a plurality of grooves 19. The grooves 19, seen from a top view, have substantially radially extension, end extend inward in a direction along the longitudinal axis X towards the bottom.

Figs. 5a and 5b show a container 200 with shoulder 22, central body 32 and bottom 52 having a cross section, orthogonal to the longitudinal axis X, which is quatrefoil-shaped. This shape permits to divide the container into four connected sections. The shoulder 22 is also provided with grooves 29, similar to grooves 19. This cross sectional shape is the only difference with the previously described embodiment, shown in Figs. 1-4.

Figs. 6a and 6b show a container 300 with central body 33 and bottom 53 having a cross section, orthogonal to the longitudinal axis X, which is square with rounded angles, the shoulder 23 having substantially circular cross sectional shape. The top portion, proximal to the neck, of shoulder 23 is in this embodiment is

undulated. The cross sectional shape and the undulated shoulder are the only differences with the previously described embodiment, shown in Figs. 1-4.

According to a preferred embodiment, shown in Figs. 7a and 7b, the central body 34 has a generally frustoconical shape along the longitudinal axis X, i.e. the envelope of the crests and roots of the ribs is frustoconical, the conicity decreasing from the bottom 54 to the neck 14.

The container 400 has bottom 54 and shoulder 24 having a cross section, orthogonal to the longitudinal axis X, which is square with rounded angles, the central body 34 having substantially circular cross sectional shape.

The shape of the ribs is the same as the previously described embodiment, shown in Figs. 1-4.

Furthermore, the shoulder 24 is provided with a plurality of grooves 49 similar to the grooves 19.

Figs. 8a and 8b show a container 500 with shoulder 25, central body 35 and bottom 55 having a cross section, orthogonal to the longitudinal axis X, which is quatrefoil-shaped. This cross sectional shape is the only difference with the previously described embodiment shown in Figs. 7a and 7b.

Figs 9a and 9b show a container 600 with shoulder 26, central body 36 and bottom 56 having a cross section, orthogonal to the longitudinal axis X, which is substantially circular. The top portion, i.e. proximal to the neck 16, of the shoulder 26 is undulated. This cross sectional shape, and the undulated shoulder are the only differences with the previously described embodiment shown in Figs. 7a and 7b.

All the containers of the invention can have shoulder, central body, and bottom having a circular, substantially square or polygonal cross section on planes orthogonal to the longitudinal axis, or combination thereof.

The invention is described with particular reference to some specific embodiments but it is worth stressing that other embodiments are possible without departing from the spirit of the invention, which is a large-volume thin-walled container for water dispensers with parallel ribs having a particular shape which allows the collapse of the container, through the collapse of each rib, starting from the bottom, successively on the lower adjacent one in a continuous motion as the

water is dispensed, this movement continuing until the container has been emptied and the group of collapsed ribs reaches the shoulder.

Claims

1. Self-collapsible container (100) made of PET, adapted to be filled with a liquid and to be used in an upside-down position with a potable liquid dispenser, the container having a capacity of at least 5 liters, defining a longitudinal axis (X) and comprising:
- a) a neck (1) with an opening for pouring the liquid,
 - b) a shoulder (2),
 - c) a bottom (5),
 - d) a central body (3), between said shoulder (2) and said bottom (5),
- wherein the central body (3) is provided with a plurality of adjacent ribs (4) substantially parallel to a plane perpendicular to said longitudinal axis (X), each of said ribs (4) having
- a first flank proximal to the neck (1), with a first straight portion (6),
 - a second flank distal to the neck (1), with a second straight portion (7),
 - a crest between the first and second flank with a first rounded portion (10),
 - a concave root portion (8) joining two adjacent ribs, wherein the first straight portion (6) of a rib and the second straight portion (7) of the adjacent rib facing the first straight portion (6) form a first angle (C) comprised between 70° and 90°;
- the concave root portion (8) has a first radius of curvature (B) comprised between 0,2 and a 1 mm;
- the maximum dimension (P), measured along a line perpendicularly crossing the longitudinal axis (X), between the crest and the concave root portion (8), is comprised between 5 mm and 8 mm;
- the second straight portion (7) is shorter than the first straight portion (6);
- and wherein a line (Y) perpendicular to the longitudinal axis (X) and passing through the concave root portion (8) divides the first angle (C) into a second angle (C1) defined by the second straight portion (7) and the line (Y), and a third angle (C2) defined by the first straight portion (6) and said line (Y), the second angle (C1) being smaller than the third angle (C2),
- whereby during use, as the liquid flows out of the container, said container gradually collapses axially reducing its volume with respect to its original shape,

the collapsing occurring as result of the force generated by atmospheric pressure due to the difference between external and internal pressure.

2. Self-collapsible container (100) according to claim 1 having a Weight/Volume ratio, without taking into account the weight of the neck, comprised between 6,5 and 9, where the weight is in grams and the volume is in liters.

3. Self-collapsible container (100) according to claim 1 or 2, wherein the central body (3) has a wall thickness comprised between 0,1 mm and 0,2 mm.

4. Self-collapsible container (100) according to anyone of the preceding claims, wherein the ratio C2/C1 is comprised between 2,5 and 5,5, preferably between 3,5 and 4,5.

5. Self-collapsible container (100) according to anyone of the preceding claims, wherein the first straight portion (6) has a first length, and the second straight portion (7) has a second length, and wherein the first length is at least five times the length of the second length.

6. Self-collapsible container (100) according to anyone of the preceding claims wherein the first rounded portion has a second radius of curvature (A) comprised between 4 mm and 8 mm.

7. Self-collapsible container (100) according to claim 6, wherein the second radius of curvature (A) is comprised between 5 mm and 7 mm.

8. Self-collapsible container (100) according to anyone of the preceding claims, wherein the first radius of curvature (B) is comprised between 0,4 mm and 0,6 mm.

9. Self-collapsible container (100) according to anyone of the preceding claims, wherein the first angle (C) is comprised between 72° and 80°.

10. Self-collapsible container (100) according to anyone of the preceding claims wherein the maximum dimension (P) is comprised between 6 mm and 7 mm.

