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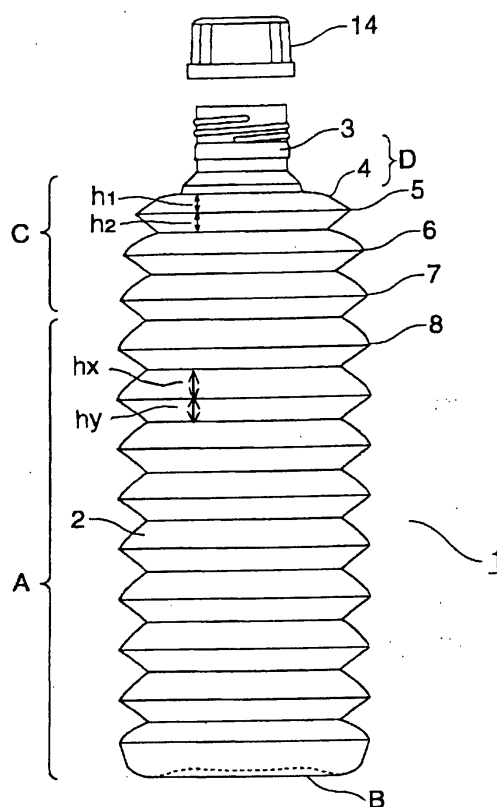
(54) **Foldable plastic bottle**

(57) To provide a container that can be manually and easily compressed when emptied to attain a significantly reduced compressed height, which container can maintain the compressed state without the need to place a cap thereon.

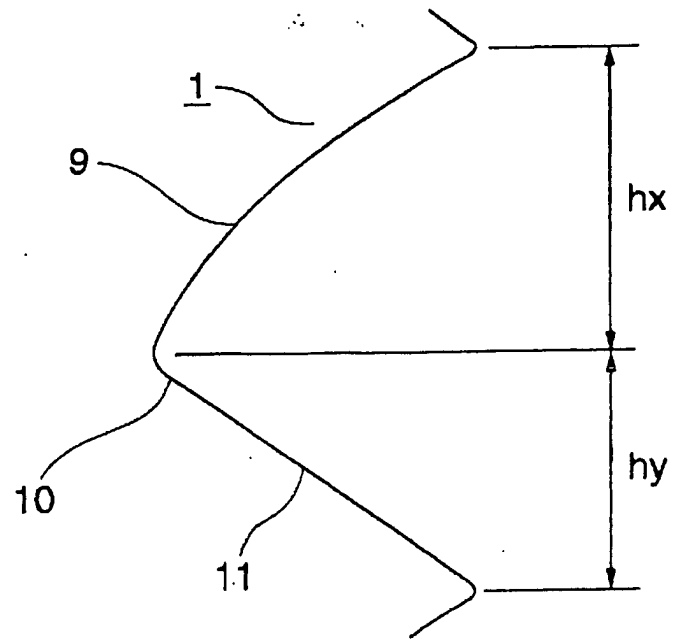
A container main body (1) has a bellows-shaped

portion (2) formed over the entire longitudinal length thereof, or over a part of the longitudinal length except for a tap portion (3). Each of the folds (6,7,8) constituting the bellows-shaped portion has an arc top surface (9) and a predominantly straight bottom surface (11) connecting to the top surface.

[FIG. 1]



【FIG. 5】



Description

[0001] The present invention relates to improvements in a container for juice or mineral water which is constructed using a blow molding process or the like, and in particular, to a container that is compressed in a longitudinal direction thereof (i.e., the volume is decreased) when emptied.

[0002] Sales of synthetic resin bottles have increased significantly in recent years. When a user drinks all the juice or mineral water in a container main body and disposes of the empty container, the bottle has the same shape as when it is full. If such container main bodies are thrown away into ordinary garbage cans, they immediately occupy the space within the garbage can as air does within the container main bodies. For this reason, some users may throw away bottles onto roads or other inappropriate areas, which causes adverse effects on environments. This is the primary disadvantage of such bottles. Additionally, the cost required to collect empty container main bodies and place significant financial burdens on public agencies.

[0003] Local governments and organizations in Japan and other countries have recently determined that empty containers are not to be collected unless they have been compressed to reduce volumes before disposal. This regulation has been enforced.

[0004] Further, although synthetic resin bottles of this kind can be manufactured using simple means such as blow molding, they are not strong enough to be transported using automobiles or other transportation means, which are subject to violent shaking or vibration, or to be stacked at stores for display.

[0005] Furthermore, it is assumed that containers are transported from a manufacturer to bottling companies. This is largely an exercise in transporting air, due to the considerable volume of the bottles or containers.

[0006] The inventor has already proposed a container whose volume can be significantly reduced when a user drinks all the juice or mineral water in a container main body and disposes of the empty container, to allow increased numbers of container main bodies to be accommodated in garbage cans.

[0007] The present invention improves the above container. It is an object of the present invention to provide a container that can be easily and manually compressed when empty, so as significantly to reduce the container dimensions, in particular, container height by compression, and can maintain its compressed state without the need to place a cap thereon.

[0008] This allows more empty containers to be disposed of with lower resulting garbage volume. Further, large numbers of empty containers can be simultaneously transported for recycling, significantly reducing collection and cleaning costs.

[0009] Further, when containers are transported from a manufacturer to bottling companies, significantly more containers can be transported than conventional con-

tainers allow.

[0010] Further, the object of the present invention is to allow the volume of a container to be significantly reduced when the empty container is to be disposed of or the container is to be transported. However, this compressed state can be maintained for extended periods or until the container main body is crushed or dissolved for recycling, without the need to apply recovery force to the container main body.

[0011] Thus, it is a general object of the present invention to allow the volume of a container main body to be significantly reduced when the user drinks all the juice or mineral water in the container main body and disposes of the empty container. This significantly reduces the number of container main bodies that can be accommodated in a garbage can compared to conventional container main bodies, which tend to take up much more volume in garbage cans.

[0012] This also allows an increased number of empty container bodies to be transported simultaneously. It is thus an object of the present invention to reduce the cost of collecting and cleaning empty container main bodies.

[0013] The present invention provides a container main body that has a sufficiently attractive external shape to interest users when used as a drink container, and which can maintain a compressed state along a longitudinal direction thereof to prevent slipping or falling during use and prevent the contents thereof from overflowing, as well as a method of compressing the container main body in the longitudinal direction thereof.

[0014] The present invention is characterized in that when a predominantly right-angle force is applied to a bellows-shaped portion of the container main body, a unidirectional force acts on one of the folds constituting the bellows-shaped portion and/or part of an inner circumference of the fold, while an opposite force acts on an outer circumference thereof, thereby maintaining a bellows shape that is compressed in a longitudinal direction.

[0015] The present invention is also characterized in that the bellows-shaped portion of the container main body is shaped so that the diameter of one side thereof is smaller than that of the other side.

[0016] The present invention is also characterized in that the bellows-shaped portion of the container main body is shaped so that the diameter of one side thereof is smaller than that of the other side and that the diameter of the bellows-shaped portion increases sequentially from one side toward the other side and is comparable to the diameter of the bottom of the container main body.

[0017] The present invention is also characterized in that the general shape of the container main body is appropriately selected from a group consisting of cylinders including ellipses, prisms including rectangles, cones or pyramids including truncations, hourglass drum shapes, and barrel shapes.

[0018] The present invention is also characterized in

that the shape of a horizontal cross section of the container main body is appropriately selected from a group consisting of circles including ellipses and prisms including rectangles.

[0019] The present invention is also characterized in that the container main body has a label wrapped around an outer circumference thereof with a notice about or a trademark for contents of the container.

