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(54) **BOTTLE AND A CORRESPONDING BOTTLE CAP**

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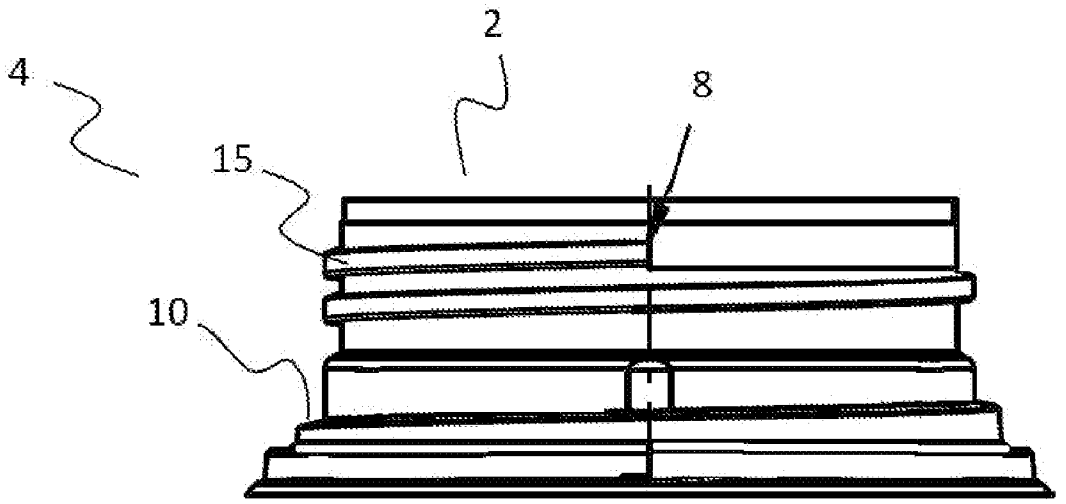
(57) **ABSTRACT**

A bottle (**1**) comprising: a neck (**4**) comprising an opening (**2**), the opening having a circular cross-section; an inner volume for receiving a flowable, preferably a liquid, composition through the opening; wherein the neck (**4**) comprises an external thread (**15**), comprising a thread-start (**8**) and a thread-end (**9**), the thread-start (**8**) being arranged closer to the opening than the thread-end (**9**); and wherein the neck further comprises an external helical slope (**10**), comprising a slope-start (**11**) and a slope-end (**12**), the slope-start (**11**) being arranged closer to the opening than the slope-end (**12**); wherein the external thread and the helical slope have the same handedness; and wherein the thread-start (**8**) and the slope-end (**11**) have a common cylindrical axis and are radially aligned relative to the common cylindrical axis (**12**); and wherein the slope-end (**12**) preferably ends at a radial wall (**13**).