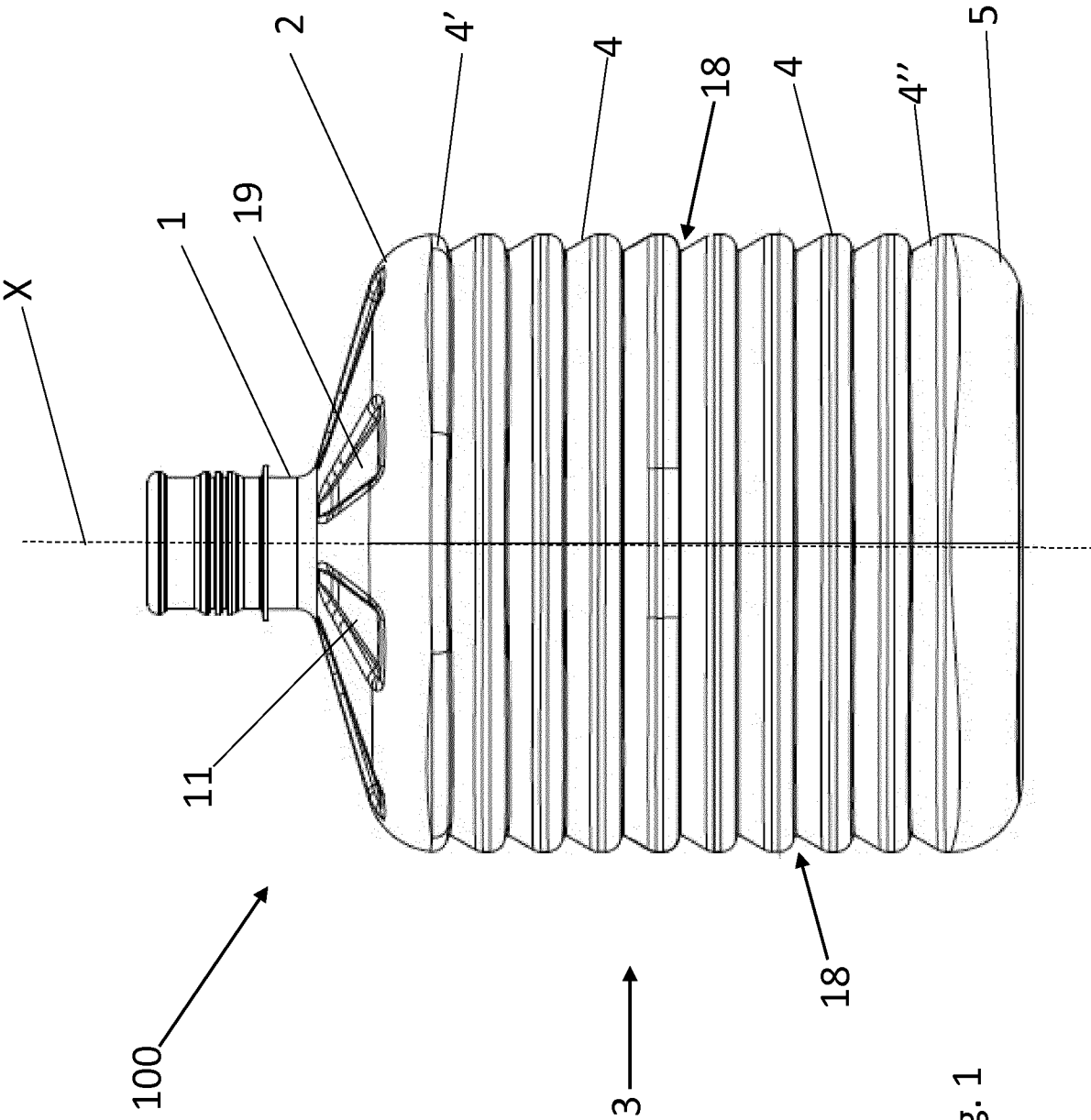
11. Self-collapsible container (100) according to anyone of the preceding claims, wherein the crest further comprises a third straight portion (9), adjacent to the first rounded portion (10), and a second rounded portion (12), between the third straight portion (9) and the second flank.

12. Self-collapsible container (100) according to anyone of the preceding claims, wherein an envelope of the crests and roots of the ribs has a generally frustoconical or frustopyramidal shape.

5 13. Self-collapsible container according to claim 12 wherein the bottom, central body, and shoulder have a cross section, orthogonal to the longitudinal axis (X), which is substantially square.

14. Self-collapsible container according to anyone of the preceding claims having a capacity comprised between 10 liters and 19 liters.

10 15. Self-collapsible container according to anyone of the preceding claims, wherein from 85 to 95 % of the longitudinal height of the central body is provided with ribs.



