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(54) **Title**: MULTIPURPOSE FOLDABLE FLEXIBLE BOTTLE

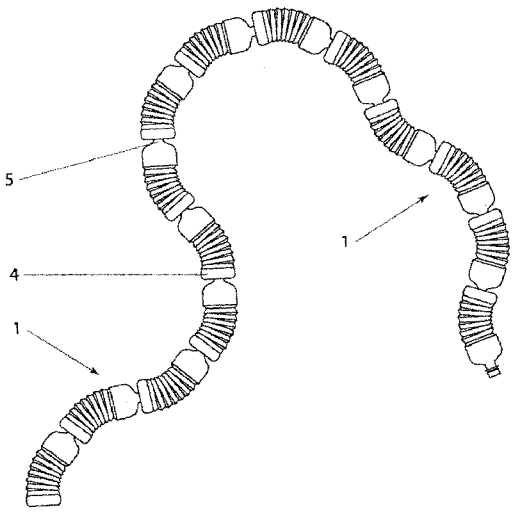

Fig. 7

(57) **Abstract**: The invention relates to a multipurpose foldable flexible bottle (1) comprising a self- enclosed, flexible side wall defining an inside space and forming a body of revolution, a neck arranged to adjoin the side wall of the bottle (1) and having at least one mouth (5), and a base (4) arranged to terminate the bottom of the bottle (1). At least one fold is arranged in the side wall perpendicular to the axis of rotation of the bottle (1). Each fold is constituted by two conical surfaces arranged at an obtuse angle relative to each other, where the conical surfaces are of different size. The adjacent conical surfaces are joined along a rim, and each fold is connected to neighbouring folds and to the side wall by articulation edges formed from the material of the fold itself. The invention is essentially characterised by that each fold is adapted to be self-retaining in a force- fit manner, and has two stable positions of equilibrium, where the fold may be brought from one stable position of equilibrium to the other by folding the neck (1) and/or the base (4) of the bottle in a direction perpendicular to the axis of rotation, and/or by pushing or pulling the neck or the base in the direction of the axis of rotation, thereby snapping in the smaller-sized conical surface under the larger-sized conical surface or snapping out the smaller-sized conical surface from under the larger-sized conical surface at least along a portion of the rim. The invention is further characterised by that the mouth (5) and the recess comprise connection elements providing the releasable interconnection of two bottles (1).

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Multipurpose foldable flexible bottle

The invention relates to a multipurpose foldable flexible bottle comprising a self-enclosed, flexible side wall defining an inside space and forming a body of revolution, a neck arranged to adjoin the side wall of the bottle and having a mouth, and a base comprising a recess adapted for receiving the mouth and extending into the inside space of the bottle, where the base is arranged to terminate the bottom of the bottle. At least one fold is arranged in the side wall perpendicular to the axis of rotation of the bottle. Each individual fold is constituted by two conical surfaces arranged at an obtuse angle relative to each other, where the conical surfaces are of different size, and adjoin each other along a rim. Each fold is connected to neighbouring folds and to the side wall by articulation edges formed from the material of the fold itself.

More and more plastic or plastic coated containers or bottles are manufactured nowadays for storing various liquids, particularly soft drinks. Bottles made from polyethylene-terephthalate, the so-called "PET bottles" have become especially widespread. Each year sees an increase in the production volumes of these PET bottles that pose significant difficulties of post-use recycling or reuse. However, due to the strict regulations governing food products the reuse of multi-use PET bottles is a costly and often unprofitable undertaking and is therefore losing ground. Selective collection or sorting is required for the recycling of single-use, throwaway bottles. Since the high volume of used bottles causes significant problems of storage and disposal, it is preferable to collect and store these bottles in a compressed or collapsed state.

The prior art contains devices for the mechanical or heat-induced compression or collapsing of bottles. These solutions, however, have not become widespread in practice because of their high material demand, high costs, and in specific cases due to their cumbersome use.

The prior art also includes plastic bottles that can be folded after use. Such a bottle is disclosed for example in patent specification EP 0408929 B1. The volume of these bottles may only be reduced to a relatively small extent, and they are usually not suitable for storing carbonated soft drinks.

Plastic bottles having a bellows-like configuration comprising adjacent folds on their side wall are also known from the prior art. In case of these types of bottle each fold is constituted by two opposing surfaces. By pushing on the bottles applying a relatively small axial-direction force the fold surfaces may be pushed one inside the other and thereby the volume of the bottles may be reduced. As the bottle is folded by compression, the inside volume of the bottle may be reduced to correspond to the amount of drink contained in it, and after the bottle has been emptied it may be compressed to a very small volume.

US patent No. 4,492,313 discloses a collapsible bottle. The side wall of the bottle capable of receiving foods and beverages has a bellows-like configuration. The pleated wall is made up of folds having a larger and a smaller surface that are joined together. The bellows-like side wall can be halfway or fully collapsed without using an external implement. To prevent the folded side wall from returning into its initial unfolded state (to prevent recovery) a smooth-walled cup is pulled over the bottom portion of the bottle, with the inside diameter of the cup being substantially equal to the largest diameter of the pleated side wall in the unfolded state of the bottle. When the bottle is collapsed, the diameter of the collapsed folds of the pleated wall slightly increases, and the folds are firmly pressed to the cup wall. Thereby the friction force between the folds and the cup wall prevents the folds from recovering into their original state.

A pleated plastic container that is foldable and can be stored in a minimum space is disclosed in the document US 5,584,413. The bottle has a bellows-like pleated side wall, a neck connected to the side wall, and a base portion. A recess is disposed in the inside surface of the base that in the collapsed state of the bottle can fittingly engage a protrusion disposed on the neck.