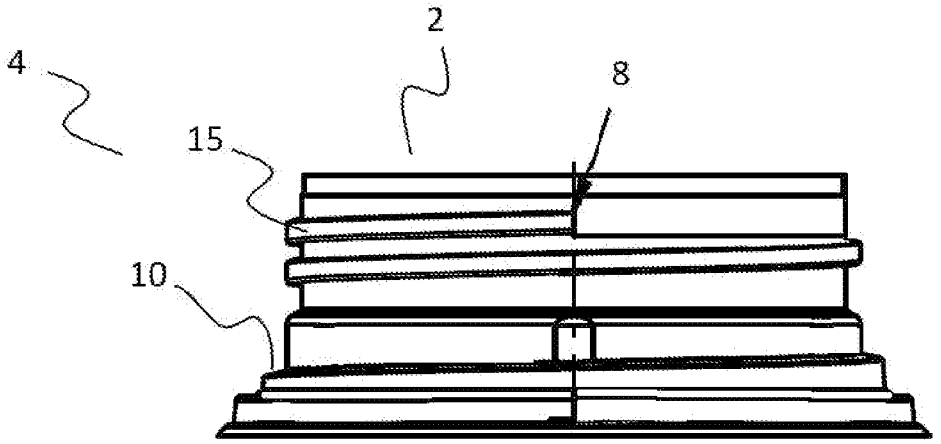


FIG. 1

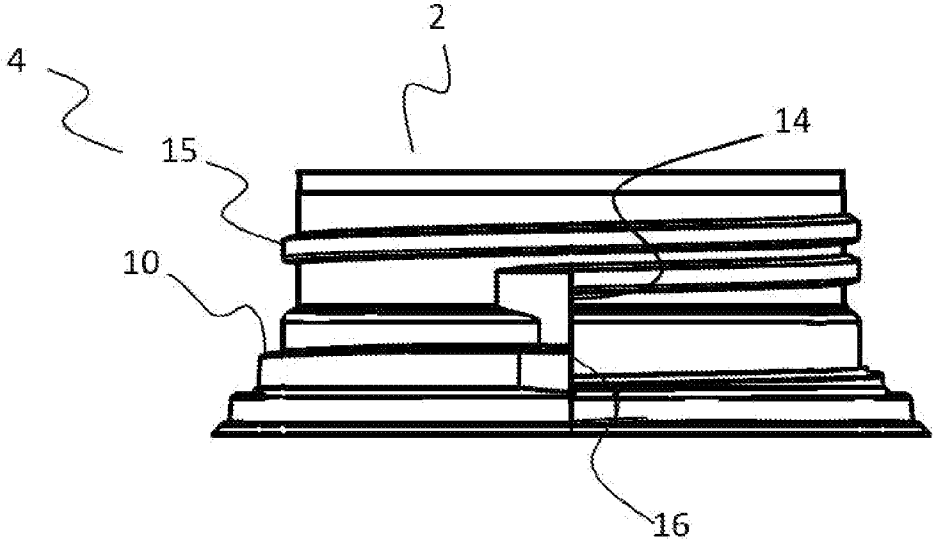


FIG. 2

BOTTLE AND A CORRESPONDING BOTTLE CAP

FIELD OF THE INVENTION

[0001] The present invention generally relates to a bottle with an inner volume for receiving a flowable, preferably a liquid, composition. The present invention further concerns an upper part, preferably a cap, for this bottle, as well as a set of bottle and upper part.

BACKGROUND OF THE INVENTION

[0002] Bottles for receiving and thus storing liquids are known to be used in the most varied kinds of shapes, and materials. Very common bottles for holding liquids, such as detergent compositions, are made of plastic material. Such bottles also comprise caps for closing the inner volume, such that when filled and closed the flowable composition (which excludes gases and vapours) is kept inside the bottle, independently of the orientation of the bottle.

[0003] However, when shipping the bottles, external forces acting on the bottle may distort the bottle neck, opening and/or cap, such that the closure is not tight enough and the flowable composition may leak. This is specially a problem when single units are shipped, e.g. by post or small parcel delivery, because the kinds of external forces cannot be controlled as well as on a pallet.

[0004] The present invention relates to addressing this problem of providing a tight seal with a bottle.

[0005] Furthermore, other desirable features and characteristics of the present invention will become apparent from the subsequent detailed description of the invention and the appended claims, taken in conjunction with the accompanying drawings and this background of the invention.

BRIEF SUMMARY OF THE INVENTION

[0006] A bottle (**1**) comprising: a neck (**4**) comprising an opening (**2**), the opening having a circular cross-section; an inner volume for receiving a flowable, preferably a liquid, composition through the opening; wherein the neck (**4**) comprises an external thread (**15**), comprising a thread-start (**8**) and a thread-end (**9**), the thread-start (**8**) being arranged closer to the opening than the thread-end (**9**); and wherein the neck further comprises an external helical slope (**10**), comprising a slope-start (**11**) and a slope-end (**12**), the slope-start (**11**) being arranged closer to the opening than the slope-end (**12**); wherein the external thread and the helical slope have the same handedness; and wherein the thread-start (**8**) and the slope-end (**11**) have a common cylindrical axis and are radially aligned relative to the common cylindrical axis (**12**); and wherein the slope-end (**12**) preferably ends at a radial wall (**13**).

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention will hereinafter be described in conjunction with the following drawing figures, wherein like numerals denote like elements, and

[0008] FIG. **1** shows a front view of a bottle neck (**4**) with an opening (**2**), a thread (**15**) comprising a thread-start (**8**) and a slope (**10**); and

[0009] FIG. **2** shows a rear view of the bottle neck (**4**) of FIG. **1** with an opening (**2**), a thread (**15**) comprising a thread-start (**8**) and a slope (**10**). The thread ends at a radial wall (**14**). The slope ends at a step (**16**).