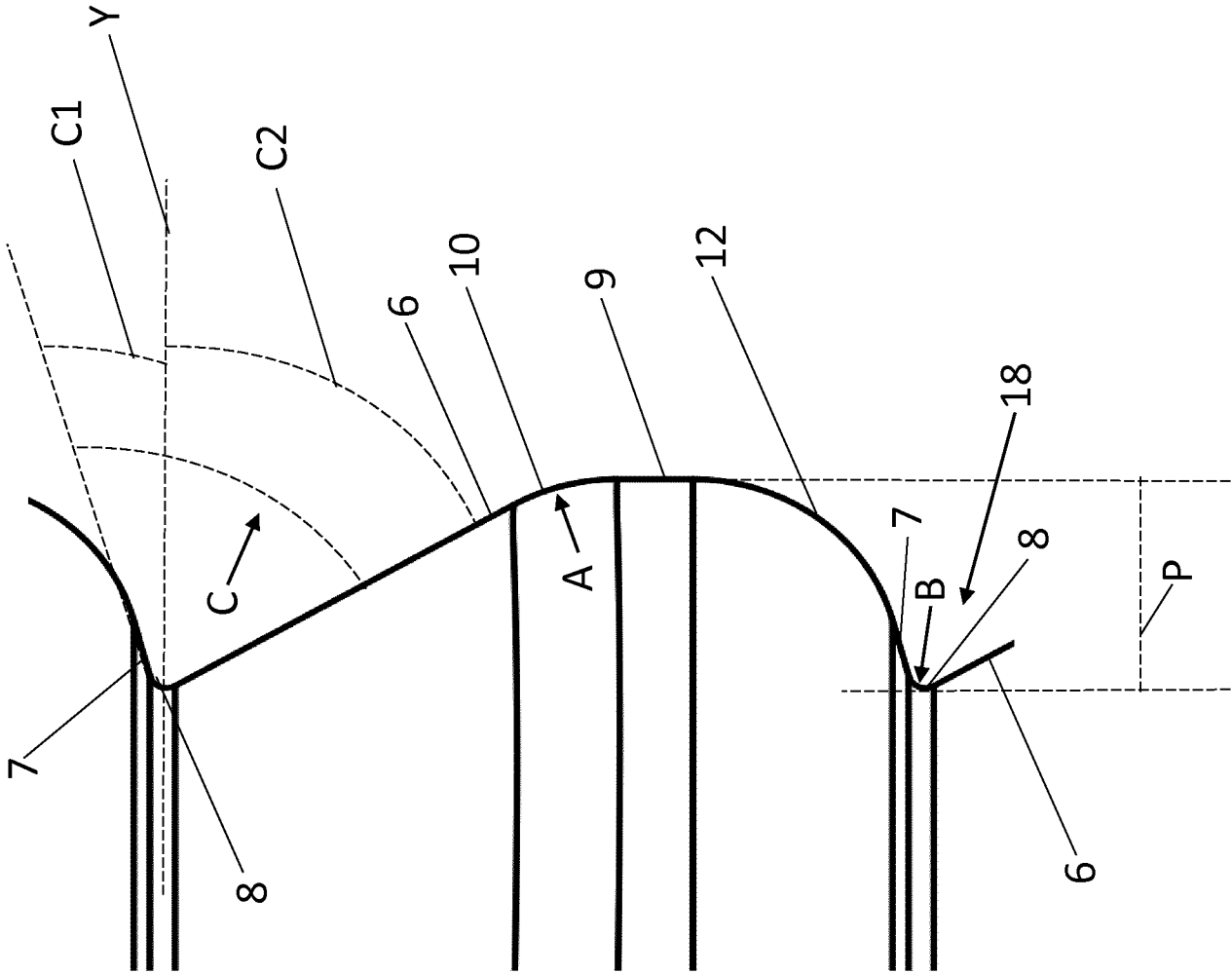


Fig. 2

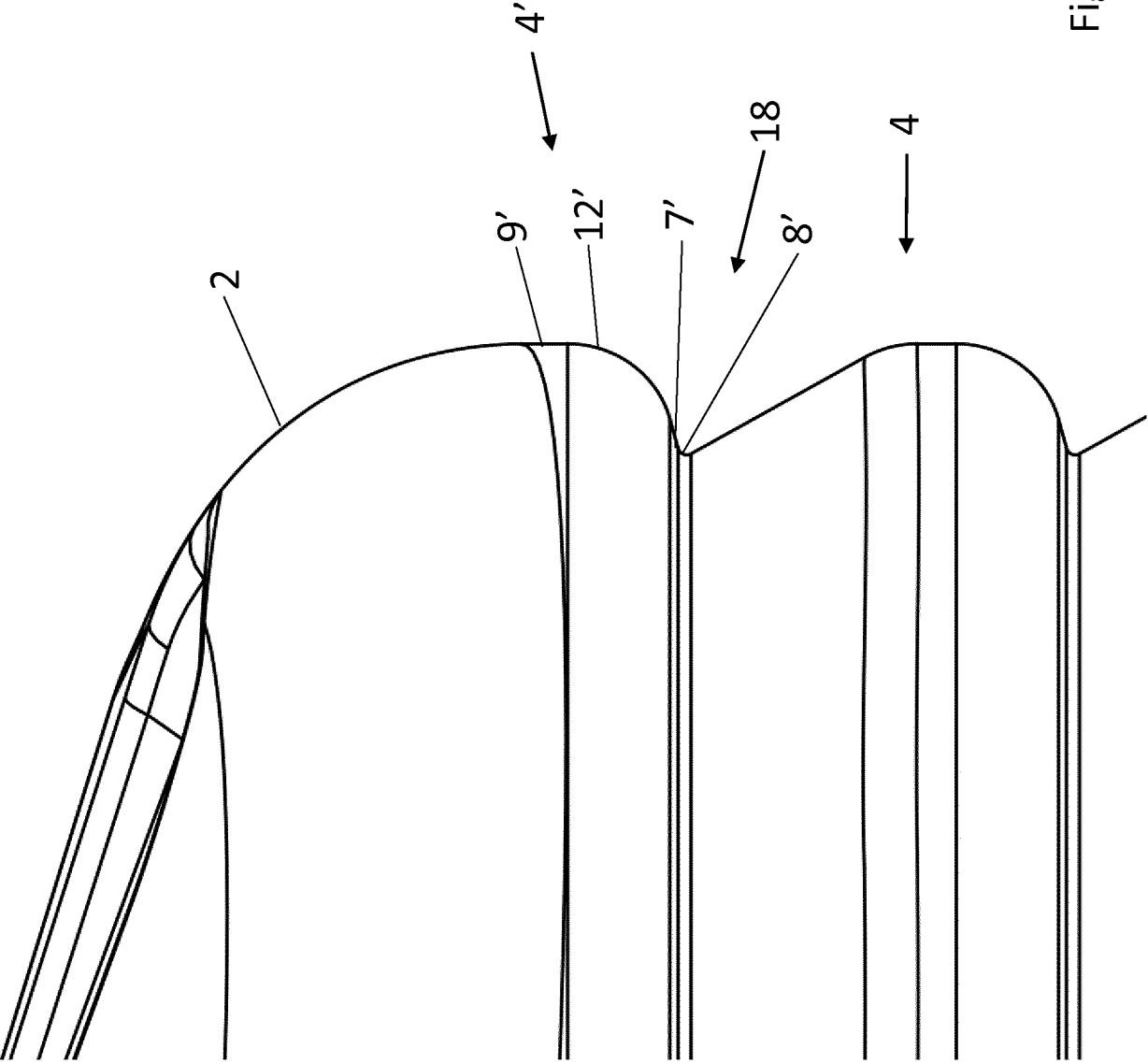


Fig. 3a

