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(54) **LINERLESS CLOSURE FOR CARBONATED BEVERAGE CONTAINER.**

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Description

The invention relates to a closure for a container having an externally screw threaded neck, said closure being molded in one piece from a resilient plastics material, and comprising a top and a skirt dependent from the top, which skirt has on an internal surface a complementary screw thread, an annular sealing rib disposed radially inward of the skirt projecting downwardly from the top lying adjacent or abutting with the skirt, said rib having a first portion and a second frusto-conical portion extending from said first portion radially inward to terminate in an annular free edge, the free edge of the frusto-conical portion having a diameter that is smaller than the outside diameter of the neck of the container to which the closure is to be attached, such that the neck of the container, during threaded engagement of the closure with the the neck, will be engaged by the frusto-conical portion of the rib.

Such a closure is known from US-A-3 203 571. This closure has a top and a depending cylindrical skirt or sidewall as well as an integral, downwardly extending, annular seal forming flange adjacent the junction of the top and the sidewall. The sealing flange comprises an inwardly tapering frusto-conical flange defining a radially inner frusto-conical surface forming a generally V-shaped recess between the flange and the top of the cap. The flange may be thickened adjacent the top of the cap in which case a radially outer surface of the flange may have, when seen in cross-section, a non-linearity between a first frusto-conical surface adjacent the top and a second such surface extending from the termination of the first annular surface to the free edge of the flange. Whether the rib is so thickened or not the flange has only a single radially inner frusto-conical surface extending from the top of the closure to the free edge of the flange. Upon being applied to a container the sealing flange is pushed against the top of the closure by contact with the neck of the container. A seal is said to be formed between the free end of the neck of the container and the radially outer side of the sealing flange.

In British Patent GB-A-788 148 is shown a one-piece closure including a continuous lip within the top positioned to engage against the annular end face of the opening and provide a seal between the lip and the free end edge of the container with the lip curling over at its free edge. However, this closure provides a seal only against the free end edge of the container.

Australian Patent Application AU-B-15456/76 discloses a one-piece closure in which an annular lip extends from the top and engages an inner bore of a container opening so as to curl the free end of the lip in against the bore or inside surface of the opening. However, with this closure effective sealing requires that the inside bore of the opening be of accurate and consistent dimensions. Furthermore, if aerated or other gaseous liquid is to be contained, gas pressure will tend to distort the lip and cause a seal failure.

Australian Patent Application AU-B-14180/83 describes a closure with two internal sealing structures. One of the structures is an annular shaped outer portion shaped to accept the outer peripheral edge of the free end of the container relying upon the pressure generated during the closing of the cap to seal against this outer edge. Further provided is an inner cylindrical lip to engage the inner bore of the container opening.

It is the object of the present invention to provide a closure for a container of the above type which seals the container particularly effectively.

For the accomplishment of this object, the closure of the afore-mentioned type is characterized by said first portion being substantially cylindrical and having an inner surface being substantially cylindrical with an inner diameter being equal to or only slightly larger than an external diameter of the neck of the container, the frusto-conical portion extending from the terminus of the first portion distal to the top, whereby, during threaded engagement of the closure with the neck of the container, the second, frusto-conical portion will be folded back against the inner surface of the first portion of the rib to form a gas-tight seal between at least an external cylindrical surface of the neck of the container and the closure.

Preferably the plastics material is high density polyethylene, low density polyethylene, or polypropylene. Where the container is to be used for gaseous liquids, the plastics material must have a very low porosity to the gas. Preferably the rib is shaped and sized so that, during the threaded engagement of the closure with the container, the free edge of the rib contacts an inner surface of the top, or the surface of a structure contiguous with the top, before the closure is fully engaged and such that the rib in the region proximal the free edge is pinched between the free end of the neck of the container and the top of the closure, or the structure contiguous with the top of the closure, when the closure is fully engaged with the container.

Preferably the first substantially cylindrical and second frusto-conical portions of the lip join at an included angle of at least 90°. It is also preferred that the rib is of a thickness tapering from a maximum thickness proximal the top to a minimum thickness at its annular free edge.

It is also preferred that the first substantially cylindrical and second frusto-conical portions of the

lip smoothly join with an internal radius of from 0.1mm to 0.5mm, most preferably 0.2mm. It is further preferred that the cross-sectional thickness of the rib proximate the join between the first and second portions is from 0.4mm to 0.8mm, most preferably approximately 0.6mm.

Where the closure is adapted to seal a container with an Alcoa step finish, the first substantially cylindrical portion of the sealing rib joins the top spaced radially inwardly from the skirt so as to define a space of annular cross-section between the rib and skirt. Where the container neck has a standard finish the rib is closely spaced from, or contiguous with, the skirt.

