A closed, preferably spherical container of rigid material, comprising a top portion bulging inwards and provided with an opening means, and a bottom portion adapted to be snapped inwards a distance thereby displacing said top portion to spherical shape.

10 Claims, 10 Drawing Figures
CLOSED, PREFERABLY SPHERICAL CONTAINER

The present invention relates to a closed, preferably spherical container of a rigid, flexible material.

A container of this kind is wanted for several reasons, among others because especially the spherical container remains spherical or ball shaped also at great inner pressures and a very small wall thickness. Also with regard to technical reasons a spherical shape of the container can be a necessary condition. A spherical shape also is favourable in case the content, e.g. food, should be heated in the container by radiation. In this connection a drum-shaped container having two bulging end walls is considered as a special embodiment of a spherical container.

For practical reasons a container of this kind must be easy to open and, moreover, it is necessary that the container be placed on a support without tilting over, which is especially important after opening of the container.

Opening of the container by cutting an opening by means of a knife or a similar tool is quite inappropriate, partly because a separate tool is required and partly because the bulging wall of the container at the opening operation is pushed inwardly giving rise to an overpressure in the container. If the container is filled with liquid and the portion of the wall of the container pushed inwardly by the tool is positioned under the surface of the liquid, a portion of the content will be squirited out when the tool penetrates the wall. Also a finger grip, known per se, protruding from the surface of the container for tearing an opening along a tear initiation is inconvenient in view of distribution. For the same reason a protruding spout with openable closure is unsuitable, and an opening in the wall of the container having an edge portion bent inwards and a countersunk sealing plug renders the pouring of liquid difficult.

The object of the invention is to provide a container of the kind initially mentioned meeting the above mentioned requirements and avoiding the above mentioned inconveniences. According to the invention this has been achieved in that a portion of the wall of the container is formed as a membrane bent inwards and provided with a pouring spout and/or an opening means, in addition to which the membrane is designed to be bent outwards with a snapping action when an opposed part, preferably a diametrically opposed part of the container wall, is pushed inwards, which part is connected to the membrane by means of a motion transmitting means which is positioned in the interior of the container and may consist of the content of the container. Thus, the container according to the invention initially has no bottom portion designed to permit placing the container upright on a support. After deformation of the portion of the container intended to be pushed inwards, however, such a bottom portion is formed. At the same time the membrane is pushed outwards, which may be achieved under the influence of the content displaced at the pushing operation, whereby the pouring spout of the container and/or the opening device will be exposed.

If the container is ball shaped at least a portion of the pouring spout and/or opening device can be designed to apply to a spherically curved surface forming an extension of the ball shape of the container covering the membrane and, moreover, a cap having the shape of a segment of a sphere and the same radius of curvature as the container may be removably secured to the container over said membrane so that a substantially smooth, ball shaped surface is achieved. In order to obtain a correct location of the membrane and the portion of the container to be pushed inwards, ring shaped bending initiations of the membrane and said opposed portion, e.g. stiffened portions, are suitably formed in the wall of the container. According to an embodiment of the invention the membrane is provided with an openable portion defined by a tear initiation extending along a curved or closed curve and adapted at least to get weakened due to the changed bowing of the wall in connection with the deflection of the membrane so that a further advantage is obtained due to the working mode of the container. If the container is completely filled with liquid or substantially no air is present in the container an hydraulic transmission is obtained to the membrane from the portion to be pushed inwards. A similar transmission of motion also can be obtained by a push rod fixedly attached to the portion to be pushed inwards. In order to permit use of the container also when an inner gas pressure can arise, e.g. for effervescent drinks, the push rod is, according to a preferred embodiment of the invention, fixedly attached not only to the portion to be pushed inwards but also to the membrane which by the push rod is prevented from bulging outwards under the influence of the gas pressure. If said tear initiation consists of a inner slot positioned in the middle of the membrane and presenting a slit surface converging towards a point in the interior of the container said push rod suitably can be fixedly attached to the openable portion of the membrane, so that a locking is obtained between the portion of the membrane attached to the push rod and the remaining portion of the membrane and so that the container can be opened by the push rod, as will be explained in detail below. An uncomplicated and especially useful container according to the invention is characterized by a motion transmitting means in the shape of a perforated tube positioned in the interior of the container, the one end of which being fixedly attached to the portion of the container adapted to be pushed inwards and the other end of which extending through the membrane and forming a closed pouring spout on the outside of the membrane.

