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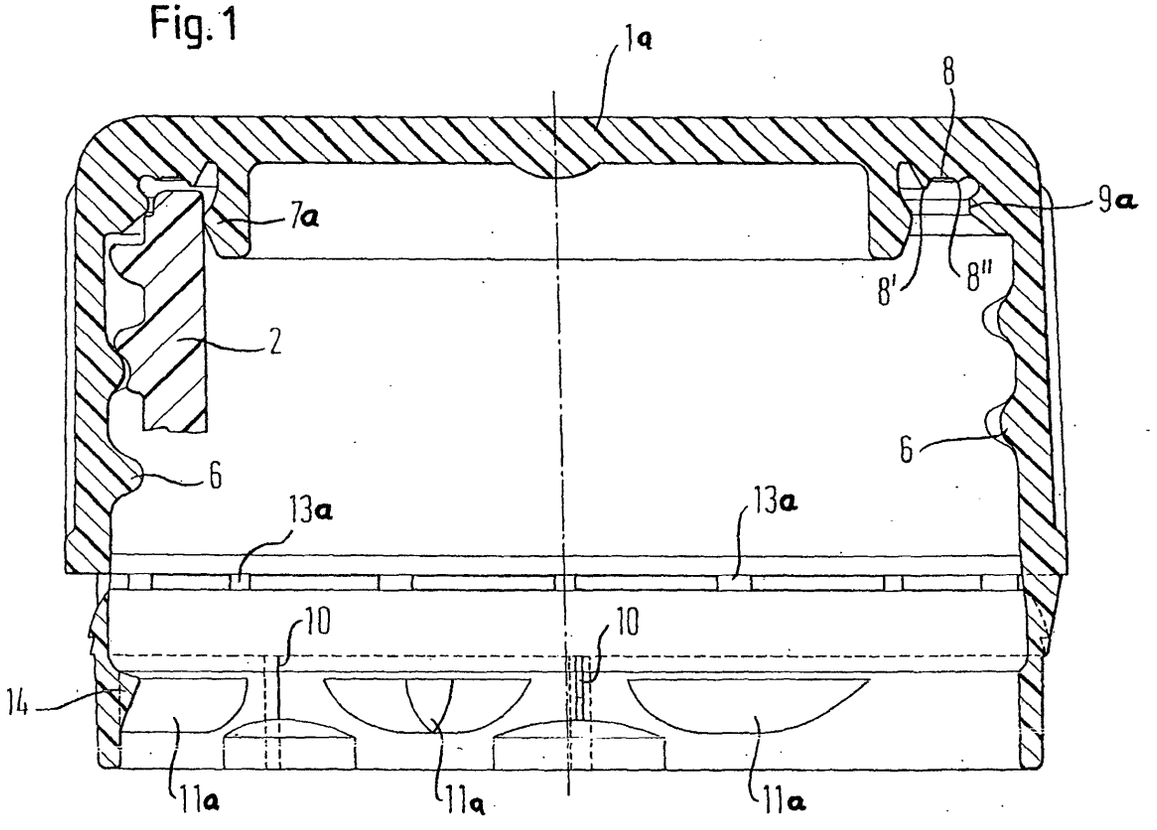
(54) Container screw-closure cap

(57) A container screw-closure cap 1a made of plastic, having a plural sealing system (7a), (8), (9a) for sealing a mouth of a container and
having a fixing system (10), (11a), (12) for fixing said cap at an overhang of said container mouth (2), characterized by
a plurality of crescent-shaped cams (11a) and
one or more intermediate stretch windows (10)
both comprised in said fixing system.

Fig. 1



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Description

[0001] The container screw closure cap according to the invention comprises a fixing system and a sealing system. The fixing system may or may not be carried out as a tamper evidence band. The crescent shaped cams and the stretch windows of the fixing system to be described are forming the novel element of the invention.

[0002] The sealing system which is also described in the context of the invention is versatile in being adaptable to returnable bottles and to non-returnable bottles, in being practicable in a one-component screw closure cap or in a two-component screw-closure cap and in being useable in conjunction with a tamper evidence band or in conjunction with a similar fixing system not having a guarantee function.

[0003] This sealing system of the screw closure cap is used for non-returnable containers as well as for returnable containers. The outer diameter of the bottle neck having the screw at the container opening is in any case standardized, so that the outer parts of the multiple sealing system have the standardized dimensions irrespectible of a non-returnable or returnable bottle to be closed. It is only the wall thickness and the inner diameter of the bottle neck that may vary. This difference is taken into consideration by shifting a tongue-like inner seal, i.e. by forming an inner seal more centrally or more towards the cap body. In other words, the position of the inner seal is dimensioned in such a way that its spacing from the outer skirt increases as the inner diameter of the bottle neck decreases.

[0004] The sealing system may be manufactured in one component (e.g. PET like the totality of the screw closure cap) or by a component design (e.g. a liner made from EVA and a cap body made e.g. from PET).

[0005] The sealing system has to cooperate with the fixing system. If the fixing system of the screw closure cap fulfils a guarantee function of a tamper evidence band, the guarantee band of a returnable-container-closure is more complex than the guarantee band of a one-way-container-closure. Basically, the tamper evidence band of a closure for returnable bottles may only tear off over a part of the circular skirt and shall remain connected to the cap body over the residual part of the circular skirt. For this purpose, the sealing system and the fixing system of the returnable-container-closure are tuned. The point is to close a full bottle by a screw closure cap in such a way that neither the sealing system nor the fixing system is damaged.

[0006] The screw of the cap (which is adapted to the standardized container) is - by virtue of the invention - relatively long, i.e. reaches far down. Thus, when the bottle is closed, the screw gets into contact before the inner seal touches the bottle opening and before the tamper evidence band touches the pilferproof ring of the bottle. It is only when the screw has been fixed by about half a turn that an axis of the closure cap is aligned with an axis of the bottle neck and the first snap-on of the tamper evidence band over the pilferproof ring is performed. In this way, the sensible parts of the tamper evidence band are protected from an undue and uneven overstretch.

[0007] If the fixing system is used as a tamper evidence band, it is fixed to the cap body by weak bridges on part of the circular skirt. The band grips over the pilferproof ring or overhang of the bottle opening (the cross section of the band being not even along the circular skirt). The tamper evidence band is so as to allow the consumer to distinctly recognize that a first opening has been performed. On the other hand, no part of the tamper evidence band may remain on the bottle opening for the purpose of bottles being returnable.

[0008] In order to function as a fixing system, the band has several crescent shaped cams gripping under the pilferproof ring of the container. Preferably three such crescent shaped cams are arranged in the vicinity of a crack point of the band. The crescent shaped cams have a sharp upper edge and extend downwardly so as to be able to slip over the pilferproof ring of the bottle opening.

[0009] Stretch windows, preferably two stretch windows, are arranged between the crescent-shaped cams, wherein the stretch windows extend as small strips downwardly and are ending in re-enforcements at the lower edge of the band. The stretch windows minimize the material of the parts to be teared off by about half of the wall thickness of the band. The longish windows extend at the outer skirt side as well as on the opposite side at the inner skirt side downwards. At the inner side, the stretch windows pass into the re-enforcements at the lower edge of the band. In this way, the band does not tear at the lower end (with the exception of the crack point), but is stretchable in the upper range of the cams. It is by this design that the caps may be screwed over the pilferproof ring of the filled bottle without damaging the fixing system. However, the cams will hook like a fishing rod at the first opening so that the crack point tears off.

[0010] Furthermore, the invention relates to a container screw-closure cap which is made of plastic and is provided, on the inner side of its cap base, with an annular sealing lip which, when the screw-closure cap is screwed onto the container mouth, seals against an inner side of the container mouth.

[0011] In the case of known screw-closure caps of this type, which are used, for example, for bottles, the annular sealing lip engages in a sealing manner with the inner edge of the container mouth. It has been found in practice that the sealing action of the annular sealing lip is not sufficient in many cases, in particular on account of a deformation of the cap base under the internal pressure of the container. Moreover, even in the case of new containers which
are filled for the first time, but in particular in the case of refilled containers, the container mouths may exhibit irregularities or damage which counteract(s) satisfactory

sealing of the container.