BRIEF DESCRIPTION OF THE DRAWINGS

An exemplary embodiment of the invention will now be described with reference to the drawings which show:

Fig. 1 an embodiment of the present invention in sectioned elevation;

Fig. 2 the embodiment of Fig. 1 screwed onto a suitable container shown in sectional elevation;

and Fig. 3 an alternative embodiment in sectional elevation.

PREFERRED EMBODIMENTS

Fig. 1 shows a cap 1 which is in many aspects a conventional screw top cap for a bottle to be used in containing a carbonated beverage. The cap 1 includes a continuous cylindrical sidewall 2 with a thread 3 formed on its interior surface. The top end of the cap 1 is closed by a top 4 which joins the skirt 2 in a continuous circular perimeter. The top 4 and skirt 2 being formed integrally from high density polyethylene by injection moulding.

The cap differs from known caps in that it includes an annular rib 6 which extends from the interior surface of the top 4 concentrically of the cap 1, being positioned close to the skirt 2. The annular sealing rib 6 includes a first or root portion 7 which extends from the top 4 approximately parallel to the skirt 2 with a second portion 8 extending from the end of the first portion 7 tapering inwardly and away from the side wall 2.

The cap 1 can be seen in Fig. 2 screwed onto the screw top end 9 of a container not fully shown in the drawing. The end 9 of the container is finished with an Alcoa step 10 at the outer periphery of its open end extremity. The Alcoa step 10 allows a space between the end 9 of the container and the inner surface of the skirt 2 of the cap 1. The size of this annular space is sufficient to allow the second portion 8 of the outer rib 6 to contact the end 9 of the container as the cap 1 is being screwed onto the container, and for the second portion 8 to fold up on itself and against the root portion 7 and structure integral with the top 4. Thus there is formed a continuous gas tight seal between the cap 1 and the container extending from the Alcoa step 10 to the end surface of the container. There is no need of a separate seal inserted into the cap 1 prior to its application to the container as is common in the art.

As the cap 1 is attached in the above described manner, the second portion 8 of the sealing rib 6 is deformed by being bent towards the top 4. The deformation continues and contact is made between the second portion 8 of the sealing rib 6 and an inner rib 5 which effectively extends the structure of the top 4. The inner rib 5 in fact is not essential to the invention and can be dispensed with if the other components are suitably modified so that the end portion 8 contacts the top 4 during this deformation.

Once the second portion 8 has contacted the inner rib 5 (or top 4) further movement attaching the cap 1 will press and grip the contacting part of the second portion 8 between the container end 9 and the top 4. As the movement attaching the cap 1 continues, it tends to pinch the free edge of rib 6 between the container and the top 4 and to "pull" the first portion 7 of the outer rib tightly in towards the container end 9 to produce a tight seal about the curved edge surface of the container end 9 extending from its extreme end annular surface 11 to the Alcoa step region 10.

In the preferred embodiment shown in the drawings, an annular gap 12 is formed between the outer rib 6 and the skirt 2, proximate the top 4. This is one means of accommodating the Alcoa step 10 and allowing the necessary movement of the outer rib 6 during application of the cap 1 to a container end 9.

The dimensions of the outer rib 6, in conjunction with the design shape of the rib 6 and its material of construction, will clearly influence the effectiveness of the cap 1. Not only the sealing effectiveness but also the mouldability, removal torque, reusability and consistency are important. For the high density polyethelene cap shown in the drawings, the inner radius joining the first and second portions 7 and 8 of the outer rib 6 is 0.2mm, the outer radius 0.5mm and the cross-sectional thickness approximately 0.6mm (slightly tapered for mould removal).

The alternative embodiment of Fig. 3 has a very much smaller inner rib 5 but is otherwise substantially the same as the embodiment of Fig. 1 and 2.

The cap is modified (not illustrated) for containers not finished with an Alcoa step. Importantly, the inner diameter at the skirt and the thread dimensions must provide a secure engagement with the

container thread. Further the inner dimension of the first portion 7 of the sealing rib 6 is preselected to be equal to, or slightly greater than, the external diameter of the container neck at the opening. Some radial flex should be provided in the sealing rib 6 so that on application of the cap to the container the second portion 8 can uniformly bend back onto the first portion 7.

