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(54) Pilfer-proof plastic closure for containers.

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Description

Field of the Invention

This invention relates to a pilfer-proof plastic closure for containers, and more specifically, to a pilfer-proof plastic closure for application to a container of the kind referred to in the pre-characterizing portion of patent claim 1. Such a closure is known from US—A—4 418 828.

Description of the Prior Art

Pilfer-proof metallic closures for containers holding various drinks have recently been superseded by pilfer-proof plastic closures. A typical example of such plastic container closures is disclosed in JP—A—74445/1981 and US—A—4,418,828.

The closure disclosed in these patent documents has a top panel wall and a cylindrical skirt wall extending downwardly from the peripheral edge of the top panel wall. A circumferentially extending breakable line is formed in the skirt wall to divide it into a main portion above the breakable line and a pilfer-proof bottom portion below it. The circumferentially extending breakable line comprises a plurality of circumferentially extending slits spaced from each other in the circumferential direction and a plurality of bridging portions positioned among the circumferential slits. An internal thread is formed on the inner surface of the main portion, and a plurality of radially inwardly projecting engaging flaps are formed on the inner surface of the pilfer-proof bottom portion at circumferentially spaced positions.

The plastic closure of the above structure is applied to a container equipped with a mouth-neck portion having an external thread formed on its peripheral surface and a holding jaw portion located beneath the external thread. To close the mouth-neck portion of the container with the closure, the closure is put over the mouth-neck portion and turned in a closing direction to fit the external thread of the mouth-neck portion in the internal thread of the closure. As a result, the closure turns in the closing direction with respect to the mouth-neck portion and at the same time, moves axially downwardly. At this time, the holding jaw portion formed on the outer surface of the mouth-neck portion interferes with the engaging flaps formed on the inner surface of the pilfer-proof bottom portion to elastically bend them radially outwardly. When the engaging flaps completely go past the holding jaw portion, they elastically return radially inwardly and are held to the undersurface of the holding jaw portion. To open the mouth-neck portion of the container, the closure is turned in an opening direction which is reverse to the closing direction. As a result, the internal thread of the closure is moved along the external thread of the mouth-neck portion, and therefore, the closure turns in the opening direction and simultaneously moves axially upwardly. The pilfer-proof bottom portion of the closure, however, cannot move axially upwardly because the engaging flaps formed on its inner surface engage the undersurface of the holding jaw portion of the mouth-neck portion. This results in a considerable stress on the bridging portions of the breakable line formed in the skirt wall of the closure. Consequently, the bridging portions are broken to separate the skirt wall into the main portion and the pilfer-proof bottom portion. Thereafter, the top panel wall and the main portion of the skit wall are removed from the mouth-neck portion. The mouth-neck portion thus opened, and the pilfer-proof bottom portion remains attached to the mouth-neck portion.

It is important that container closure of the above structure and function should meet the following two requirements. Firstly, in closing the mouth-neck portion of the container with the closure, the engaging flaps should be easily bendable elastically in the radially outward direction during their passage over the holding jaw portion, so as to mount the closure on the mouth-neck portion with a relatively low rotating torque and to accurately prevent generation of an excessive stress on the bridging portions of the breakable line which will result in its breakage. Secondly, in opening the mouth-neck portion of the container, the engaging flaps should fully accurately engage the holding jaw portion so as to accurately prevent the closure from slipping out of the mouth-neck portion without the breakage of the bridging portions of the breakable line as a result of the engaging flaps going past the holding jaw portion while being bent radially outwardly. It will be appreciated that if this slipping occurs, the pilfer-proof characteristics of the closure will be impaired. In order for the closure to meet these two requirements, it is necessary to reduce sufficiently the downwardly rotating torque which must be exerted on the closure when the engaging flaps are passed over the holding jaw portion axially downwardly from above, to increase sufficiently the upwardly rotating torque which must be exerted on the closure when the engaging flaps are passed over the holding jaw portion axially upwardly from below, and to adjust the breaking rotating torque which must be exerted on the closure for breaking the bridging portions of the breakable line as desired to a value between the required downwardly rotating torque and the required upwardly rotating torque.

