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(54) **A RESEALABLE CAP**

HERMETISCH WIEDERVERSCHLIESSBARE KAPPE
BOUCHON REFERMABLE HERMETIQUEMENT

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EP 0 625 948 B1

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DescriptionField of the Invention

[0001] The present invention relates to sealing structures for pour spouts and vials; and more particularly to a seal and method for releasably sealing a cap onto a structure such as a pour spout or vial.

Background of the Invention

[0002] Resealable caps are well known in the art. Such caps may be used on gabled top containers and brick type containers. See Figures 11 and 12, respectively, of U.S. Patent No. 5,108,029. In addition, caps of a similar style have been used to seal vials of different sizes and shapes. See, for example, Figure 4 of U.S. Patent No. 4,783,056. Such caps are convenient because they form a liquid-tight seal and can be repeatedly opened and closed easily.

[0003] For purposes of convenience, such caps are frequently integrally connected to the structure that they are intended to seal. For example, they may be connected by a flexible flange that allows the cap to pivot from an opened position to a sealed position.

[0004] In order to enhance the seal between the cap and the structure or container onto which the cap is fastened, an annular seal may be provided within the cap in order to form an annular gap between the seal and the outer rim of the cap. The annular gap is designed to receive an upper edge of the container onto which the cap is sealed. In order to obtain a good, liquid-tight seal between the container and the cap, it is preferable that the upper edge of the container wall fit tightly within the annular gap. However, fitting the upper edge of the container wall tightly within the annular gap creates difficulties. Specifically, if the cap is not properly aligned with the container immediately prior to closing, the upper edge of the container wall may improperly contact the annular seal or outer rim of the cap, thus bending or damaging the seal, the outer rim of the cap, or the upper edge of the container wall. In addition, if the annular gap is too narrow, the upper edge of the container wall may not fit properly within the gap, thus also creating problems with the seal.

[0005] Caps of the type to which the present invention relates are generally injection molded from plastic.

[0006] The invention provides a fluid-tight seal arrangement for a resealable cap for use with a vial comprising:

- (a) a flange integrally connecting the cap to the vial, the flange including a recess to direct bending of the flange with proper alignment of the cap on an upper edge of the vial, the recess extending in a direction perpendicular to the longitudinal axis of the flange,
- (b) an annular seal extending from the inner cap

surface, the annular seal including an inner edge and an outer edge, the outer edge of the seal extending toward the inner cap surface at an angle of approximately 45 degrees, the annular seal being concentric with respect to the inner peripheral wall of the cap so as to form a gap between the outer edge of the seal and the inner peripheral wall for receiving an upper edge of a rim of the vial, the inner peripheral wall of the cap including first and second sections, the first section being normal to the inner cap surface and the second section forming a ridge that protrudes from the first section for contacting the upper edge of the rim of the vial, characterised in that

- (1) the flange includes an elongate ridge which extends in a direction perpendicular to the longitudinal axis of the flange;
- (2) the annular seal has a truncated top surface,
- (3) the inner edge of the seal intersects the inner cap surface at an angle of approximately 45 degrees,
- (4) the width of the seal at its base is at least twice the height of the seal,
- (5) the first section of the inner peripheral wall of the cap is substantially the same height as the seal so that the truncated top surface of the seal ends at approximately the same height as the end of the first section of the wall, whereby the annular seal design and inner wall arrangement result in the upper edge of the rim of the vial contacting the cap at least along the first wall section, along the second wall section and at the outer seal wall when the upper edge is sealed within the cap.

The first section is substantially the same height as the seal means, and extends substantially perpendicular to the inner cap surface.

Brief Description of the Drawings**[0007]**

Figure 1 is a cross-sectional view of a known vial and cap.

Figure 2 is a cross-sectional view of a cap connected to a vial with a flange constructed according to the present invention.

Figure 3 is a perspective view of a known gabled top container having a pour spout mounted thereon.

Figure 4 is a cross-sectional view of a spout and cap according to the present invention.

Figure 5 is an enlarged view of a portion of Figure 4.

Figure 6 is a cross-sectional view of a vial and cap

according to the present invention.

Figure 7 is an enlarged view of a portion of Figure 6.

Detailed Description of the Preferred Embodiments

[0008] With reference to Figure 1, a known vial and cap arrangement is disclosed. Specifically the vial and cap illustrated in Figure 1 is disclosed in U.S. Patent No. 4,783,056, which issued on November 8, 1988. According to the known arrangement, a vial 10 is connected to a cap 12 by means of a flange 14. An annular seal 16 is provided on the inside of the cap 12 in order to define a corresponding annular gap 18. The annular gap 18 is designed to accommodate the upper edge 20 of the vial 10.

