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(54) **Container finish and combination of a container finish and a closure cap**

(57) This invention concerns a container finish (1) having an essentially cylindrical outside surface (2) with one single thread (3), said thread being arranged on the outside surface (2) so as to extend over an angle of less

than 550 DEG and more than 360 DEG. The container finish (1) comprises at least one venting recess (4), said venting recess (4) interrupting the thread (3), wherein the thread (3) has a pitch (6) of less than 3mm.

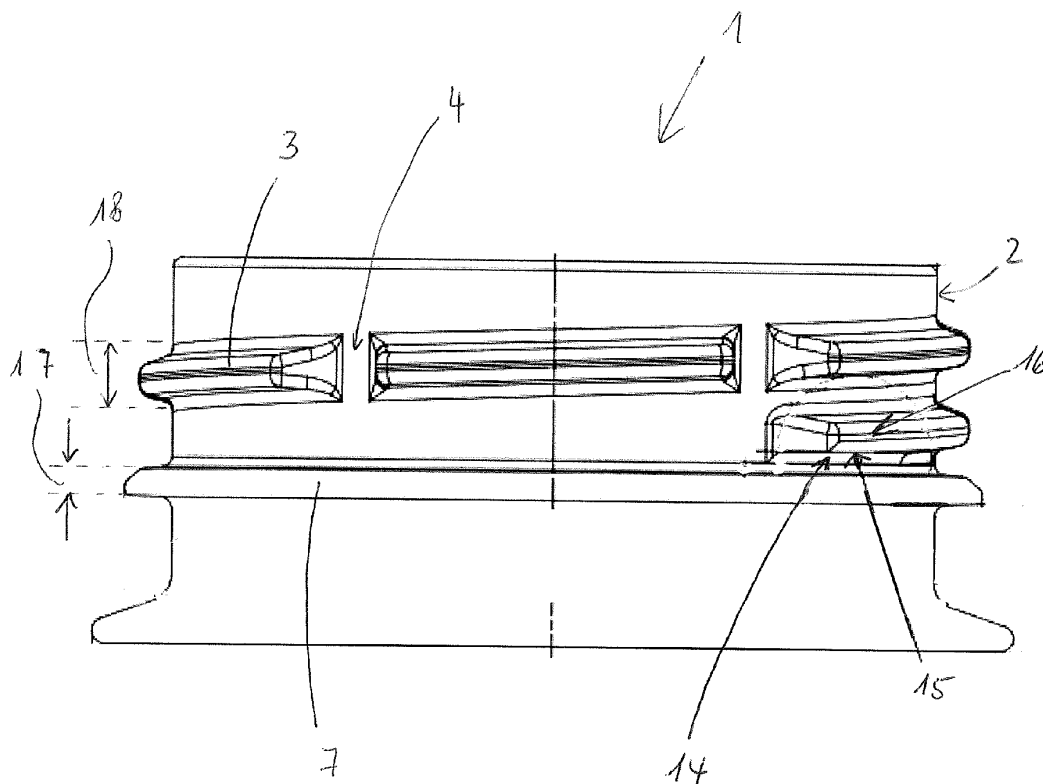


Fig. 2

Description

[0001] This invention concerns a container finish, a container with a container finish and a combination of a container finish and a closure cap according to the preamble to the independent patent claims.

[0002] In the case of containers that are filled with beverages containing carbon dioxide, the internal pressure will be raised when such a container is in the closed condition. Upon opening the container, sudden ejection of the closure due to the raised internal pressure should be avoided. Such ejection is accompanied by a risk of injury to the consumer.

[0003] Thus usually containers or closures are provided with means to vent the closure during unscrewing, allowing a venting time that lasts long enough to prevent an intentionally rapid unscrewing and the risk of a high-speed ejection of closures.

[0004] In order to facilitate opening, short opening angles are preferred.

[0005] Various closure arrangements with multi-start threads on the closure and the container finish are state of the art for such purpose. With short opening angles, the opening time until full release of the closure is reduced and the venting capacity thus needs to be increased.

[0006] WO 97/28057, for example, discloses a closure that possesses a twin-start thread. Two outwardly protruding threads are displaced by 180 DEG. Each thread preferably extends over an angle of 240 DEG to less than 360 DEG.

[0007] The distribution of the force exerted from the container finish onto a closure is, with such an arrangement, point-symmetrical and diagonally opposed so that the risk of tilting or one-sided ejection is reduced.

[0008] Recently there has been an increased demand for short and lightweight finishes. US 7,866,496 discloses a finish for a hot fill container with a weight from about 3.5 to 8 g. US 4,242,398 concerns a pressure resistant thermoplastic container, wherein in order to reduce the centre of gravity the material or wall thickness in the neck and shoulder region is redistributed to the lower portion of the container. Whereas a typical upper neck or finish weighs about six grams, a lightweight finish weighs as low as two grams. Short finishes are also known for non carbonated beverages.

[0009] The object of the invention is to avoid drawbacks of the state of the art, and in particular to create a short lightweight container finish and a combination of container finish and a short closure cap which nevertheless possesses venting properties for reduction of the internal pressure during the opening sequence of containers containing beverages with a carbon dioxide content.

[0010] According to the invention, these and other objects are solved with a closure finish and a combination of a closure cap and a container finish according to the independent patent claims.

[0011] A container finish according to the present in-

ventions possesses an essentially cylindrical outside surface with one single thread. All parts of the single thread are arranged on one virtual continuous screw line which has no kink and no step.