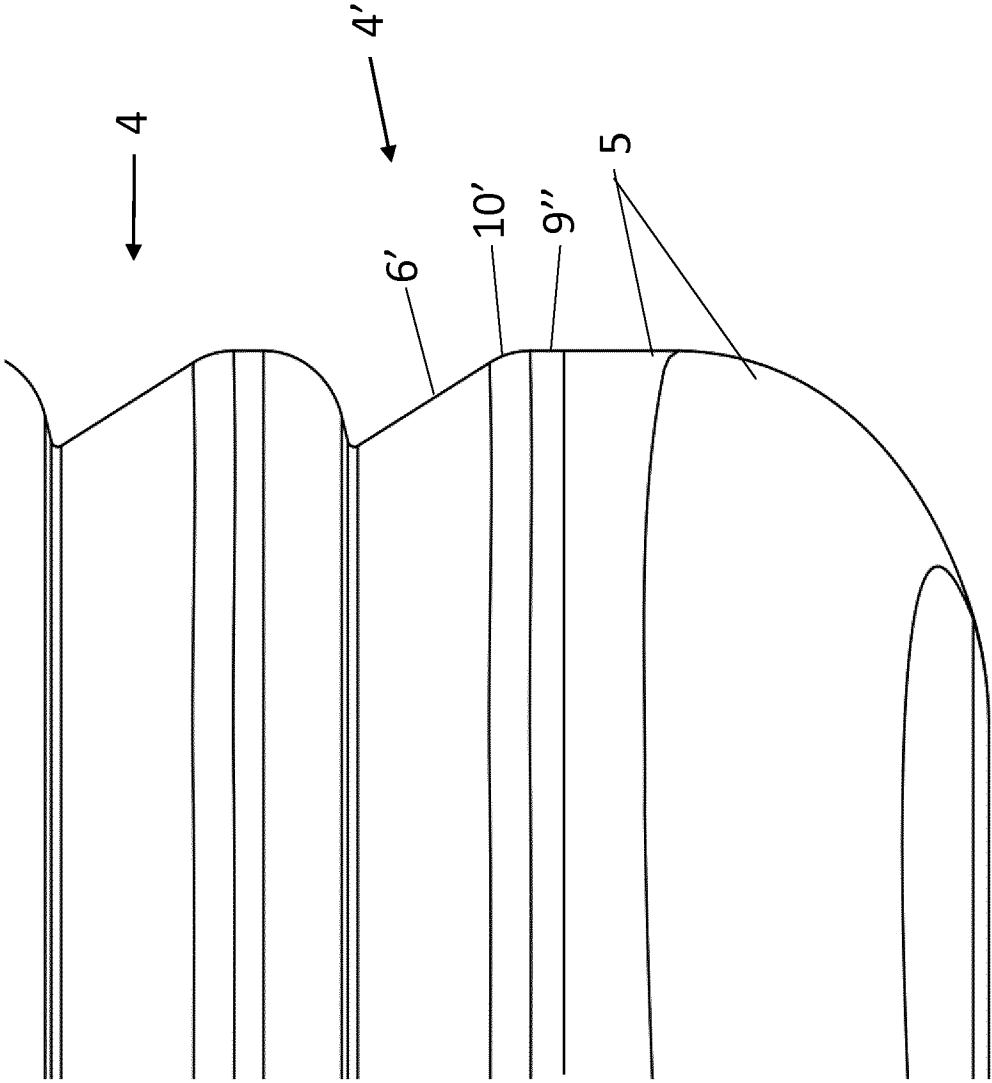


Fig. 3b

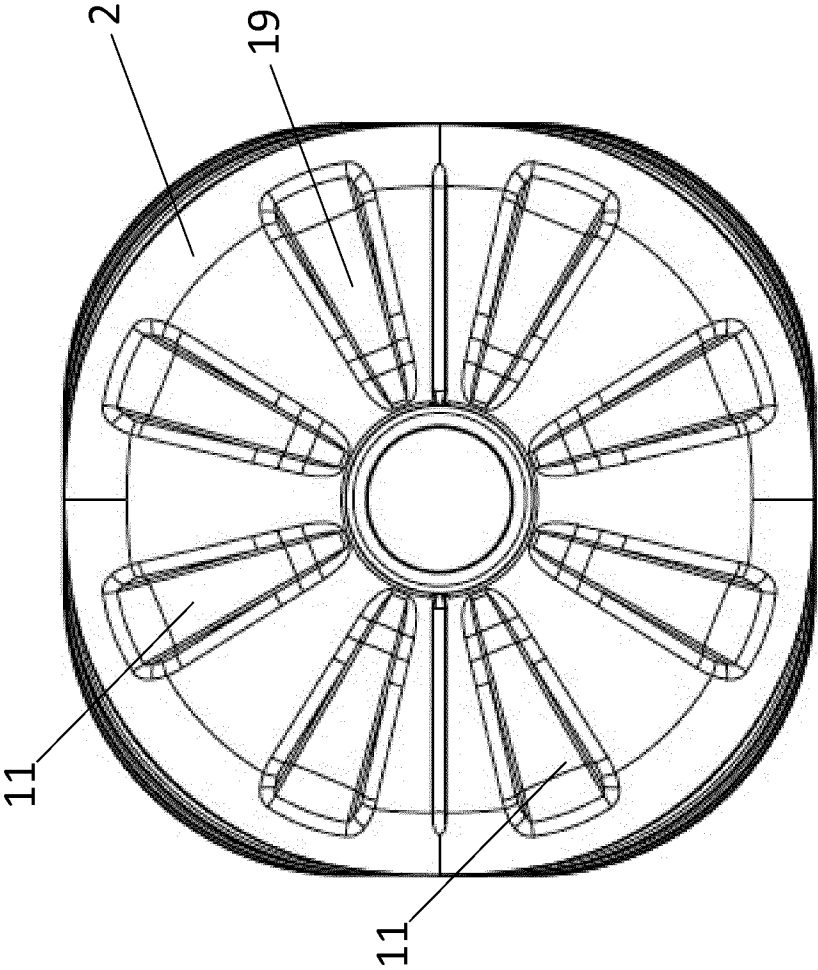