Claims

1. A closure (1) for a container (9) having an externally screw threaded neck, said closure (1) being molded in one piece from a resilient plastics material, and comprising a top (4) and a skirt (2) dependent from the top (4), which skirt (2) has on an internal surface a complementary screw thread (3),an annular sealing rib (6) disposed radially inward of the skirt (2) projecting downwardly from the top (4) lying adjacent or abutting with the skirt (2), said rib (6) having a first portion (7) and a second frusto-conical portion (8) extending from said first portion (7) radially inward to terminate in an annular free edge, the free edge of the frusto-conical portion (8) having a diameter that is smaller than the outside diameter of the neck of the container (9) to which the closure (1) is to be attached, such that the neck of the container (9), during threaded engagement of the closure (1) with the neck, will be engaged by the frusto-conical portion (8) of the rib (6),
characterized by
said first portion (7) being substantially cylindrical and having an inner surface being substantially cylindrical with an inner diameter being equal to or only slightly larger than an external diameter of the neck of the container (9), the frusto-conical portion (8) extending from the terminus of the first portion (7) distal to the top (4), whereby, during threaded engagement of the closure (1) with the neck of the container (9), the second frusto-conical portion (8) will be folded back against the inner surface of the first portion (7) of the rib (6) to form a gas-tight seal between at least an external cylindrical surface of the neck of the container (9) and the closure (1).

2. A closure (1) as defined in claim 1 wherein during said threaded engagement interaction between the rib (6) and the neck of the container (9) will cause said rib (6), while folding back, to contact an inner surface portion (5) of the top (4) or of a structure (5) contiguous with the top (4) to provide a gas-tight seal with the container (9).

3. A closure (1) as defined in claim 1 wherein the rib (6) has a shape, size and material of construction selected such that, during attachment of said closure to a container, said rib (6) is frictionally engaged between said free end of the container neck and a surface portion (5) of the top (4), once mutual contact is made so that final movement of said closure (1) draws an end part of the second, frustoconical portion (8) of the rib (6) adjacent an outer top surface of the container tightly against said top surface of the container so as to form a continuous seal from said top surface to a cylindrical side surface of the container neck.

4. A closure (1) as defined in claim 2 wherein said surface portion (5) is defined by part of a second continuous annular rib (5) being contiguous with the top (4) of the closure (1).

5. A closure (1) as defined in claim 4 wherein the second rib (5) extends radially inwardly and away from said top (4) and is tapered in cross-section.

6. A closure (1) as defined in claim 5, wherein upon attachment of said closure (1) to a said container (9), said second rib (5) is deformed by being bent towards said top (4) subsequent to contact with said sealing rib (6).

7. A closure (1) as defined in claim 6 wherein said first portion (7) joins said top (4) radially displaced from said skirt (2) so as to define a generally annular gap between said first portion (7) and said skirt (2).

8. A closure (1) as defined in claim 1 wherein said rib (6) is tapered in cross-section so as to allow ejection of the closure (1) from an injection mold.

9. A closure (1) as defined in claim 2 wherein the rib (6) has a shape, size and material of construction selected such that, during attachment of said closure (1) to a container (9), said rib (6) is frictionally engaged between said free end of the container neck and a surface portion (5) of the top (4) once mutual contact is made so that final movement of said closure (1) draws an end part of the second, frustoconical portion of the rib (6) adjacent an outer top surface of the container (9) tightly against said top surface so as to form a continuous seal from said top surface to a cylindrical side surface of the container neck.

10. A closure (1) as defined in claim 3 wherein said surface portion (5) is defined by part of a second continuous annular rib (5) being contiguous with the top (4) of the closure (1).

11. A closure (1) as defined in claim 9 wherein said surface portion (5) is defined by part of a second continuous annular rib being contiguous with the top of the closure (1).

12. A closure (1) as defined in claim 11 wherein said first portion (7) joins said top (4) radially displaced from said skirt (2) so as to define a generally annular gap between said first portion (7) and said skirt (2).