In conventional container closures, however, no sufficient difference can be set up between the required downwardly rotating torque and the required upwardly rotating torque, and frequently, owing to errors in production, the containers do not meet the aforesaid first or second requirement.

Summary of the Invention

It is the object of this invention to provide a pilfer-proof plastic container closure which is improved in that a sufficient difference is set up between the required downwardly rotating torque and the required upwardly rotating torque by sufficiently decreasing the former and sufficiently increasing the latter and

consequently the closure accurately meets the aforesaid first and second requirements.

According to the present invention this object is achieved with a pilfer-proof plastic closure as claimed. Dependent claims are directed on features of preferred embodiments of the invention.

Other advantages of this invention will become apparent from the following description of one embodiment of the present invention.

In a conventional plastic closure, each of the engaging flaps in its intirety is tilted in a direction opposite to the rotating direction of the closure during mounting on the mouth-neck portion of a container and extends continuously in a straight line from the inner surface of the pilfer-proof bottom portion. Extensive investigations and experiments of the present inventors have now led to the discovery that if each of the engaging flaps is bent to provide a first portion extending from the inner surface of the pilfer-proof bottom portion and a second portion further extending from the forward end of the first portion while being inclined to the first portion in the closing direction of the container closure for mounting the closure on the mouth-neck portion, the aforesaid required upwardly rotating torque can be increased considerably while suppressing the increase of the required downwardly rotating torque, and consequently, the object can be achieved.

Thus, according to this invention, there is provided a pilfer-proof plastic closure for a container equipped with a mouth-neck portion having an external thread formed on its peripheral surface and an holding jaw portion located below the external thread, said closure comprising a top panel wall and a cylindrical skirt wall extending downwardly from the peripheral edge of the top panel wall, said skirt wall having formed therein a circumferentially extending breakable line dividing the skirt wall into a main portion above the breakable line and a pilfer-proof bottom portion below it, said main portion having formed on its inner surface an internal thread to be engaged with the external thread on the mouth-neck portion of the container and said pilfer-proof bottom portion having formed on its inner surface a plurality of radially inwardly projecting engaging flaps at circumferentially spaced positions; characterized in that each of said engaging flaps having a first portion extending from the inner surface of the pilfer-proof bottom portion and a second portion further extending from the forward end of the first portion inclinedly to the first portion in the closing direction of the closure for mounting the closure on the mouth-neck portion.

Brief Description of the Drawings

Figure 1 is a side elevation showing, partly in section, a blank to be formed into one embodiment of the closure constructed in accordance with this invention;

Figure 2 is a partial perspective view showing an engaging flap in the blank of Figure 1;

Figure 3 is a partial bottom view showing the engaging flap in the blank of Figure 1;

Figure 4 is a side elevation showing, partly in section, one embodiment of the closure constructed in accordance with this invention;

Figure 5 is a side elevation showing, partly in section, the closure of Figure 4 as it is mounted on the mouth-neck portion of a container;

Detailed Description of Preferred Embodiments

The invention will be described in greater detail with reference to the accompanying drawings.