[0009] A recess 22 is formed in the flange 14 to facilitate the bending of the flange 14 during the process of transferring the cap 12 to the top of the vial 10. Specifically, the recess 22 is intended to weaken the flange 14 at a particular point so that bending of the flange 14 is encouraged in the region of the recess 22. By attempting to direct the bending of the flange 14, alignment of the upper edge 20 of the vial wall with the annular gap 18 is facilitated. Such alignment, of course, reduces the number of incidents where the tip of the annular seal 16 abuts directly against the upper edge 20 of the vial wall thus damaging either the annular seal 16 or the upper edge 20 of the wall. Such damage would reduce the effectiveness of the seal between the cap and the vial.

[0010] The subject matter of U.S. Patent No. 4,783,056 is hereby incorporated herein by reference.

[0011] However, it has been found that the recess 22 in the flange 14 does not always adequately guide the cap 12 onto the vial. To further facilitate the bending of the flange 14 so that the cap 12 accurately aligns itself on the edge 20 of the wall of the vial 10, the flange 14 has been further modified.

[0012] Turning attention now to Figure 2, an improved version of the flange is illustrated. A flange 114 interconnects a vial 110 with a cap 112. A recess 122 is provided in the flange 114 to facilitate bending of the flange at a particular location. In addition to the recess 122, an elongated ridge 124 extends across most of the flange 114. The ridge 124 is preferably parallel to the recess 122 and preferably extends perpendicularly across the flange 114. The ridge 124 stiffens a portion of the flange 114 adjacent the recess 122. The combination of the ridge 124 and the recess 122 functions so as to more precisely direct the bending of the flange 114 to ensure proper alignment of the cap 112 on the edge 120 of the wall of the vial 110 when the cap is being moved to seal the vial. The improved alignment of the cap with the end wall of the vial minimizes the number of occurrences in which the seal 116 of the cap improperly contacts the upper edge 120 of the vial wall so as to damage either the cap or the vial wall. As a

result, the performance of the seal of the cap to the vial is greatly improved.

[0013] The ridge 124 further functions so as to engage with a shoulder in the mold in which the vial and cap are formed. By engaging the shoulder of the mold, the ridge 124 prevents the flange 114 from slipping in the mold because of buckling of the vial. Thus, the ridge 124 helps to ensure that the cap 112 aligns properly on the vial 110.

[0014] Turning attention to Figure 3, it can be seen that the type of cap and flange arrangement used with the vial of Figure 2, can also be used with a spout arrangement for a gabled top container. The subject matter of U.S. Patent 5,108,029 and pending U.S. application serial no. 07/07/753,855 is hereby incorporated herein by reference.

[0015] An enlarged view of a spout and cap for use with such a gable top container is illustrated in Figure 4. A spout 210 includes a lower end 226 that fits within the container and retains the spout in place on the container. The cap 212 includes an annular seal 216 that forms an annular gap 218 between the seal 216 and the outer peripheral wall 228 of the cap. The annular gap 218 is designed to accommodate the upper edge 220 of the spout 210.

[0016] The spout 210 is integrally attached to the cap 212 by a flange 214. The flange 214 includes a recess 222 and an elongated ridge 224 to direct the bending of the flange 214 to a preferred location. As set forth above with respect to the embodiment shown in Figure 2, the recess 222 provides a weak region in the flange 214 while the ridge 224 provides a strengthened region. The recess 222 and the ridge 224 coact so as to ensure the proper alignment of the cap 212 on the upper edge 220 of the spout 210.

[0017] Other improvements have been made to the cap to ensure optimum sealing with the upper edge of the wall of the structure onto which the cap is seated. The portion of the cap illustrated in Figure 4 that is identified by circle 5 is enlarged and illustrated more clearly in Figure 5. As illustrated in Figure 5, both the shape of the annular seal 216 and the inner peripheral wall 228 of the rim 230 of the cap 212 have been modified.

[0018] Specifically, with respect to the seal 216, the upper edge 236 of the seal has been truncated to a flat surface. In addition, the inner edge 232 of the seal 216 has been changed from substantially normal to the inner surface 238 of the cap to a surface that intersects the inner cap surface 238 at an angle of approximately 45°. Similarly, the outer edge 234 of the seal 216 is similarly angled with respect to the inner cap surface 238. The angle formed by the outer edge 234 may be between 30° and 60°, but is preferably 45°. At the base of the seal 216, the outer edge 234 includes a very small portion 240 that extends perpendicularly to the inner cap surface 238. In the preferred embodiment, the small portion 240 extends for only about 0.003 inches.