The invention will be explained in detail below with reference to the accompanying drawings, wherein

FIG. 1 shows by way of example an embodiment of a container according to the invention adopted for transport, FIG. 2 shows the same container standing on a support and prepared to be opened, FIGS. 3 and 4 shows a detail of the container shown in FIGS. 1, 2, resp., FIG. 5 shows another embodiment of the container according to the invention, FIG. 6 shows a modification of the container shown in FIG. 5, FIG. 7 shows a further embodiment of the container according to the invention, FIG. 8 shows a detail of the container according to FIG. 7, FIG. 9 shows a modification of the embodiment shown in FIG. 6, and FIG. 10 shows a tin shaped in accordance with the invention.

The container shown in FIG. 1 comprises a thin-walled sphere consisting of a rigid plastics material.
and provided with a portion 2 bulging inwards, the periphery of which is defined by an angular bulge 4 integral with the wall of the container. A similar angular bulge 4 is provided at an opposite portion of the wall of the container. The portion 2 is provided with a tear initiation S, known per se, for tearing up a flap 6 of the portion 2 by means of a ring shaped finger grip 7 attached to the point of the flap 6. The portion 2 and the finger grip 7 are covered by a segment of a sphere 8 shaped of cardboard glued to the periphery of the portion 2.

The container is completely filled with liquid introduced through a slot in the wall of the container which slot after filling has been sealed. The container is completely spherical and the small variations in volume which may arise due to variations in temperature of the liquid are adopted without influences on the exterior of the container by the portion 2 working as a membrane. A container having this shape can be conveyed in an automatically operated distribution system in which the containers are rolled in a system of tubes or similar means, in which system considerable advantages are involved compared with distribution systems in which conventional conveyors are used.

The container is opened by pushing the bottom portion 9 inwards so that a bulging arises having its periphery located at the bulge 4, FIG. 2. At the same time the portion 2 is deflected outwards by the content of the container, which occurs with a distinct snap action so that the segment 8 is thrown away, if not removed earlier. The finger grip 7 is exposed so that the container can be opened, and after the bottom portion 9 has been pushed inwards the container can stand upright steadily upon a support. In order to facilitate opening of the container the portion 2 is suitably shaped in connection with the manufacture of the container. In this case the tear initiation 5 may consist of a notch 10, FIG. 3, in the outer surface of the wall, by which the wall is weakened. Thus, when the portion 2 is deflected outwards a tension (FIG. 4) arises due to the bending in the remaining uncut portion of the wall which accordingly is further weakened or partly bursts.

The container shown in FIG. 5 differs from the container shown in FIGS. 1 - 4 in that it is provided with a pouring spout 11 closed by a cap or screw plug 12, having a contour adapted to the spherical shape of the container. In this case the segment 8 may be omitted or provided with a perforation at the periphery of the cap or screw plug. Filling of the container may be carried out through the spout which may be positioned in its outer position.

If the container is intended for a content which can give rise to high pressures in the container, e.g. effervescent drinks, or if the container is intended to contain a considerable proportion of air or gas, a push rod 3, 4, for example in the shape of a perforated tube 13, is suitably fixedly attached to the center of the bottom portion 9 and the center of the portion 2 or the spout 11, as shown in FIG. 6, or to at least one of these portions, respectively. When the bottom portion 9 is pushed inwards the membrane portion 2 is positively deflected outwards, the bulges 3, 4 suitably being positioned so that the volume displaced by the bottom portion 9 is less than the displacement of the membrane portion 2, so that a pressure reduction is obtained in the interior of the container before opening.

The container shown in FIG. 7, essentially corresponds to the container shown in FIGS. 1 - 4. In FIG. 7, however, the finger grip 7 is replaced by a push rod 14 having a similar function as the tube 13 in FIG. 6. The original shape of the container is indicated by the lines 9' and 2'. The upper end of the push rod 14 is provided with a circular cover 15 fixedly clamped in an opening 16 tapered inwardly towards the interior of the container by means of a small flange 17 extending along the edge of the opening, as shown in FIG. 8. After pushing the bottom portion 9 inwards this portion is deflected under snap action to the position indicated by the line 9'' at the same time as the portion 2 is deflected to the position indicated by full lines. In this position the cover 15 is completely or partly disengaged due to the bending of the portion 2 in the direction opposite to the original direction so that the flange 17 is withdrawn from the cover 15. A continued pushing of the bottom portion inwards, thus, is accompanied by a lifting of the cover 15 away from the opening 16 after which the cover may be closed again by releasing the bottom portion 9. Sealing of the interspace between the cover 15 and the opening 16 may be effected by a sealing tape 18 glued on the cover 15 and the edge portion of the opening. As an alternative the cover 15 may be hingedly attached to the edge portion of the opening.