Figure 1 shows a closure blank to be processed into one embodiment of the closure constructed in accordance with this invention. The blank shown generally at 2, which is formed from a suitable plastic material such as polypropylene or polyethylene by injection molding, compression molding, etc., has a circular top panel wall 4 and a cylindrical skirt wall 6 extending downwardly from the peripheral edge of the top panel wall 4. An annular protrusion 8 is formed in the upper end portion of the inner surface of the skirt wall 6 so that it projects radially inwardly from the upper end portion. In the lower part of the peripheral surface of the skirt wall 6 is formed a step portion 10 displaced diametrically inwardly. A portion 12 above the step portion 10 has a considerable wall thickness, whereas the thickness of a portion 14 below the step portion 10 is decreased. In the illustrated embodiment, a step portion 16 is formed also on the inner circumferential surface of the skirt wall 6 below the step portion 10, and the portion 14 has a relatively thick portion 18 above the step portion 16 and a relatively thin portion 20 below the step portion 16. As will be clear from a description given hereinbelow, the thickness t_1 of the portion 20 is sufficiently small, and preferably 0.05 to 0.75 mm, especially 0.20 to 0.50 mm. The thickness t_2 of the relatively thick portion 18 is conveniently 0.50 to 1.10 mm, especially 0.75 to 0.85 mm. If desired, the thickness t_2 of the portion 18 can be made sufficiently small as in the portion 20 (therefore, the step portion 16 does not exist). A raised and depressed or knurled portion 22 is formed on the peripheral surface of the portion 12 of the skirt wall 6 in order to prevent slippage of a finger which engages it. An internal thread 24 is formed on the inner circumferential surface of the portion 12 of the skirt wall 6. A plurality of circumferentially spaced engaging flaps 26 are formed on the inner circumferential surface of the portion 14 of the skirt wall 6. Each of the engaging flaps 26 is projected radially inwardly from its base edge 28 connected to the inner circumferential surface of the portion 14. As will be clear from a description given hereinbelow, it is important that at least a greater portion of the base edge 28 of each of the engaging flaps 26 be positioned in the relatively thin portion 20 below the step portion 16 in the portion 14. In the illustrated embodiment, the upper end of the base edge 28 of each of the engaging flaps 26 is positioned in alignment with the step

portion 16. Hence, the entire base edge 28 of each of the engaging flaps 26 is positioned in the relatively thin portion 20 below the step portion 16.

According to this invention, the following improvement is made in the engaging flaps 26. With reference to Figures 2 and 3, each of the engaging flaps 26 is bent along a bending line 30 and defined by a first portion 32 extending from the base edge 28 to the bending line 30 and a second portion 34 extending from the bending line 30 to its free end. The base edge 28 extends substantially parallel, and therefore substantially vertically, to the central axis 36 (Figure 1) of the blank 2. If desired, however, the base edge 28 may be inclined in a suitable direction with respect to the central axis 36 (Figure 1) of the blank 2; namely it may be inclined downwardly at a suitable angle to the closing direction of the closure for mounting the closure on the mouth-neck portion of the container (the clockwise direction as viewed from above in Figure 1, the direction shown by arrow 36 in Figures 2 and 3) or in an opposite direction. Preferably, the first portion 32 is inclined in a direction opposite to the aforesaid closing direction and extends radially from the base edge 28. The angle α of inclination of the first portion 32 to the inner surface of the portion 20 is preferably $5° \leqq \alpha \leqq 85°$, more preferably $20° \leqq \alpha \leqq 80°$, especially preferably $30° \leqq \alpha \leqq 70°$. It is important that the second portion 34 extending radially inwardly from the bending line 30 should extend inclinedly with respect to the first portion 32 in the aforesaid closing direction. The angle β of inclination of the second portion 34 to the first portion 32 is preferably $0° < \beta \leqq 90°$, more preferably $0° < \beta \leqq 70°$, especially preferably $5° < \beta \leqq 45°$. The bending line 30 may extend substantially parallel, and therefore substantially vertically to the central axis 36 (Figure 1) of the blank 2, or may be inclined downwardly approaching the inner surface of the portion 20. Preferably, it is inclined downwardly in a direction away from the inner surface of the portion 20. The angle of inclination of the bending line 30 to the downward direction away from the inner surface of the portion 20 is preferably $5° \leqq \gamma \leqq 80°$, more preferably $10° \leqq \gamma \leqq 60°$, especially preferably $20° \leqq \gamma \leqq 50°$.

As shown in Figures 1 and 2, the upper edge 38 of the first portion 32 conveniently extends downwardly inclinedly in a radially inward direction forming a gentle curve, and the upper edge 40 of the second portion 34 extends nearly horizontally. On the other hand, it is convenient that the lower edge 42 of the first portion 32 and the lower edge 44 of the second portion 34 extend upwardly inclinedly in a radially inward direction. Generally, the angle δ_2 of inclination of the lower edge 44 of the second portion 34 is slightly larger than the angle δ_1 of inclination of the lower edge 42 of the first portion 32. Conveniently, the angle δ_1 of inclination is $10° \leqq \delta_1 \leqq 30°$, and the inclination angle δ_2 is $20° \leqq \delta_2 \leqq 50°$.