[0019] In addition, the height to width ratio of the

seal 216 has been changed. The improved seal 216 preferably has a height of approximately 0.018 inches and a width of approximately 0.041 inches. Thus, the width of the seal is at least twice the height of the seal in the preferred embodiment. However, it should be understood that not only the specific height and width of the seal may vary, but also the ratio of the height to width may vary.

[0020] The inner peripheral wall 228 has also been modified to improve the seal. The wall 228 now includes a first section 246 that is normal to the inner cap surface 238 and extends for approximately 0.017 inches. A second section 244 continues from the first section at an angle of approximately 26°. The second section 244 ends at a distance of approximately .040 inches from the inner cap surface 238. Thus, the tip 236 of the seal 216 ends at approximately the same height as the end of the first section 246 of the wall 228.

[0021] Because of the angle of the second wall section 244, a third wall section 242 extends out from the first wall section 246 by a distance of approximately 0.011 inches. A fourth wall section 248 extends away from the third wall section at an angle of approximately 31°.

[0022] A result of the configuration of the wall sections is that there is a protruding ridge extending from the inner peripheral wall 228 of the rim 230. The protruding ridge coacts with the annular seal 216 to control the movement of the upper edge 220 of the spout 210 when the cap 212 is being sealed onto the spout 210. When the upper edge 220 is sealed within the cap 212, the edge contacts the cap 212 at three difference points: (1) along the first wall section 246, (2) along the second wall section 244, and (3) at the outer wall 234 of the seal 216. The three point contact helps to assure a fluid-tight seal. Of course, the upper edge 220 may contact the cap 212 at other locations in addition to the three points listed above.

[0023] Although the modifications to the cap 212 have been illustrated on a cap that is fixed to a container spout, the same principles apply equally to a cap for use with a vial of the type illustrated in Figure 2. Figures 6 and 7 illustrate such a vial and cap.

[0024] The cap 312 includes an annular seal 316 that forms an annular gap 318 between the seal 316 and the outer peripheral wall 328 of the cap. The annular gap 318 is designed to accommodate the upper edge 320 of the vial 310.

[0025] The vial 310 is integrally attached to the cap 312 by a flange 314. The flange 314 includes a recess 322 and an elongated ridge 324 to direct the bending of the flange 314 to a preferred location. As set forth above with respect to the embodiment shown in Figure 2, the recess 322 provides a weak region in the flange 314 while the ridge 324 provides a strengthened region. The recess 322 and the ridge 324 coact so as to ensure the proper alignment of the cap 312 on the upper edge 320 of the vial 310.

[0026] The portion of the cap 312 illustrated in Figure 6 that is identified by circle 7 is enlarged and illustrated more clearly in Figure 7.

[0027] Specifically, with respect to the seal 316, the upper edge 336 of the seal has been truncated to a flat surface. In addition, the inner edge 332 of the seal 316 intersects the inner cap surface 338 at an angle of approximately 45°. Similarly, the outer edge 334 of the seal 316 is similarly angled with respect to the inner cap surface 338. The angle formed by the outer edge 334 may be between 30° and 60°, but is preferably 45°. At the base of the seal 316, the outer edge 334 includes a very small portion 340 that extends perpendicularly to the inner cap surface 338. In the preferred embodiment, the small portion 340 extends for only about 0.003 inches.

[0028] The improved seal 316 preferably has a height of approximately 0.018 inches and a width of approximately 0.041 inches. Thus, the width of the seal is at least twice the height of the seal in the preferred embodiment. However, it should be understood that not only the specific height and width of the seal may vary, but also the ratio of the height to width may vary.

[0029] The inner peripheral wall 328 includes a first section 346 that is normal to the inner cap surface 338 and extends for approximately 0.017 inches. A second section 344 continues from the first section at an angle of approximately 26°. The second section 344 ends at a distance of approximately .040 inches from the inner cap surface 338. Thus, the tip 336 of the seal 316 ends at approximately the same height as the end of the first section 346 of the wall 328.

[0030] Because of the angle of the second wall section 344, a third wall section 342 extends out from the first wall section 346 by a distance of approximately 0.011 inches. A fourth wall section 348 (Figure 6) extends away from the third wall section 342 at an angle of approximately 31°.