DETAILED DESCRIPTION OF THE INVENTION

[0010] The following detailed description of the invention is merely exemplary in nature and is not intended to limit the invention or the application and uses of the invention. Furthermore, there is no intention to be bound by any theory presented in the preceding background of the invention or the following detailed description of the invention.

[0011] The invention concerns a bottle comprising a neck. The neck comprise an opening, and the opening has a circular cross-section. The bottle has an inner volume for receiving a flowable, preferably a liquid, composition through the opening. The neck comprises an external thread. An example of such a thread is a right-handed external thread of a plastic bottle suitable for a plastic screw cap. The thread according to the invention comprises a thread-start and a thread-end, the thread-start being arranged closer to the opening than the thread-end.

[0012] The neck further comprises an external helical slope, comprising a slope-start and a slope-end, the slope-start being arranged closer to the opening than the slope-end. The external thread and the helical slope have the same handedness. Thus, the thread and the slope are either both right handed or both left handed.

[0013] The thread is preferably arranged at a position of the neck, which is closer to the opening. Thus, closer to the top of the bottom for a bottle which has the opening on the top when standing on a base. The slope is preferably arranged at a position of the neck that is further from the opening as the position for the thread. Thus, the slope is preferably below the thread for a bottle having the opening on the top when standing on a base.

[0014] The thread-start and the slope-end have a common cylindrical axis and are radially aligned relative to the common cylindrical axis.

[0015] The slope-end preferably ends at a radial wall. A radial wall is a wall that extends along a radius starting from the common cylindrical axis.

[0016] In one preferred embodiment of the invention the neck comprises a first cylindrical section, a second cylindrical section, wherein the first cylindrical section has a smaller outer diameter than the outer diameter of the second cylindrical section and is closer to the opening than the second cylindrical section. In this embodiment, it is further preferred that the neck further comprises a third cylindrical section; wherein the second cylindrical section has a smaller outer diameter than the outer diameter of the third cylindrical section and is closer to the opening than the third cylindrical section. The first and second sections, preferably also the third if available, have a common cylindrical axis. The thread is arranged on the first cylindrical section and the slope is arranged on the second cylindrical section. When the third cylindrical, if available, has the function to flush close the outer surface of the bottle with an outer surface of a suitable closing upper part, or cap, so that the thread and slope can be hidden from the exterior.

[0017] It is envisaged that the slope and the thread are arranged parallel in axial direction relative to the common axis. Thus, they have the same lead.

[0018] In any case or possible combination of the invention, it is highly preferred that the thread has a single start. This ensures that the end position of the upper part is always the same pre-determined position when threaded on the neck.

[0019] It is preferred that the diameter of the neck immediately following the lower side of the slope, thus the side

which is facing away from the thread, is equal or greater than the external diameter of the slope. That reinforces the slope against axial forces.

[0020] The neck preferably comprises a stopper at a pre-defined angular position. Because of the stopper, it is possible to screw a suitable counter-thread over the thread, the screw movement stopping at the pre-defined angular position. The angular position is relative to the common axis (as named herein as common cylindrical axis).

[0021] In a preferred embodiment, the slope-end and the slope-start are radially aligned relative to the common axis so that the radial wall is a step bridging the slope-end to the slope-start. That means that the slope's angular length is preferably multiple of 360°. In one preferred embodiment the step is the stopper.

[0022] It is also preferred that the thread-end ends at a radial wall, so that when a suitable counter-thread is threaded over the thread, the radial wall is suitable to stop the screw motion when the counter-thread reaches the radial wall. In one preferred embodiment the radial wall is an auxiliary stopper, and is preferably aligned with the step at the same pre-defined angular position.

[0023] It is preferred that the major thread diameter of the thread is smaller than the minor slope diameter. The minor slope diameter is the diameter of the neck at the position extending from the slope towards the thread.

[0024] A second aspect of the invention concerns an upper part for the bottle according to the invention. Thus, upper-part and bottle are made to cooperate with each other. The upper-part is preferably a cap.

[0025] The upper part is able to close the opening, and comprises:

[0026] a counter-thread arranged to cooperate with the thread of the bottle's neck;

[0027] a counter-slope arranged to cooperate with the slope of the bottle's neck;

[0028] the counter-thread and the counter-slope are configured such that when unscrewing the upper part on the bottle, on at least one angular position, the counter-thread contacts the thread and the counter-slope contact the slope simultaneously. Therefore, the counter-thread is an inner thread so that it can cooperate with the external thread of the bottle. The counter-slope and the counter-thread have preferably a common cylindrical axis. In all embodiments of the upper part, the counter-thread is arranged on the inner side of a cylindrical wall.