Patentansprüche

1. Verschluß (1) für einen Behälter (9) mit einem mit Außengewinde versehenen Hals, wobei der Verschluß (1) in einem Stück aus einem elastischen Kunststoffmaterial geformt ist und einen Oberteil (4) und einen von dem Oberteil (4) abhängenden Randteil (2) umfaßt, welcher Randteil (2) auf einer Innenfläche ein komplementäres Schraubgewinde (3) aufweist, eine ringförmige Dichtungsrippe (6), welche radial innerhalb des Randteils (2) angeordnet ist und von dem Oberteil (4) nach unten hervorsteht und benachbart dem Randteil (2) liegt oder an diesen anstößt, wobei die Rippe (6) einen ersten Abschnitt (7) aufweist sowie einen zweiten kegelstumpfartigen Abschnitt (8), welcher sich von dem ersten Abschnitt (7) radial nach innen erstreckt, um in einem ringförmigen freien Rand zu enden, wobei der freie Rand des kegelstumpfartigen Abschnitts (8) einen Durchmesser aufweist, der kleiner ist als der Außendurchmesser des Halses des Behälters (9), an welchem der Verschluß (1) anzubringen ist, so daß der Hals des Behälters (9) während des Schraubeingriffs des Verschlusses (1) mit dem Hals in ein Eingriff mit dem kegelstumpfartigen Abschnitt (8) der Rippe (6) ist,
dadurch gekennzeichnet,
daß der erste Abschnitt (7) im wesentlichen zylindrisch ist und eine im wesentlichen zylindrische Innenfläche mit einem Innendurchmesser aufweist, welcher gleich oder nur geringfügig größer als ein Außendurchmesser des Halses des Behälters (9) ist, wobei der kegelstumpfartige Abschnitt (8) sich von dem vom Oberteil (4) entfernten Ende des ersten Abschnitts (7) erstreckt, wodurch während des Schraubeingriffs des Verschlusses (1) mit dem Hals des Behälters (9) der zweite kegelstumpfartige Abschnitt (8) gegen die Innenfläche des ersten Abschnitts (7) der Rippe (6) zurückgefaltet wird, um eine gasdichte Abdichtung zwischen wenigstens einer äußeren zylindrischen Fläche des Halses des Behälters (9) und dem Verschluß (1) zu bilden.

2. Verschluß (1) nach Anspruch 1, worin während des Schraubeingriffs eine Zusammenwirkung zwischen der Rippe (6) und dem Hals des Behälters (9) verursacht, daß die Rippe (6), während sie zurückgefaltet ist, einen Innenflächenabschnitt (5) des Oberteils (4) oder einer an den Oberteil (4) angrenzenden Struktur (5) berührt, um eine gasdichte Abdichtung mit dem Behälter (9) zu bilden.

3. Verschluß (1) nach Anspruch 1, worin die Rippe (6) eine Form, Größe und ein Aufbaumaterial aufweist, welche derart ausgewählt sind, daß während der Anbringung des Verschlusses an dem Behälter die Rippe (6) in Reibungseingriff zwischen dem freien Ende des Behälterhalses und einem Flächenabschnitt (5) des Oberteils (4) ist, wenn einmal gegenseitiger Kontakt hergestellt ist, so daß die Endbewegung des Verschlusses (1) einen Endteil des zweiten, kegelstumpfartigen Abschnitts (8) der Rippe (6) benachbart einer äußeren oberen Fläche des Behälters dicht gegen die obere Fläche des Behälters zieht, um eine kontinuierliche Abdichtung von der oberen Fläche zu einer zylindrischen Seitenfläche des Behälterhalses zu bilden.

4. Verschluß (1) nach Anspruch 2, worin der Flächenabschnitt (5) teilweise durch eine zweite kontinuierliche ringförmige Rippe (5) gebildet ist, welche an den Oberteil (4) des Verschlusses (1) angrenzt.

5. Verschluß (1) nach Anspruch 4, worin die zweite Rippe (5) sich radial nach innen und von dem Oberteil (4) weg erstreckt und im Querschnitt sich verjüngend ausgebildet ist.

6. Verschluß (1) nach Anspruch 5, worin nach Anbringung des Verschlusses (1) an dem Behälter (9) die zweite Rippe (5) durch Biegen in Richtung des Oberteils (4) nach dem Kontakt mit der Dichtungsrippe (6) verformt ist.

7. Verschluß (1) nach Anspruch 6, worin der erste Abschnitt (7) mit dem Oberteil (4) radial von dem Randteil (2) versetzt verbunden ist, um einen im allgemeinen ringförmigen Zwischenraum zwischen dem ersten Abschnitt (7) und dem Randteil (2) zu bilden.

8. Verschluß (1) nach Anspruch 1, worin die Rippe (6) einen sich verjüngenden Querschnitt aufweist, um das Ausstoßen des Verschlusses (1) aus einer Spritzform zu ermöglichen.

9. Verschluß (1) nach Anspruch 2, worin die Rippe (6) eine Form, Größe und ein Aufbaumaterial aufweist, welche derart ausgewählt sind, daß während der Anbringung des Verschlusses (1) an einem Behälter (9) die Rippe (6) in Reibungseingriff zwischen dem freien Ende des Behälterhalses und einem Flächenabschnitt (5) des Oberteils (4) ist, wenn einmal gegenseitiger Kontakt hergestellt ist, so daß eine Endbewegung des Verschlusses (1) einen Endteil des zweiten, kegelstumpfartigen Abschnitts der Rippe (6) benachbart einer äußeren oberen Fläche des Behälters (9) dicht gegen die obere Fläche zieht, um eine kontinuierliche Abdichtung von der oberen Fläche zu einer zylindrischen Seitenfläche des Behälterhalses zu bilden.