[0012] The thread is arranged on the outside surface so as to extend over an angle less than 550 DEG and more than 360 DEG. During opening, such an arrangement prevents tilting or one-sided opening of the closure, and its ejection from the finish, since the force exerted from the container finish onto a closure is evenly distributed around the whole circumference of the finish. Thus the risk of premature and one-sided ejection is reduced. On the other hand the opening angle is still small enough for providing a quick and comfortable opening.

[0013] The container finish according to the present invention further comprises at least one venting recess, said venting recess interrupting the thread. During the opening sequence, the venting recess permits reduction of the internal pressure within the container at a time when a closure is still firmly engaged with the container finish.

[0014] According to the present invention the thread has a pitch of less than 3mm, in particular 2 to 3 mm, in particular 2.5 mm.

[0015] The relatively small pitch results in a high percentage of the holding force acting in axial direction and therefore supports the prevention of ejection. The low pitch further allows the design of a short and thus lightweight container finish.

[0016] In a preferred embodiment of the invention at least two venting recesses are aligned to each other, preferably in axial direction.

[0017] The alignment of the venting recesses, preferably in a vertical arrangement, results in a "slot", which interrupts the thread twice and thus good venting behaviour is attained. A certain lateral displacement of the superimposed "slots" is possible as long as the free passage for exiting gas is not essentially restricted.

[0018] Preferably the venting recess has a certain circumferential aperture. The at least one venting recess interrupts the base line of the thread over a circumferential aperture angle around the finish axis. In a sectional top view said aperture angle is between 4 DEG and 10 DEG at the bottom of the venting recess.

[0019] Advantageously the at least one venting recess is defined by two lateral surfaces, wherein at least one lateral surface in a radial cross section includes an angle with respect to a radial line. In the present context a radial line is a line running from the axis of the finish to a centre of the bottom of venting recess in a plane perpendicular to the axis. Said angle is being between half of the aperture angle and 90 DEG in a plane perpendicular to the axis, preferably said angle being 30 DEG or 60 DEG.

[0020] The individual venting recesses are thus formed to taper outwardly and to open from the base line of the thread towards an outer line of the thread.

[0021] In a favourable embodiment a plurality of venting recesses or venting slots is arranged at regular spac-

ings in the circumferential direction, in particular six venting recesses are arranged with a 60 DEG spacing between the radial lines.

[0022] The object of the present invention are also solved with a closure finish, preferably as described above, wherein the container finish comprises at least one thread and at least one venting recess. At least one venting recess has a first lateral surface. Said first lateral surface in a radial cross section includes a first angle with respect to the radial line. The at least one venting recess further has a second lateral surface, said second lateral surface in a radial cross section includes a second angle with respect to the radial line.

[0023] According to a further aspect of the present invention the first angle and the second angle are different.

[0024] Thus the venting recess tapers outwardly and opens asymmetrically.

[0025] Preferably the first angle is equal or smaller than 30 DEG and preferably the second angle is longer than 30 DEG, more preferably is about 60 DEG.

[0026] Preferably asymmetric venting recesses are arranged near opening lines of the mould splits. The lateral surfaces of the venting recesses are arranged in a way that there is no undercut in the moving direction of the mould splits. Thus the asymmetric openings enable an easy de-moulding of the container finish, especially in the region of a venting recess.

[0027] Particularly the container finish is formed in a mould with two parts forming the outer surface of the finish. Thus there is a single parting line for de-moulding. The lateral surfaces of a venting recess shall be parallel to or taper outwardly from the moving direction, thus in a direction perpendicular to the parting line. This is achieved by asymmetrically arranged lateral surfaces for venting recesses close to the parting line.

[0028] According to a further aspect of the present invention the thread comprises a truncated thread end, preferably a basically horizontal surface on the lower side of the thread end.

[0029] The shorter the distance between the lower container thread end and a retaining bead for retaining a tamper evident strip of a closure, the shorter the distance that can be selected between the lower thread end of the closure and an anti-tamper strip on the closure. A longer distance between the lower container thread and the retaining bead leads to a longer passage of the gas. The exiting gas thus will be subject to higher resistance. By selecting a longer distance a worsened gas-release behaviour results.

[0030] In order to allow the thread to pass into the fully screwed on position, even with a small distance between lower thread end and retaining bead, the lower side of the thread end is truncated. Preferably the lower side of the thread end is flattened, thus the thread end has a smaller axial extension than the rest of the thread.

[0031] The truncation typically extends over the first tread segment.

[0032] Preferably the axial distance between the lower

side of the thread end and the upper side of the retaining bead is smaller than the distance between the upper side of the thread and the lower side of the thread part which is axially above.

[0033] Hence the thread engagement between closure and neck finish is maximized with at the same time allowing an appropriate venting time when the closure gets unscrewed.

[0034] In a beneficial embodiment the finish has a weight of 2.0 g - 2.1 g, in particular 2.05g.

[0035] The container finish comprises a cylindrical wall with a thickness of about 2-2.5mm and is preferably made from PET.

[0036] In a preferred embodiment the container finish beneath the threads, possesses a circumferential retaining bead for an anti-tamper strip of a closure cap. Said bead protrudes radially outwards, in particular more than the thread, in particular more than 1.25 times the radial extension of the thread.

[0037] When capping the container finish the anti-tamper strip may easily pass the thread and only bulge when passing the retaining bead.

[0038] Preferably the retaining bead has an axial extension which is smaller than the axial extension of the thread, in particular less than 70% of the axial extension of the thread.