[0029] Preferably, the counter-thread and the counter-slope have an angular length of at least 90°, preferably at least 180° so that, when unscrewing the upper part on the bottle, the simultaneous contact extends to an angular length of at least 90°, more preferably at least 180°.

[0030] Preferably, wherein the counter-thread comprises a counter-radial-segment at its end configured to cooperate with the radial-wall of the thread-end, when screwed on the bottle.

[0031] Preferably, the slope and the thread are arranged parallel in axial direction relative to the common axis, therefore providing two contact points for a suitable cap with a counter thread and a corresponding counter slope. Thus, while unthreading the upper part, there are two contact points exerting a force to separate the upper part from the bottle.

[0032] The counter-slope preferably comprises a counter-step, preferably in axial direction, configured to cooperate with the step of the slope-end. In one preferred embodiment, the wall of the cylindrical wall, on which the thread is arranged has, at one end which is suitable to face the slope when the upper part is screwed on the bottle, an axially protruding wall segment, preferably as a slope shaped cut, which is suitable to cooperate with the slope. The advantage of having the protruding segment axially is that the cylinder can be taken out of a mould. This is especially an advantage when the upper part is double walled.

[0033] Preferably the upper part further comprises an annular contact surface, configured to seal a bottle at the bottle opening, when the upper part is screwed the bottle, preferably when the upper part is screwed to the bottle until at least one, preferably both, of the following conditions is satisfied:

[0034] (i) the counter-stopper contacts the stopper;

[0035] (ii) the counter-radial-segment contacts the radial-wall.

Accordingly, due to the thread and slope, and the pre-determined angle defining the end-position up to which the upper part can be screwed on the bottle, a tight seal is achieve with the pre-determined strength, because the use knows when the end position is achieved, and an over-screwing is not possible.

[0036] In one embodiment of the invention, the upper part is a cap for the bottle, the cap being configured to provide a tight seal to the bottle. Particularly preferably, the cap provides a tight seal to the bottle for closing the inner volume of the bottle and thus configured to retain liquid inside when the bottle is filled.

[0037] The present invention also foresees a set of bottle with cap comprising a bottle and an upper part as described herein. Preferably is a closed bottle, further preferably a closed bottle comprising liquid detergent.

[0038] The bottle and/or the set according to the invention is especially advantageously when being used with an upper part having a spout. The upper part when screwed on the bottle will always be oriented on the bottle at a pre-determined orientation, thus the spout will have the pre-determined orientation.

[0039] In all embodiments and variants of the invention, it is advantageous that the external thread is a trapezoidal thread. The profile of such a thread has a trapezoidal outline. Such thread profiles are known, although for other uses. Such a thread, as also shown in the figures, provide a secure screwing and unscrewing for the upper part on the bottle. Larger forces can be applied without damaging the screw, thus enabling a tight lock of the upper part on the bottle to be achieved.

[0040] In one alternative of the invention above, the neck is free of an external helical slope; the neck comprises an abutment serving as a stopper to the counter-slope. In this alternative, it is further required that the thread be a trapezoidal thread. The abutment is configured to cooperate with the counter-step of the counter-slope when a suitable counter-thread is threaded until the end over the thread. Thus, providing a stop position to the screwing action when the upper-part is screwed on the neck. The abutment thus shares a function in common with the step of the helical slope (which slope is not provided in this case). This alternative of the invention can be combined with all the description for the bottle and neck in this document, with the according changes as described in this paragraph.

[0041] Further definitions:

[0042] Screw motion, screwing, threading, or when threaded have all the same meaning within the current invention disclosure.

[0043] External thread means it is a male thread.

[0044] Diameter of the neck is the external diameter.

[0045] A helical slope is slope is defining a helicoid in axial direction.

[0046] The outer diameter of the neck includes the major diameter of the thread at the threads position.

[0047] The outer diameter of the slope includes the major diameter of the thread at the slope's position.

[0048] FIGS. **1** and **2** show an example of an embodiment according to the invention.

[0049] FIG. **1** shows one view of a neck according to the invention, a neck (**4**) with an opening (**2**), a thread (**15**) comprising a thread-start (**8**) and a slope (**10**).