10. Verschluß (1) nach Anspruch 3, worin der Flächenabschnitt (5) teilweise durch eine zweite kontinuierliche, ringförmige Rippe (5) gebildet ist, welche an den Oberteil (4) des Verschlusses (1) angrenzt.

11. Verschluß (1) nach Anspruch 9, worin der Flächenabschnitt (5) teilweise durch eine zweite kontinuierliche, ringförmige Rippe (5) gebildet ist, welche an den Oberteil des Verschlusses (1) angrenzt.

12. Verschluß (1) nach Anspruch 11, worin der erste Abschnitt (7) mit dem Oberteil (4) radial von dem Randteil (2) versetzt verbunden ist, um einen im allgemeinen ringförmigen Zwischenraum zwischen dem ersten Abschnitt (7) und dem Randteil (2) zu bilden.

Revendications

1. Elément de fermeture (1) pour un récipient (9) ayant un goulot fileté extérieurement, ledit élément de fermeture (1) étant moulé d'une seule pièce dans une matière plastique élastique, et comportant un sommet (4) et une jupe (2) qui s'étend depuis le sommet (4), la jupe (2) ayant sur une surface interne un filetage complémentaire (3), une nervure d'étanchéité annulaire (6) disposée radialement à l'intérieur de la jupe (2) faisant saillie vers le bas depuis le sommet (4) et s'étendant de façon adjacente ou butant contre la jupe (2), ladite nervure (6) ayant une première partie (7) et une deuxième partie tronconique (8) qui s'étend radialement vers l'intérieur depuis ladite première partie (7) afin de se terminer par un bord libre annulaire, le bord libre de la partie tronconique (8) ayant un diamètre qui est inférieur au diamètre extérieur du goulot du récipient (9) sur lequel doit être fixé l'élément de fermeture (1), de sorte que le goulot du récipient (9), pendant l'engagement vissé de l'élément de fermeture (1) avec le goulot, est engagé par la partie tronconique (8) de la nervure (6), caractérisé par ladite première partie (7) qui est sensiblement cylindrique et a une surface interne qui est sensiblement cylindrique avec un diamètre interne qui est égal ou légèrement supérieur au diamètre externe du goulot du récipient (9), la partie tronconique (8) s'étendant depuis le point terminal de la première partie (7) éloigné du sommet (4), de sorte que, pendant l'engagement vissé de l'élément de fermeture (1) avec le goulot du récipient (9), la deuxième partie tronconique (8) est repliée en arrière contre la surface interne de la première partie (7) de la nervure (6) afin de former une étanchéité au gaz entre au moins une surface cylindrique extérieure du goulot du récipient (9) et l'élément de fermeture (1).

2. Elément de fermeture (1) selon la revendication 1, dans lequel pendant ledit engagement vissé, l'interaction entre la nervure (6) et le goulot du récipient (9) amène ladite nervure (6), tout en se repliant, à venir en contact avec une partie de surface interne (5) du sommet (4) ou d'une structure (5) contiguë au sommet (4) afin de procurer une étanchéité au gaz avec le récipient (9).

3. Elément de fermeture (1) selon la revendication 1, dans lequel la nervure (6) a une forme, une taille et une matière de construction choisies de telle sorte que, pendant la fixation dudit élément de fermeture sur un récipient, ladite nervure (6) est engagée avec friction entre ladite extrémité libre du goulot de récipient et une partie de surface (5) du sommet (4), une fois qu'un contact mutuel est réalisé de sorte qu'un mouvement final dudit élément de fermeture (1) tire une partie d'extrémité de la deuxième partie tronconique (8) de la nervure (6) de façon adjacente à une surface supérieure extérieure du récipient fermement contre ladite surface supérieure du récipient afin de former un joint continu depuis ladite surface supérieure jusqu'à une surface latérale cylindrique du goulot de récipient.

4. Elément de fermeture (1) selon la revendication 2, dans lequel ladite partie de surface (5)

est définie par une partie d'une deuxième nervure annulaire continue (5) qui est contiguë au sommet (4) de l'élément de fermeture (1).

5. Elément de fermeture (1) selon la revendication 4, dans lequel la deuxième nervure (5) s'étend radialement vers l'intérieur et à l'écart dudit sommet (4) et est de section transversale conique.