US patent No. 5,002,193 relates to a collapsible bottle comprising handle means. The base and neck portions of the bottle are connected by a bellows-like pleated side wall. The pleats or folds are composed of smaller and larger conical surfaces that are pressed one into another when the bottle is folded in the axial direction, thereby reducing the inside volume of the bottle. A circular groove is formed between each two adjacent folds with a diameter smaller than the diameter of the juncture of the adjacent folds. Two non-adjacent grooves of the bottle receive clips of handle means, where the clips are connected by a grip. The handle means prevents the side wall of the bottle from getting folded in the section between the clips, and also

prevents collapsed side wall sections below and above the handle means from returning to their initial state.

US patent No. 6,598,755 discloses a disposable, collapsible bottle. The side walls of the bottle have an accordion-like structure comprising several adjacent folds. Each fold has two opposed surfaces of different size. The smaller fold surface has an arced configuration, the convexity of the surface being directed towards the adjacent larger surface against which it collapses. To hold the collapsed folds in a stable position the adjoining rims of the folds as well as the rims of the bottle adjoining the side wall are reinforced by cylindrical ring portions.

The document US 3,301,293 discloses a collapsible container. The container has a flexible wall having a bellows-like structure comprising several pleats. The container may be partially or fully collapsed by compressing a part or all of the pleats. Grooves and tongues disposed on adjacent pleats interlock with each other to create a positive connection and thereby retain the pleats and also the container in their collapsed position.

A disadvantage of the above solutions is that the collapsed folds cannot safely retain their compressed state, or in other words the folds have only one state of equilibrium. The bottles thereby return to their original state sooner or later after hey have been collapsed. The prior art solutions described in detail above aim at providing additional means or mechanisms that prevent the recovery of folds or pleats after they already have been compressed.

European patent EP 1,706,326 relates to a collapsible plastic bottle having accordion-like pleated side wall. The folds or pleats have curved bottom and upper surfaces, where one of the surfaces comprises embossed or stamped stiffenings. A positioning recess or depression is disposed in the base of the bottle to facilitate stacking. This positioning recess is capable of retaining a bottle stack in vertical position, but cannot withstand loads other than tensile and compressive loads.

The objective of the present invention is to provide a foldable flexible bottle that circumvents the above mentioned disadvantages. The bottle according to the present invention retains its collapsed or folded state without the application of any additional means. A further objective of the invention is to provide other possible applications for the bottle in addition to the storage of liquids.

The objective of the invention is fulfilled by providing a foldable bottle configuration described in the introductory paragraph where each fold is adapted to be

self-retaining in a force-fit manner, and has two stable positions of equilibrium, where the fold may be brought from one stable position of equilibrium to the other by folding the neck and/or the base of the bottle in a direction perpendicular to the axis of rotation, and/or by pushing or pulling the neck or the base in the direction of the axis of rotation, thereby snapping in the smaller-sized conical surface under the other, larger-sized conical surface or snapping out the smaller-sized conical surface from under the larger-sized conical surface at least along a portion of the rim. The invention is further characterised by that the mouth and the recess comprise connection elements providing the releasable interconnection of two bottles.

According to the present invention the emptied bottles may be utilized for multiple purposes. By introducing the mouth of a bottle into the recess on the base of another bottle and thereby producing a releasable connection of bottles a snake-shaped bottle compound or "bottle rope" may be produced, which may be utilized as a children's toy for indoor or outdoor use. In a particularly preferred application the snake-shaped bottle compound is used as a toy in a kindergarten or playground, where after use it may be taken apart and the individual bottles may be selectively collected in their collapsed state. Thereby, in addition to giving children the pleasure of play, environmental education may also be provided. Another possible field of application is construction industry, where the bottle compound, folded to different shapes, may be utilized as formwork for special, thin concrete posts.

The invention may be applied for plastic bottles, and especially for bottles made from PET. These bottles are usually applied for storing soft drinks, and primarily carbonated soft drinks. The bottle has a self-enclosed, flexible side wall forming a body of revolution that may be terminated by a neck at the top end and by a base at the bottom end. In the most preferred embodiment the body of revolution has a circular cross-sectional shape, but the cross-section may be oval, rounded-corner polygonal, or of similar shape.

According to a preferred embodiment of the bottle the side wall is transitioned to the neck and the base by a transition that does not contain any stress concentration locations. The neck of the bottle, as in conventional configurations, may be shaped as a truncated cone, spherical section or may be bounded by planes. The neck is terminated in a mouth arranged concentric to the side wall. The mouth is terminated in a threaded end capable of receiving and securing the cap. The neck and the mouth may also be arranged in a different manner. The mouth may be covered by a cap or

other similar closure means. The base of the bottle may be flat or may be a convex surface transitioning from a flat annulus. A recess extending concentrically into the inside space of the bottle is disposed on the base.

The side wall of the bottle comprises folds arranged bellows-like, perpendicular to the axis of rotation. The term "perpendicular" refers here not only to folds arranged at exactly 90° with respect to the axis of rotation but also encompasses folds having minor deviations resulting from manufacturing inaccuracies, implying that the folds should be substantially perpendicular to the axis of rotation. Each fold is constituted by two opposing conical surfaces. According to a preferred embodiment of the invention the first conical surface, situated proximate to the neck of the bottle has larger size than the oppositely disposed second conical surface. The first and second conical surfaces are arranged at an obtuse angle with respect to each other. In a preferred embodiment the obtuse angle is between 91 and 125 degrees. The fold constituted by the conical surfaces is joined to the adjacent fold or to the side wall of the bottle forming an articulation edge, and the two conical surfaces are joined forming a rim. The articulation edges and rims are formed by a bend or curved transition of the material of the fold along which the conical surfaces may be turned. According to a preferred embodiment of the invention the articulation edge has the same wall thickness as the side wall and the folds. In another preferred embodiment, by decreasing wall thickness a groove is formed in the articulation edge that allows easier collapsing of the fold.