With reference to Figure 4 together with Figure 1, to produce the container closure of this invention, a circumferential breakable line 46 is formed in the blank 2. As shown in Figure 4, the circumferential breakable line 46 is disposed immediately below the step portion 10, and therefore, the portion 12 having a considerable thickness located above the step portion 10 constitutes a main portion of the skirt wall 6; and the portion 14 having a decreased thickness below the step portion 10 composed of the relatively thick portion 18 and the relative thin portion 20 constitutes a pilfer-proof bottom portion. The circumferential breakable line 46 itself is comprised of a plurality of circumferentially spaced and circumferentially extending slits 50 and a plurality of bridging portions 52 located among the slits 50. The portion 14, i.e. the pilfer-proof bottom portion 14, is connected to the portion 12, i.e. the main portion 12 of the skirt wall 6, via the bridging portions 52.

The formation of the sealing liner 58 can be effected by a molding method known *per se*. Instead of forming the sealing liner 58 separately, a sealing protrusion of a suitable shape may be integrally formed on the inner surface of the top panel wall 4 of the blank 2.

The finished closure 60 so formed is applied to a container having a mouth-neck portion 62 of the form indicated in Figure 5. On the cylindrical peripheral surface of the mouth-neck portion 62, an external thread 64 and a holding jaw portion 66 beneath it are formed.

In closing the mouth-neck portion 62 with the closure 60, the closure 60 is put over the mouth-neck portion 62 and turned in a closing direction, that is, in the clockwise direction as viewed from above in Figure 5. As a result, the internal thread 24 formed in the closure 60 is engaged with the external thread 64 formed in the mouth-neck portion 62, and the closure 60 is moved axially downwardly. Each of the engaging flaps 26 formed in the closure 60 thus goes past the external thread 64 formed on the mouth-neck portion 62 and further passes over the holding jaw portion 66. During passage over the holding jaw portion 66, each of the engaging flaps 26 undergoes interference by the holding jaw portion 66 and is elastically bent radially outwardly. When the internal thread 24 of the closure 60 is fully engaged with the external thread 64, each of the engaging flaps 26 completely goes past the holding jaw portion 66 and is released from interference by the holding jaw portion 66. As a result, the engaging flaps 26 are elastically returned to their original state.

It will be clearly understood from Example and Comparative Example given hereinbelow that the required downwardly rotating torque which must be exerted on the closure 60 engaging flaps 26 over the holding jaw portion 66 is nearly equal to that in a conventional container closure in which the second portion 34 of each engaging flap 26 is not bent with the first portion 32 but extends in a straight line with the first portion 32 as shown by a two-dot chain line in Figure 3, and is therefore sufficiently low.

When the engaging flaps 26 fully return to their original state, they engage the undersurface of the holding jaw portion 66 as clearly shown in Figure 5. When the internal thread 24 of the closure 60 is in full engagement with the external thread 64 on the mouth-neck portion 62, the sealing liner 58 is in intimate

contact with the end surface portion of the mouth-neck portion 62, and thus seals up the mouth-neck portion 62.

To open the mouth-neck portion 62, the closure 60 is turned in the opening direction, i.e. counterclockwise as viewed from above in Figure 5. Thus, the internal thread 24 of the closure 60 moves along the external thread 64 of the mouth-neck portion 62, and therefore, the closure 60 moves axially upwardly as it is turned. The pilfer-proof bottom portion 14, however, cannot move axially upwardly since the engaging flaps 26 formed on its inner surface and engaged with the undersurface of the holding jaw portion 66 of the mouth-neck portion 62. Consequently, a considerable stress is generated on the circumferential breakable line 46, and more specifically on its bridging portions 52. The bridging portions 52 of the circumferential breakable line 46 are therefore broken. As will be clearly understood from the description of the following Example and Comparative Example, the engaging flaps 26 engage the undersurface of the holding jaw portion 66 more strongly in the closure 60 improved in accordance with this invention than in the conventional closure in which the second portion 34 of each engaging flap 26 is not bent with respect to the first portion 32 but extends in a straight line with the first portion 32 as shown by the two-dot chain line in Figure 3. In other words, the required upwardly rotating torque which must be exterted on the closure 60 of this invention when the engaging flaps 26 are passed in the elastically bent state over the holding jaw portion 66 in the axially upward direction is made considerably higher than that on the conventional closure. Hence, the closure 60 is surely prevented from being removed from the mouth-neck portion 62 without the desired breakage of the breakable line 46, and the pilfer-proof characteristics of the closure 60 can be retained.