[0012] The object of the invention is thus to provide a screw-closure cap which has an annular seal on the cap base which seals against an inner side of a container mouth and in the case of which the problems outlined are avoided and by means of which satisfactory sealing is ensured even in the case of the container being reclosed and in the case of irregularly formed mouths.

[0013] The screw-closure cap according to the invention is distinguished in that the annular sealing lip, which has a predetermined bending strength, at a radial spacing in the outward direction, is assigned a double annular rib which extends away from the inner side of the cap base with a downwardly double tapering cross section and with a smaller height than the sealing lip and engages with the end side of the container mouth when the screw-closure cap is screwed on, and in that extending away from the transition region of the cap base into the lateral cap surface is another annular rib, with tapering cross section, which acts in a sealing manner on the outer side of the container mouth. The double annular rib, on its end side, has two spaced-apart annular protrusions.

[0014] By virtue of this end side and outer side sealing region extending over a right angle, the cap base is bowed (doming effect) in the event of a build-up in pressure of the medium in the container, the lever action resulting in an additional pressure being exerted on the outer and radial sealing region of the container mouth and in an increase in the contact pressure per unit surface area. It is precisely on account of the wide range of different types of damage in this region of the container mouth that this seal design performs an additional important function specifically for use in the drinks industry.

[0015] According to a preferred embodiment of the invention, the annular rib, which acts on the outer side of the container mouth, is preferably of essentially V-shaped design in cross section.

[0016] The invention further relates to a closure cap for a container, with a closure cap base and at least two radially spaced sealing projections running around the cap and extending away from the closure cap base, which, when the closure cap rests on the container mouth, are each in touching contact with the container mouth and thus seal the container interior in relation to the container exterior.

[0017] Closure caps of the type referred to here are known. They serve to close containers in which filling material is stored. The filling material may be a preferably granular solid, but may also be a liquid. In the storage of liquids, the problem frequently arises that these liquids increase their volume, for example under the action of heat or as a result of chemical reactions. This has a number of disadvantageous effects. It may lead to what is known as the doming effect, for example, as a result of which the closure cap base curves outwardly in a domed shape owing to the application of pressure from the container interior. This can lead to damage to the container or the closure cap and, in extreme cases, even to the container bursting or the closure cap being blown off. Both of these endanger a user of the container.

[0018] It is therefore an object of the invention to provide a closure cap of the type referred to here, which makes possible safe storage of the filling material in the container, pressure release in the event of increased inner pressure and reseating when the pressure in the container decreases again, so that safe handleability is guaranteed for the user.

[0019] The object is achieved by a closure cap of the type referred to here, in which sealing projections are provided, which are designed and interact in such a way that, in the event of increased inner pressure, as burst protection for the container, an ending of the touching contact between a radially inner sealing projection and the container mouth brings about an ending of the touching contact between a radially outer sealing projection and the container mouth and that, after pressure equalization by venting has taken place, both sealing projections retum to their previous touching-contact position and consequently lie sealingly in their respective area of the container mouth again.

[0020] The curving of the closure cap base, which arises when pressure is applied from the container interior, leads first to a physical displacement of the radially inner sealing projection. This displacement ends the touching contact between the radially inner sealing projection and the container mouth, so that this sealing projection no longer seals the container interior in relation to the container exterior. According to the lever law, the radially staggered arrangement of the two sealing projections on the closure cap base causes the touching contact between the radially outer sealing projection and the container mouth as well to be ended, and therefore this sealing projection also no longer seals the container interior in relation to the container exterior. A direct connecting path is brought about between the container interior and the container exterior. The overpressure acting in the interior of the container is reduced (the container is vented, blowing-up effect). The risk of damage to the container or the closure cap, and in particular the bursting of the container or the blowing-off of the closure cap and the attendant danger to the container user, are thus effectively avoided.

[0021] With regard to the ending of the touching contact between the radially inner sealing projection and the container mouth, it has been found to be especially advantageous if the radially inner sealing projection and the container mouth are in touching contact along an area directly adjacent to the end side of the container mouth, since in this case the ending of the touching contact between the radially inner sealing projection and the container mouth requires a particularly small physical displacement, and therefore a very small application of pressure. The closure cap in this illustrative embodi-

ment is therefore extremely sensitive in the event of pressure variations.

[0022] The sealing projections can be designed physically differently. In practice, radially inner sealing projections designed as annular sealing lips which run around the cap, project into the container interior and have on their outer side a bulge facing the inner side of the container mouth have proved successful. In this illustrative embodiment of the closure cap, the touching contact is brought about between the bulge and the container mouth when the closure cap rests on the containermouth.

[0023] A further illustrative embodiment of the closure cap comprises a radially outer sealing projection which is designed as an annular rib having a W-shaped cross section, the points of which face the end side of the container mouth. In this illustrative embodiment, the two points of the radially outer sealing projection and the end side of the container mouth are in touching contact when the closure cap rests on the container mouth.

[0024] Simpler to manufacture in comparison with the abovementioned illustrative embodiment is a closure cap with a radially outer sealing projection which is designed as an annular rib having a V-shaped cross section, the point of which faces the end side of the container moan In this illustrative embodiment, the point of the radially outer sealing projection and the end side of the container mouth are in touching contact when the closure cap rests on the container mouth.

[0025] In a further illustrative embodiment of the closure cap, a further sealing projection designed as an annular rib, which has on its inner side a bulge facing the outer side of the container mouth, extends away from the edge of the closure cap base. In this illustrative embodiment, three sealing projections are therefore present, each of which individually seals the container interior in relation to the container exterior.

[0026] If, after venting of the container, the closure cap is to resume its original physical shape, an illustrative embodiment of the closure cap in which the cap consists of elastic material is proposed. In this illustrative embodiment, the touching contact between the sealing projections and the container mouth is in each case reestablished after venting, and the container interior is therefore sealed in relation to the container exterior again.

[0027] Plastic has been found to be an elastic material which is very simple to handle in practice, for which reason plastic closure caps constitute a preferred illustrative embodiment of the closure cap.

[0028] The closure cap can enter into engagement with the container mouth in various ways. In this connection, an illustrative embodiment of the closure cap in which the cap is designed as a screw-closure cap has been found to be advantageous. In this illustrative embodiment, the outer side of the container mouth is provided with an external thread, and the inner side of the closure cap wall is provided with an internal thread, which threads enter into engagement with one another when the bottle is closed.

[0029] The invention is explained in more detail hereinbelow by way of exemplary embodiments and with reference to the accompaning drawings in which:

Fig. 1 shows an axial section through a screw-closure cap, with a tamper evidence band for returnable bottles, having four sealing elements according to the invention;

Fig. 2 shows a bottom view onto the tamper evidence band of the sealing cap according to Fig. 1;

Fig. 3 shows an axial section through the tamper evidence band of Fig. 2;

Fig. 4 shows an axial section through a screw-closure cap, with a tamper evidence band for disposable bottles, having four sealing elements according to the invention;

Fig. 5 shows a bottom view onto the tamper evidence band of the cap according to Fig. 4;

Fig. 6 shows an axial section through the tamper evidence band of Fig. 5; and

Fig. 7 shows an enlarged axial section through part of the caps, namely through the sealing elements according to the invention.

Fig. 8 shows an axial section through part of a container mouth and a closure cap before venting, and

Fig. 9 shows an axial section through the part of the container mouth and the closure cap during venting.

[0030] Referring to Figs. 1, 4 and 7 together, there is shown a screw-closure cap 1 (illustrated only in part in Fig. 7), which is produced from plastic, e.g. by injection moulding or compression moulding. The cap 1a is intended for mounting on a container mouth 2, and has a lateral surface 3a and a base 4. The lateral cap surface 3a bears, on its inner side, a thread 6 via which the screw-closure cap 1a can be screwed onto a mating thread 5a on the outer side of the container mouth 2.