6. Elément de fermeture (1) selon la revendication 5, dans lequel, lors de la fixation dudit élément de fermeture (1) sur ledit récipient (9), ladite deuxième nervure (5) est déformée en étant repliée vers ledit sommet (4) à la suite du contact avec ladite nervure d'étanchéité (6).

7. Elément de fermeture (1) selon la revendication 6, dans lequel ladite première partie (7) rejoint ledit sommet (4) radialement déplacé depuis ladite jupe (2) de façon à définir un espace globalement annulaire entre ladite première partie (7) et ladite jupe (2).

8. Elément de fermeture (1) selon la revendication 1, dans lequel ladite nervure (6) est de section transversale de façon à permettre l'éjection de l'élément de fermeture (1) d'un moule d'injection.

9. Elément de fermeture (1) selon la revendication 2, dans lequel la nervure (6) a une forme, une taille et une matière de construction choisies de telle sorte que, pendant la fixation dudit élément de fermeture (1) sur un récipient (9), ladite nervure (6) est engagée avec friction entre ladite extrémité libre du goulot de récipient et une partie de surface (5) du sommet (4) une fois qu'un contact mutuel est réalisé de sorte qu'un mouvement final dudit élément de fermeture (1) tire une partie d'extrémité de la deuxième partie tronconique de la nervure (6) de façon adjacente à une surface supérieure extérieure du récipient (9) fermement contre ladite surface supérieure afin de former un joint continu depuis ladite surface supérieure jusqu'à une surface latérale cylindrique du goulot du récipient.

10. Elément de fermeture (1) selon la revendication 3, dans lequel ladite partie de surface (5) est définie par une partie d'une deuxième nervure annulaire continue (5) qui est contiguë au sommet (4) de l'élément de fermeture (1).

11. Elément de fermeture (1) selon la revendication 9, dans lequel ladite partie de surface (5) est définie par une partie d'une deuxième nervure annulaire continue qui est contiguë au sommet de l'élément de fermeture (1).

12. Elément de fermeture (1) selon la revendication 11, dans lequel ladite première partie (7) rejoint ledit sommet (4) radialement déplacé depuis ladite jupe (2) de façon à définir un espace globalement annulaire entre ladite première partie (7) et ladite jupe (2).