Fig. 4

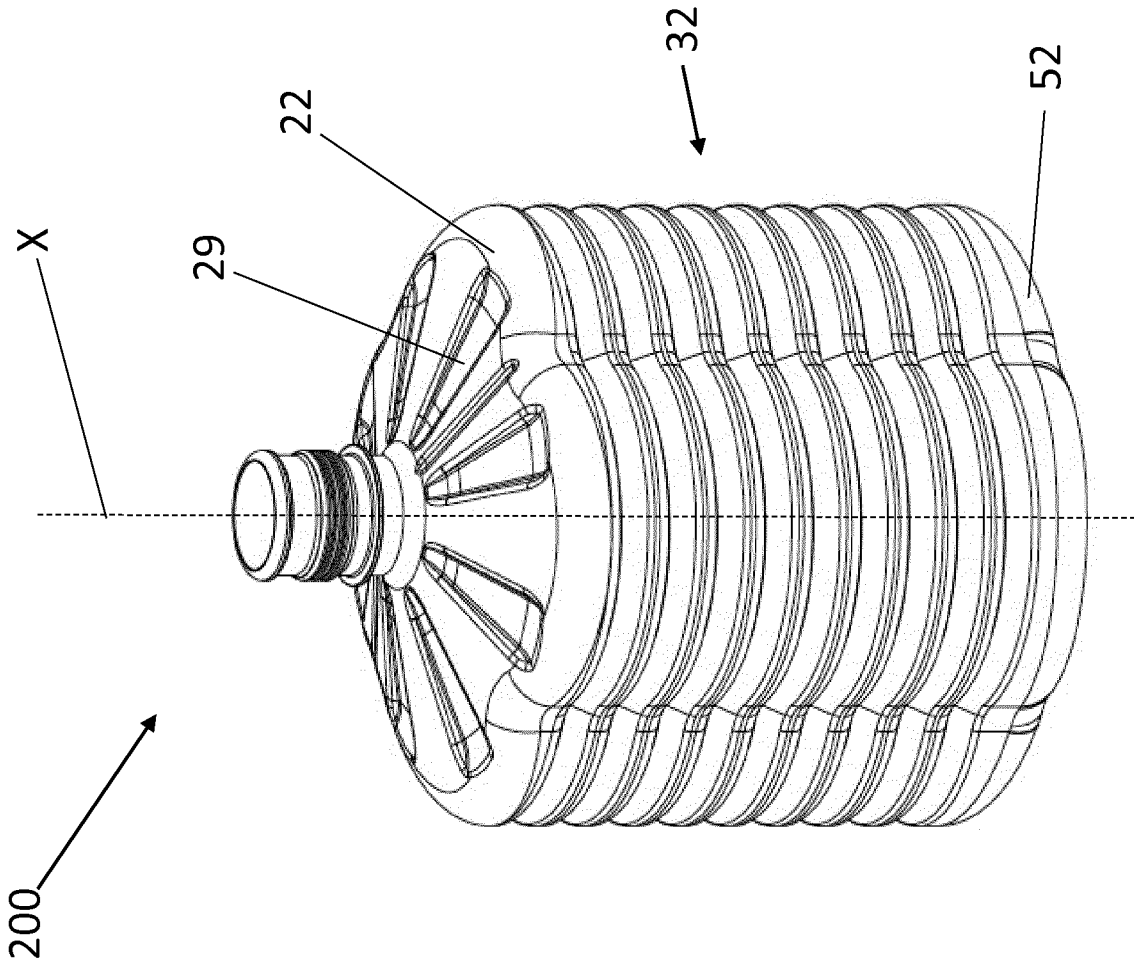


Fig. 5a

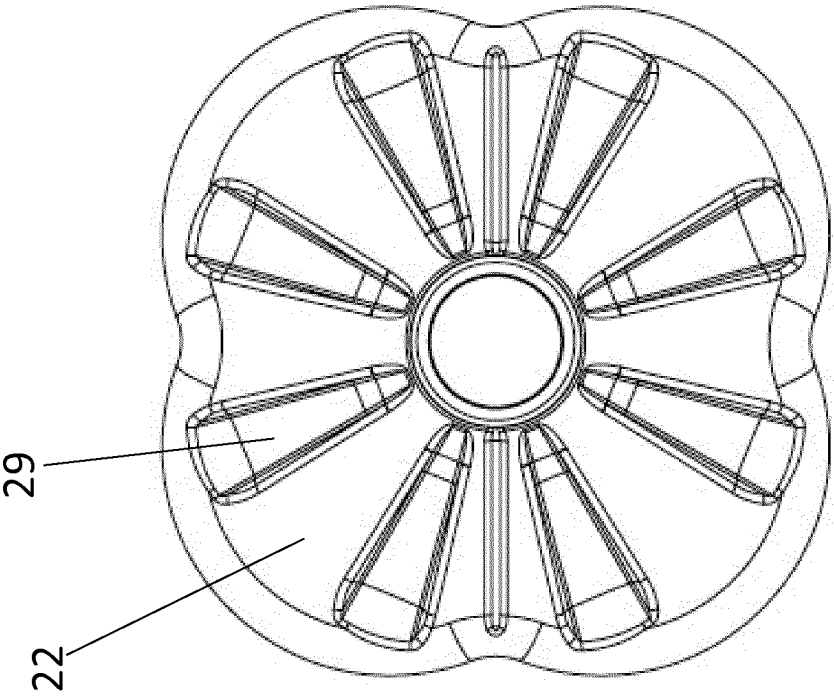