[0050] FIG. **2** shows the other side view of the neck of FIG. **1**, a neck (**4**) with an opening (**2**), a thread (**15**) comprising a thread-start (**8**) and a slope (**10**). The thread ends at a radial wall (**14**). The slope ends at a step (**16**).

[0051] While at least one exemplary embodiment has been presented in the foregoing detailed description of the invention, it should be appreciated that a vast number of variations exist. It should also be appreciated that the exemplary embodiment or exemplary embodiments are only examples, and are not intended to limit the scope, applicability, or configuration of the invention in any way. Rather, the foregoing detailed description will provide those skilled in the art with a convenient road map for implementing an exemplary embodiment of the invention, it being understood that various changes may be made in the function and arrangement of elements described in an exemplary embodiment without departing from the scope of the invention as set forth in the appended claims and their legal equivalents.

What is claimed is:

1. A bottle (**1**) comprising:

a neck (**4**) comprising an opening (**2**), the opening having a circular cross-section;

an inner volume for receiving a flowable, preferably a liquid, composition through the opening;

wherein the neck (**4**) comprises an external thread (**15**), comprising a thread-start (**8**) and a thread-end (**9**), the thread-start (**8**) being arranged closer to the opening than the thread-end (**9**); and

wherein the neck further comprises an external helical slope (**10**), comprising a slope-start (**11**) and a slope-end (**12**), the slope-start (**11**) being arranged closer to the opening than the slope-end (**12**);

wherein the external thread and the helical slope have the same handedness; and

wherein the thread-start (**8**) and the slope-end (**11**) have a common cylindrical axis and are radially aligned relative to the common cylindrical axis (**12**); and

wherein the slope-end (**12**) ends at a radial wall (**13**).

2. A bottle according to claim **1**, wherein the slope (**10**) and thread (**15**) are arranged parallel in axial direction relative to the common axis.

3. A bottle according to claim **1**, wherein the neck (**15**) further comprises a stopper at a predefined angular position.

4. A bottle according to claim **1**, wherein the slope-end (**12**) and the slope-start (**11**) are radially aligned relative to the common axis (**12**) so that the radial wall (**13**) is a step (**16**) bridging the slope-end (**11**) to the slope-start (**12**).

5. A bottle according to claim **1**, wherein the thread-end (**9**) ends at a radial wall (**14**), so that when a suitable counter-thread is threaded over the thread (**15**), it stops when reaching the radial wall (**14**).

6. A bottle according to claim **1**, wherein the step (**16**) of claim **4** is the stopper according to claim **3**.

7. A bottle according to claim **6**, wherein the radial wall (**14**) is an auxiliary stopper, is aligned with the step (**16**) at the pre-defined angular position.

8. A bottle according to claim **1**, wherein major thread diameter of the thread (**15**) is smaller than the minor slope diameter

9. An upper part suitable for a bottle according to claim **1**, the upper part being able to close the opening, and comprising:

a counter-thread (**17**) arranged to cooperate with the thread (**15**);

a counter-slope (**18**) arranged to cooperate with the slope (**10**);

the counter-thread (**17**) and the counter-slope (**18**) configured such that when unscrewing the upper part on the bottle, on at least one angular position, the counter-thread (**17**) contacts the thread (**15**) and the counter-slope (**18**) contact the slope (**10**) simultaneously;

10. An upper part according to claim **9**, wherein the counter-thread (**17**) and the counter-slope (**18**) have an angular length of at least 90°, so that, when unscrewing the upper part on the bottle, the simultaneous contact extends to an angular length of at least 90°.

11. An upper part according to claim **9**, wherein the counter-thread comprises a counter-radial-segment at its end configured to cooperate with the radial-wall (**14**) when screwed on the bottle.

12. An upper part according to claim **9**, wherein the counter-slope (**17**) comprises a counter-step, in axial direction, configured to cooperate with the step (**16**).

13. An upper part according to claim **9**, further comprising an annular contact surface, configured to seal a bottle, when the upper part is screwed to the bottle until at least one of the following conditions is satisfied:

(i) the counter-stopper contacts the stopper;

(ii) the counter-radial-segment contacts the radial-wall (**14**).

14. An upper part according to claim **9**, wherein the bottle cap is configured to provide a tight seal for a composition to the bottle.

15. An upper part according to claim **9**, wherein the bottle cap is configured to provide a tight seal to the bottle for closing the inner volume of the bottle and thus configured to retain liquid inside when the bottle is filled.

* * * * *