[0039] The closure is held on the container by the threads. The threads therefore need to withstand high axial forces due to internal pressure. Depending on the frangible connection between the main part of the closure cap and the taper evident strip the retaining bead being responsible for breaking this connection needs not to be as strong as the thread.

[0040] The objects of the present invention are also solved with a container finish, preferably as described above, which has at least one thread and a circumferential retaining bead for an anti-tamper strip, said bead protruding radially outwards. At least a part of the upper side of the retaining bead in an axial cross section includes an angle of less than 10 DEG, in particular 5 DEG to 10 DEG, more particularly 8 DEG, with a plane perpendicular to the axis.

[0041] Preferably, the lower side of the sealing bead is basically horizontal. The angle between the lower side of the retaining bead and a plane perpendicular to the axis may deviate up to 3 DEG, is preferably 2 DEG.

[0042] A small angle between the upper side and the lower side of the retaining bead provides for a flat retaining bead.

[0043] In a favourable embodiment the upper side of the retaining bead comprises a radially inner part arranged close to the essentially cylindrical outside surface of the finish and an outer part arranged adjacent and exterior with respect to the inner part of the upper side. In an axial cross section the inner part and the outer part have different angles to a plane perpendicular to the axis.

[0044] Whereas the inclination of the inner part defines the axial extension of the retaining bead, the radially outer

part provides a sliding face for the tamper evident strip passing the retaining band.

[0045] Preferably the outer part of the upper side in an axial cross section includes an angle of 35 DEG - 45 DEG, in particular 40 DEG, with a plane perpendicular to the axis.

[0046] It turned out that this angle being arranged only on the outer part of the retaining bead is suitable to allow the tamper evident strip passing the retaining bead without breaking the frangible connection.

[0047] Advantageously the ratio between the radial lengths of the inner part of the upper side and the radial length of the outer part of the upper side is between 1:1 and 2:1.

[0048] The basic shape of the retaining bead is determined by the inclination of the inner part of the upper side. Since the inner part of the surface includes a small angle with the plane perpendicular to the axis, the retaining bead has a small axial extension and has a flat appearance.

[0049] The finish comprises a total axial height extending from the underside of a transfer ring to the upper open end and an axial closing height extending from the underside of the retaining bead to the upper open end. Preferably, the ratio between the total axial height and the axial closing height is between 1.5:1 and 1.75:1.

[0050] Preferably the total axial height is 12 mm and the axial closing height is 7.4 mm. These measures correspond to measures for finishes of containers for non carbonated products. Finishes for non carbonated beverages usually have a more simple form since there is no need for closing forces suitable to withstand internal pressure or for venting properties.

[0051] Thus the finish may be run on the same swing lines which are also used for bottling non carbonated beverages without considering huge handling equipment changeover.

[0052] A further aspect of the invention concerns a container with a container finish as described above.

[0053] A further aspect of the invention concerns in combination, a container finish as described above and a closure cap. The closure cap comprises a top panel, a cylindrical skirt depending from the periphery of the top panel, said skirt possessing an essentially cylindrical inside surface with at least one thread protruding radially inwards.

[0054] Beneficially the closure cap comprises a tamper indicating band, frangibly connected to the open end of the skirt.

[0055] The tamper indicating band has a locking element with a retaining surface, which abuts against the lower surface of the retaining bead of the closure finish when the closure cap is applied to the container and opened for the first time.

[0056] Preferably the thread start of the closure, located at the bottom end of the closure skirt has a truncated thread profile, in order to allow proper passage along the truncated thread end of the closure finish. Preferably the

lower side of the thread start of the closure is flattened. Thus the thread start of the closure has a smaller axial extension than the rest of the thread and matches with the upper side of the retaining bead.

[0057] With a truncated thread an optimal closing is provided whereas the de-moulding constraints are as low as possible.

[0058] The invention will now be further described and illustrated by way of the following description of preferred embodiments with reference to the accompanying drawings, in which

Figure 1 is a first side view of a container finish;

Figure 2 is a second side view of the container finish;

Figure 3 is a sectional view of a part of the container finish;

Figure 4 is a top view of the container finish;

Figure 5 is a sectional view of a combination of a closure finish and a closure cap.

[0059] Figure 1 is a first side view of a container finish 1 according to the present invention.

[0060] The container finish 1 has an essentially cylindrical outside surface 2 with one single thread 3.

[0061] The container finish 1 comprises several venting recesses 4, said venting recesses 4 interrupting the thread 3. Some venting recesses 4 are axially aligned and form a venting slot 5.

[0062] In this embodiment the thread 3 has a pitch 6 of 2.5 mm.

[0063] The container finish 1 possesses a circumferential retaining bead 7 for an anti-tamper strip, said bead protruding radially outwards.

[0064] The container finish 1 further comprises a transfer ring 8 also protruding radially outwards.

[0065] The total axial height 9 extending from the underside 10 of the transfer ring 8 to the upper open end 11 is 12mm. The axial closing height 12 extending from the underside 13 of the retaining bead 7 to the upper open end 11 is 7.4mm. Thus the ratio between the total axial height 9 and the axial closing height 12 is about 1.5:1.

[0066] The typical inner diameter of the finish 1 is 21.74mm, the maximal outer diameter including the transfer ring 8 is 29.25mm. Thus the finish 1 is compatible to standard bottling lines.

[0067] Figure 2 is a second side view of the container finish 1.

[0068] The thread 3 comprises a horizontal truncated thread end 16, a flattened surface 14 on the lower side 15 of the thread end 16. The truncation typically extends over the first thread segment.