[0031] The base 4 of the screw-closure cap 1a bears on its inner side, in the region of the inner edge 2" of the container mouth 2, an annular sealing lip 7a, which projects integrally downwards from the base 4 and in axial section, in the non-deformed state, has a substantially vertical inner side 7', a radially outwardly curving top outer-wall section and a conically downwardly and inwardly running bottom outer-wall section.

[0032] In the embodiments shown in Fig. 1, 4 and 7, the annular sealing lip 7a, by way of its outher-wall sections (obliquely inwardly running conical outer-wall section and curved outer-wall section), comes into contact with the inner edge 2", before the thread engagement, when the screw-closure cap 1a is screwed on and, when it penetrates into the cylindrical inner side 2" of the container mouth 2, is deformed by compression such that a relatively wide annular zone is produced as a sealing

surface in relation to the inner side 2" of the container mouth 2. In the case of the material of the screw-closure cap having a predetermined level of rigidity, the contact and/or sealing pressure per unit surface area is reduced as a result.

[0033] At a radial spacing from the annular sealing lip 7a, a double annular rib 8 extends away from the base 4 of the screw-closure cap 1a, said double annular rib 8 being of a considerably smaller height than the annular sealing lip 7a and acting on the end side of the container mouth 2 via two annular protrusions 8', 8". At right angles to the annular rib 8, in addition, a further annular rib 9a is provided from the transition region of the cap base 4 into the lateral cap surface 3a, said further annular rib 9a acting on the outer side of the container mouth 2 and being designed to taper in an essentially V-shaped manner in cross section.

[0034] By virtue of this right-angled sealing zone 8, 9a, the cap base 4 is bowed (doming effect) in the event of a build-up in pressure of the medium within the closed container. Consequently, an additional pressure is exerted on the radially outer sealing region 8 "of the container mouth 2 and the sealing rib 9a as a result of lever action, which means that there is an increase in the contact pressure per unit surface area in this region. It is on account of the wide range of different types of damage in this region of the container mouth 2 that the screw cap 1a according to the invention performs an additional important function, specifically for use in the drinks industry. The screw cap 1a according to the invention is preferably produced from plastic by injection moulding or by compression moulding.

[0035] To summarize the essential features, the container screw-closure cap 1a is made of plastic, preferably polyethylene, and has four sealing elements.

[0036] The main sealing element is the tongue-like sealing lip 7a which engages a sealing contact border in the inner side of the container 2. A second extension 9a seals the container on the outer side. A fixed stop 8 with annular protrusions 8' and 8" is located on the top border of the container 2. Said annular protrusions are of different heights. The inner annular protrusion 8' is higher than the outer protrusion 8".

[0037] By virtue of an increase in pressure in the container, the cap base 4 bows in a dome-like manner. The inner seal 7a moves away from the container wall 2". At the same time, the annular protrusion 8' lifts up slightly, but the outer side of the cap 1a presses more in the direction of the center of the container 2 and the extension 9a and the annular protrusion 8" is thus pressed to a more pronounced extent against the container mouth 2 and, in the process, seals the closure 1a again on the top out side of the container 2 and via the extension 9a.

[0038] A tamper evidence band (Fig. 2, 3 or Fig. 5, 6, respectively) is fixed to the base body 1a by means of weak bridges 13a. A wraparound projection element 14 snaps on an overhang at the lower end of the bottle outlet 2. The shaping of the wraparound projection element 14 guarantees the function of the tamper evidence band. After the bottle 2 has been opened the band remains on the container 2 (Fig. 4 to 6) or the band remains on the cap body 1a (Fig. 1 to 3).

[0039] The described sealing system 7a, 8, 9a of the closure cap 1a is applicable for disposable containers as well as for returnable containers. The outer diameter of the bottle neck 2 having the screw thread 5a at the container mouth 2 is standardized, so that the outer sealing 9a and the double annular rib 8 of the closure cap 1a may have the same dimensions, regardless whether a non-returnable bottle or a returnable bottle is to be closed. It is only the wall thickness and, thus, the clear opening 2" of the bottle neck 2 that may differ. This difference is taken into account by forming the inner seal 7a further inwards or further outwards with respect to the cap base 4. In other words, the position of the inner seal 7a is designed such that its spacing from the outer seal 9a increases as the clear opening 2" of the bottle neck 2 decreases.

[0040] However, the tamper evidence band (Fig. 2, 3) of a closure cap for returnable bottles (Fig. 1) has a more complex design than the tamper evidence band (Fig. 5, 6) of a closure cap belonging to a non-returnable bottle (Fig. 4). The tamper evidence band, in the case of returnable containers, is to break off at only part of the circle (crack point 12 in Fig. 2) and shall remain connected to the cap 1a at the residual part of the circle. In accordance with such purpose, the sealing system 7a, 8, 9a and the tamper evidence band of such a closure cap are tuned as described below. The point is to close a filled bottle by the closure cap 1a in such a way that neither the sealing system 7a, 8, 9a nor the tamper evidence band (Fig. 1 to 3) are damaged.

[0041] The counter screw 6 of the closure cap 1a which is adapted to the standardized container 2 is drawn downwards to a relatively large extent (Fig. 1). When the cap 1a is going to close the filled bottle 2, an intervention of the screw 6 occurs before the inner seal 7a touches the bottle neck 2 and before the tamper evidence band 10-14 touches the pilfer proof ring of the bottle 2. Only after the screw 6 has performed approximately a half turn so that the axis of the closure cap 1a is aligned with the axis of the bottle neck 2, the first snap-on of the tamper evidence band 10-14 occurs at the pilfer proof ring. In this manner, the crack point 12 of the tamper evidence band 10-14 is guarded against premature extension.

[0042] The tamper evidence band is, on a part of the circuit, fixed to the cap body 1a by weak bridges 13a. The band grips below the pilfer proof ring of the bottle neck 2, although the protrusion 14 of the tamper evidence band (Fig. 1-3) does not have the same form all along the circle. The tamper evidence band is designed such that the consumer may immediately recognize the occurrence of a first opening. On the other hand, no part of the tamper evidence band remains at the bottle neck because the bottle shall be cleanly re-usable.

[0043] In order to guarantee such functions, the tamper evidence band has several crescent-shaped cams 11a gripping under the pilfer proof ring of the bottle. Preferably three such cams 11a are arranged in the vicinity of the crack point 12 of the tamper evidence band. The cams 11a are provided with a sharp-edged upper surface and have a tapering extension downwards to be able to slide over the pilfer proof ring of the bottle neck 2.

[0044] Stretch windows 10 are arranged between the cams 11a. The stretch windows 10 extend like narrow stripes in vertical direction and close in re-inforcements at the lower edge of the band. The stretch windows 10 are designed to lessen the material of the tear-off part of the tamper evidence band. The longish notches 10 extend downwards at the outer circle (Fig. 2) and at the opposite location of the inner circle (Fig. 3). The stretch windows 10 at the inner side when approaching the lower edge of the tamper evidence band, pass into the re-inforcements (Fig. 3). In this way, the tamper evidence band does not tear off at its lower edge (apart from the crack point 12), but may be stretched in the upper part where the cams 11 a are located. It is by this design that the cap 1a may be screwed on without damaging the crack point 12, while the cams 11a are interlocking at the first opening thus tearing off the crack point 12.

[0045] It goes without saying that the exemplary embodiment shown may be modified in various ways within the context of the idea of the invention, in particular as far as the configuration of the double rib 8 and the further rib 9a is concerned.

[0046] Figure 8 shows part of a container or bottle mouth 1 and a closure cap 3. The container mouth 1 is part of a container (not illustrated in the drawing) which is filled with a filling material (likewise not illustrated). The container mouth 1 is of rotationally symmetrical design in relation to an axis of extent 5. The container mouth 1 has an inner side 7 facing the axis of extent 5 and an outer side 9 facing away from it. Between the inner side 7 and the outer side 9 of the container mouth 1, an end side 11 of the container mouth 1 facing in a direction running parallel to the axis of extent 5 is located on the upper edge of the container mouth 1. The end side 11 merges with the inner side 7 via a first rounded portion 13 and with the outer side 9 of the container mouth 1 via a second rounded portion 15. The container mouth 1 is provided with an external thread 17 on its outer side 9.