Fig. 5b

Fig. 6b

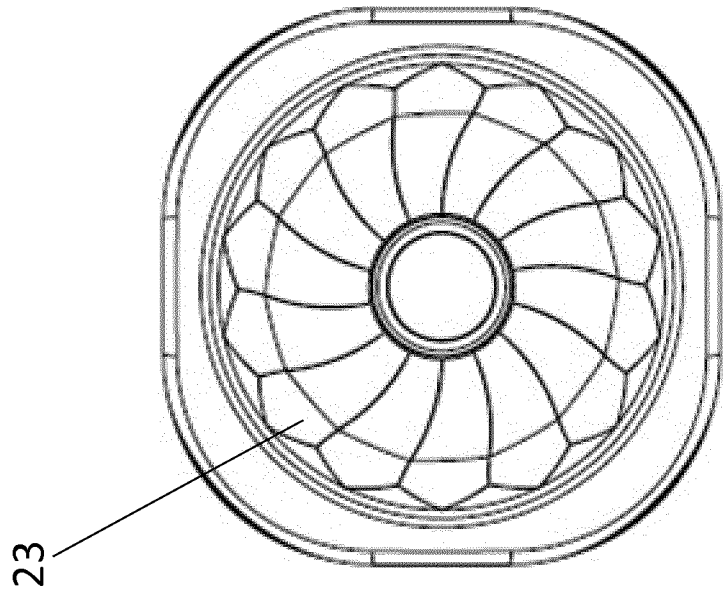
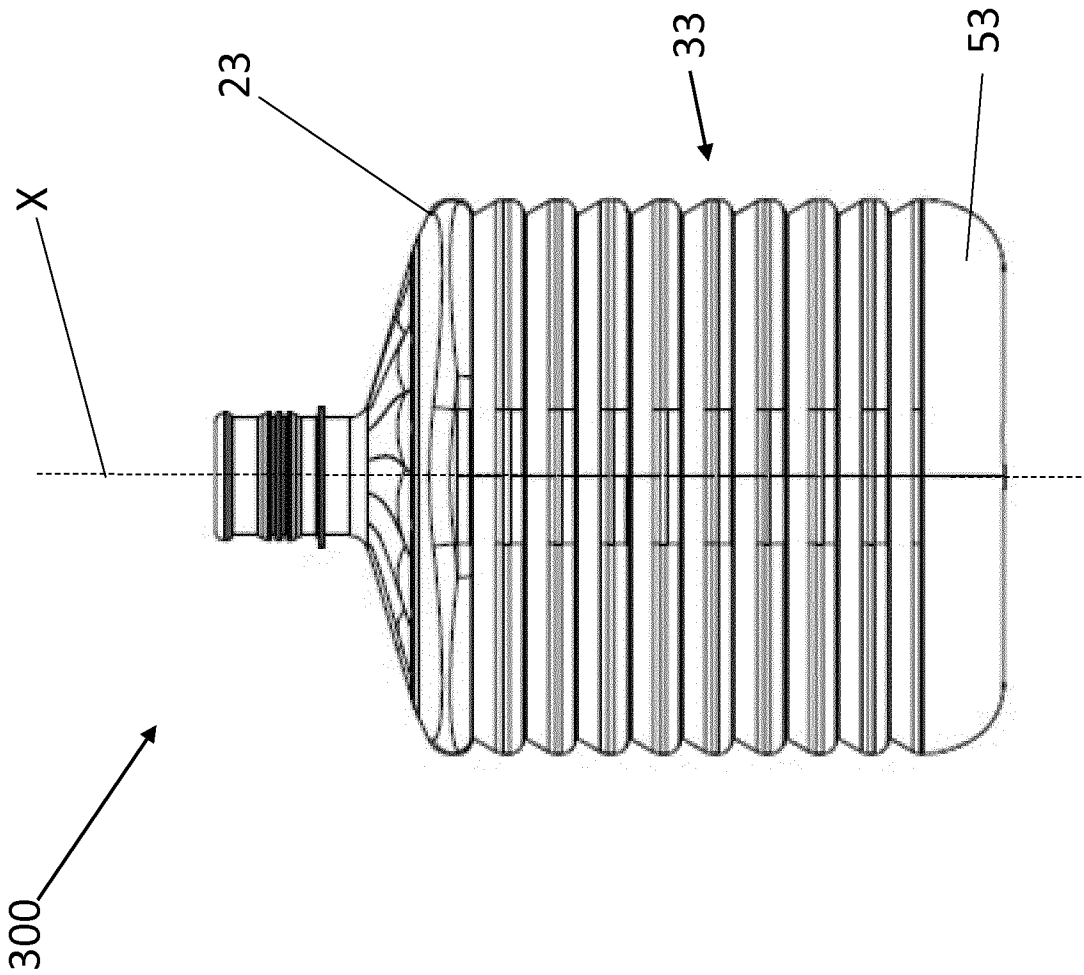