According to a preferred embodiment of the invention the first and second conical surfaces are connected along a sharp rim. In a further preferred embodiment of the invention the first and second conical surfaces are connected along a rounded rim.

At least one fold is arranged in the side wall of the bottle. However, to optimally achieve the inventive objective, it is expedient to arrange multiple folds in the side wall. In a preferred embodiment folds are disposed in at least two-thirds of the side wall. Such an arrangement allows that the bottle can be collapsed to a high extent and thereby its volume can be significantly reduced. The size and shape of the folds formed in the side wall of the bottle may be uniform along the side wall but embodiments where the size and/or shape of the folds varies in the direction of the axis of rotation also fall into the scope of the present invention. The shape and

outward appearance of the bottle may be widely varied by changing the size and location of the folds.

According to a preferred embodiment of the invention both conical surfaces of the folds are truncated cone-shaped, meaning that their cross section is bounded by straight lines. The conical surfaces may be of other shapes, for instance they may be barrel-shaped. In a further preferred embodiment of the invention the cross section of at least one of the conical surfaces is bounded by curved lines.

The compression and snapping from one stable position to the other of the folds along the rims is allowed by the flexible plastic material of the bottle and by the configuration according to the invention. In conventional bellows-like configurations the inside volume of the bottle may be changed only by the compression or bending of the flexible material of the folds. According to the present invention, however, the folds are self-retaining in a force-fit manner, and have two stable positions of equilibrium. Under tensile, compressive, or bending load the folds are not only bent along their rims but are snapped from one terminal position to the other, in which position they are firmly retained. This is achieved because in case axial-direction compression is combined with bending or folding in a direction perpendicular to the axis of rotation the smaller conical surface is fully or partially snapped in under the larger-sized conical surface. As one conical surface is snapped in under the other, the flexible material of the bottle undergoes non-permanent deformation (stretch). The smaller-sized conical surface may be snapped in under the other conical surface along a portion or along the entire circumference of the rim. Depending on the degree of the partial or full snapping-in the bottle is either folded along its axis of rotation or is collapsed to a given extent. Since each fold has two stable positions of equilibrium, the bottle may assume several different shapes between its fully compressed, smallest-volume state where the folds are fully compressed and the bottle has a straight axis of rotation, and the fully extended, largest-volume state where the folds are fully extended and the bottle stands upright. Different portions of the bottle may be folded in different directions at once because the adjacent and non-adjacent folds may be folded and snapped in different directions.

Therefore, to change the shape and/or the volume of the bottle it has to be subjected to simultaneous bending and pulling/compressing action. By bending the neck and/or the base of the bottle in directions perpendicular to the axis of rotation, and by pushing on the neck and/or base in an axial direction the folds may be brought

from the extended state of equilibrium into the collapsed one, and thereby the bottle may be folded or collapsed. In the fully collapsed state the conical surfaces of the folds are seated on one another and thereby the inside volume of the bottle is reduced to minimum. Applying opposite-direction bending or pulling action the volume of the bottle may be increased and/or the bottle may be extended and/or straightened.

The number of the folds, as well as the angle between the conical surfaces of the folds should be chosen to correspond to the size and the material of the bottle and to the design conceptions. Thanks to the folded (pleated) side wall configuration the bottle is able to withstand lateral loads and resist inner pressure.

The emptied and fully collapsed bottle may be restored to its original shape and volume by folding and pulling, and may be refilled a few times. Reusability is limited by the material of the bottle as due to prolonged use and refilling the material of the bottle will sooner or later crack or break.

The bottle may be put to an alternative use by producing a snake-shaped bottle compound of arbitrary length. This can be achieved by pressing the mouth of an empty bottle into the base of another empty bottle. Bottles interconnected in that manner are attached to one another by releasable connection, which implies that the connection is not released easily and the bottle compound can resist tensile, compressive and bending loads. When the bottle compound is not to be used any more, the connections between individual bottles may be released, and the bottles may be collapsed one by one for selective collection. By folding or compressing the side wall of the interconnected bottles the bottle compound may assume several different shapes, providing the possibility of creative play for children.

For the interconnection of bottles a recess is disposed on the base. The recess extends into the inside space of the bottle in a concentric manner. The recess is configured to correspond to the mouth in shape and dimensions such that the recess is capable of receiving the mouth. In a preferred embodiment of the invention the axial depth of the recess is greater than the length at which the mouth can be introduced therein. In such a case the inside spaces of the bottles do not communicate with each other after the bottles are screwed together. Configurations where the depth of the recess is smaller than the length of the mouth portion may also be advantageous. In case of bottles produced in such a manner the end of the mouth portion breaks through the base of the other bottle when the bottles are pressed together and thus

the inside spaces of the bottles become interconnected. A bottle compound made from bottles so configured may be utilized as formwork.

To provide the releasable connection of the bottles the mouth and the recess comprise connection elements. According to a preferred embodiment the connection elements are implemented as threads that may be screwed together. The collar disposed below the thread on the mouth may be seated against the flat bottom surface of the mouth, or according to another arrangement may be seated against the conical surface of the recess, thereby improving the strength of the connection.

According to a further preferred embodiment the connection elements are implemented as a groove and a rim adapted to be snapped in the groove.