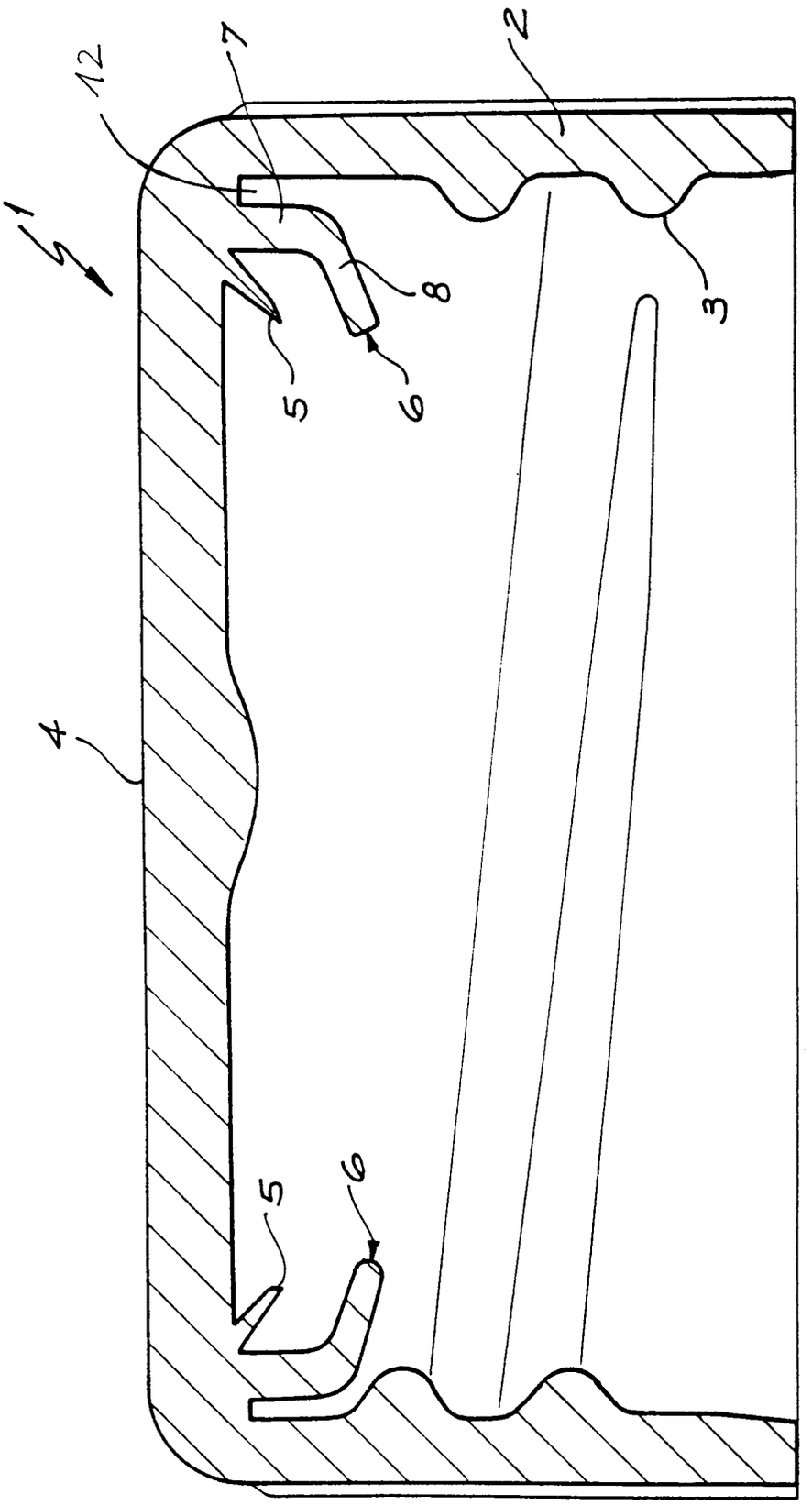

FIG. 1

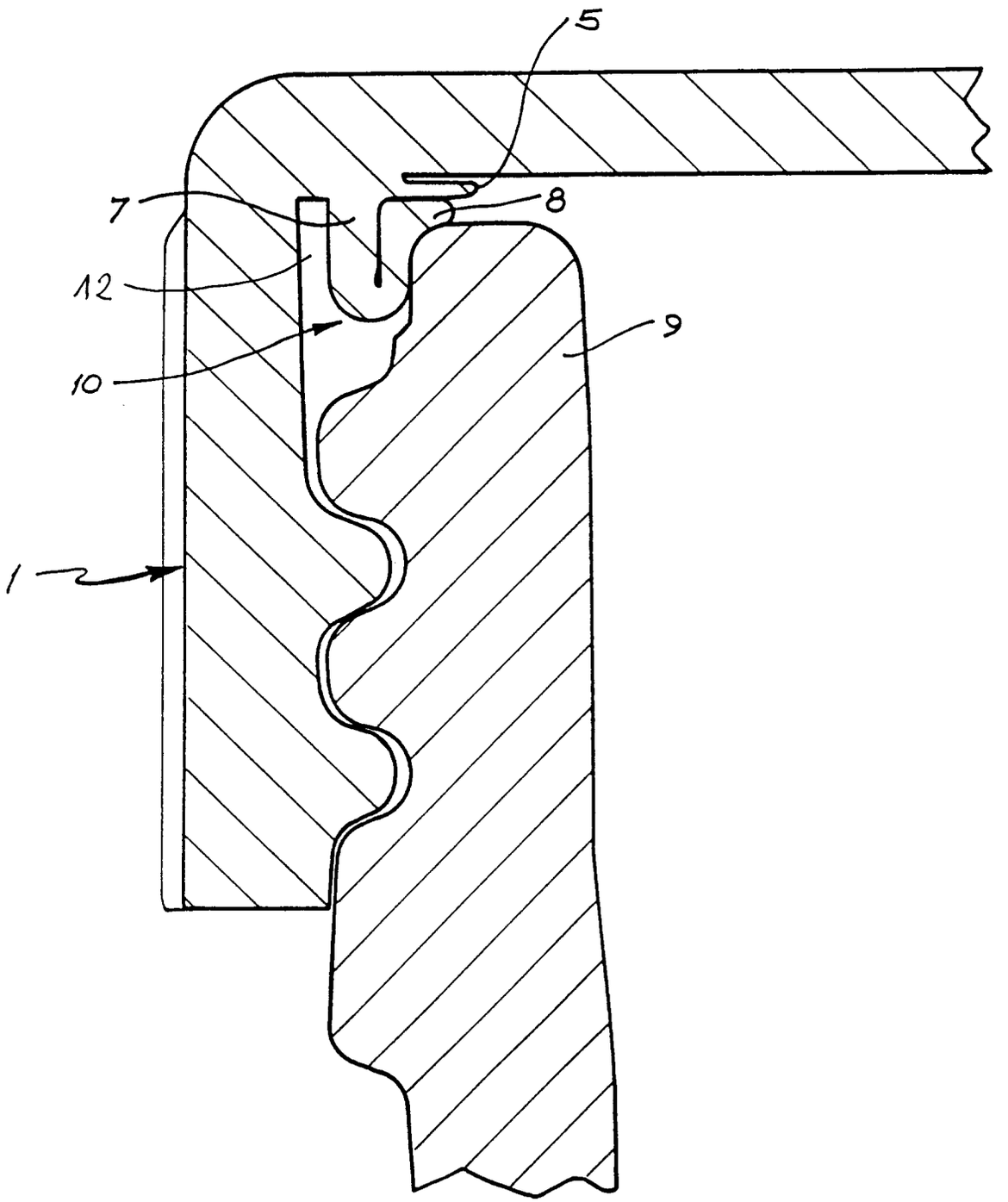