[0020] The present invention provides a container comprising a container main body having a tap portion projecting upward from a central portion of an upper end and a bellows-shaped portion formed in inner and outer walls of the container main body over the entire longitudinal length thereof, or over a part of the longitudinal length, except for the tap portion, the bellows-shaped portion having horizontally extending folds, the diameter of the bellows-shaped portion being smaller in an upper part thereof than in a lower part thereof and increasing from the upper part to the lower part, the container being characterized in that when a predominantly right-angle force is applied to the bellows-shaped portion of the container main body, a downward force acts on an inner diameter direction of the upper folds of the bellows-shaped portion, while an upward force acts on an outer diameter direction thereof, and an upward force acts on an inner diameter direction of lower folds of the bellows-shaped portion, while an upward and downward forces act on an outer diameter direction thereof, thereby maintaining a compressed bellows shape to reduce the length (height) of the container main body.

[0021] The present invention provides a container comprising a bellows-shaped portion formed over the entire longitudinal length thereof, or over a part of the longitudinal length, except for a tap portion, the container being characterized in that a connection between the tap portion and a rear portion of a top surface of a container main body is bent to project downward, and when a predominantly right-angle force is applied to the bellows-shaped portion, all or part of the tap portion can be folded into the container main body using the bent portion as a base point, and in that a unidirectional force acts on one of the folds constituting the bellows-shaped portion and/or part of an inner circumference of the fold, while an opposite force acts on an outer circumference thereof, thereby maintaining a bellows shape that is compressed in a longitudinal direction.

[0022] The present invention is also characterized in that the bent portion projects downward and has a radius of curvature of 3 to 10 mmR, and is drawn or reversed to push part or all of the tap portion into the container main body when the container main body is compressed, thereby maintaining the state in which the container is compressed in the longitudinal direction thereof.

[0023] The present invention is also characterized in that the connection between the tap portion and the container main body is shaped like a trumpet, having height at least half that of the tap portion of the container main

body, and is reversed to push part or all of the tap portion into the container main body when the container main body is compressed, thereby maintaining the state in which the container is compressed in the longitudinal direction thereof.

[0024] The present invention is also characterized in that the container main body is formed as a bellows-shaped portion extending over the entire longitudinal length thereof or over a part of the longitudinal length and has horizontally-extending or spiral folds. When a predominantly right-angle force is applied to the bellows-shaped portion of the container main body, a force is exerted to unidirectionally push one of the folds constituting the bellows-shaped portion and/or part of an inner circumference of the fold, while an opposite force acts on an outer circumference thereof, thereby maintaining a bellows shape that is compressed in a longitudinal direction thereof.

[0025] Further, to attain the above object, i.e., to allow the container to be easily compressed and to maintain the compressed state, it is important to numerically limit the shape of the container and to define the characteristics thereof.

[0026] For example, the present invention is characterized in that the container main body has the size that of a typical container called a "PET bottle (mini bottle)" and having a volume of 500 ml, at least a first fold has an outer diameter of approximately 60.5 mm and a second fold has an outer diameter of approximately 68 mm, and a portion between the first and second folds has an inner diameter of approximately 47 mm; in that a third fold has an outer diameter of approximately 70 mm and a portion between the second and third folds has an inner diameter of approximately 51 mm, the inner diameter increasing sequentially; and in that the container main body typically has an outer diameter of approximately 71.5 mm and an inner diameter of approximately 54.5 mm, as well as three to six upper folds, and typically has a total of 10 to 15 folds, thereby maintaining a shape that is compressed in a longitudinal direction of the container.

[0027] The present invention is also characterized in that each fold is divided into upper and lower portions by a horizontal line and is shaped like an unidentified flying object (UFO) known as the "Adamski type," whereby the upper and lower portions of the first fold have heights of approximately 6.5 mm and 5.5 mm, respectively, the upper and lower portions of the second fold have heights of approximately 7 mm and approximately 5 mm, respectively, and the upper and lower portions of the third fold have heights of approximately 8.5 mm and approximately 6.5 mm, respectively, with the width of the folds increasing sequentially; and in that a top surface of the bead-on-abacus shape projects outward to form a bay-like shape having a radius of curvature of approximately 20 mmR, whereas a bottom surface thereof is shaped like a straight line following a projecting arc having a radius of curvature of approximately

0.8 mmR, thereby maintaining the state in which the container is compressed in the longitudinal direction thereof.

[0028] The present invention is also characterized in that the bent portion of the rear portion of the container main body is shaped to project downward to have a radius of curvature of 3 to 10 mmR and is drawn or reversed to push part or all of the tap portion into the container main body when the container main body is compressed; and in that the trumpet-shaped connection of the container main body has a height at least half that of the tap portion of the container main body and is reversed to push part or all of the tap portion into the container main body when the container main body is compressed.

[0029] The present invention is also characterized in that the container main body has a bellows-shaped portion formed over the entire longitudinal length thereof or over a part of the longitudinal length and has horizontally-extending or spiral folds, and a top surface of each of the folds constituting the bellows-shaped portion is shaped like an arc, and a bottom surface connecting to the top surface is shaped substantially like a straight line, thereby maintaining the state in which the container is compressed in the longitudinal direction thereof.

[0030] The present invention is also characterized in that each fold is divided into upper and lower portions by a horizontal line and is shaped like a UFO known as the "Adamski type," whereby the upper and lower portions of the first fold have heights of approximately 6.5 mm and 5.5 mm, respectively, the upper and lower portions of the second fold have heights of approximately 7 mm and approximately 5 mm, respectively, and the upper and lower portions of the third fold have heights of approximately 8.5 mm and approximately 6.5 mm, respectively, with the width of the folds increasing sequentially; and in that a top surface of this bead-on-abacus shape projects outward to form a bay-like shape having a radius of curvature of approximately 20 mmR, whereas a bottom surface thereof is shaped like a straight line following a projecting arc having a radius of curvature of approximately 0.8 mmR.

[0031] Other excellent objects, features, and effects of the present invention will be apparent from the following descriptions of embodiments.

Fig. 1 is a front view of the entire container main body according to an embodiment.

Fig. 2 is a bottom view of Fig. 1.

Fig. 3 is a partial cutaway sectional view of a compressed state.

Fig. 4 is a sectional view of the entire compressed container.

Fig. 5 is an enlarged sectional view illustrating folds

constituting a container main body.

Fig. 6 is a diagram showing a compression initial stage in which the container main body is compressed to deform the shoulder thereof.

Fig. 7 is a diagram showing a compression intermediate stage in which the container main body is compressed to deform the shoulder thereof.

Fig. 8 is a diagram showing a compression complete stage in which the container main body is compressed to deform the shoulder thereof.

Fig. 9 is a diagram showing the compression initial stage in which the container main body is compressed to deform the central shell thereof.

Fig. 10 is a diagram showing the compression intermediate stage in which the container main body is compressed to deform the central shell thereof.

Fig. 11 is a diagram showing the compression complete stage in which the container main body is compressed to deform the central shell thereof.

Fig. 12 is a perspective view showing another embodiment of the container main body.

Fig. 13 is a front view of the container main body, provided with an advertisement surface.

Fig. 14 is a diagram showing an example in which the horizontal cross section of the container is shaped like a circle.

Fig. 15 is a diagram showing an example in which the horizontal cross section of the container is shaped like an ellipse.

Fig. 16 is a diagram showing an example in which the horizontal cross section of the container is shaped like a rectangle.

Fig. 17 is a front view showing another embodiment of appearance of the container main body in which a bellows-shaped portion is formed as a spiral.

Fig. 18 is a diagram showing an example in which the container main body externally has recesses and projections extending obliquely.

Fig. 19 is a diagram showing an example in which the container main body externally has inclined recesses similar to straight lines.

Fig. 20 is a sectional view of the entire compressed container.

Fig. 21 is a diagram showing a compression initial stage in which the container main body is compressed to deform a shoulder thereof.

[0032] Embodiments of the present invention will be described below with reference to the drawings.

[0033] In Fig. 1, reference numeral 1 denotes a container main body comprising a bellows-shaped portion (2) in outer and inner circumferences thereof in a height (length) direction thereof.