The invention will now be explained in detail with reference to the attached drawings, where

Fig. 1 is a schematic view of a bottle according to the invention in its fully extended (largest volume) state,

Fig. 2 shows the schematic view of a bottle according to the invention in a folded state,

Fig. 3 shows the schematic view of a bottle according to the invention in its fully collapsed (smallest volume) state,

Fig. 4 is a magnified schematic view of the side wall of the bottle,

Fig. 5 shows the magnified schematic view of the two states of equilibrium of a single fold, and

Fig. 6 shows a magnified view of the two states of equilibrium of three folds,

Fig. 7 shows a schematic view of bottles interconnected with releasable connection,

Fig. 8 shows the schematics of the connection of two bottles, and

Fig. 9 is the schematic view of a further solution for connecting two bottles.

Fig. 1 shows the bottle according to the invention in its largest-volume state, while Fig. 2 illustrates the bottle in its folded state, and Fig. 3 shows the bottle in its fully collapsed state. The bottle 1 is made from PET, and according to a known arrangement has a side wall 2 terminated by a neck 3 and a base 4. A mouth 5 is arranged in a rotational-symmetric fashion on the neck 3. In a manner known per se the mouth 5 is covered by a threaded cap. The side wall 2 has folds 7 shaped like a bellows or accordion.

Fig. 4 is a detail view of the side wall 2 of the bottle 1, showing only the side wall portion where the folds 7 are disposed. Each fold 7 is connected to the non-folded

side wall 2 portion and to the neighbouring folds 7 along articulation edges 10. The articulation edges 10 are located in the lowest-diameter section of the bottle 1. Each fold 7 has two conical surfaces 8, 9 that are connected in the largest-diameter section of the fold 7 along a rim 11. The folds 7 and consequently the rims 11 are arranged perpendicular to the axis of rotation 6 of the bottle 1. The conical surfaces 8, 9 are of different size, with the first conical surface 8 having a larger surface than the second conical surface 9. According to the embodiment illustrated in the figures the angle between the conical surfaces 8, 9 is $\alpha = 130^{\circ}$.

The bottle 1 can be brought from the largest-volume state to a folded or collapsed state by folding the bottle 1 perpendicularly to the axis of rotation 6 in the direction of arrow B, and then pushing on the bottle in the direction of arrow A. Depending on the extent to which the bottle is folded or collapsed - according to the kinematics detailed below - the second conical surface 9 of the folds 7 partially or fully snaps under the corresponding first conical surface 8, and thereby the bottle 1 is brought into a folded state illustrated in Fig. 2 or a collapsed state shown in Fig. 3. As the second conical surface 9 snaps under the first conical surface 8 the fold 7 is brought from one of its stable positions of equilibrium into the other. The fold 7 retains this position of equilibrium as long as the bottle 1 does not undergo further folding or pulling action. The conical surfaces 8, 9 of the folds 7 are arranged to be self-retaining in a force-fit manner, which implies that the shape and size of the folds is chosen such that they can leave their stable position of equilibrium only under a predetermined external force or bending torque. If this predetermined external force or torque is chosen such that it is greater than the internal load to which the side wall and the folds are subjected under normal use conditions, then the folds 7 may be prevented during normal use from returning from their collapsed position of equilibrium to the other equilibrium position even if the bottle is filled with a carbonated soft drink.

Depending on the extent of folding and collapsing, the bottle 1 may be folded or collapsed to a different degree. Since each fold 7 has two stable positions of equilibrium, by collapsing certain folds 7 or groups of folds 7 and keeping others extended, many different spectacular bottle 1 shapes may be created. By pulling the bottle 1 in a direction opposite the direction of arrow A, or by folding it back perpendicular to the axis of rotation 6, the second conical surface 9 of the folds 7 may be snapped out from under the first conical surface 8, and thereby the bottle 1 may be brought into its largest-volume state.

Fig. 5 shows a detail of a bottle 1 side wall 2 portion with two folds 7. The drawing presents in more detail the kinematics of snapping a fold 7 from its first stable position of equilibrium into the second one, where the uppermost fold 7 of the bottle 1 has snapped into its second stable position while the adjoining fold 7 has remained in its initial stable position. The first stable position of equilibrium of the conical surfaces 8, 9 of the folds 7 is shown in continuous lines, while the second position of equilibrium is shown in dashed lines. In this case, the angle between the first conical surface 8 and the second conical surface 9 is $\alpha' = 120°$. Due to the folding and collapsing action the flexible material of the bottle 1 undergoes non-permanent deformation such that the articulation edge 10 slides to position 10' along axis of rotation 6, while the rim 11 snaps to position 11' along arc 12.

Fig. 6 shows the side wall 2 of a bottle 1 where the first conical surface 8 is arranged at an angle $\alpha'' = 95°$ with respect to the second conical surface 9. Two stable positions of equilibrium of three folds 7 are illustrated in the drawing, with one of the positions being shown in continuous lines and the other in dashed lines. In the first stable position of equilibrium the conical surfaces 8, 9 are connected to each other and to the side wall 2 along articulation edges 10 and rims 11. When the bottle 1 is folded and collapsed, in addition to the articulation edges 10 sliding into position 10", the rims 11 are also rotated along arc 12 to position 11", and the second conical surfaces 9 snap under the corresponding first conical surfaces 8. Axial-direction size reduction of the bottle 1 (in the direction of axis of rotation 6) is also well illustrated in the drawing.

By subjecting the bottle 1 to an opposite-direction load, some or all of the folds 7 may be returned from their snapped-in position of equilibrium to their other position of equilibrium. The volume of the bottle 1 may be increased or reduced - and thereby the folds 7 may be snapped from one of their balance positions to the other - only on a limited number of occasions depending on the characteristics of the bottle material. This can be rephrased to imply that the bottle may be refilled on a limited number of occasions. If the bottle is folded or collapsed too many times, it may crack or break along the articulation edges or the rims. In this case the bottle may be disposed of by first fully collapsing it to its smallest volume and then dumping it in a selective waste container.