[0047] The closure cap 3 rests on the container mouth 1. The closure cap 3 has a closure cap base 19 and *a* closure cap wall 21. The closure cap base 19 extends essentially at right angles to the axis of extent 5 of the container mouth 1, while the closure cap wall 21 extends parallel to it. The closure cap wall 21 is provided on its inner side 23 with an internal thread 25 which is in engagement with the external thread 17 of the container mouth 1.

[0048] The closure cap 3 has three sealing projections 27a, 27b, 27c. The sealing projections 27a, 27b, 27c extend away from the closure cap base 19 of the closure cap 3 and are designed in one piece with it.

[0049] The radially innermost sealing projection 27a is designed as an annular sealing lip 31 which runs around the cap, projects into the container interior 29 and is provided on its outer side 33 with a bulge 35 which faces and lies against the inner side 7 of the container mouth 1.

[0050] The radially outer sealing projection 27b is designed as an annular rib 37 having a W-shaped cross section, the two points 39a, 39b of which rest on the end side 11 of the container mouth 1.

[0051] The sealing projection 27c lastly is designed as an annular rib 41 which is arranged at the edge of the closure cap base 19 and is provided on its inner side 43 with a bulge 45 with which it lies against the rounded area 15 and the outer side 9 of the container mouth 1.

[0052] The illustrative embodiment of the closure cap 3 therefore has four places where touching contact with the container mouth 1 exists, namely with regard to the sealing projection 27a that place at which its bulge 35 lies against the inner side 7 of the container mouth 1, with regard to the sealing projection 27b those places at which the points 39a, 39b of the sealing projection 27b rest on the end side 11 of the container mouth 1, and with regard to the sealing projection 27c that place at which its bulge 45 lies against the second rounded portion 15 and the outer side 9 of the container mouth 1. It is clear that the container interior 29 is sealed in relation to the container exterior 47 by the same touching-contact places.

[0053] Both the container mouth 1 and the closure cap 3 of the illustrative embodiment described in Figure 8 consist of elastic plastic. It is to be expressly pointed out, however, that other materials are also possible for this. The container mouth, and the entire container as well, can thus also consist of glass, for example.

[0054] If the filling material present in the container expands, pressure is applied to the closure cap base 19 in the direction of an arrow 49, as illustrated diagrammatically in Figure 9. The closure cap base 19, which in the absence of pressure application from the container interior 29, as illustrated in Figure 8, has an essentially plane extent, is deformed in a domed or arched shape under the action of the overpressure from the container interior, that is to say it bulges in the direction of the arrow 49 in its central area 51.

[0055] Owing to this deformation of the closure cap base 19, the sealing projections 27a, 27b, 27c change their physical position, and in particular all three sealing projections 27a, 27b, 27c are displaced in the direction of the arrow 49. As can be seen in Figure 9, the touching contact between the sealing projections 27a, 27b, 27c and the container mouth is ended as a result, so that the container interior 29 is no longer sealed in relation to the container exterior 47.

[0056] The overpressure present in the container in-

terior 29 can then, as indicated by arrows 53, escape from the container interior 29, and the closure cap 3 is therefore vented. The abrupt cessation of the application of pressure to the closure cap base 19 accompanying the venting of the container brings about, on account of the elasticity of the closure cap 3, a deformation of the closure cap base 19 back into its original shape. As a result of this, the sealing projections 27a, 27b, 27c also return to their original physical position, that is to say they enter into touching contact with the container mouth 1 again. The container interior 29 is then sealed in relation to the container exterior 47 again. In the event of an overpressure developing in the container interior 29 again, the closure cap 3 can be vented again.

[0057] In practice, the overpressure in the container interior 29 is of the order of preferably 8 to 12 bar. After venting of the closure cap, the pressure in the container interior 29 is reduced to roughly 5 bar.

[0058] From all the above, it is clear that the closure cap 3 according to the invention makes possible safe storage of filling materials in containers.

List of Reference Numbers

[0059]

1	bottle mouth
1a	screw-closure cap
2	container mouth
2"	cylindrical inner edge of container mouth 2
3	closure cap
3a	lateral cap surface
4	cap base
5	axis of extent
5a	thread on the container mouth 2
6	thread on the lateral cap surface 3a
7	inner side of the bottle mouth 1
7a	annular sealing lip
7'	vertical inner side of annular sealing lip 7a
8	double annular rib
8'	inner annular protrusion
8"	outer annular protrusion
9	outer side of the bottle mouth 1
9a	outer annular rib
10	stretch windows
11	end side of the bottle mouth 1
11a	crescent-shaped cams
12	crack point
13	first rounded portion of the bottle mouth 1
13a	weak bridges
14	cross section for gripping under the pilferproof ring of the container
15	second rounded portion of the bottle mouth 1
17	extemal thread of the bottle mouth 1
19	closure cap base of the closure cap 3
21	closure cap wall of the closure cap 3
23	inner side of the closure cap 3
25	extemal thread
27a	sealing projection
27b	sealing projection
27c	sealing projection
29	container interior
31	annular sealing lip
33	outer side of the annular sealing lip 31
35	bulge of the annular sealing lip 31
37	annular rib
39a	first point of the annular rib 37
39b	second point of the annular rib 37
41	further annular rib
43	inner side of the annular rib 41
45	bulge of the annular rib 41
47	container exterior
49	arrow
51	central area of the closure cap base 19
53	arrows

Claims

1. A container screw-closure cap made of plastic, having a plural sealing system for sealing a mouth of a container and
having a fixing system for fixing said cap at an overhang of said container mouth,
characterized by
a plurality of crescent-shaped cams (11) and
one or more intermediate stretch windows (10)
both comprised in said fixing system.

2. The container screw-closure cap according to claim 1, **characterized in that** said fixing system forms a circular tamper evidence band having weak bridges (13) to the cap body.

3. The container screw-closure cap of claim 2, **characterized in**
having said crescent-shaped cams protruding for snapping on said overhang of said container mouth and
having said stretch windows between said cams on a part of the circular tamper evidence band in the vicinity of a crack point,
such that the tamper evidence band remains at the cap body when the container is opened.

4. The container screw-closure cap of claim 1, **characterized in**
having said cams as protruding elements snapping on said overhang of the container mouth
such that the tamper evidence band remains at the container when the container is opened.

5. The container screw closure cap according to one of the claims 1 to 4, **characterized in that** said plural sealing system is provided on an inner side of a cap base, with an annular sealing lip having a form

such that, when the screw-closure cap is screwed onto said container mouth, said lip seals against an inner side of the container mouth, the cap further comprising a double annular rib which extends away from the inner side of the cap base with a downwardly double tapering cross section, each with a height smaller than that of the sealing lip, such that the double annular rib has two spaced-apart annular protrusions for engaging with an end of the container mouth when the screw-closure cap is screwed on, and a further annular rib extending away from a transition region between the cap base and a cap side, said further annular rib having a tapering cross section for acting in a sealing manner on an outer side of the container mouth.

6. The container screw-closure cap according to claim 5, **characterized in that** the annular rib which acts on the outer side of the container mouth is of essentially V-shaped design in cross section.

7. The container screw-closure cap according to one of the claims 1 to 6 **characterized in that** said plastic is PET.

8. The container screw-closure cap according to claim 5, 6 or 7 **characterized in that** said sealing system is a plastic liner made from EVA and the remainder of the cap is made from PET.

9. Closure cap for a container according to one of the previous claims, with a closure cap base and at least two radially spaced sealing projections running around the cap and extending away from the closure cap base, which, when the closure cap rests on the container mouth, are each in touching contact with the container mouth and thus seal the container interior in relation to the container exterior, **characterized in that** the at least two sealing projections are designed and intact in such a way that, in the event of a rise in pressure in the container interior, an ending of the touching contact between the radially inner sealing projection (21 a) and the container mouth (1) brings about an ending of the touching contact between the radially outer sealing projection (27b) and the container mouth (1) and that, after equalization of the overpressure, both sealing projections (27a, 27b) lie sealingly in their respective area of the container mouth again.