[0031] A result of the configuration of the wall sections is that there is a protruding ridge extending from the inner peripheral wall 328 of the rim 330. The protruding ridge coacts with the annular seal 316 to control the movement of the upper edge 320 of the vial 310 when the cap 312 is being sealed onto the vial 310. When the upper edge 320 is sealed within the cap 312, the edge contacts the cap 312 at three difference points: (1) along the first wall section 346, (2) along the second wall section 344, and (3) at the outer wall 334 of the seal 316. The three point contact helps to assure a fluid-tight seal. Of course, the upper edge 320 may contact the cap 312 at other locations in addition to the three points listed above.

Claims

1. A fluid-tight seal arrangement for a resealable cap for use with a vial comprising:

(a) a flange integrally connecting the cap to the vial, the flange including a recess (222,322) to direct bending of the flange with proper alignment of the cap on an upper edge of the vial, the recess extending in a direction perpendicular to the longitudinal axis of the flange, 5

(b) an annular seal (216,316) extending from the inner cap surface(238,328), the annular seal including an inner edge (232,332) and an outer edge (234,334), the outer edge of the seal extending toward the inner cap surface at an angle of approximately 45 degrees, the annular seal being concentric with respect to the inner peripheral wall (246,346) of the cap so as to form a gap between the outer edge of the seal and the inner peripheral wall for receiving an upper edge of a rim of the vial, the inner peripheral wall of the cap including first and second sections (246,244,346,344), the first section (246,346) being normal to the inner cap surface and the second section (244,344) forming a ridge that protrudes from the first section for contacting the upper edge of the rim of the vial, characterised in that 10 15 20

(1) the flange includes an elongate ridge (224,324) which extends in a direction perpendicular to the longitudinal axis of the flange; 25

(2) the annular seal has a truncated top surface (236,336), 30

(3) the inner edge of the seal intersects the inner cap surface at an angle of approximately 45 degrees,

(4) the width of the seal at its base is at least twice the height of the seal, 35

(5) the first section (246,346) of the inner peripheral wall of the cap is substantially the same height as the sea] (216,316) so that the truncated top surface (236,336) of the seal ends at approximately the same height as the end of the first section of the wall, 40

whereby the annular seal design and inner wall arrangement result in the upper edge of the rim of the vial contacting the cap at least along the first wall section, along the second wall section and at the outer seal wall when the upper edge is sealed within the cap. 45 50

Patentansprüche

1. Fluiddichte Dichtungsanordnung für eine abnehmbare Kappe zur Anwendung bei einem Behälter mit: 55

(a) einem Flansch, der in einem Stück die Kappe mit dem Behälter verbindet, wobei der

Flansch eine Aussparung (222, 322) zur Biegeführung des Flansches mit einer korrekten Ausrichtung der Kappe auf einen oberen Rand des Behälters enthält, und die Aussparung sich in einer Richtung senkrecht zu der Längsachse des Flansches erstreckt,

(b) eine ringförmige Dichtung (216,316), die sich von der Kappeninnenoberfläche (238, 338) aus erstreckt, wobei die ringförmige Dichtung einen Innenrand (232, 332) und einen Außenrand (234, 334) enthält, der Außenrand der Dichtung sich zu der Kappeninnenoberfläche in einem Winkel von etwa 45° erstreckt, die ringförmige Dichtung konzentrisch in Bezug auf die Innenumfangswand (246, 346) der Kappe liegt, um so einen Spalt zwischen dem Außenrand der Dichtung und der Innenumfangswand für die Aufnahme einer Oberkante eines Wulstes des Behälters auszubilden, die Innenumfangswand der Kappe erste und zweite Abschnitte (246, 244, 346, 344) enthält, der erste Abschnitt (246, 346) senkrecht zu der Kappeninnenoberfläche verläuft und der zweite Abschnitt (244, 344) eine Erhebung bildet, die aus dem ersten Abschnitt hervorsticht, um die Oberkante des Wulstes des Behälters zu berühren, dadurch gekennzeichnet, daß

(1) der Flansch einen langgestreckten Steg (224, 324) enthält, der sich in einer Richtung senkrecht zu der Längsachse des Flansches erstreckt;

(2) die ringförmige Dichtung eine beschnittene Oberseite (236, 336) aufweist;

(3) die Innenkante der Dichtung die Kappeninnenoberfläche in einem Winkel von etwa 45° schneidet;

(4) die Breite der Dichtung an ihrer Basis mindestens die zweifache Höhe ist;

(5) der erste Abschnitt (246, 346) der Innenumfangswand der Kappe im wesentlichen dieselbe Höhe wie die Dichtung (216, 316) aufweist, so daß die beschnittene Oberseite (236, 336) der Dichtung in etwa in derselben Höhe wie das Ende des ersten Abschnittes der Wand endet, wodurch die Auslegung der ringförmigen Dichtung und die Innenwandanordnung dazu führen, daß die Oberkante des Wulstes des Behälters die Kappe zumindest entlang dem ersten Wandabschnitt, entlang dem zweiten Wandabschnitt und an der äußeren Dichtungswand berühren, wenn die Oberkante innerhalb der Kappe eingeschlossen ist.