Fig. 7 shows a snake-shaped bottle compound made by connecting several bottles 1. The mouth 5 of a bottle 1 is pressed into a recess 13 disposed in the base 4

of another bottle 1 producing a releasable connection with the help of connection elements. An arbitrary number of bottles may be connected to form the bottle compound that can assume various spectacular shapes by folding, collapsing, or extending the individual bottles.

Fig. 8, 9 illustrate conceivable arrangements of the connection elements. In the arrangement shown in Fig. 8 the connection elements are implemented as threads 14. The base 4 of the bottle 1 has a concentrically arranged recess 13, with the female thread thereof receiving the male thread of the mouth 5. The collar 15 of the mouth 5 is seated against the inside curve of the base 4 and limits the extent to which the thread is screwed in. Fig. 9 illustrates another configuration of the connection elements. A concentrically arranged recess 13 is disposed in the flat base 4 of the bottle 1, with an annular groove 16 being arranged in the wall of the recess 13. The groove 16 is adapted for receiving a rim 17 disposed on the mouth of another bottle 1, the rim 17 being able to be snapped in the groove 16. The flexibility of the material of the bottles 1 allows that the two bottles may be connected in a releasable manner.

In addition to preserving the advantages of known bottle designs the foldable flexible bottle described here offers alternative possibilities for storage, recycling and reuse. First, the volume of the bottle may be reduced to match the amount of liquid contained in it. After the bottle is emptied it can be refilled on a limited number of occasions after restoring it to the original-volume state. If the bottle is not to be refilled any more, it can be easily collapsed to a small size in a recovery-free manner, and so it can be easily collected and stored. A further advantage of the bottle according to the invention is that notwithstanding its simple configuration it may assume many different shapes. Before their collection and dumping as waste, empty bottles may be used as a toy, or for other purposes.

LIST OF REFERENCE NUMERALS

1	bottle
2	side wall
3	neck
4	base
5	mouth
6	axis of rotation
7	fold
8	conical surface
9	conical surface
10	articulation edge
10'	articulation edge
10"	articulation edge
11	rim
11'	rim
11"	rim
12	arc
13	recess
14	thread
15	collar
16	groove
17	rim
A	arrow
B	arrow
α	angle
α'	angle
α"	angle

Claims

1. Multipurpose foldable flexible bottle, comprising

- a self-enclosed, flexible side wall defining an inside space and forming a body of revolution,

- a neck arranged to adjoin the side wall of the bottle and having at least one mouth, and a base extending into the inside space of the bottle, the base being arranged to terminate the bottom of the bottle and comprising a recess adapted for receiving the mouth,

- at least one fold, being arranged in the side wall perpendicular to the axis of rotation of the bottle,

- and is arranged such that each fold is constituted by two conical surfaces arranged at an obtuse angle relative to each other, where the conical surfaces are of different size, and adjoin each other along a rim, with each fold being connected to neighbouring folds and to the side wall by articulation edges formed from the material of the fold itself,

characterised by that

- the fold (7) is self-retaining in a force-fit manner, and has two stable positions of equilibrium, where the fold (1) may be brought from one stable position of equilibrium to the other by folding the neck (3) and/or the base (4) of the bottle in a direction perpendicular to the axis of rotation (6), and/or by pushing or pulling the neck (3) or the base (4) in the direction of the axis of rotation (6), thereby snapping in the smaller-sized conical surface (9) under the larger-sized conical surface (8) or snapping out the smaller-sized conical surface (9) from under the larger-sized conical surface (8) at least along a portion of the rim (11, 11', 11''),

- the mouth (5) and the recess (13) comprise connection elements providing the releasable interconnection of two bottles (1).

2. The bottle according to Claim 1, characterised by that folds (7) are disposed in at least two-thirds of the side wall (2) of the bottle (1).

3. The bottle according to Claim 1, characterised by that the folds (7) disposed in the side wall (2) of the bottle (3) are of uniform size and shape.

4. The bottle according to Claim 1, characterised by that the size and/or shape of the folds (7) disposed in the side wall (2) of the bottle (1) varies in the direction of the axis of rotation (6).

5. The bottle according to Claim 1, characterised by that the cross-section of both conical surfaces (8, 9) of the folds (7) is bounded by straight lines.

6. The bottle according to Claim 1, characterised by that the cross-section of at least one of the conical surfaces (8, 9) constituting the folds (7) is bounded by arcs.

7. The bottle according to Claim 1, characterised by that of the conical surfaces (8, 9) constituting the fold (7) the first conical surface (8), situated proximate to the neck (3) of the bottle (1), has larger size than the second conical surface (9).

8. The bottle according to Claim 1, characterised by that the angle (α) between the conical surfaces (8, 9) constituting the folds (7) is between 91 and 125 degrees.

9. The bottle according to Claim 1, characterised by that the connection elements are implemented as threads (14).

10. The bottle according to Claim 1, characterised by that the connection elements are implemented as grooves (16) and rims (17) arranged to be snapped into the grooves (16).