[0069] The retaining bead 7 has an axial extension 17 which is smaller than the axial extension 18 of the thread 3.

[0070] Figure 3 is a sectional view of a part of the container finish 1.

[0071] The upper side 19 of the retaining bead 7 comprises a radially inner part 21 arranged close to the es-

essentially cylindrical outside surface 2 of the finish 1 and an outer part 22 arranged adjacent and exterior with respect to the inner part 21 of the upper side 19.

[0072] The inner part 21 of the upper side 19 of the retaining bead 7 includes an angle 20 of 6 DEG, with a plane perpendicular to the axis of the finish.

[0073] The inner part 21 and the outer part 22 in an axial cross section include different angles with the lower side 13 of the retaining bead 7.

[0074] The outer part 22 includes an angle 23 of 40 DEG, with plane perpendicular to the axis.

[0075] The ratio between the radial lengths 24 of the inner part 21 and the radial length 25 of the outer part 22 is 1.5:1.

[0076] Figure 4 is a top view of the container finish 1.

[0077] The thread 3 is arranged on the outside surface 2 so as to extend over an angle 26 of 500 DEG.

[0078] The venting slots 5 are arranged at regular circumferential spacings 27 of 60 DEG.

[0079] The venting recesses 4 interrupt the thread 3 over an aperture angle 28 around the outside surface 2. The aperture angle 28 is 10 DEG at the bottom 29 of the recess 4.

[0080] A first venting recess 104 is delimited by two lateral surfaces 30.

[0081] The lateral surfaces 30 include an angle 32 with respect to the radial line 33 connecting the centre 34 of the finish 1 and the centre 35 at the bottom of the venting recess 4 of 30 DEG.

[0082] A further venting recess 204 has a first lateral surface 230, including in a radial cross section a first angle 236 with respect to the radial line 233.

[0083] The venting recess 204 has a second lateral surface 231, including a second angle 237 with respect to the radial line 233.

[0084] The first angle 236 and second angle 237 are different: The first angle 236 is 30 DEG and the second angle is 60 DEG.

[0085] Asymmetric venting recesses 204 are arranged close to the parting line 38 of the moulding tool (not shown in the figure), whereas symmetric venting recesses 104 are arranged perpendicular to the parting line. The orientation of the lateral surfaces 30, 230, 231 pointing away from the parting lines facilitates the de-moulding.

[0086] Figure 5 is a sectional view of a combination of a closure finish 1 and a closure cap 40 comprising a top panel 41, a cylindrical skirt 42 depending from the periphery of the top panel 41. The skirt 42 possesses an essentially cylindrical inside surface with at least one thread 43 protruding radially inwards and a tamper indicating band 44, frangibly connected to the open end 45 of the skirt 42 (bridges are not explicitly shown in this sectional view).

[0087] The thread 3 of the finish comprises a horizontal truncated thread end 16. A flattened surface 14 is arranged on the lower side 15 of the thread end 16. The flattened surface provides more axial space between the lower side 15 of the thread end 16 and the retaining bead

7.

[0088] Correspondingly the thread start 46 of the closure cap 40 which is located near the open end 45 of the skirt 42 is also truncated. The thread start 46 has a flattened surface 47 on its lower side 48. Thus the thread start 46 as a smaller axial extension than the rest of the thread 43. The thread start 46 may be located in the axial gap between the thread end 16 of the closure finish and the retaining bead 7. The lower side 48 of the thread start matches with the upper side of the retainer bead 7.

[0089] Hence the closure cap 40 may be brought to the fully screwed on position.

15 Claims

1. Container finish (1) with an essentially cylindrical outside surface (2) with one single thread (3), said thread (3) being arranged on the outside surface (2) so as to extend over an angle of less than 550 DEG and more than 360 DEG, the container finish comprising at least one venting recess, said venting recess (4; 104, 204) interrupting the thread (3), wherein the thread (3) has a pitch (6) of less than 3mm, in particular 2 to 3 mm, in particular 2.5 mm.
2. Container finish according to claim 1 wherein at least two venting recesses (4; 104, 204) are aligned, preferably in axial direction.
3. Container finish according to claim 1 or 2 wherein the at least one venting recess (4; 104, 204) interrupts the thread (3) over an aperture angle (28) around the outside surface (2), said aperture angle being between 4 DEG and 10 DEG at the bottom (29) of the recess (4; 104, 204).
4. Container finish according to claim 3 wherein the at least one venting recess (4; 104, 204) has two lateral surfaces (30, 230, 231), wherein at least one lateral surface (30, 230, 231) in a radial cross section includes an angle (32, 236, 237) with respect to a radial line (33, 233), said angle (32, 236, 237) being between half of the aperture angle (28) and 90 DEG, preferably said angle (32, 236, 237) being 30 DEG or 60 DEG.
5. Container finish according to at least one of the preceding claims, **characterized in that** a plurality of venting recesses (4; 104, 204) is arranged at regular spacings (27) in the circumferential direction, in particular six venting recesses (4; 104, 204) with a 60 DEG spacing.
6. Container finish, preferably according to claim 3, 4 or 5, the container finish comprising at least one