10. Closure cap according to claim 9, **characterized in that** the radially inner sealing projection (27a) and the container mouth (1) are in touching contact along an area directly adjacent to the end side (11) of the containermouth(1).

11. Closure cap according to one of the preceding claims 9 or 10, **characterized in that** the radially inner sealing projection (27a) is designed as an annular sealing lip (31) which runs around the cap, projects into the container interior (29) and has on its outer side (33) a bulge (35) facing the inner side (7) of the container mouth (1).

12. Closure cap according *to* one of *the* preceding claims 9 to 11, **characterized in that** the radially outer sealing projection (27b) is designed as an annular rib (37) having a W-shaped cross section, the points (39a, 39b) of which face the end side (11) of the container mouth(1).

13. Closure cap according to one of the preceding claims 9 to 12, **characterized in that** the radially outer sealing projection (27b) is designed as an annular rib having a V-shaped cross section, the point of which faces the end side (11) of the container mouth (1).

14. Closure cap according to one of the preceding claims 9 to 13, **characterized in that** a further sealing projection (27c) designed as an annular rib (41), and having on its inner side (43) a bulge (45) facing the outer side (9) of the Container mouth (1), extends away from the edge of the closure cap base (19).

15. Closure cap according to one of the preceding claims 9 to 14, **characterized in that** the closure cap (3) consists of elastic material.

Amended claims in accordance with Rule 86(2) EPC

1. A container screw-closure cap made of PET plastic,
having a plural sealing system for sealing a mouth of a container and
having a fixing system for fixing said cap at an overhang of said container mouth,
wherein a plurality of crescent-shaped cams (11) and
one or more intermediate stretch windows (10)
are comprised in said fixing system.

2. The container screw-closure cap according to claim 1, **characterized in that** said fixing system forms a circular tamper evidence band having weak bridges (13) to the cap body.

3. The container screw-closure cap of claim 2, **characterized in**
having said crescent-shaped cams (11) protruding for snapping on said overhang of said container mouth and
having said stretch windows (10) between said cams (11) on a part of said circular tamper evidence

band in the vicinity of a crack point,
such that the tamper evidence band remains at the cap body when the container is opened.

4. A container screw-closure cap made of plastic,
having a plural sealing system for sealing a mouth of a container and
having a fixing system for fixing said cap at an overhang of said container mouth,
wherein a plurality of crescent-shaped cams (11) and
one or more intermediate stretch windows (10)
are comprised in said fixing system,
having said cams (11) as protruding elements snapping on said overhang of the container mouth,
such that the fixing system forming a tamper evidence band remains at the container when the container is opened.

5. The container screw closure cap according to one of the claims 1 to 4,
characterized in that said plural sealing system is provided on an inner side of a cap base, with an annular sealing lip having a form such that, when the screw-closure cap is screwed onto said container mouth, said lip seals against an inner side of the container mouth, the cap further comprising a double annular rib which extends away from the inner side of the cap base with a downwardly double tapering cross section, each with a height smaller than that of the sealing lip, such that the double annular rib has two spaced-apart annular protrusions for engaging with an end of the container mouth when the screw-closure cap is screwed on, and a further annular rib extending away from a transition region between the cap base and a cap side, said further annular rib having a tapering cross section for acting in a sealing manner on an outer side of the container mouth.

6. The container screw-closure cap according to claim 5, **characterized in that** the annular rib which acts on the outer side of the container mouth is of essentially V-shaped design in cross section.

7. The container screw-closure cap according to one of the claims 4 to 6
characterized in that said plastic is PET.

8. The container screw-closure cap according to claim 5, 6 or 7
characterized in that said sealing system is a plastic liner made from EVA and the remainder of the cap is made from PET.

9. Closure cap for a container according to one of the previous claims, with a closure cap base and at least two radially spaced sealing projections running around the cap and extending away from the closure cap base, which, when the closure cap rests on the container mouth, are each in touching contact with the container mouth and thus seal the container interior in relation to the container exterior,
characterized in that the at least two sealing projections are designed and interact in such a way that, in the event of a rise in pressure in the container interior, an ending of the touching contact between the radially inner sealing projection (21a) and the container mouth (1) brings about an ending of the touching contact between the radially outer sealing projection 827b) and the container mouth (1) and that, after equalization of the overpressure, both sealing projections (27a, 27b) lie sealingly in their respective area of the container mouth again.

10. Closure cap according to claim 9, **characterized in**
that the radially inner sealing projection (27a) and the container mouth 81) are in touching contact along an area directly adjacent to the end side (11) of the container mouth (1).

11. Closure cap according to one of the preceding claims 9 or 10,
characterized in that the radially inner sealing projection (27a) is designed as an annular sealing lip (31) which runs around the cap, projects into the container interior (29) and has on its outer side (33) a bulge (35) facing the inner side (7) of the container mouth (1).

12. Closure cap according to one of the preceding claims 9 to 11,
characterized in that the radially outer sealing projection (27b) is designed as an annular rib (37) having a W-shaped cross section, the points (39a, 39b) of which face the end side (11) of the container mouth (1).

13. Closure cap according to one of the preceding claims 9 to 12,
characterized in that the radially outer sealing projection (27b) is designed as an annular rib having a V-shaped cross section, the point of which faces the end side (11) of the container mouth (1).

14. Closure cap according to one of the preceding claims 9 to 13,
characterized in that a further sealing projection (27c) designed as an annular rib (41), and having on its inner side (43) a bulge (45) facing the outer side (9) of the container mouth (1), extends away from the edge of the closure cap base (19).