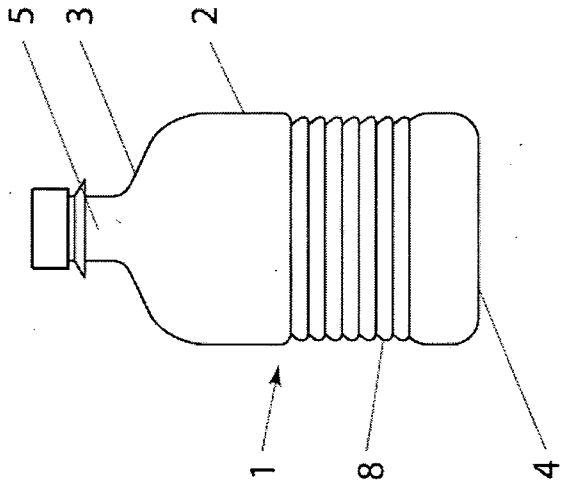


Fig. 3

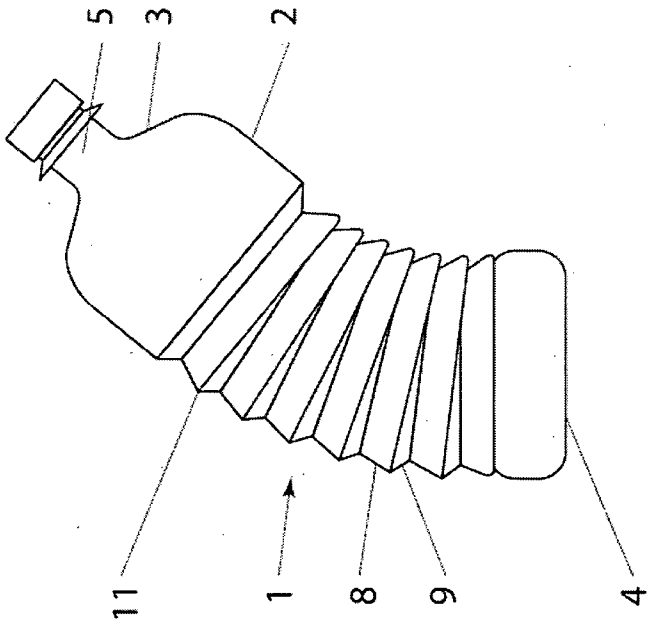


Fig. 2

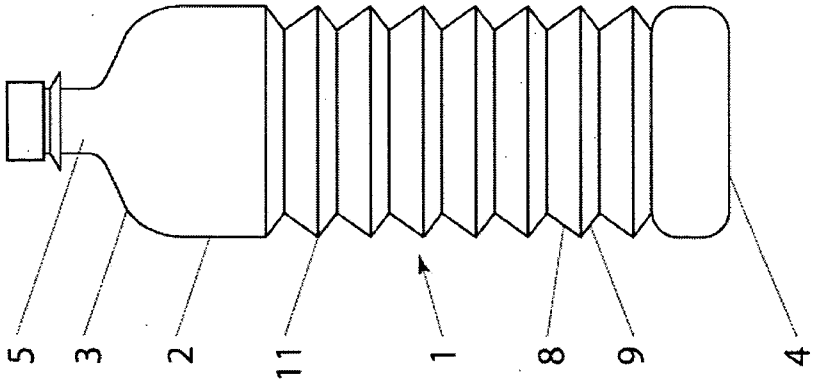


Fig. 1

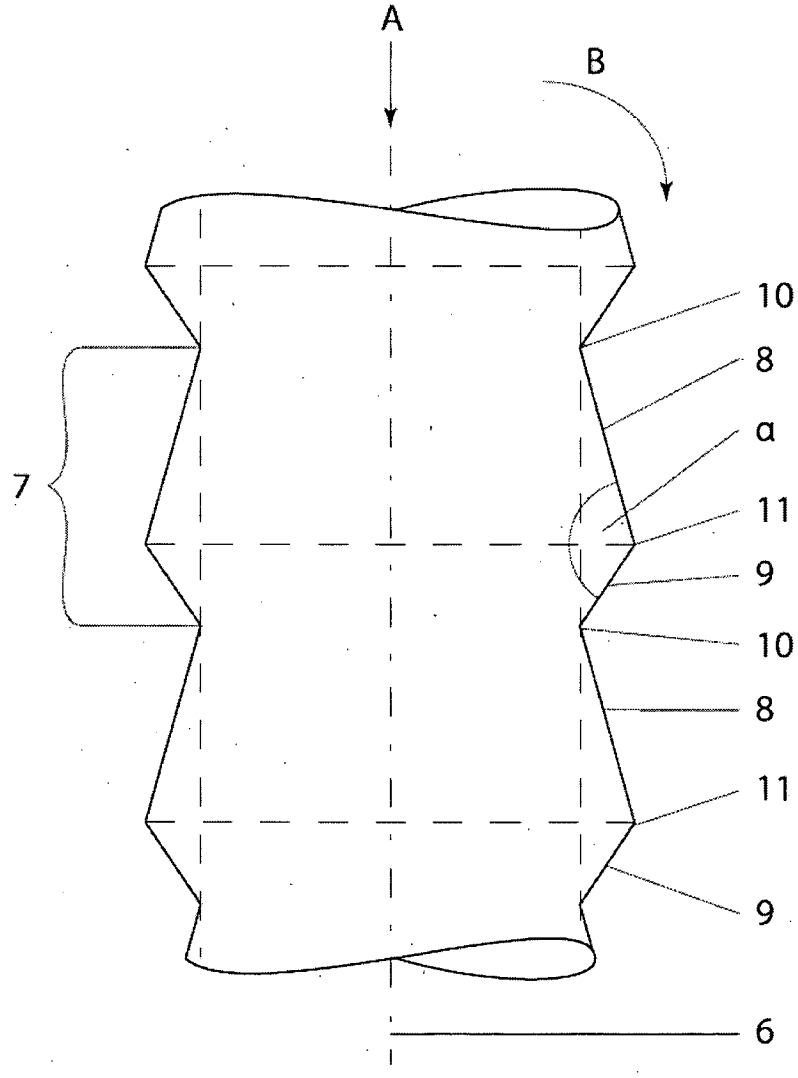
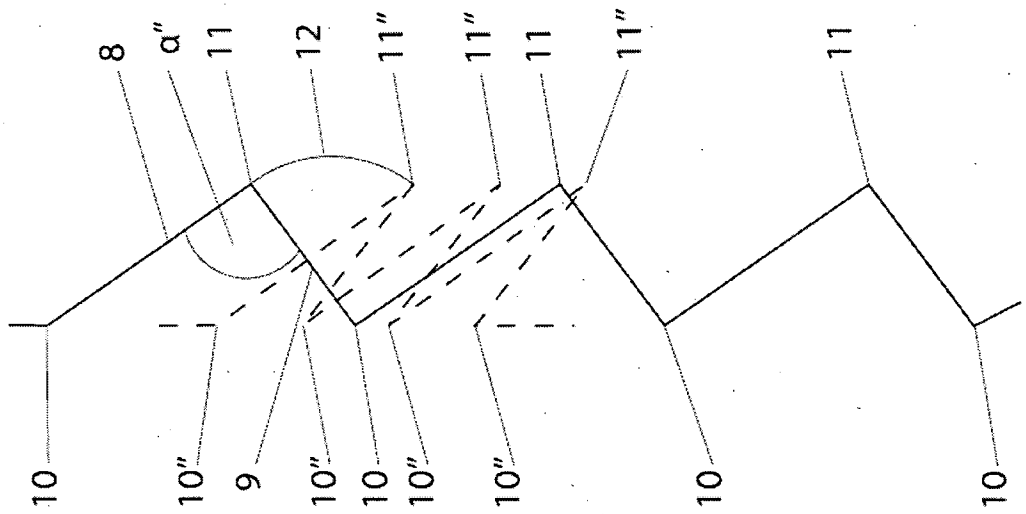