In FIG. 9 an alternative embodiment is shown of the container shown in FIG. 6 and provided with a pouring device and a sealing plug. The inwardly bulging portion 2 is reduced and the end of the tube 13 is positioned at a distance from the portion 2. A sealing plug 19 is attached to the end of the tube 13 by means of a bayonet catch. The free end of the tube 13 is guided by a flange 21 directed towards the interior of the container and extending around the edge of the opening 20. The sealing plug 19 is provided with a cap 22 sealingly applied against the edge of the opening 20 tapered towards the interior of the container. A perforated locking tape 23 may be glued to the cap 22 along its periphery. Also in this case a vaulted cap may be provided over the portion 2. As an alternative the cap 22 of the plug may have a vaulted shape adapted to the spherical shape of the container. Moreover, a sealing sleeve 21' consisting of foil material is provided between the flange 21 and the tube 13.

When the bottom portion is pushed inwards the portion 2 is displaced outwards and vaulted to a shape corresponding to the spherical shape of the container and at the same time the tube 13 starts sliding on the plug 19 guided by the flange 21 until the end of the tube hits the inside of the cap 22 and drives out the plug after which the end of the tube 13 is displaced a distance out of the container. After removing of the plug 19 the content can be poured out.

The embodiments shown in FIGS. 1 - 5 and FIG. 9 may be made of a soft wall material so that the lower half of the container can be pressed into the upper half in order to permit squeezing out a viscous content (see FIGS. 2, 9'').

The container shown in FIG. 10 is in the shape of a cylindrical tin 24 having an end wall 25 bulging inwards and provided with a finger grip 27 for permitting opening of the container and an end wall 26 bulging outwards. This container thus is a modification of the container shown in FIGS. 1 - 4. This container may be provided with the pouring pipe shown in FIG. 5 or, in order to permit the container to be used for e.g. effervescent drinks, anyone of the push rods shown in FIGS. 6 - 9. A conventional tin adapted for high pressures and
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made of extremely thin-walled sheet-metal necessarily has two end walls bulging outwards. In order to permit placing the tin upright upon a support and to protect the opening device, e.g. a finger grip 7 or a pouring pipe 11, the cylindrical portion of the conventional tin has to be extended beyond both end walls of the tin which makes the manufacture of the tin complicated and expensive and makes the tin space consuming.

The container according to the invention can be manufactured of a material acceptable in point of view of self-destruction, as for example thin-walled polyethylene plastics material, stiff plastic-faced paper, or extremely thin-walled sheet-metal, possibly in combination with an aluminum foil lining. Due to the fact that the container can be thin-walled also in case of high interior pressures it can easily be squeezed together after use and, thus, is less space consuming and, moreover, self-destruction arises more rapidly as compared with conventional containers consisting of thick-walled material. Also a drum-shaped container having a square cross-section can be manufactured.

I claim:

1. A closed, substantially spherical container of a flexible material, comprising a wall portion formed as an inwardly bent membrane, said membrane having outwardly projecting opening means, and a cap covering said opening means being detachably secured to the container and having an outer contour forming a segment of a sphere with a radius of curvature substantially equal to that of the container, said membrane being adapted to be outwardly snapped in response to an opposed container wall portion being snappingly pushed inwardly said container wall portion having a circular periphery defined by an angular bulge portion forming a ring shaped bending initiation, and said snapping curvature of said membrane being transmitted from said inwardly snapped wall portion through motion transmitting means interiorly of the container.

2. Container as claimed in claim 1, said opening means being provided with a removable closure supporting said cap.

3. A container as claimed in claim 1, said opening means comprising a pouring spout.

4. A container as claimed in claim 1, said motion transmitting means comprising the contents of said container.

5. A container as claimed in claim 1, characterized in that the membrane (2, 25) is provided with an openable portion (6) defined by a tear initiation (5) extending along a curved or closed curve and adapted at least to get weakened due to the changed bowing of the wall (1) in connection with the deflection of the membrane (2, 25).

6. A container as claimed in claim 1, characterized in that the motion transmitting means comprises a push rod (13, 14) fixedly attached to the portion (9) to be pushed inwards.

7. A container as claimed in claim 6, characterized in that the push rod (13, 14) is fixedly attached to the membrane (2).

8. A container as claimed in claim 5, characterized in that the tear initiation consists of an inner slot (16) positioned in the center of the membrane (2) and presenting a slit surface converging towards a point in the interior of the container.

9. A container as claimed in claim 1, characterized by a motion transmitting means in the shape of a perforated tube (13) positioned in the interior of the container, the one end of which being fixedly attached to the portion (9) of the container adapted to be pushed inwards and the other end of which extending through the membrane (2) and forming a closed pouring spout on the outside of the membrane.

10. A container as claimed in claim 1, characterized in that the volume displaced by said opposed portion (9) to be pushed inwards is less than the volume displaced by the membrane (2).