[0034] Figs. 3, 4, and 20 show that mineral water is contained in the container main body (1). A user drinks all the mineral water and compresses the container main body in the height (longitudinal) direction from one or both sides thereof. That is, the present invention has excellent construction and effects to compress the container main body (1) and maintain a compressed state.

[0035] By way of example, in the figures, reference numeral (3) denotes a tap portion of the container main body (1), which is externally threaded in an outer circumference thereof and has a diameter of approximately 28 mm and a height of 23 mm. A trumpet-shaped connection (D) is arranged immediately below the tap portion (3) and connected thereto on the axis thereof. The trumpet-shaped connection (D) includes a bottom portion having an increased diameter of approximately 51 mm and has a height of 5 to 10 mm. The container main body (1) comprises a shoulder (C) having a "U" shaped annular groove (E) with a horizontal inner end. As shown in Fig. 21, a terminal of the trumpet-shaped connection (D) is connected to an inner side of the annular groove (E). Further, an outer side of the U-shaped groove (E) constitutes a blastomere-shaped portion (4) extending outward. A first fold (5) of a bellows-shaped portion has an outer diameter (the highest fold of the bellows-shaped portion (2)) (d1) smaller than the outer diameter (d) of the container main body. Following the first fold, a second fold (6) has an outer diameter (d2) larger than the outer diameter (d1) of the first fold (5) and smaller than the outer diameter (d) of the container main body.

[0036] Furthermore, following the second fold, a third fold (7) has an outer diameter (d3) larger than the outer diameter (d2) of the second fold (6) and smaller than the outer diameter (d) of the container main body. Thus, the container main body looks like a stairway when viewed from the side. However, of course, the number of folds is not limited to three as described above, but may be an arbitrary plural number. In the embodiment shown in Fig. 1, four folds are shown.

[0037] More specifically, the main body (1) of the container in Fig. 1 has a height of 195 mm, a maximum di-

ameter of approximately 71.5 mm, and a volume of 500 ml, as well as 12 folds.

[0038] However, in this case, the first fold (5) of the bellows-shaped portion has an outer diameter (d1) of 60.5 mm. The second fold (6) of the bellows-shaped portion has an outer diameter (d2) of 67.9 mm. The portion between the first and second folds (5) and (6) of the bellows-shaped portion has an inner diameter of 47 mm.

[0039] Likewise, the third fold (7) of the bellows-shaped portion has an outer diameter (d3) of 69.7 mm. The portion between the second and third folds (6) and (7) of the bellows-shaped portion has an inner diameter of 51.1 mm. Furthermore, a fourth fold (8) of the bellows-shaped portion has an outer diameter (d) equal to the largest outer diameter of the container main body (1), i. e., 71.5 mm. The portion between the third and fourth folds (7) and (8) of the bellows-shaped portion has an inner diameter of 54.5 mm. The following fifth to twelfth folds of the bellows-shaped portion each have the same outer diameter as that (d) of the fourth fold (8). Further, the portion between each pair of folds within this range has the same inner diameter as that of the portion between the third and fourth folds (7) and (8).

[0040] In this case, each fold is shaped like a UFO known as the "Adamski type" and is thus divided into upper and lower portions by a horizontal line. In Fig. 1, the upper and lower portions (h1 and h2) of the first fold have heights of 6.5 mm and 5.5 mm, respectively. The upper and lower portions of the second fold have heights of 7 mm and 5 mm, respectively. The upper and lower portions of the third fold have heights of 8.5 mm and 6.5 mm, respectively.

[0041] More specifically, the sectional shape of these folds is shown in Fig. 5. That is, this example shows the dimensions of the first to third folds (5) to (7). In Fig. 5, the following is important: A top surface (20) of the wide bead-on-abacus-like shape (9) is formed like a bay projecting outward and having a radius of curvature of 20 mmR in this embodiment. In contrast, a bottom surface (21) thereof is shaped like a straight line (11) following a projecting arc (10) having a radius of curvature of 0.8 mmR.

[0042] The construction of this example will be described in connection with the operation thereof. The container main body (1), schematically shown in Fig. 1, is divided into a shell (A) including a central portion and a bottom portion, and a shoulder (C) located above. The shell (A) and shoulder (C) each have two diameters, a larger and a smaller diameter, thus serving to maintain a stable vertical state.

[0043] That is, the shell (A), including the central portion and the bottom portion, has its inner and outer diameters formed by the same fold. The shoulder (C) is bent and gently inclined to form the projecting tap portion (3). In particular, between the central portion of the shoulder (C) and the tap portion (3), troughs (18) forming the folds have an inner diameter gradually decreasing and have larger differences in inclination between

themselves than in the shell (A). Accordingly, when the central portion is extended, the inner diameters and inclined surfaces of crests (17) and the troughs (18) forming the folds serve to maintain an extended state on the basis of the strength and elasticity of material for the container. Of course, when a bottom surface (B) is recessed to have a steep inclination, the container can be stably placed on a level surface.

[0044] A commercially available container main body (1) is provided with a cap (14). Thus, a user removes the cap (14), drinks all the contents of the container, and then presses the tap portion (3). Then the shoulder (C) and the shell (A) are compressed and contracted, as shown in Figs. 3 and 20. In the state shown in Fig. 6, one of the folds of the shoulder (C) is pressed to cause the end surface of the corresponding trough (18) to compress the end surface of the trough of the vertically adjacent fold. At this time, as viewed from the vertices of the crests (17) of the folds, both troughs (18) are pressed toward the vertices of the crests 17, as shown in Figs. 7 and 8. At this time, the partial pressure on the gently inclined top surface (20) of the fold is higher than that on the steeply inclined bottom surface (21) due to the smaller inclination. Consequently, the steeply inclined troughs (18) are moved toward the vertices of the crests (17).

[0045] At this time, two major changes occur in the container main body (1). First, the inner diameter of the crest (17) constituting the fold is increased owing to pressure, or the inner diameter of the trough (18) is reduced owing to compressing pressure. Second, the steeply inclined surface of the bottom surface (21) constituting the fold is bent.

[0046] Subsequently, the steeply inclined bottom surface passes immediately below the crest (17) and then slips to the inside of the gently inclined top surface (20). The bottom surface is moved until the height of the container main body (1) is sufficiently reduced. Then, force is exerted to restore the inner diameters of the crests (17) and troughs (18), or the bottom surface (21), which has been bent through the above operation, is restored to its extended state. Thus, a stable state is established. Therefore, this compressed state can be maintained without always applying compressive force.

[0047] Having smaller inner diameters, the troughs (18) are subjected to compressive pressure to further reduce their inner diameters. Consequently, pressure stress is generated. When compressive pressure is eliminated, the stress is relaxed to restore the troughs to their extended state. The user then puts the cap (14) on the container under pressure to allow atmospheric pressure to act on the container. The container main body (1) maintains the compressed state. This state is maintained unless compressive stress is generated owing to a difference in inner diameter between the troughs (18).

[0048] In repeated experiments conducted by the inventor, the container main body (1) had its height (vol-

ume) reduced to one-third to one-fourth. When such container main bodies were accommodated in a garbage can or the like, they occupied significantly less space.

[0049] According to the present invention, in the state established through the above operation, the tap portion (3) is further pressed toward the bottom surface (B) of the container main body. At this time, the shell (A) and the shoulder (C) have their folds tightly contacted with one another, further pressing does not cause them to lower. When the tap portion (3) is pressed downward, the terminal side of the trumpet-shaped connection (D) presses the inside of the U-shaped groove (E) downward. Since the outer upper end side of the groove (E) is connected and secured to the shoulder (C), the U-shape is collapsed in such a manner that the inside of the groove is pushed downward. Thus, a terminal portion of the trumpet-shaped connection (D) is pressed downward and enlarged. Finally, as shown in Fig. 4, the connection (D) is pushed into the container main body (1) together with the tap portion (3).

[0050] Furthermore, when the container main body (1) is disposed of, it is compact and has a height approximately one-fifth that of the original container main body (1). That is, the volume of the container main body (1) can be significantly reduced.