Fig. 4


8
α''
11
12
11''
11''
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11''
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10''
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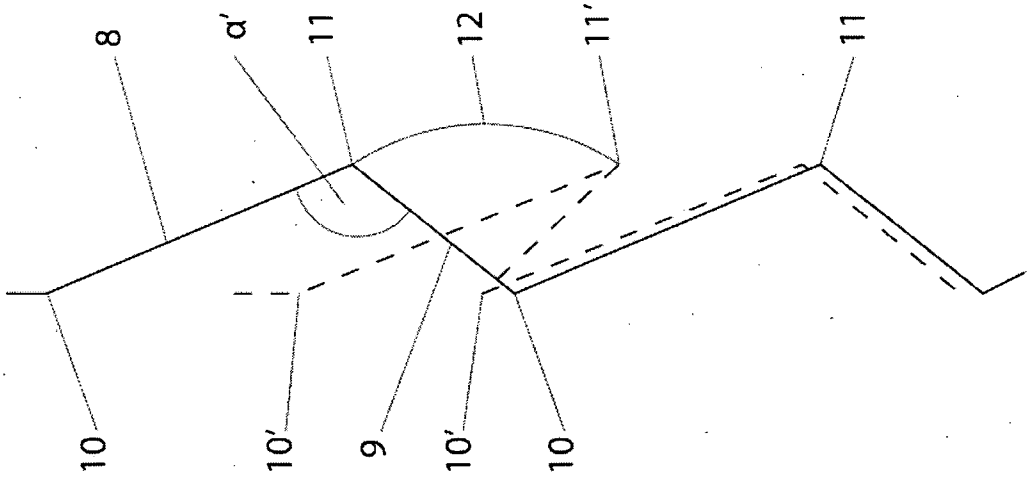
10''
10''
10
10

Fig. 6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10'
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10'
10