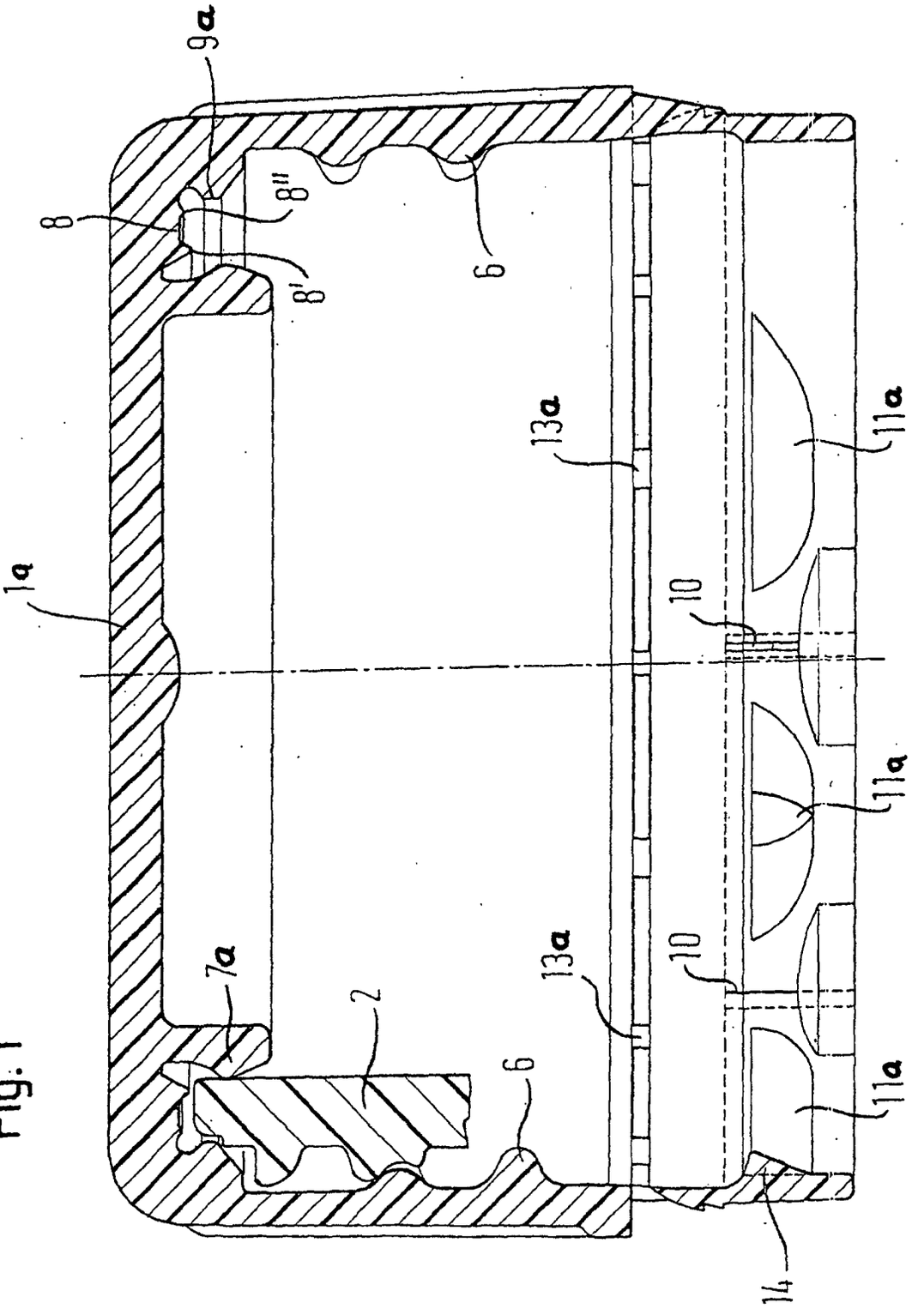


Fig. 1

Fig. 2

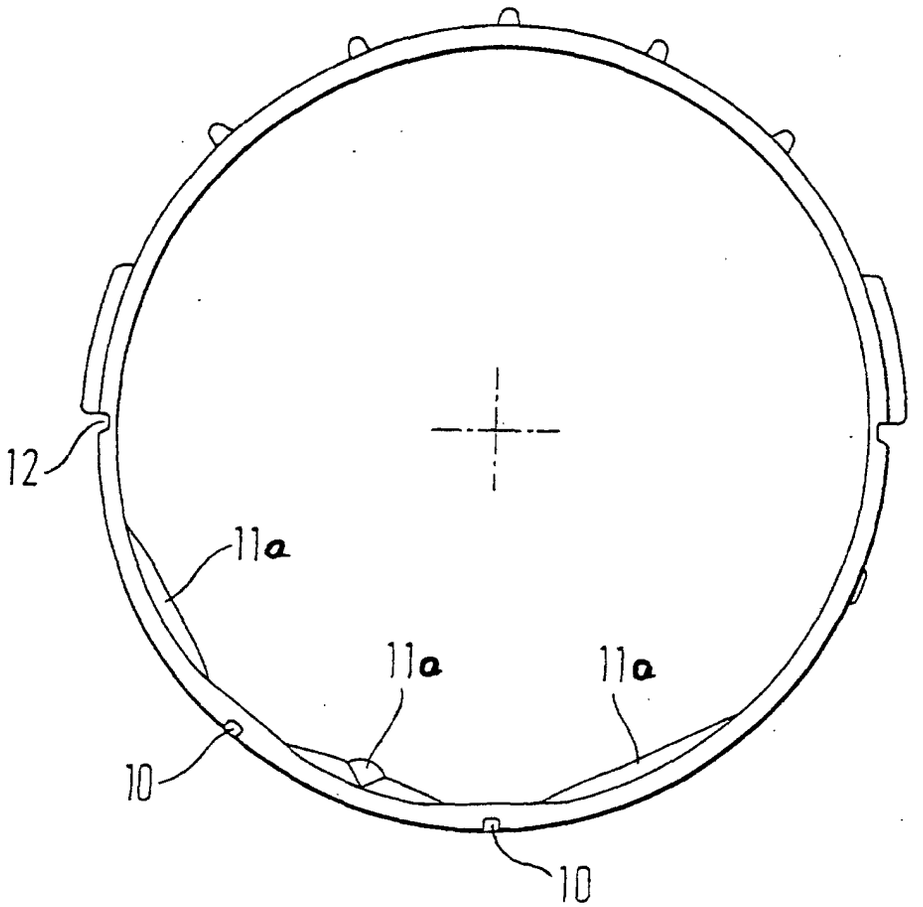
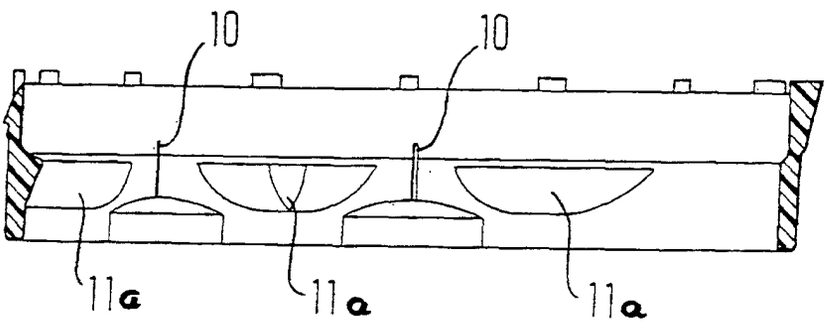