[0051] In the above embodiment, the connection (D) between the tap portion (3) and the container main body (1) is shaped like a trumpet. When the container main body (1) is compressed, the connection (D) is reversed and fitted into the container main body (1).

[0052] However, the tap portion (3) can have its height (volume) sufficiently reduced without being forcibly pushed into the compressed container main body (1). This will be described with reference to Figs. 20 to 22, and the same components as those of the above embodiment are denoted by the same reference numerals. The folds of the container main body (1) are each shaped like a wide Adamski-type UFO and are thus divided into upper and lower portions. In Fig. 1, the upper and lower portions (h1 and h2) of the first fold have heights of 6.5 mm and 5.5 mm, respectively. The upper and lower portions of the second fold have heights of 7 mm and 5 mm, respectively. The upper and lower portions of the third fold have heights of 8.5 mm and 6.5 mm, respectively.

[0053] More specifically, the sectional shape of these folds is shown in Figs. 9 to 11. These figures show an example of the dimensions of each fold of the 4-fold bellows-shaped portion (8) and 12-fold bellows-shaped portion, i.e., the heights of the upper and lower portions (hx and hy) of the fold shown in Fig. 5. All folds have the same shape.

[0054] That is, in the figures, reference numeral (20) denotes a top surface of the wide Adamski-type UFO-shaped fold, including an inner surface thereof. Reference numeral (21) denotes a bottom surface of the wide Adamski-type UFO-shaped fold including an inner sur-

face thereof. The following is important: The top surface (20) is shaped to project outward to have a radius of curvature of 20 mmR in this embodiment. On the other hand, the bottom surface (21) is shaped like a straight line following a projecting arc (10) having a radius of curvature of 0.8 mmR.

[0055] A commercially available container main body (1) is provided with a cap (14).

[0056] Thus, a user removes the cap (14), drinks all the contents of the container, and then presses the tap portion (3). The shoulder (C) and the shell (A) are compressed and contracted as shown in Figs. 3 and 20. In this state, one of the folds of the shoulder (C) is pressed to cause the end surface of the corresponding trough (18) to compress the end surface of the trough of the vertically adjacent fold, as shown in Figs. 9 to 11. At this time, as viewed from the vertices of the crests (17) of the folds, both troughs (18) are pressed toward the vertices of the crests (17), as shown in Figs. 10 and 11. The partial pressure on the gently inclined top surface (20) of the fold is now higher than that on the steeply inclined bottom surface (21) due to the smaller inclination. Consequently, the steeply inclined troughs (18) are moved toward the vertices of the crests (17).

[0057] Two major changes now occur in the container main body (1). First, the inner diameter of the crest (17) constituting the fold is increased owing to enlarging pressure, or the inner diameter of the trough (18) is reduced owing to compressing pressure. Second, the steeply inclined surface of the bottom surface (21) constituting the fold is bent.

[0058] Subsequently, the steeply inclined bottom surface passes immediately below the crest (17) and slips to the inside of the gently inclined top surface (20), as shown in Figs. 10 and 11. The bottom surface is moved until the height of the container main body (1) is sufficiently reduced. Force is then exerted to restore the inner diameters of the crests (17) and troughs (18), or the bottom surface (21), which has been bent through the above operation, is restored to its extended state. Thus, a stable state is established. This compressed state can be maintained without always applying compressive force.

[0059] Having smaller inner diameters, the troughs (18) are subjected to compressive pressure. Consequently, pressure stress is generated. When the compressive pressure is eliminated, the stress is relaxed to restore the troughs to their extended state. The user then puts the cap (14) on the container under pressure to allow atmospheric pressure to act on the container. The container main body (1) then maintains the compressed state. This state is maintained unless compressive stress is generated owing to a difference in inner diameter between the troughs (18).

[0060] In this embodiment, lower folds of the shoulder (C) of the container main body (1) have larger diameters, as described previously. As a result, the compressed folds are pressed against one another and in-

clined so that their outer periphery lies above their inner periphery.

[0061] Subsequently, when the top surface of the tap portion (3) and/or the blastomere-shaped portion (4) of the shoulder is pressed, force (f4) is also exerted on the outer periphery of each fold to push it down, as shown in Figs. 9 to 11. As a result, as shown in Fig. 4, the folds of the shell (A), including the central portion and the bottom portion, are pressed against one another and inclined in the direction opposite to that in the shoulder (C) so that their outer periphery lies below their inner periphery.

[0062] In the compressed container main body (1), the blastomere-shaped portion (4) and bay-shaped portion (9) forming an upper inclined portion of each fold of the shoulder portion (C) are "balanced" with respect to a lower inclined portion of each fold of the shell (A). Thus, the container main body (1) can maintain its compressed state without requiring the placement of a cap (14) on the tap portion.

[0063] In repeated experiments conducted by the inventor, it was found to be possible to reduce the height (volume) of the container main body (1) to one-third to one-fourth of the value in its uncompressed state. Within garbage containers, such container main bodies occupied significantly less space.

[0064] In the above described embodiments, the container main body (1) is shaped externally like a cylinder or cylinder analog. However, it has been found that if the container main body (1) is shaped like an hourglass drum (22), as shown in Figs. 12 and 13, the main body (1) can be grasped more easily. Further, if the container main body (1) is shaped like a truncated cone or pyramid, it is more stable. It has thus been found that an appropriate external shape can be freely selected. Furthermore, as shown in Figs. 14, 15, and 16, the horizontal sectional shape of the container main body (1) is not limited to a circle (23) but may be freely selected. For example, it may be an ellipse (24) or a square (25).

[0065] In the above-described embodiments, the bellows-shaped portion (2) formed in the container main body (1) comprises annular folds connected vertically, with each fold extending horizontally.

[0066] However, it has been found that if the bellows-shaped portion (2) comprises a continuous spiral (26), as shown in Fig. 17, the container main body (1) is more easily compressed. This is because the container main body (1) is subjected not just to vertical force and pressed upward or toward the center thereof, but is twisted. This spiral (26) may comprise one or more pieces. Furthermore, the spiral (26) need not be continuous, but may be discontinuous (26), as shown in Fig. 18, or may comprise slightly inclined straight lines (26), as shown in Fig. 19.

[0067] In the above-described embodiments, the container main body (1) has a bellows-shaped portion (2) formed over the entire vertical length. However, in this embodiment, the container main body (1) includes a flat

portion in the middle thereof, or at a terminal thereof, to permit placement of a trademark or description of contents.

[0068] The main effect of the present invention, described above, is a significant reduction in the volume occupied by the container main body at disposal, thereby increasing the number of container main bodies that can be accommodated in a garbage can or like vessel.

[0069] Such a compressed container main body makes it possible to transport large numbers of containers simultaneously, reducing the costs associated with cleaning and collecting empty containers.

[0070] Furthermore, the shape of the container main body of the present invention is sufficiently attractive to interest users. The bellows-shaped portion of the container main body acts as a frictional stop, thereby preventing slipping or tipping during use and preventing the contents thereof from overflowing.

[0071] Further, the container main body according to the present invention is designed to retain an attractive shape even when compressed. Even the compressed container main body can be used for other purposes.

Claims

1. A container capable of maintaining its compressed state along the longitudinal axis, the container comprising a container main body formed like a bellows over the entire longitudinal length thereof, or over a part of the longitudinal length, except for a tap portion, the bellows comprising folds extending horizontally, the container main body being **characterized in that** when a predominantly right-angle force is applied to a bellows-shaped portion of said container main body, a unidirectional force acts on one of the folds constituting the bellows-shaped portion and/or part of an inner circumference of the fold, while an opposite force acts on an outer circumference thereof, thereby maintaining a longitudinally compressed bellows shape.
2. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 1, the container being **characterized in that** the bellows-shaped portion of the container main body is smaller so as to maintain a folded state, in which the diameter of one side thereof is less than that of the other side.
3. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 3, the container being **characterized in that** the bellows-shaped portion of the container main body is shaped so as to maintain a folded state in which the diameter of one side thereof is smaller than that of the other side and in which the diameter of the bellows-shaped portion increases sequentially from

one side toward the other side and is comparable to the diameter of the bottom of the container main body.