Fig. 5

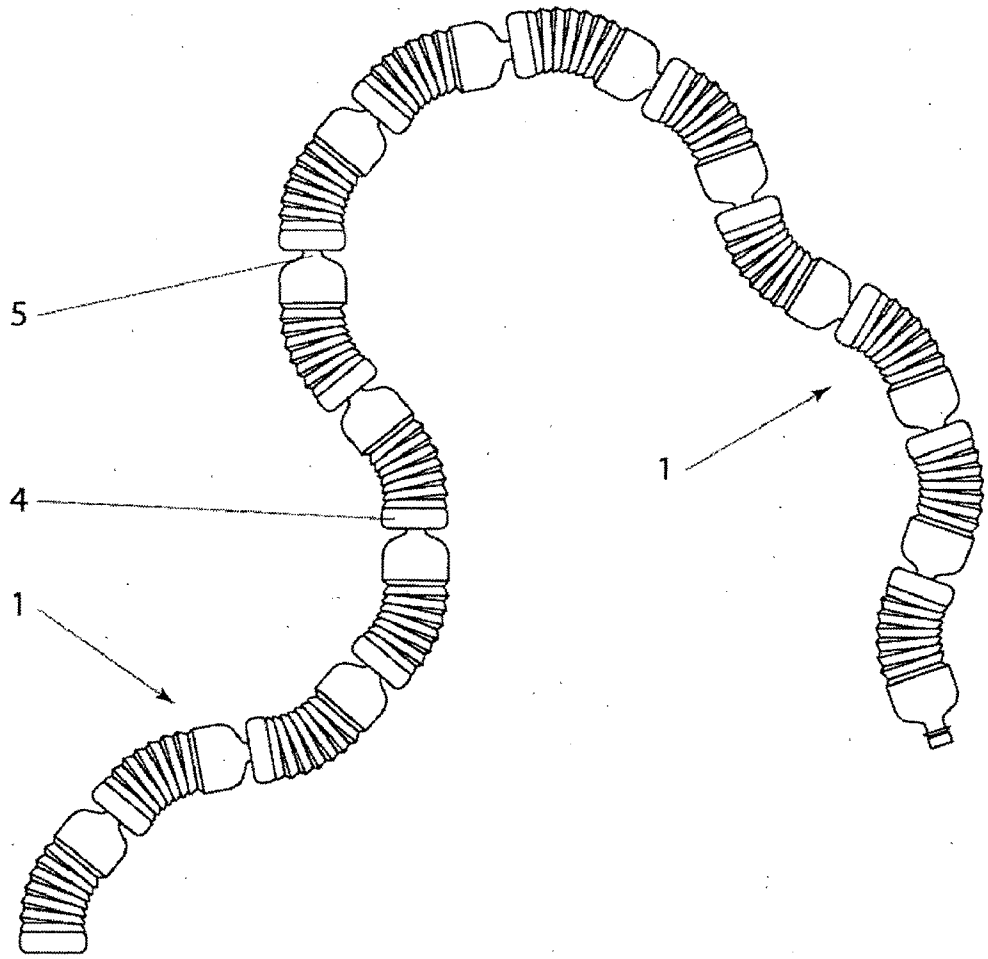

Fig. 7

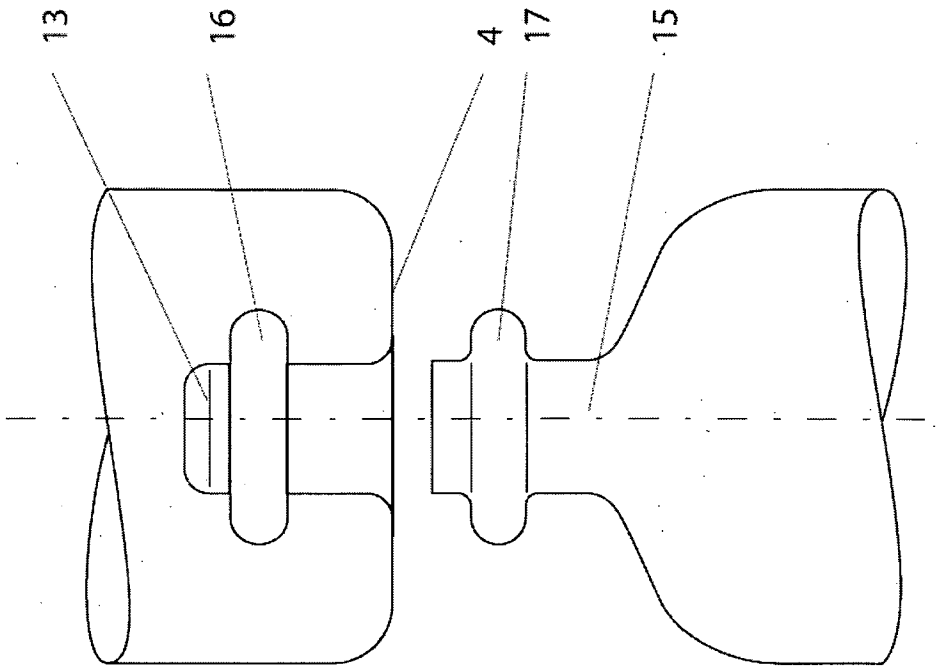

Fig. 9

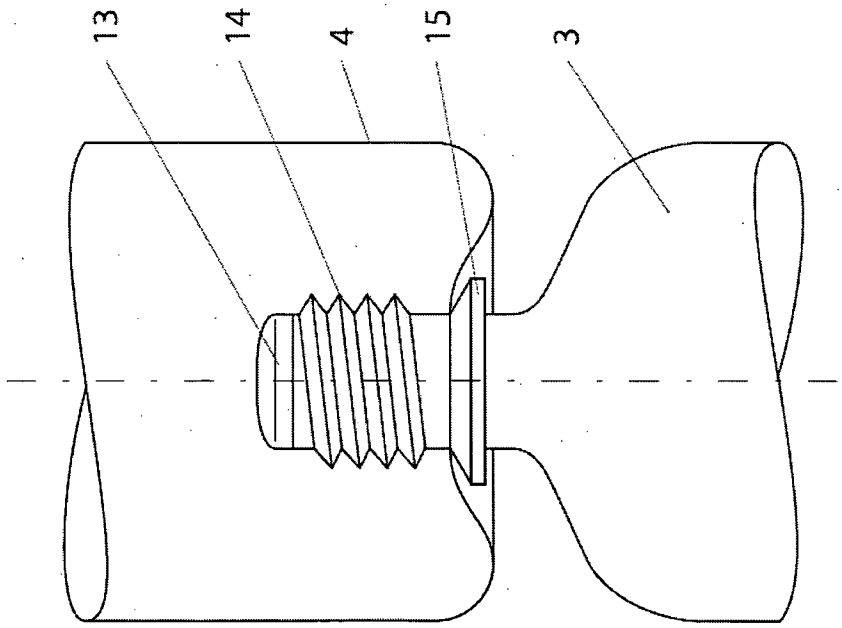

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/HU2010/000115

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D1/02 B65D21/02
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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	DE 38 07 019 A1 (HOERKENS REINER [DE]) 14 September 1989 (1989-09-14) column 1, line 64 - column 2, line 41; figures	1-3,5-8, 10 4,9
Y	US 5 584 413 A (JUNG MYUNG G [KR]) 17 December 1996 (1996-12-17) figures	4
Y	WO 2008/087616 A2 (ALFASI ASAF [IL]; ALFASI AMOS [IL]) 24 July 2008 (2008-07-24) figures	9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 February 2011	25/02/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Vigilante, Marco

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/HU2010/000115

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3807019 A1	14-09-1989	NONE	
US 5584413 A	17-12-1996	CN 2240495 Y	20-11-1996
WO 2008087616 A2	24-07-2008	NONE	