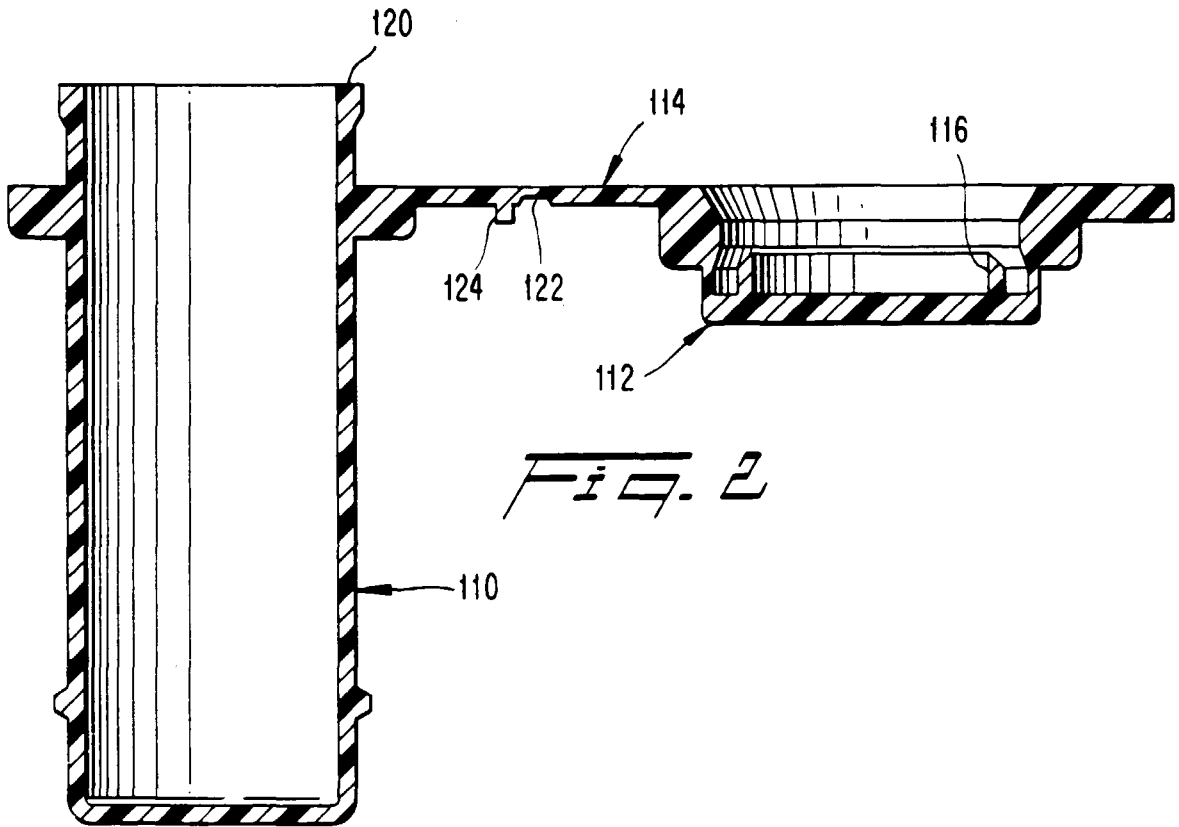
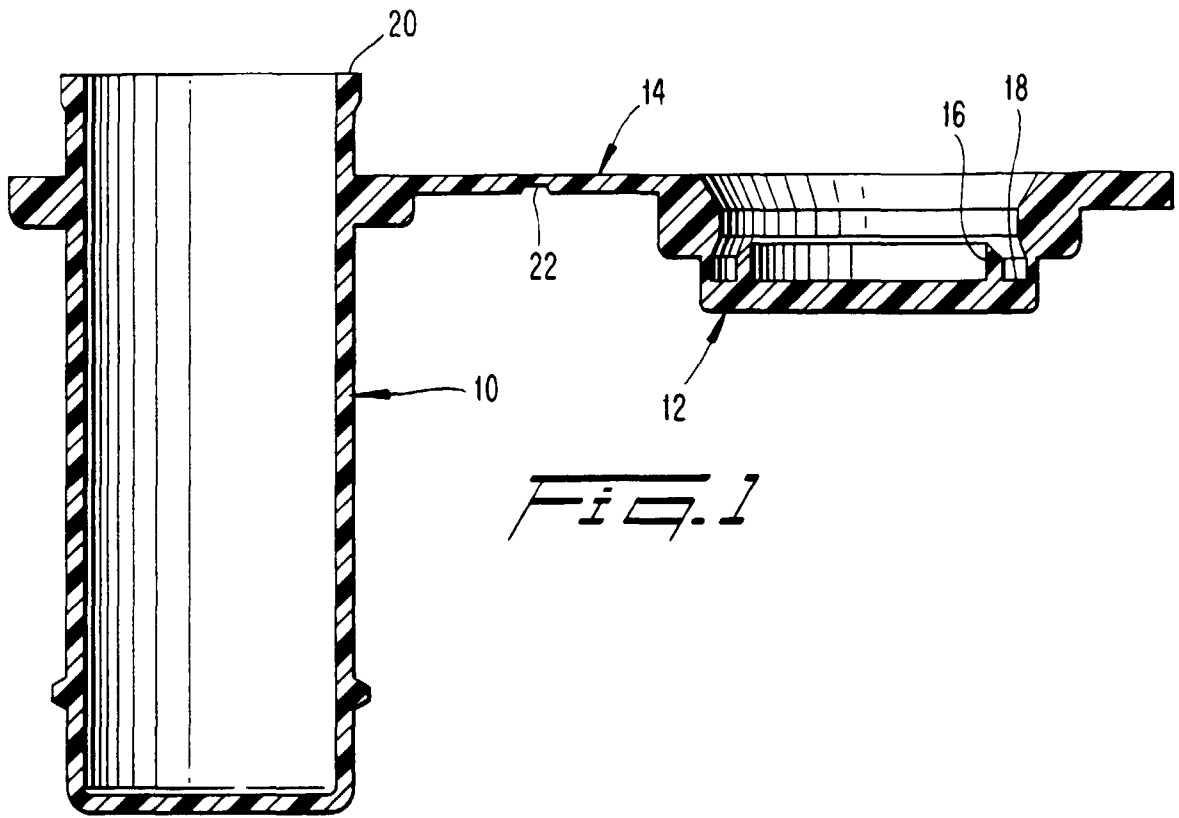
Revendications