4. A container capable of maintaining its compressed state in a longitudinal direction according to Claims 1 to 3, the container being **characterized in that** the general shape of the container main body is appropriately selected from a group consisting of cylinders including ellipses, prisms including rectangles, cones or pyramids including truncations, hourglass drum shapes, and barrel shapes.
5. A container capable of maintaining its compressed state in a longitudinal direction according to Claims 1 to 4, the container being **characterized in that** the shape of a horizontal cross section of the container main body is appropriately selected from a group consisting of circles including ellipses and prisms including rectangles.
6. A container capable of maintaining its compressed state in a longitudinal direction according to Claims 1 to 6, the container being **characterized in that** the container main body has a label wrapped around an outer circumference thereof bearing a notice or about or a trademark for contents of the container.
7. A container capable of maintaining its compressed state in a longitudinal direction, the container comprising a container main body having a tap portion projected upward from a central portion of an upper end and a bellows-shaped portion formed in an inner and outer walls of the container main body over the entire longitudinal length thereof, or over part of the longitudinal length, except for the tap portion, the bellows-shaped portion having horizontally extending folds, the diameter of the bellows-shaped portion being smaller in an upper part thereof than in a lower part thereof and increasing from upper part to lower part, the container being **characterized in that**: when a predominantly right-angle force is applied to the bellows-shaped portion of the container main body, a downward force acts on an inner diameter direction of upper folds of the bellows-shaped portion, while an upward force acts on an outer diameter direction thereof, and an upward force acts on an inner diameter direction of lower folds of the bellows-shaped portion, while upward and downward forces act on an outer diameter direction thereof, thereby maintaining a compressed bellows shape so as to reduce the length (height) of said container main body.
8. A container capable of maintaining its compressed state in a longitudinal direction, the container comprising a container main body having a bellows-

shaped portion formed over the entire longitudinal length thereof, or over a part of the longitudinal length, except for a tap portion, the container being **characterized in that** a connection between said tap portion and a rear portion of a top surface of a container main body is bent so as to project downward, and when a predominantly right-angle force is applied to the bellows-shaped portion, all or part of the tap portion can be folded into the container main body using the bent portion as a base point, and **in that** a unidirectional force acts on one of the folds constituting the bellows-shaped portion and/or part of an inner circumference of the fold, while an opposite force acts on an outer circumference thereof, thereby maintaining a bellows shape compressed in a longitudinal direction.

9. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 1, the container being **characterized in that** the connection between the tap portion and the container main body is shaped like a trumpet that is open in the bottom thereof.
10. A container capable of maintaining its compressed state in a longitudinal direction according to Claims 1 to 9, the container being **characterized in that** the container main body has a spiral or spiral folds formed on an outer circumferential surface thereof, and the compressed state is maintained in the longitudinal direction by pushing or twisting one or both sides of the container main body.
11. A container capable of maintaining its compressed state in a longitudinal direction according to Claims 1 and 2, the container being **characterized in that** in the container main body has the size that of a typical container called a "PET bottle (mini bottle)" and having a volume of 500 ml, at least a first fold has an outer diameter of approximately 60.5 mm and a second fold has an outer diameter of approximately 68 mm, and a portion between the first and second folds has an inner diameter of approximately 47 mm; **in that** a third fold has an outer diameter of approximately 70 mm, and a portion between the second and third folds has an inner diameter of approximately 15 mm, the inner diameter increasing sequentially; and **in that** the container main body typically has an outer diameter of approximately 71.5 mm and an inner diameter of approximately 54.5 mm, as well as three to six upper folds, and typically has a total of 10 to 15 folds.
12. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 11, the container being **characterized in that** each fold is divided into upper and lower portions by a horizontal line and is shaped like a wide bead on an

abacus or an unidentified flying object (UFO) known as an "Adamski type," whereby the upper and lower portions of the first fold have heights of approximately 6.5 mm and 5.5 mm, respectively, the upper and lower portions of the second fold have heights of approximately 7 mm and approximately 5 mm, respectively, and the upper and lower portions of the third fold have heights of approximately 8.5 mm and approximately 6.5 mm, respectively, with the width of the folds increasing sequentially; and **in that** a top surface of said bead-on-abacus shape projects outward to form a bay-like shape having a radius of curvature of approximately 20 mmR, whereas a bottom surface thereof is shaped like a straight line following a projecting arc having a radius of curvature of approximately 0.8 mmR.

13. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 8, the container being **characterized in that** the bent portion is shaped to project downward so as to have a radius of curvature of 3 to 10 mmR and is drawn or reversed to push part or all of the tap portion into the container main body when the container main body is compressed.
14. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 9, the container being **characterized in that** the trumpet-shaped connection of the container main body has a height at least half that of the tap portion of the container main body and is reversed to push part or all of the tap portion into the container main body when the container main body is compressed.
15. A container capable of maintaining its compressed state in a longitudinal direction, the container comprising a container main body having a bellows-shaped portion formed over the entire longitudinal length thereof, or over a part of the longitudinal length and having horizontally-extending or spiral folds, the container being **characterized in that**: a top surface of each of the folds constituting the bellows-shaped portion is shaped like an arc, and a bottom surface connecting to the top surface is shaped predominantly like a straight line.
16. A container capable of maintaining its compressed state in a longitudinal direction according to Claim 15, the container being **characterized in that** each fold is divided into an upper and lower portions by a horizontal line and is shaped like a UFO known as an "Adamski type," **in that** the upper and lower portions of the first fold have heights of approximately 6.5 mm and 5.5 mm, respectively, the upper and lower portions of the second fold have heights of approximately 7 mm and approximately 5 mm, respectively, and the upper and lower portions of

the third fold have heights of approximately 8.5 mm and approximately 6.5 mm, respectively, with the width of the folds increasing sequentially; and **in that** a top surface of this bead-on-abacus shape projects outward to form a bay-like shape having a radius of curvature of approximately 20 mmR, whereas a bottom surface thereof is shaped like a straight line following a projecting arc having a radius of curvature of approximately 0.8 mmR.