Fig. 3



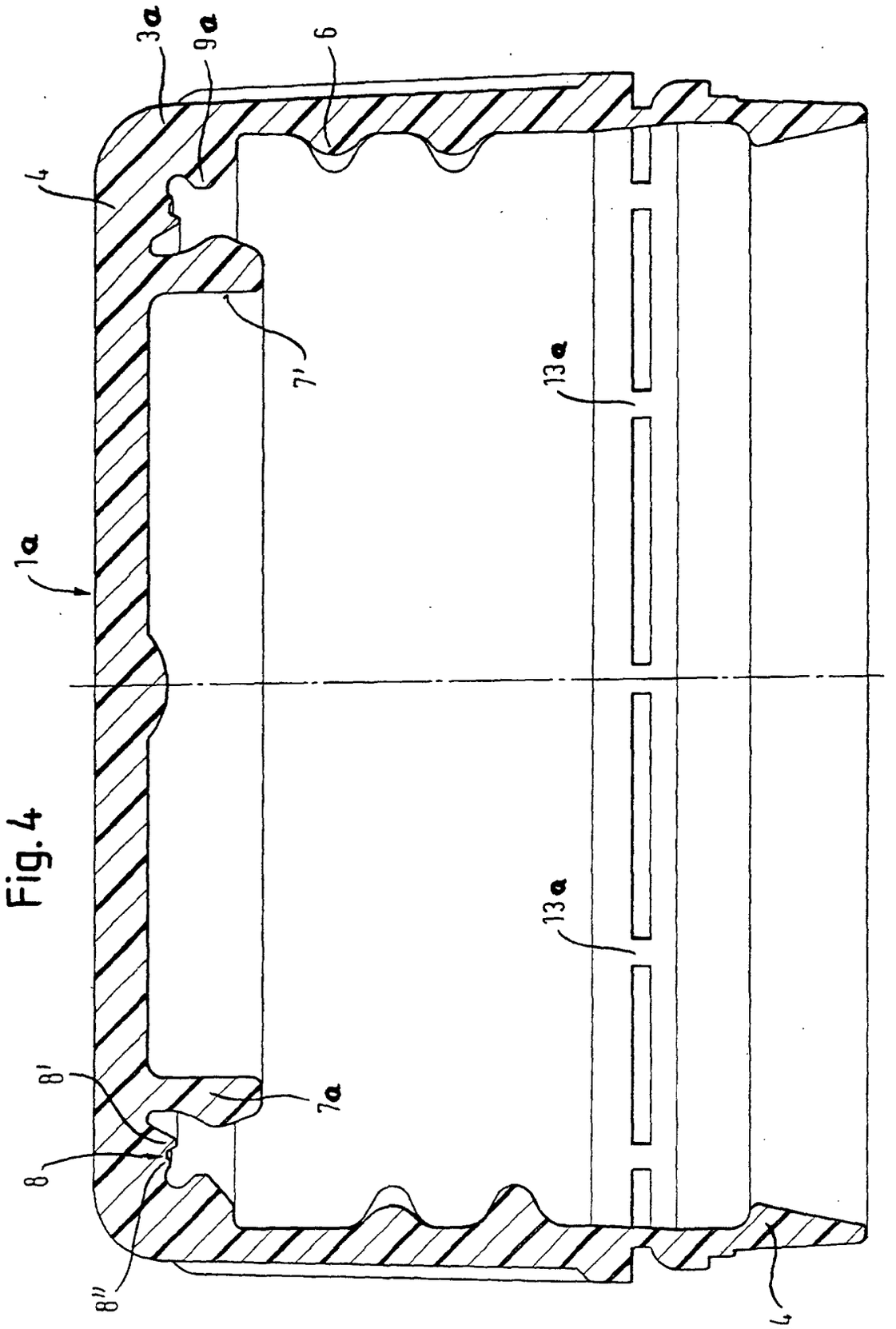


Fig. 4

Fig. 5

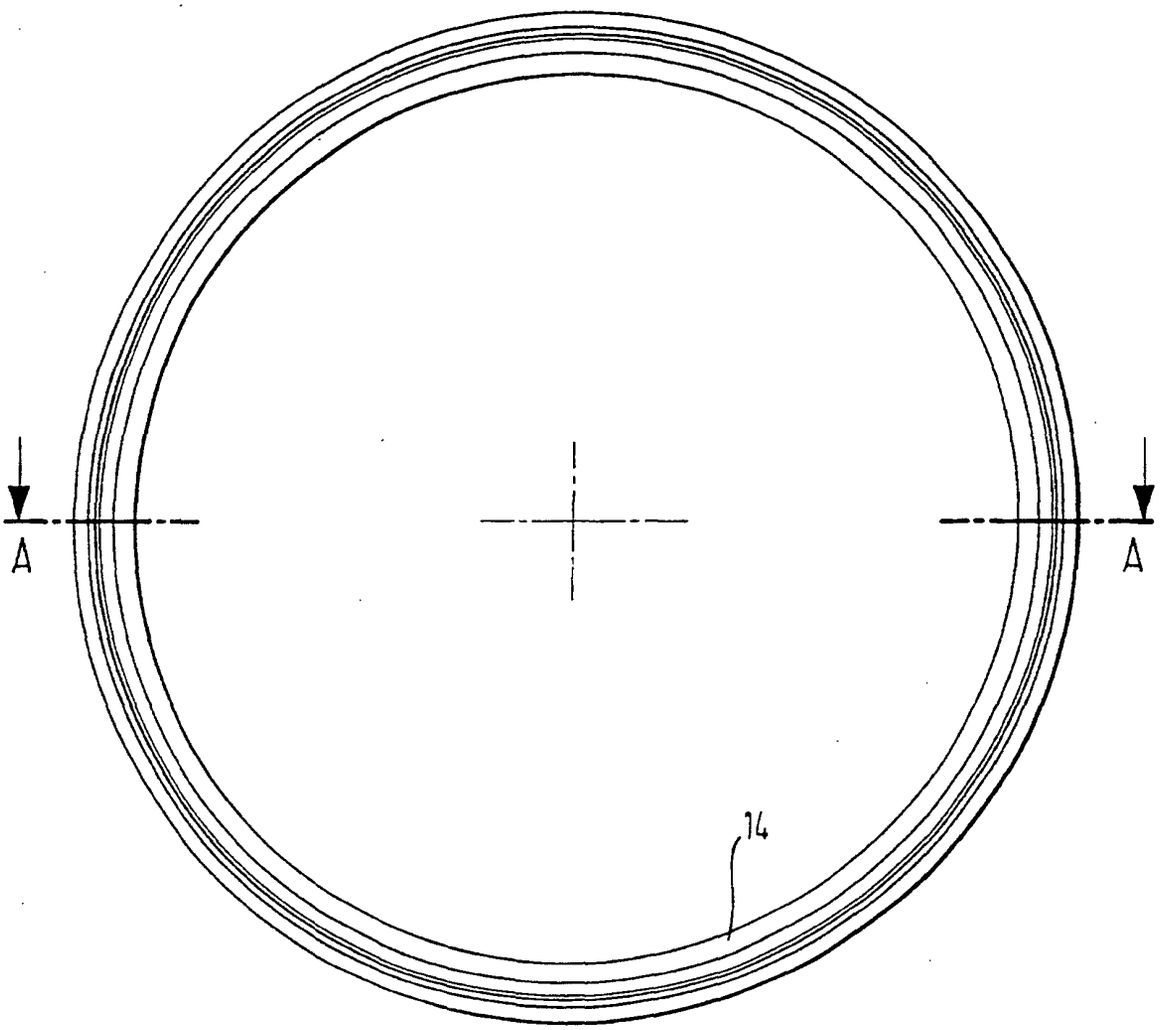


Fig. 6

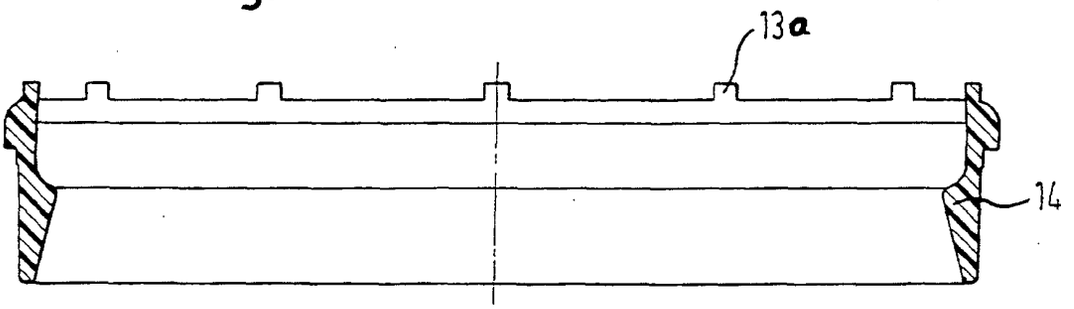


Fig. 7

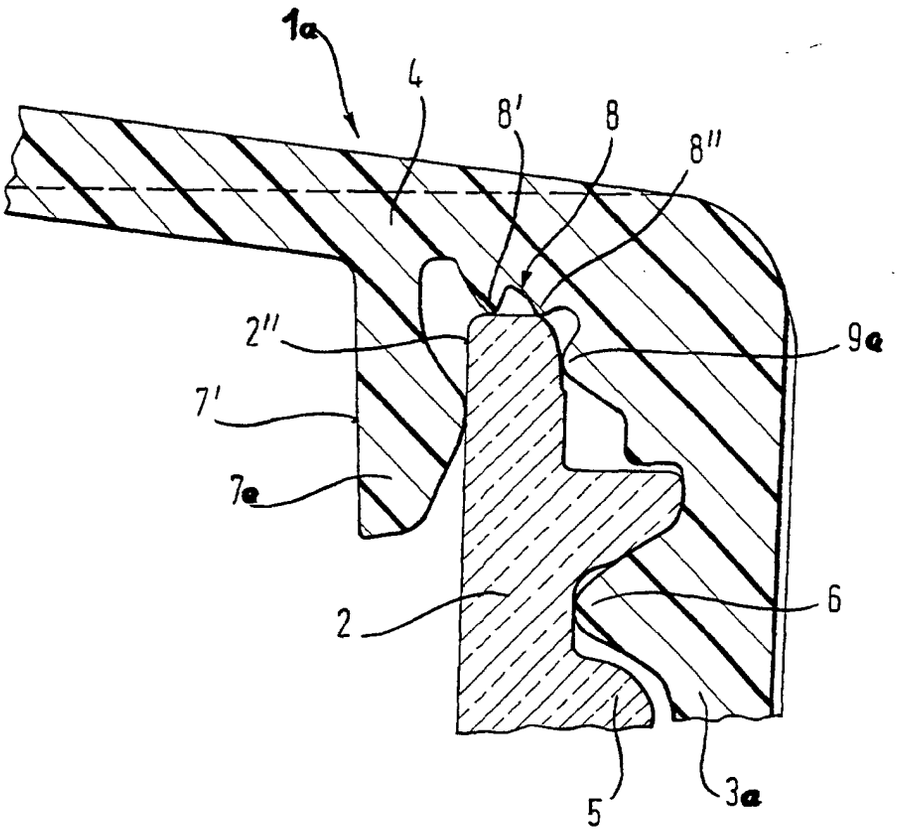


Fig. 8

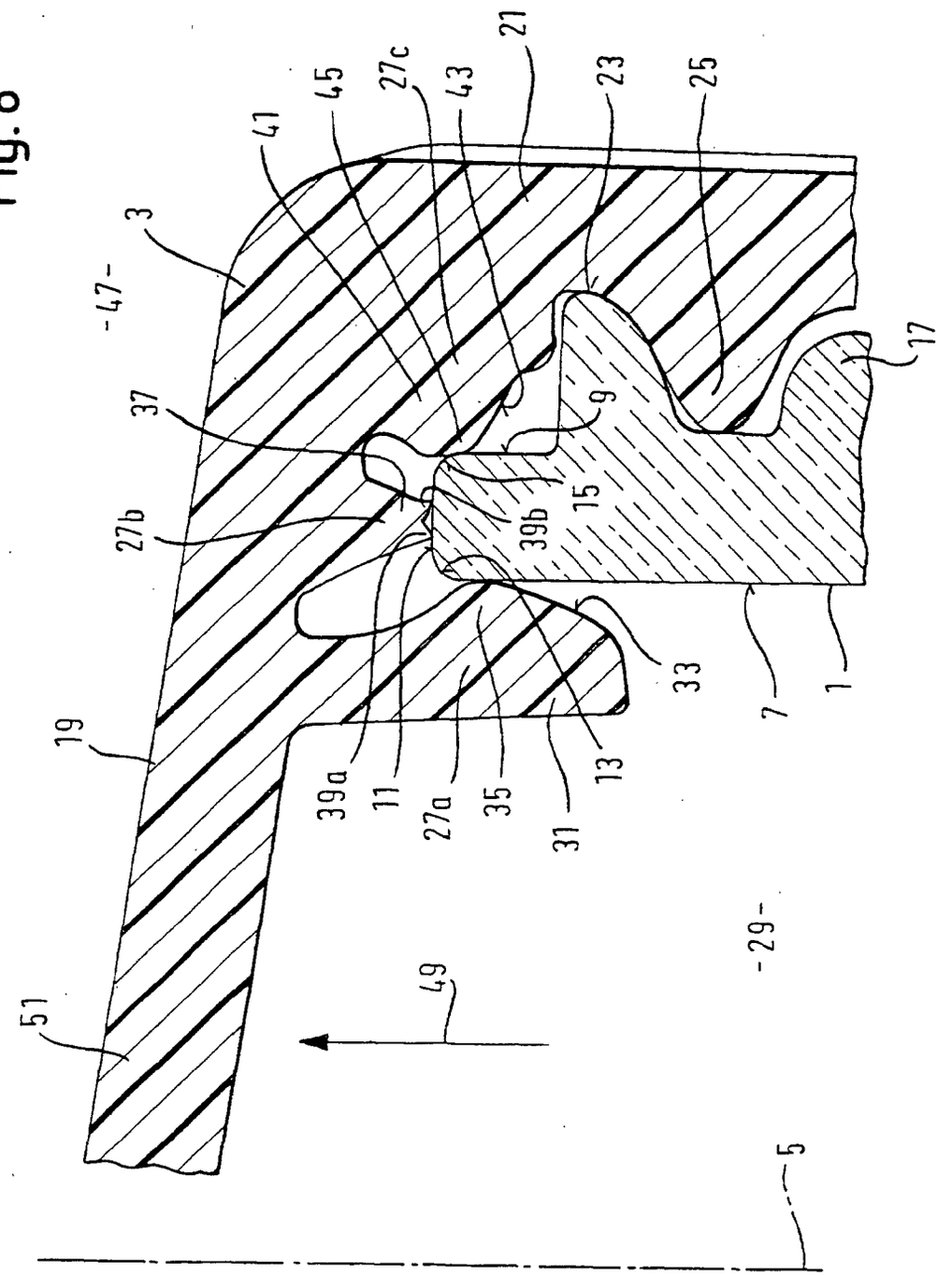

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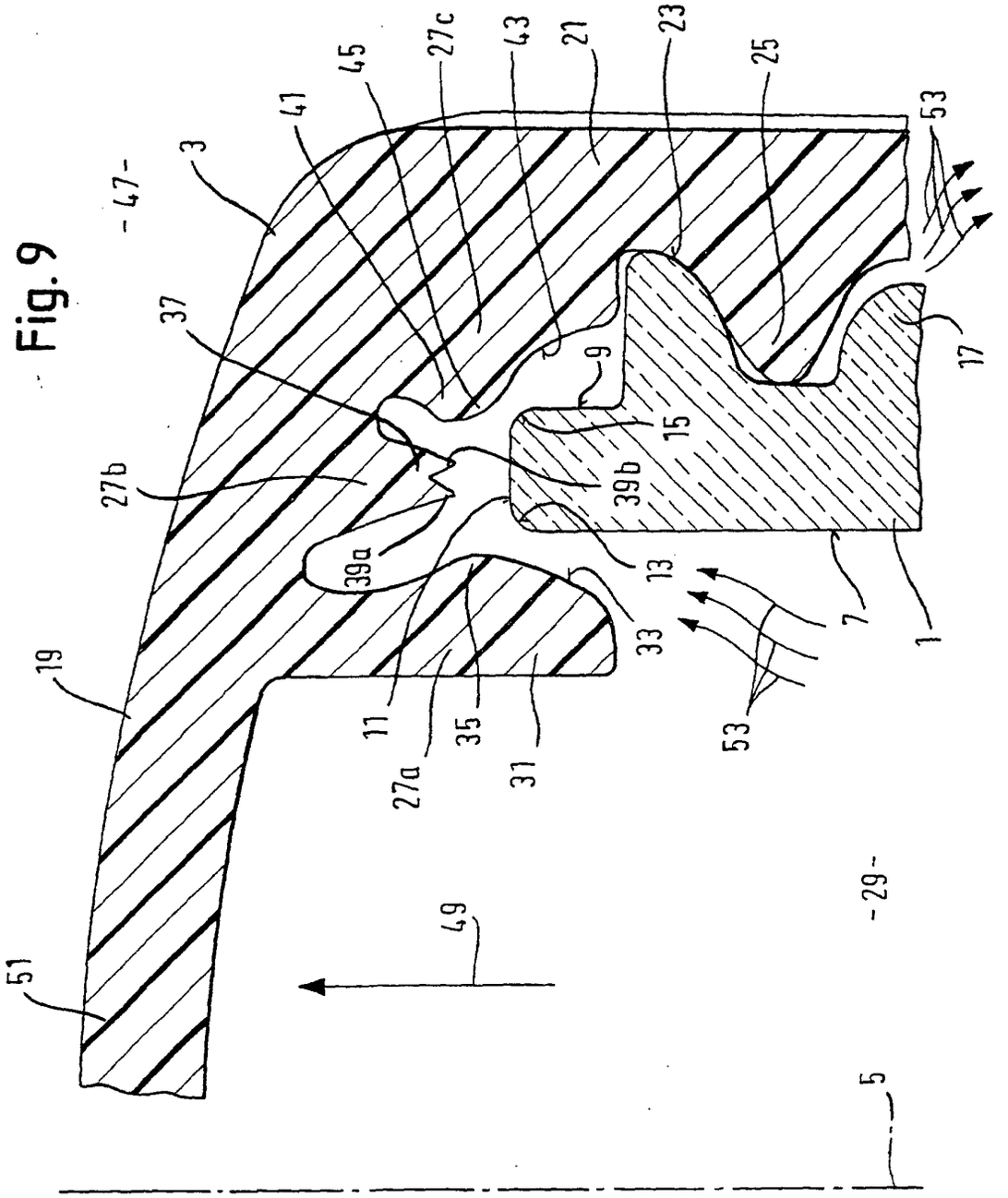
Fig. 9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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 02 3643

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B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 March 2003	Gino, C

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