Fig. 6a



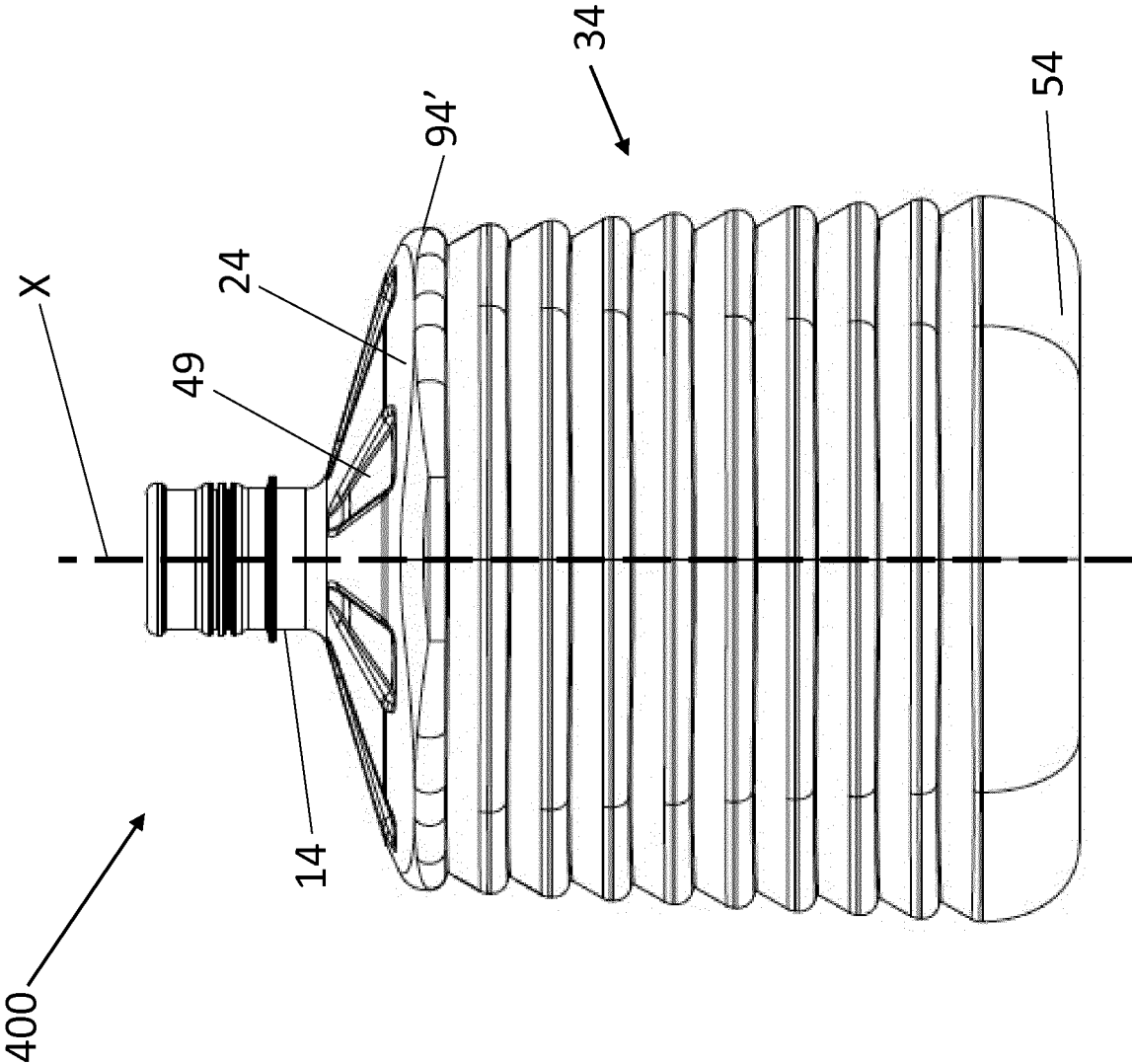


Fig. 7a

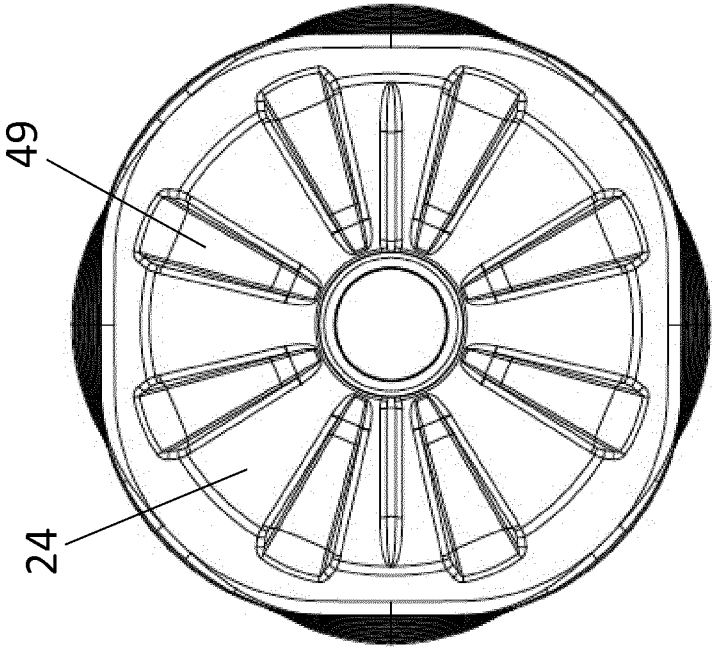


Fig. 7b

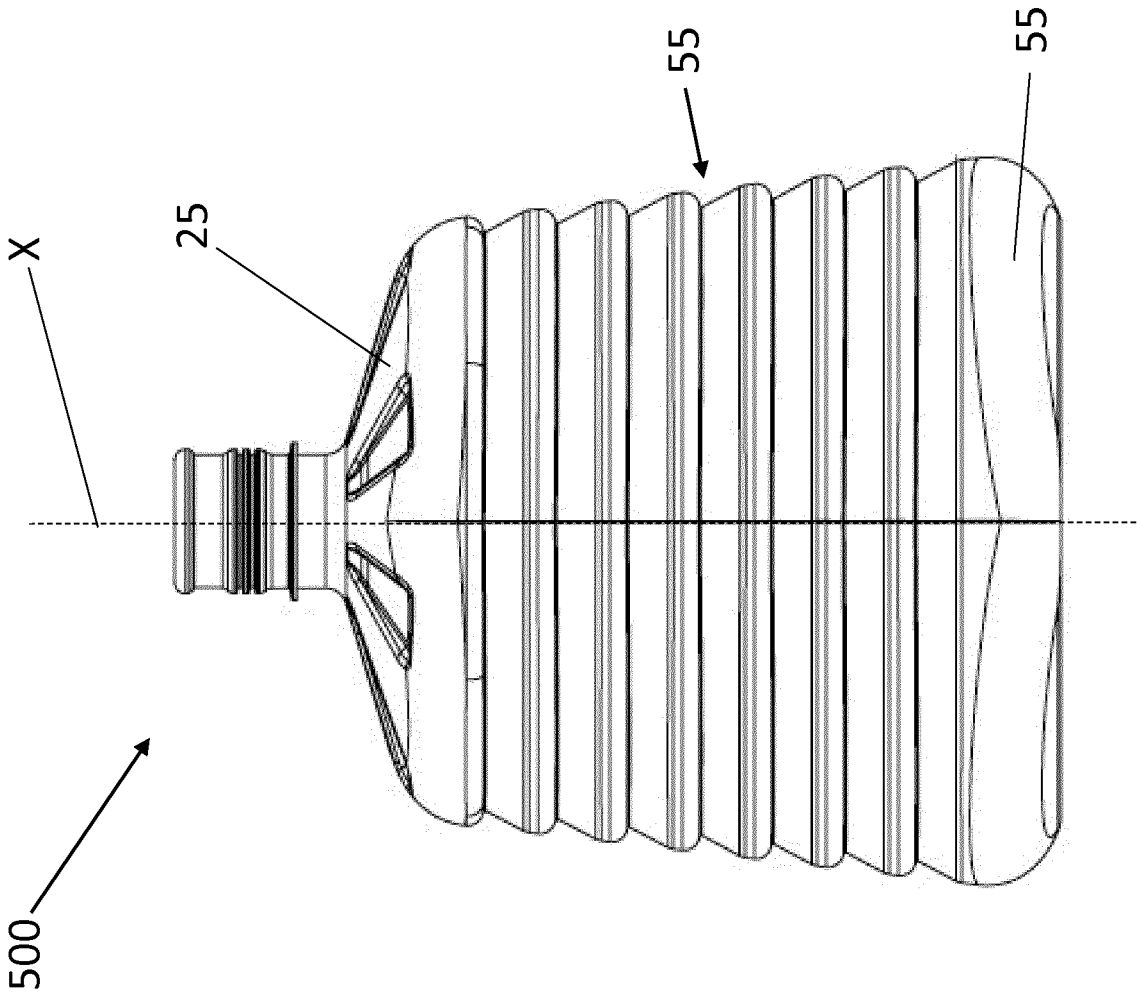


Fig. 8a

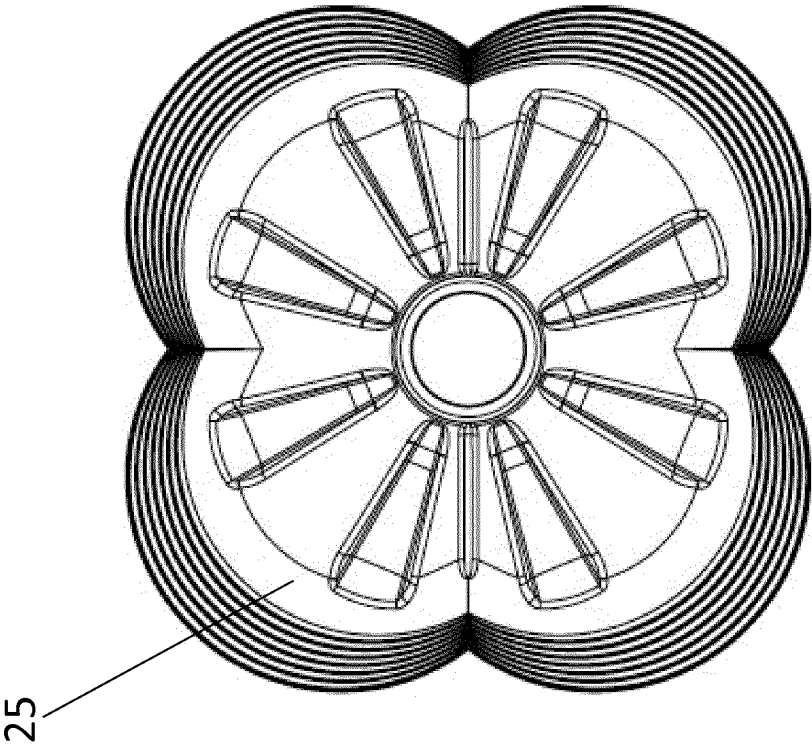


Fig. 8b

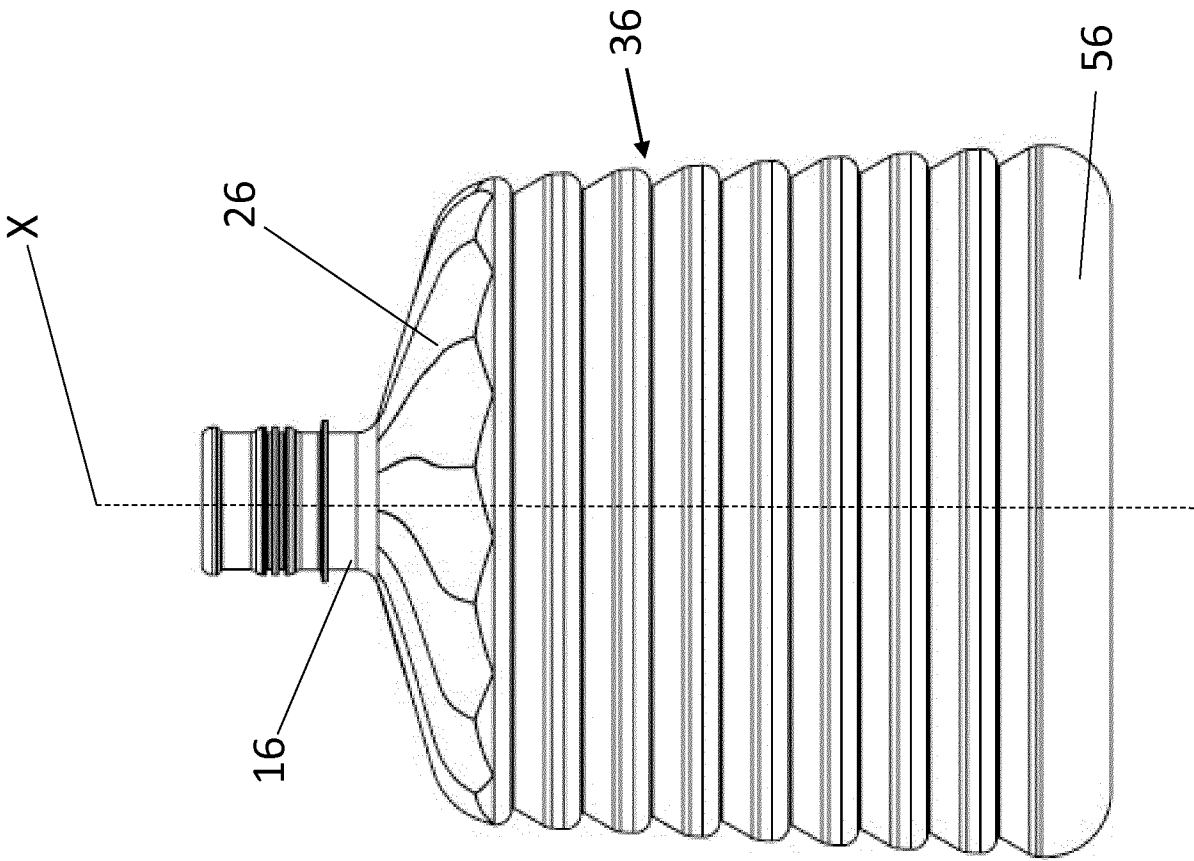


Fig. 9a

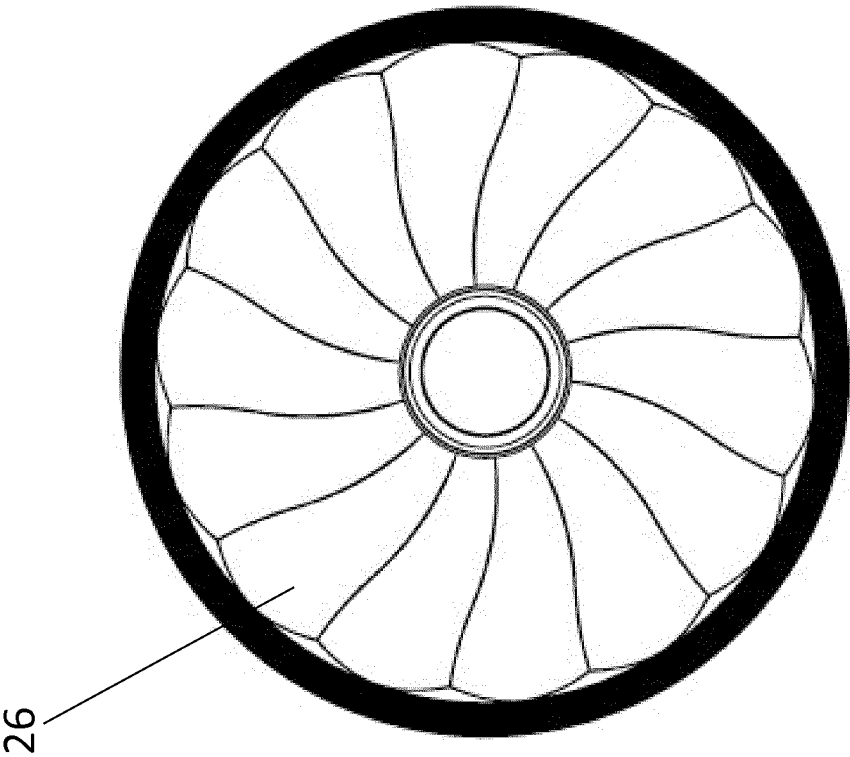


Fig. 9b

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/072871

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B65D1/02
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2010/007744 A1 (WATER DIRECT CO LTD [JP]; AWAI HIDERO [JP]) 21 January 2010 (2010-01-21) the whole document	1-15
A	WO 2014/101956 A1 (EVIAN SAEME SA [FR]) 3 July 2014 (2014-07-03) abstract; claims; figures Big bottle for dispensing units	1-15
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A	US 4 492 313 A (TOUZANI WILLIAM [US]) 8 January 1985 (1985-01-08) the whole document	1-15
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Date of the actual completion of the international search

7 January 2016

Date of mailing of the international search report

18/01/2016

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Authorized officer

Dederichs, August

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/072871

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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International application No

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