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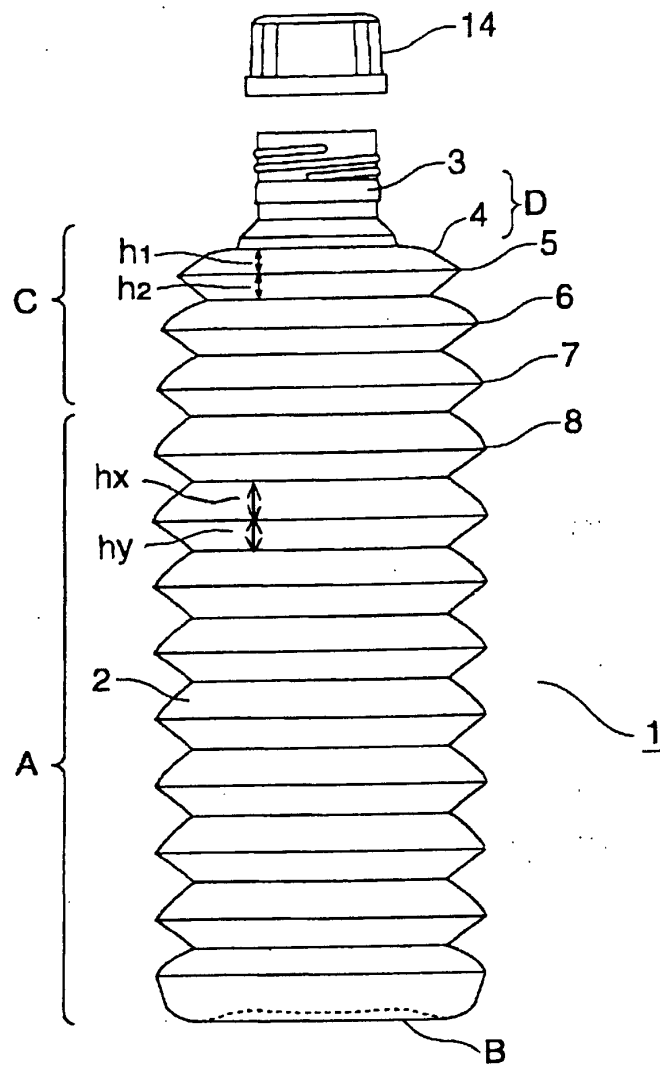
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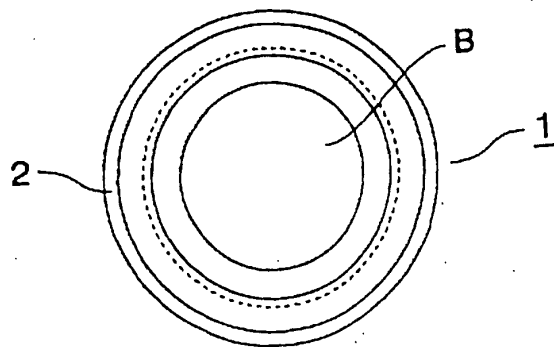
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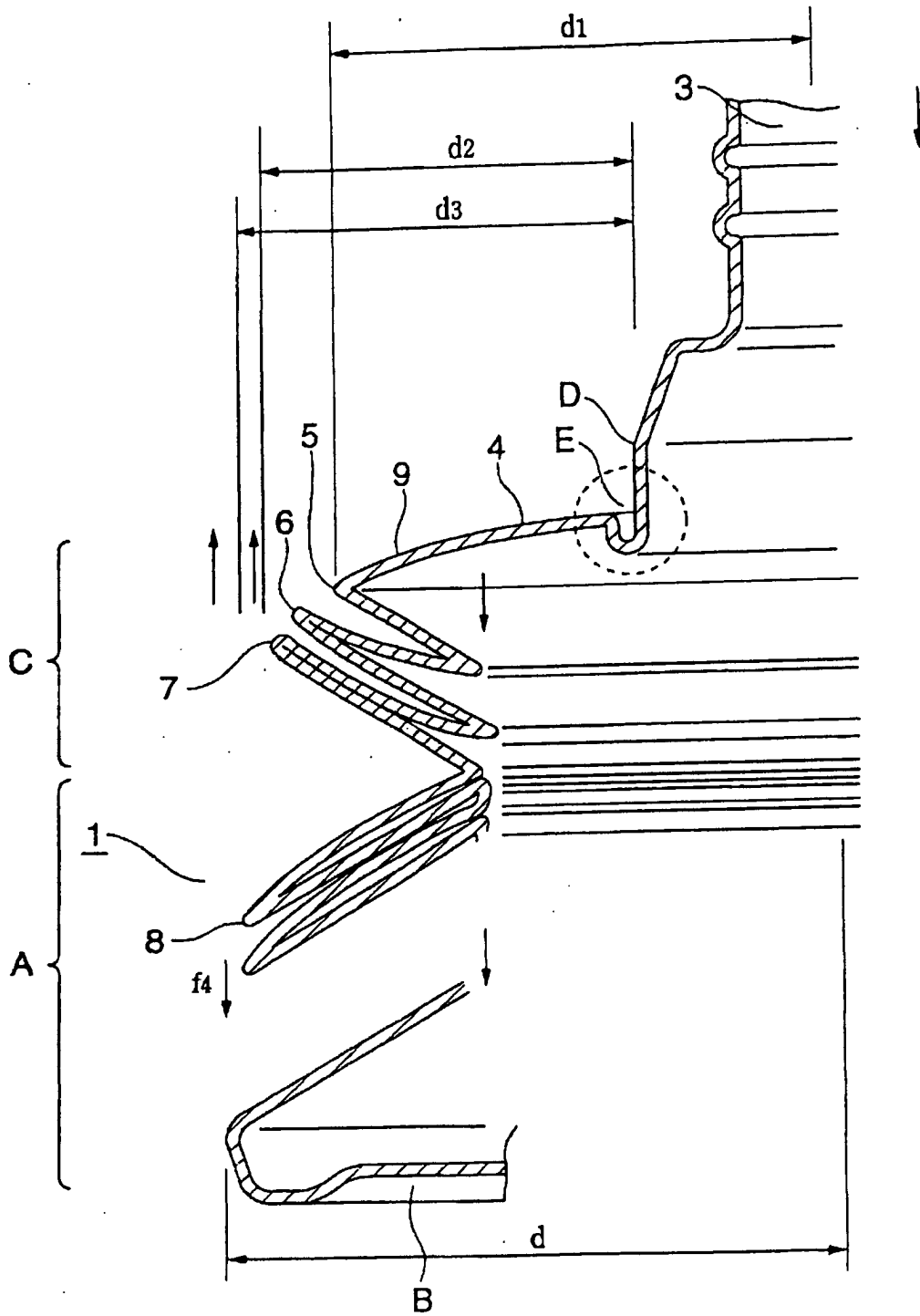
【FIG. 1】