1. Agencement de joint étanche aux fluides pour un bouchon refermable hermétiquement à utiliser avec un flacon, comportant :

(a) une bride reliant de façon intégrée le bouchon au flacon, la bride présentant un évidement (222, 322) pour diriger une flexion de la bride avec un alignement approprié du bouchon sur un bord supérieur du flacon, l'évidement s'étendant dans une direction perpendiculaire à l'axe longitudinal de la bride, (b) un joint annulaire (216, 316) d'étanchéité faisant saillie de la surface intérieure (238, 328) du bouchon, le joint annulaire d'étanchéité comportant un bord intérieur (232, 332) et un bord extérieur (234, 334), le bord extérieur du joint d'étanchéité s'étendant vers la surface intérieure du bouchon sous un angle d'environ 45°, le joint annulaire d'étanchéité étant concentrique par rapport à la paroi périphérique intérieure (246, 346) du bouchon afin de former un espace entre le bord extérieur du joint d'étanchéité et la paroi périphérique intérieure pour recevoir une arête supérieure d'un rebord du flacon, la paroi périphérique intérieure du bouchon comprenant des première et seconde sections (246, 244, 346, 344), la première section (246, 346) étant normale à la surface intérieure du bouchon et la seconde section (244, 344) formant une nervure qui fait saillie de la première section pour entrer en contact avec l'arête supérieure du rebord du flacon, caractérisé en ce que

- (1) la bride comporte une nervure allongée (224, 324) qui s'étend dans une direction perpendiculaire à l'axe longitudinal de la bride ;
- (2) le joint annulaire d'étanchéité présente une surface supérieure tronquée (236, 336),
- (3) le bord intérieur du joint d'étanchéité intersecte la surface intérieure du bouchon sous un angle d'environ 45 degrés,
- (4) la largeur du joint d'étanchéité à sa base est au moins double de la hauteur du joint d'étanchéité,
- (5) la première section (246,346) de la paroi périphérique intérieure du bouchon est sensiblement de la même hauteur que le joint d'étanchéité (216, 316) afin que la surface supérieure tronquée (236, 336) du joint d'étanchéité s'arrête approximativement à la même hauteur que l'extrémité de la première section de la paroi, grâce à quoi la conception du joint annu-

laire d'étanchéité et l'agencement de la paroi intérieure aboutissent à ce que l'arête supérieure du rebord du flacon soit en contact avec le bouchon au moins le long de la première section de paroi, le long de la seconde section de paroi et à la paroi extérieure d'étanchéité lorsque l'arête supérieure est logée de façon étanche dans le bouchon.