- thread (3) and at least one venting recess (4; 104, 204),
 at least one venting recess (204) having a first lateral surface (230), said first lateral surface (230) in a radial cross section including a first angle (236) with respect to a radial line (233),
 the at least one venting recess (204) having a second lateral surface (231), said second lateral surface (231) in a radial cross section including a second angle (237) with respect to the radial line (233), wherein the first angle (236) and second angle (237) are different, preferably the first angle (236) is equal or smaller than 30 DEG and preferably the second angle (237) is greater than 30 DEG, more preferably 60 DEG.
7. Container finish, preferably according to at least one of the preceding claims, the container finish comprising at least one thread (3) and, preferably, a circumferential retaining bead (7) for an anti-tamper strip, said bead protruding radially outwards, **characterized in that** the thread (3) comprises a truncated thread end (14), preferably a horizontally truncated surface (14) on the lower side (15) of the thread end (16).
8. Container finish according to at least one of the preceding claims **characterized in that** the finish (1) has a weight of 2.0 g - 2.1 g, in particular 2.05g.
9. Container finish according to at least one of the preceding claims, **characterized in that** container finish (1) beneath the thread (3), possesses a circumferential retaining bead (7) for an anti-tamper strip, said bead (7) protruding radially outwards, in particular more than the thread (3), in particular more than 1.25 times the radial extension of the thread (3).
10. Container finish according to claim 9, **characterized in that** the retaining bead (7) has an axial extension (17) which is smaller than the axial extension (18) of the thread (3), in particular less than 70% of the axial extension (18) of the thread (3).
11. Container finish, preferably according to claim 9 or claim 10, the container finish comprising at least one thread (3) and a circumferential retaining bead (7) for an anti-tamper strip, said bead protruding radially outwards, wherein at least a part of the upper side (19) of the retaining bead (7) in an axial cross section includes an angle (20) of less than 10 DEG, in particular 5 DEG to 10 DEG, more particularly 6 DEG, with a plane perpendicular to the axis of the finish of the finish.
12. Container finish according to claim 9, 10 or 11, **characterized in that** the upper side (19) of the retaining bead (7) comprises a radially inner part (21) arranged close to the essentially cylindrical outside surface (2) of the finish (1) and an outer part (22) arranged adjacent and exterior with respect to the inner part (21) of the upper side (19), the inner part (21) and the outer part in an axial cross section including different angles (20,23) with a plane perpendicular to the axis of the finish.
13. Container finish according to claim 12, **characterized in that** the outer part (22) of the upper side (19) in an axial cross section includes an angle (23) of 35 DEG - 45 DEG, in particular 40 DEG, with a plane perpendicular to the axis of the finish.
14. Container finish according to claim 12 or claim 13, **characterized in that** the ratio between the radial lengths (24) of the inner part (21) of the upper side (19) and the radial length (25) of the outer part (22) of the upper side (19) is between 1:1 and 2:1.
15. Container finish according to at least one of the claims 9-14, **characterized in that** the finish (1) comprises a total axial height (9) extending from the underside (10) of a transfer ring (8) to the upper open end (11) and an axial closing height (12) extending from the underside (13) of the retainer bead (7) to the upper open end (11), wherein the ratio between the total axial height (9) and the axial closing height (12) is between 1.5:1 and 1.75:1.
16. Container with a container finish according to one of the claims 1 to 15.
17. In combination, a container finish according to one of the claims 1 to 15 and a closure cap (40) comprising a top panel (41), a cylindrical skirt (42) depending from the periphery of the top panel (41), said skirt (42) possessing an essentially cylindrical inside surface with at least one thread (43) protruding radially inwards and a tamper indicating band (44), frangibly connected to the open end (45) of the skirt (42).
18. A combination according to claim 17, **characterized in that** the at least one thread (43) protruding radially inward from the cylindrical inside of the cylindrical skirt (42) of the closure cap (40) is designed to match with the lower end (16) of the thread (3) of the container finish (1) in a closed position, preferably with a truncated thread end on the lower side (15) of the thread end (16), more preferably the at least one closure thread (43) comprises a truncated thread start (46) on the upper and/or lower side (48).