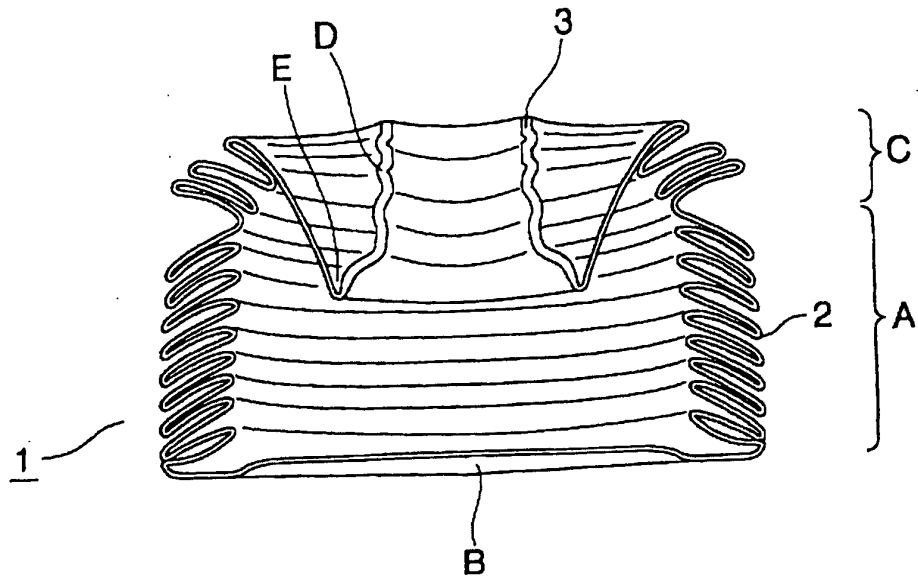
【FIG. 2】



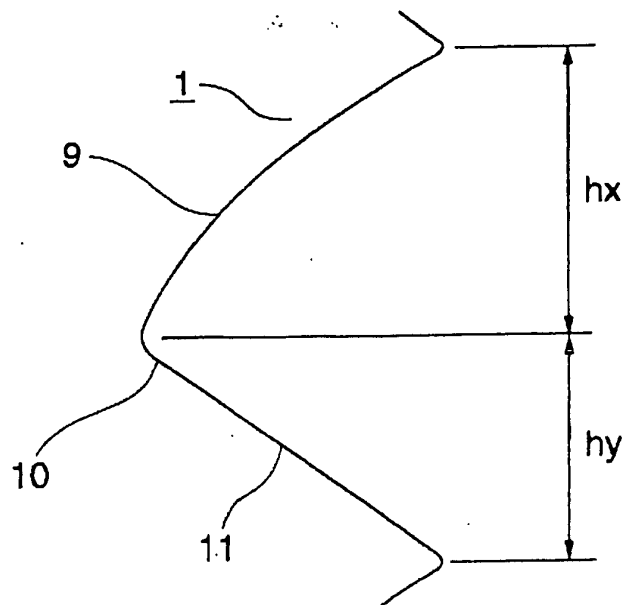
【FIG. 3】



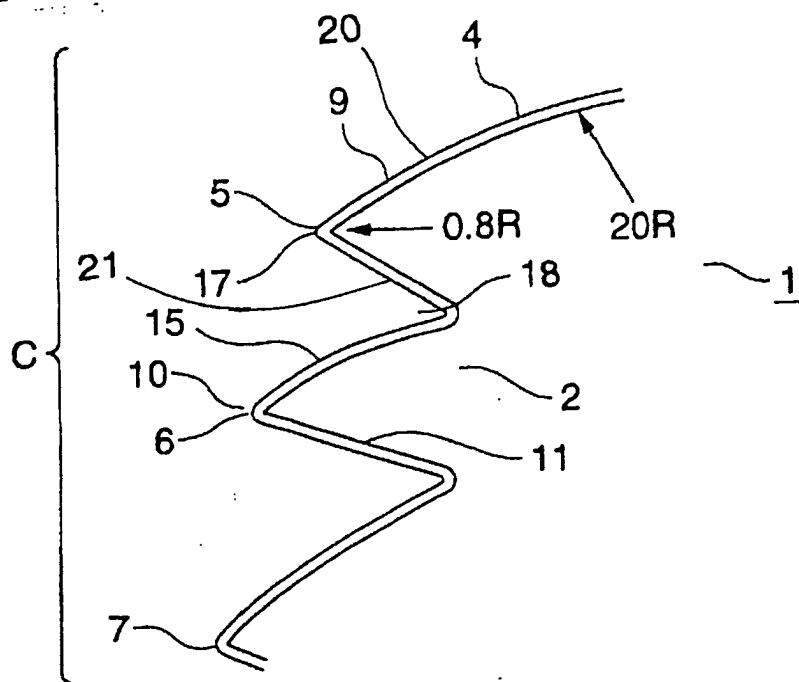
【FIG. 4】



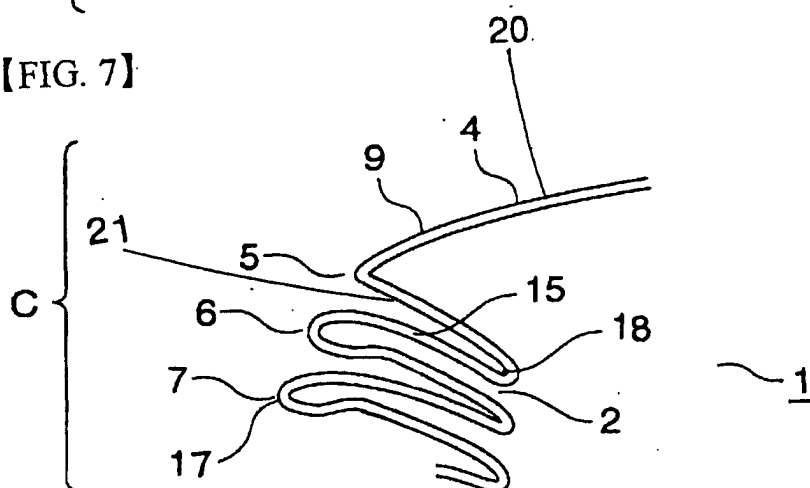
【FIG. 5】



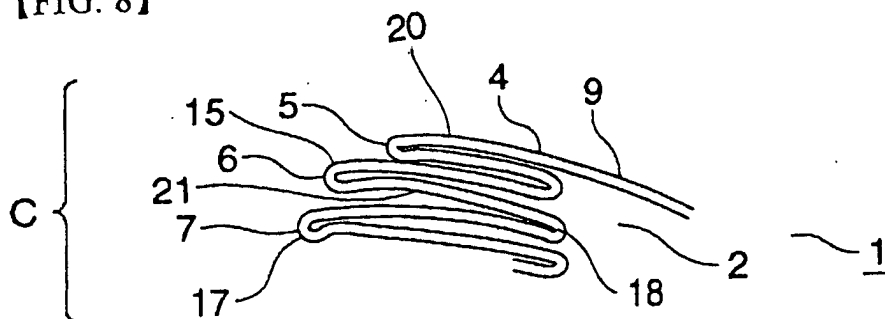
【FIG. 6】



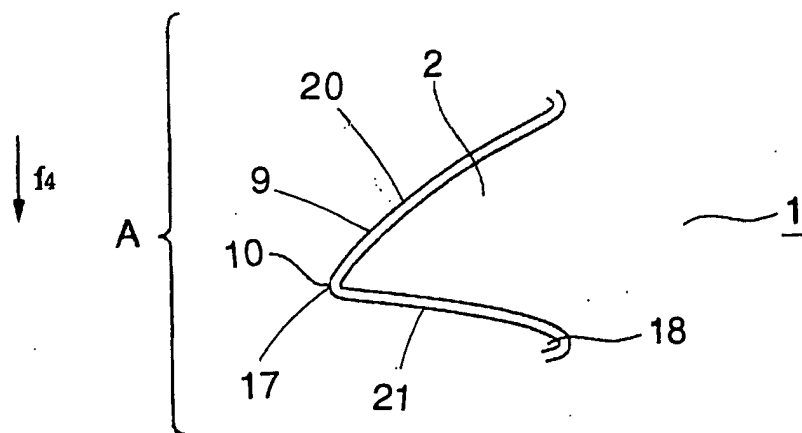
【FIG. 7】



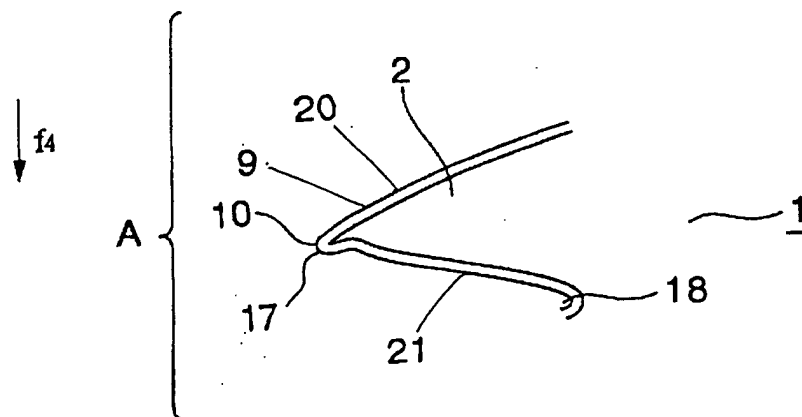
【FIG. 8】



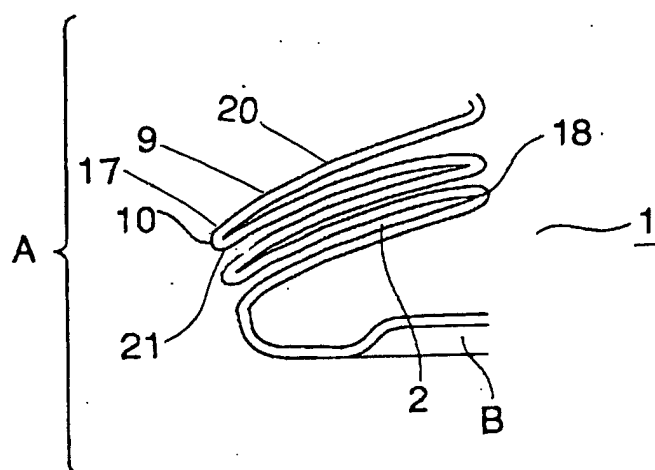
【FIG. 9】



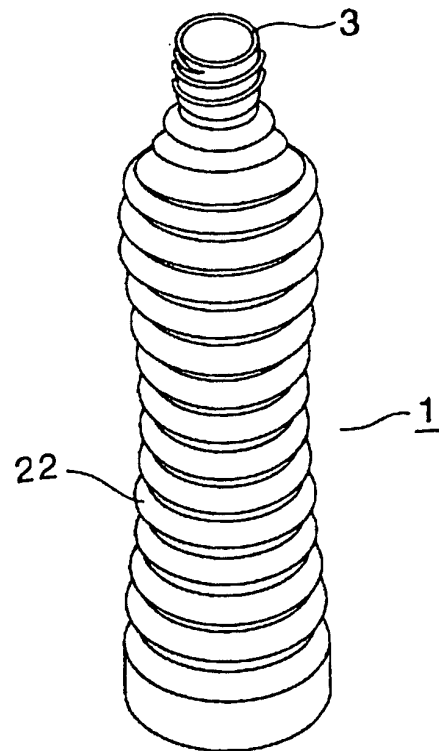
【FIG. 10】