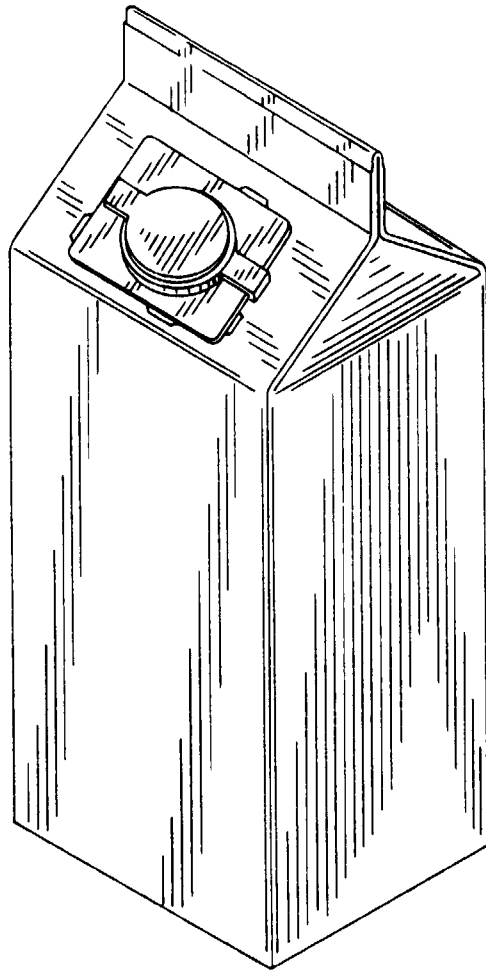


Fig. 3

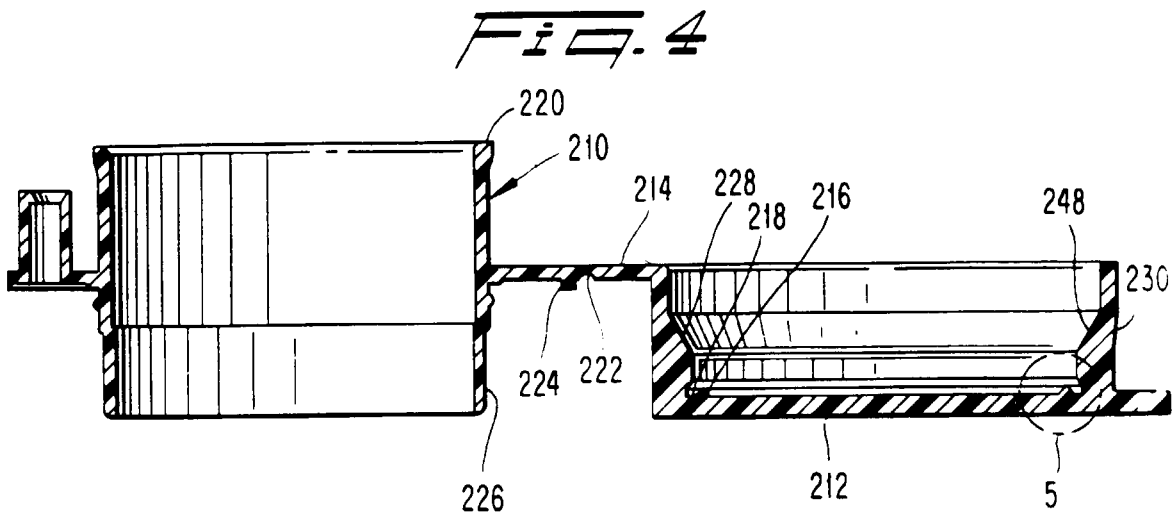


Fig. 4

Fig. 5