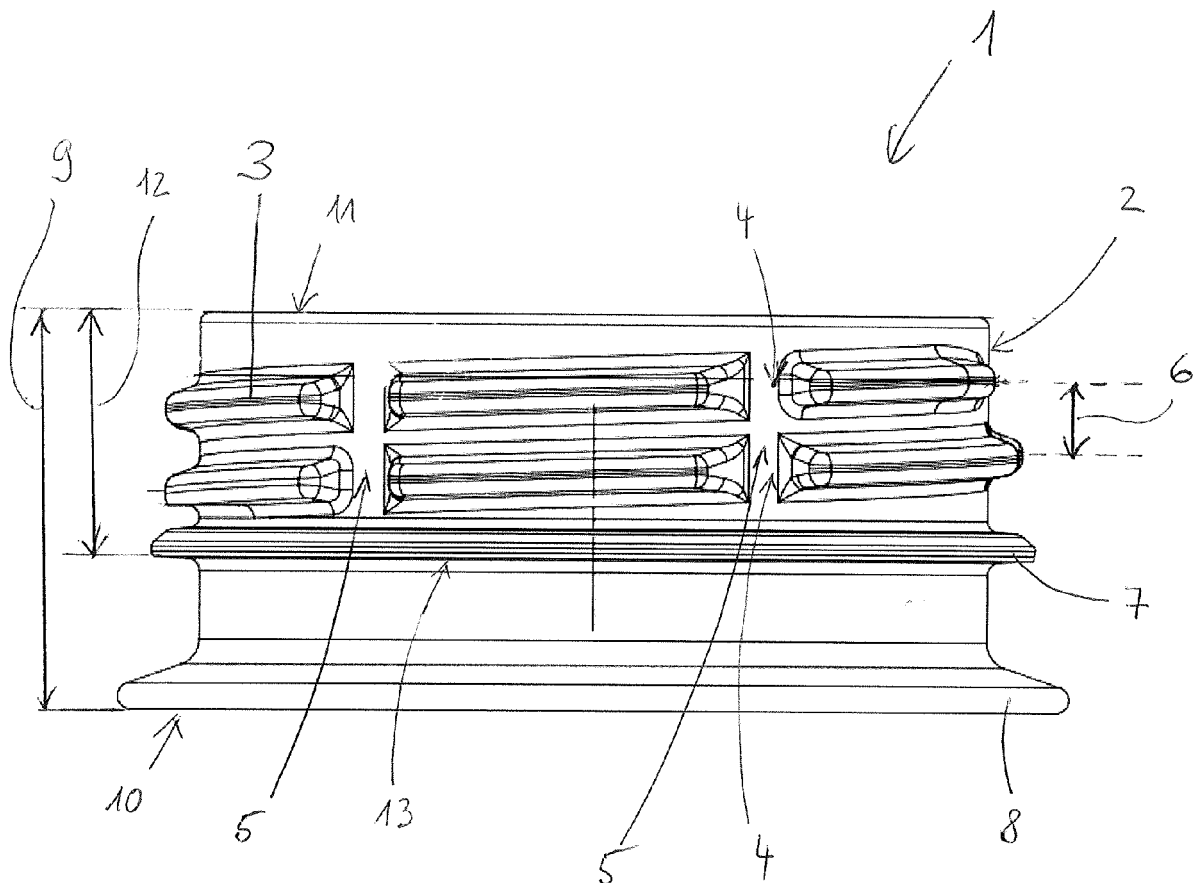


Fig. 1

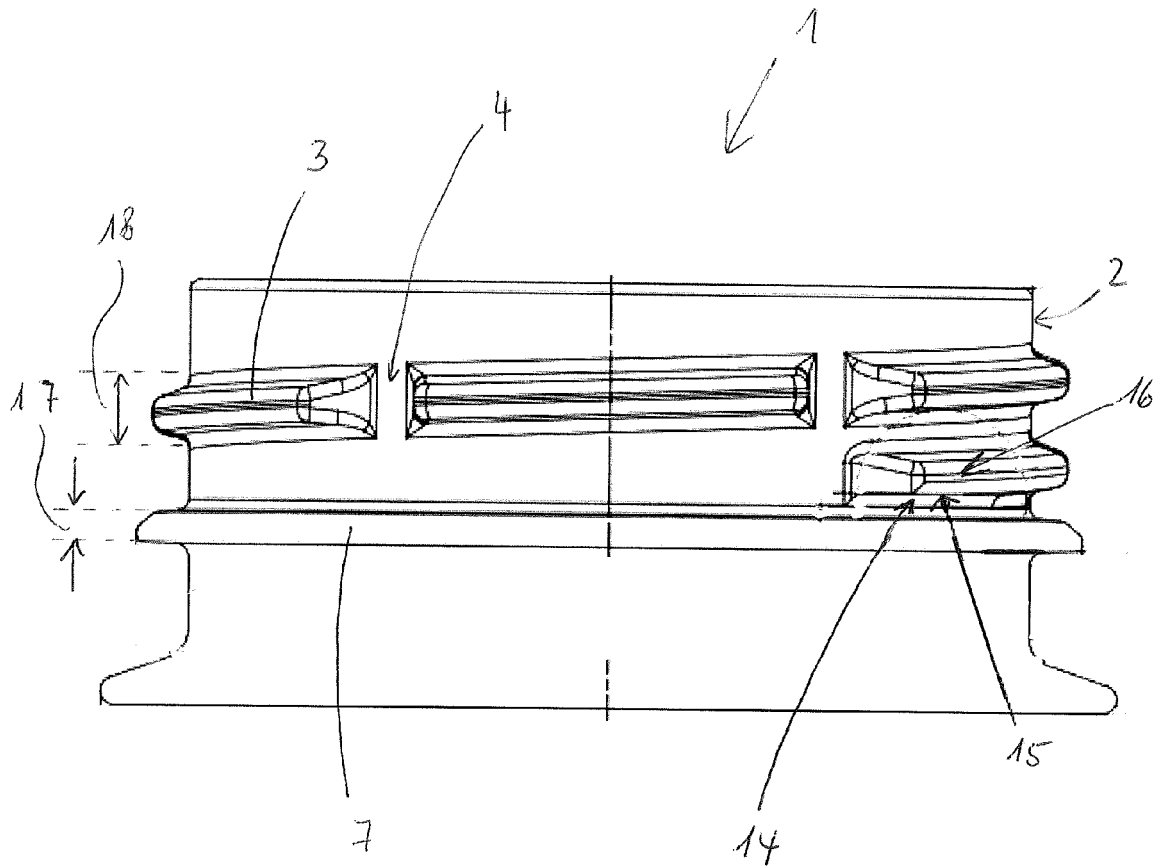


Fig. 2

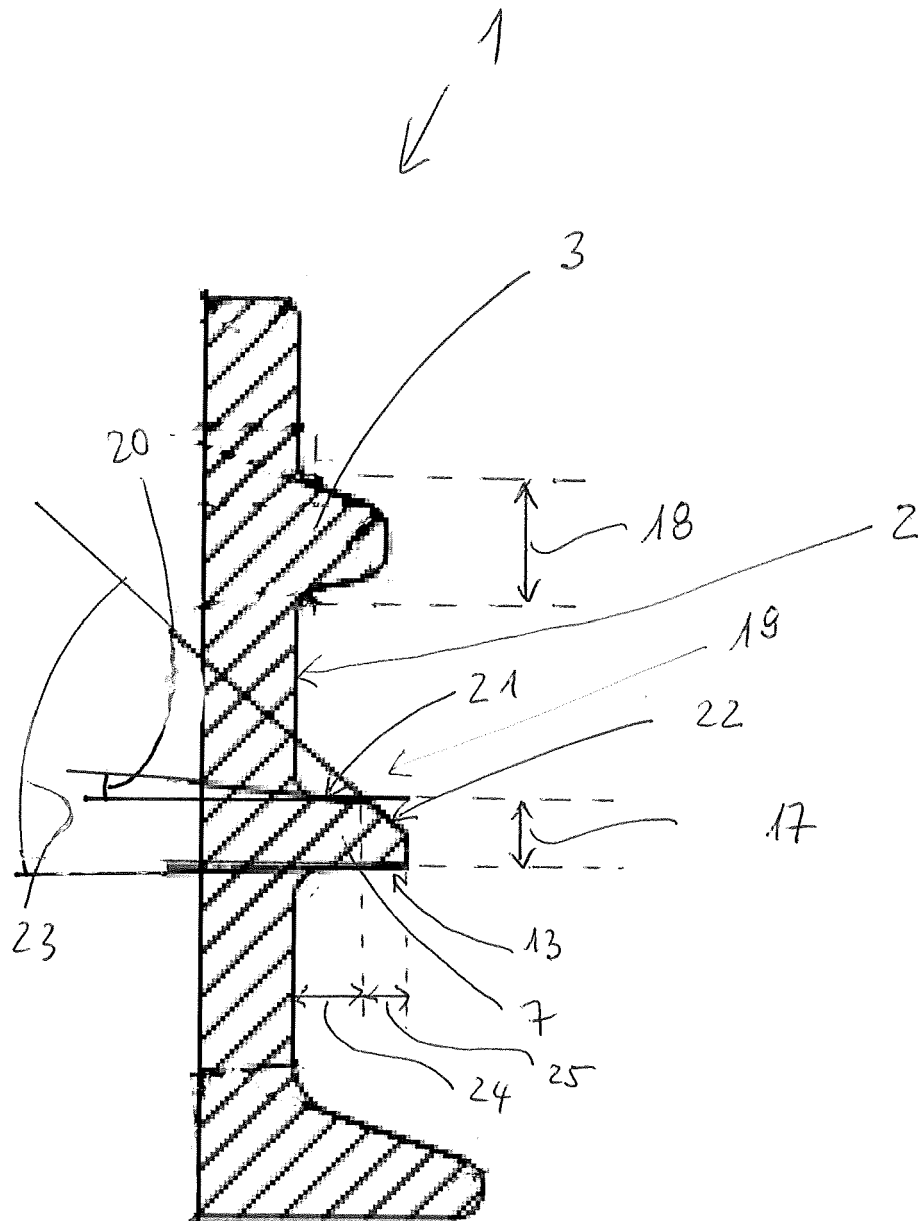


Fig. 3

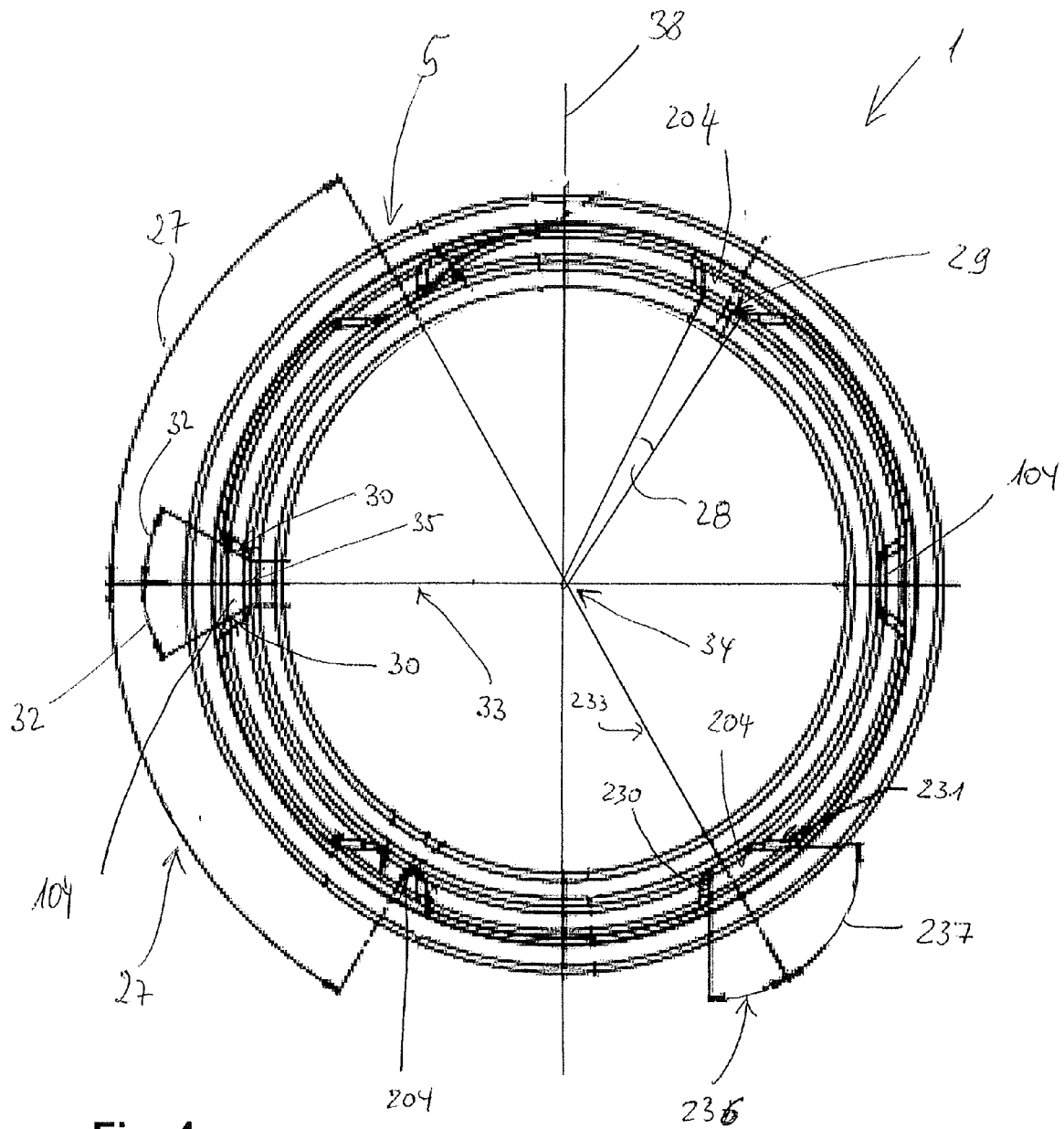