FIG. 2

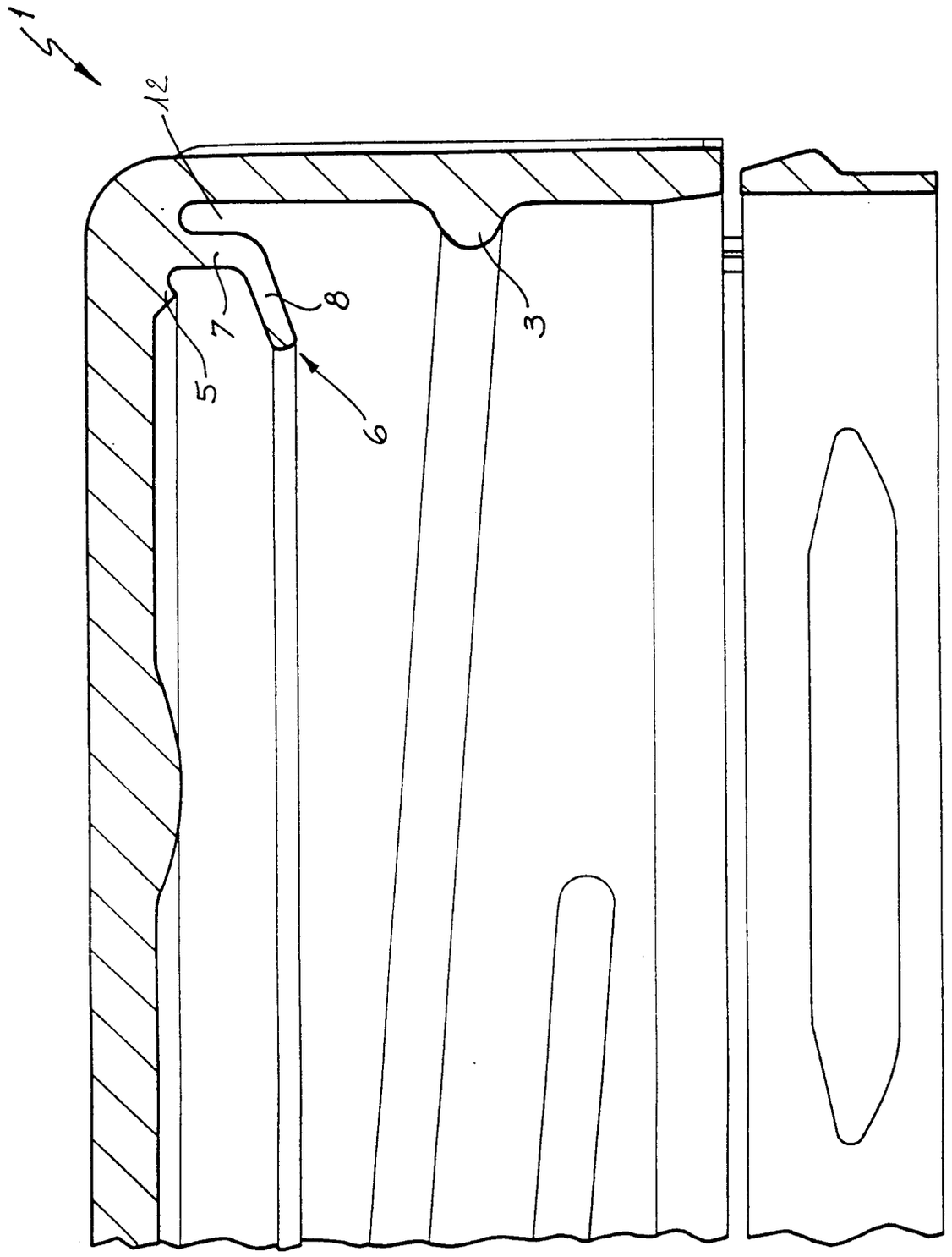

FIG.3