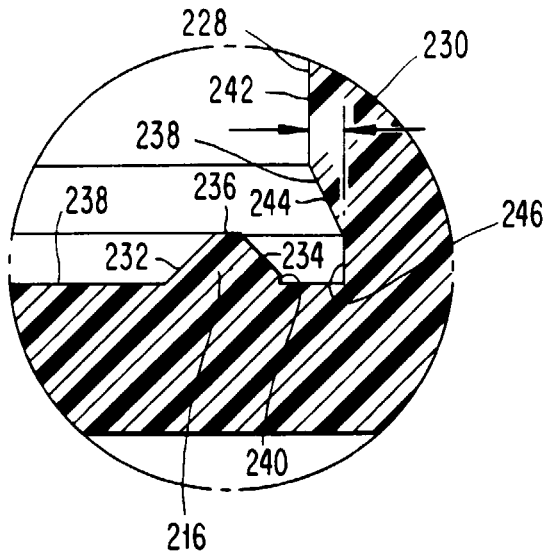


Fig. 7

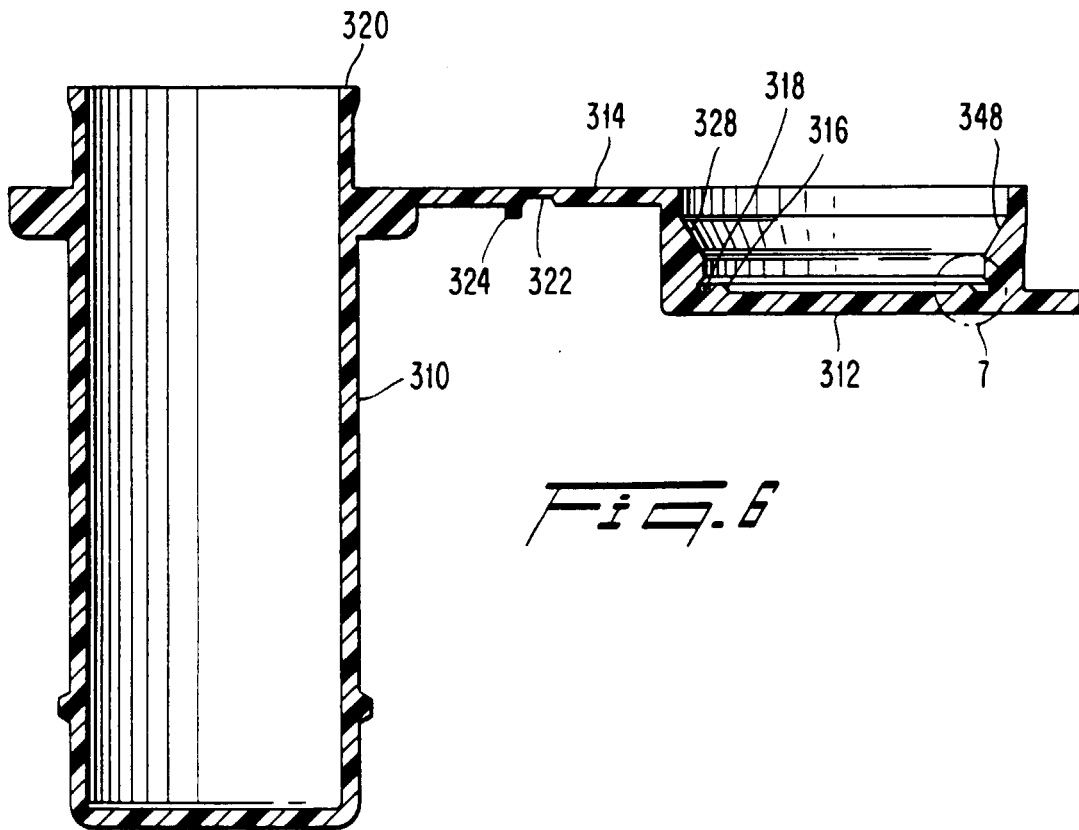
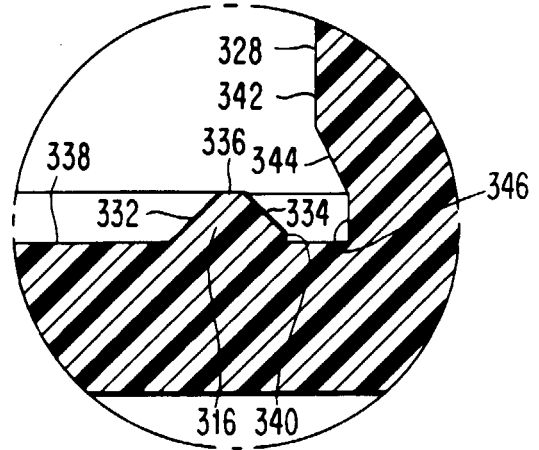


Fig. 6