Fig. 4

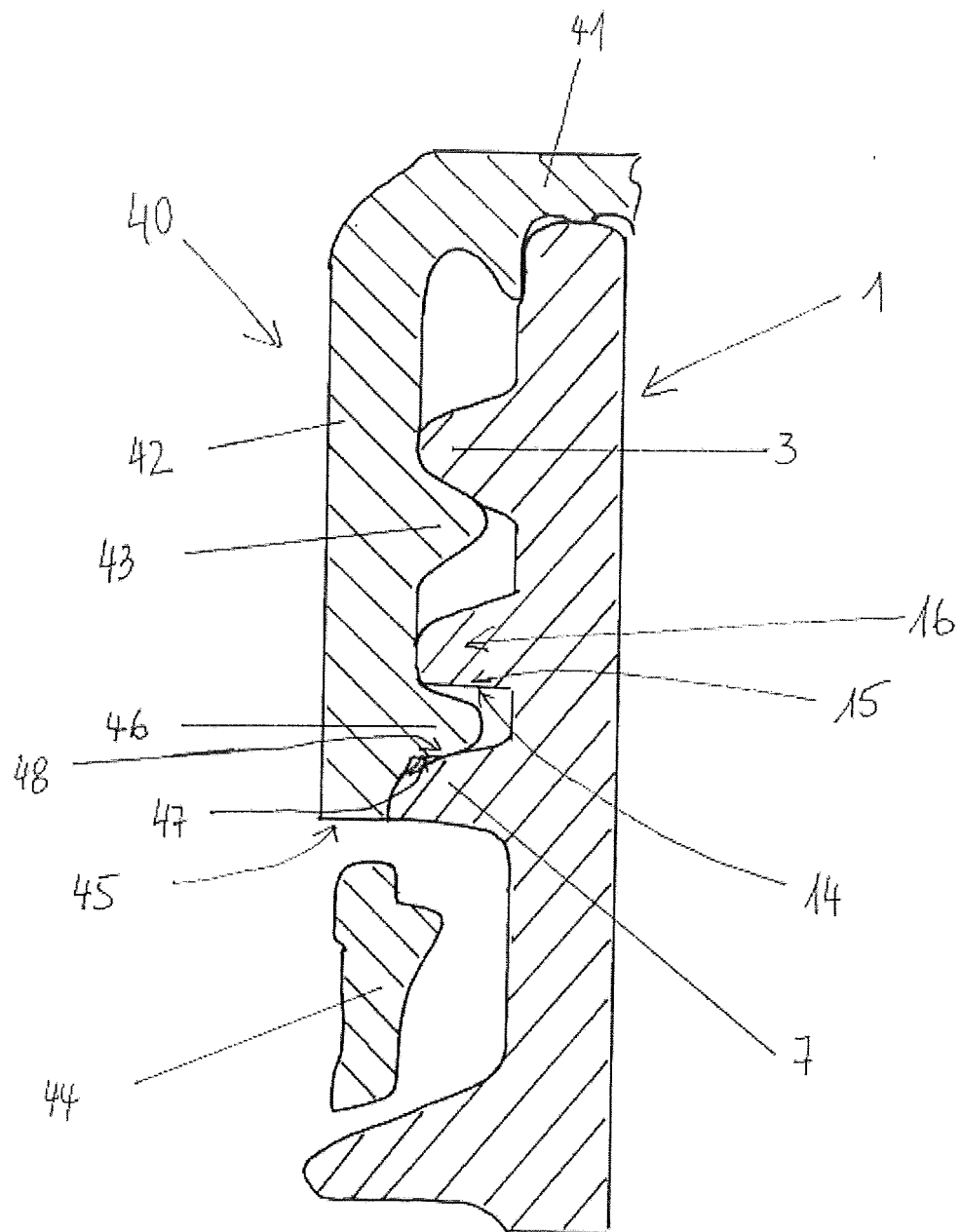


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 12 17 6574

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 August 2012	Examiner Gino, Christophe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 17 6574

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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