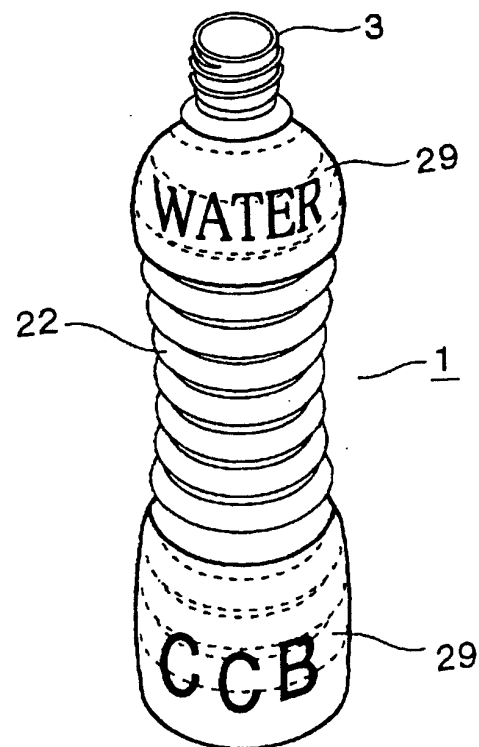
【FIG. 11】



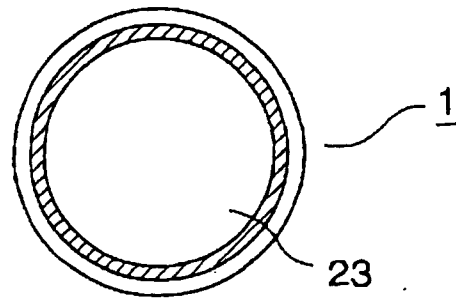
【FIG. 12】



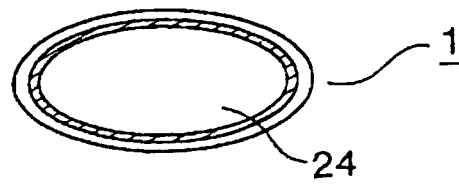
【FIG. 13】



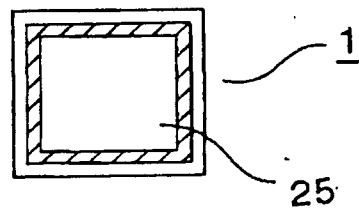
【FIG. 14】



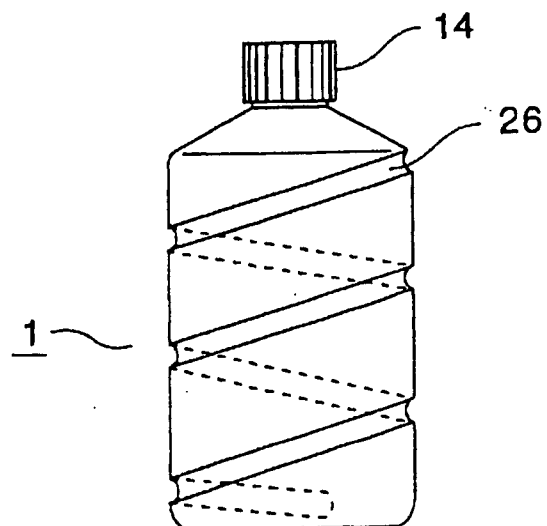
【FIG. 15】



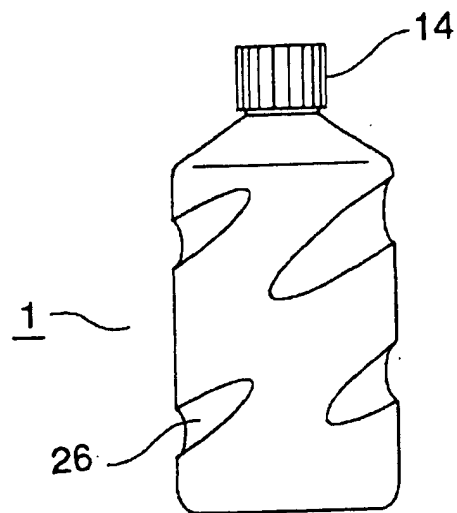
【FIG. 16】



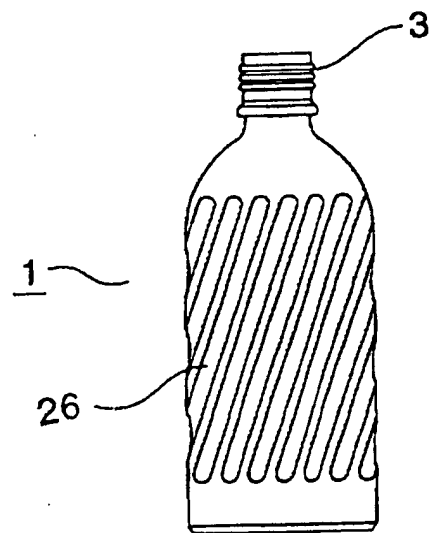
【FIG. 17】



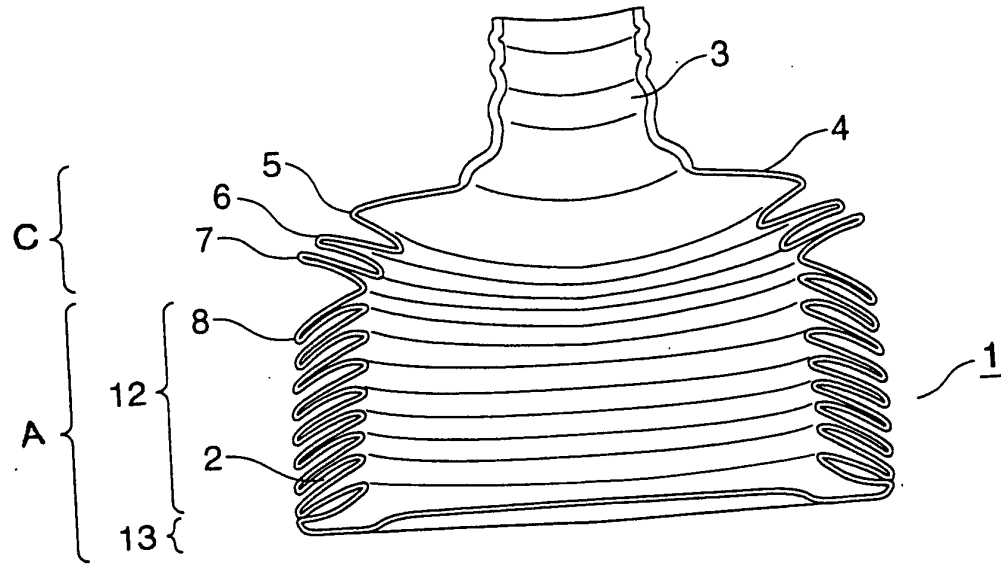
【FIG. 18】



【FIG. 19】



【FIG. 20】



【FIG. 21】