Example

Ten blanks having substantially the same form as the blank 2 shown in Figures 1 to 3 were molded from polypropylene having a melt index of 2.0 and a density of 0.90. Each blank has an internal thread inside diameter *d* of 25.4 mm, an upper portion outside diameter D of 30.0 mm and a total height H of 19.0 mm. Each of the engaging flaps 26 formed on the inner surface of the portion 20 had the following specification.

Thickness W: 0.35 mm

Length l_1 of the lower edge 42 of the first portion 32:1.9 mm

Length l_2 of the lower edge 44 of the second portion 34:2,0 m

Inclination angle α: 50°

Inclination angle β: 10°

Inclination angle γ: 30°

Inclination angle δ_1: 20°

Inclination angle δ_2: 45°

The upper edge 38 of the first portion 32 was of an arcuate shape having a radius of 0.5 mm, and the upper edge 40 of the second portion 34 was substantially horizontal.

Each of the blanks was mounted on the mouth-neck portion 62 of a glass container having the form shown in Figure 6 and a nominal diameter of 28 mm, and the required downwardly rotating torque was measured.

Thereafter, the blank was forcedly removed from the mouth-neck portion 62, and the required upwardly rotating torque was measured. The results are shown in Table 1 below.

Comparative Example

For comparison, ten blanks same as in Example were molded except that each of the engaging flaps 26 formed on the inner surface of the portion 20 had the form shown by the two-dot chain line in Figure 3 (namely, the second portion 34 was not bent with respect to the first portion 32 but extended in a straight line with the first portion 32).

In the same way as in Example, the required downwardly rotating torque and the required upwardly rotating torque were measured. The results are shown in Table 1.

Table 1

	Required downwardly rotating torque (kg-cm)			Required upwardly rotating torque (kg-cm)		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Example	1.5	2.0	1.0	9.0	10.0	8.0
Comparative Example	1.4	2.0	1.0	4.0	4.5	3.5

Claims

1. A pilfer-proof plastic closure for a container equipped with a mouth-neck portion having an external thread formed on its peripheral surface and a holding jaw portion located below the external thread, said closure comprising a top panel wall (4) and a cylindrical skirt wall (6) extending downwardly from the peripheral edge of the top panel wall (4), said skirt wall (6) having formed therein a circumferentially extending breakable line dividing the skirt wall (6) into a main portion (12) above the breakable line and a pilfer-proof bottom portion (14) below it, said main portion (12) having formed on its inner surface an internal thread to be engaged with the external thread on the mouth-neck portion (62) of the container and said pilfer-proof bottom portion (14) having formed on its inner surface a plurality of inwardly projecting engaging flaps (26) at circumferentially spaced positions; characterized in that each of said engaging flaps (26) has a first portion (32) extending from the inner surface of the pilfer-proof bottom portion (14) and a second portion (34) extending further from the forward end of the first portion (32) inclinedly to the first portion (32) in the closing direction of the closure for mounting the closure on the mouth-neck portion (62).

2. The closure of claim 1 wherein the first portion (32) extends from the inner surface of the pilfer-proof bottom portion (14) inclinedly in a direction opposite to said closing direction.

3. The closure of claim 2 wherein the angle α of inclination of the first portion (32) to the inner surface where the base edge (28) of the flap is positioned of the pilfer-proof bottom portion is $5° \leqq \alpha \leqq 85°$.

4. The closure of claim 3 wherein the inclination angle is $20° \leqq \alpha \leqq 80°$.

5. The closure of claim 4 wherein the inclination angle is $30° \leqq \alpha \leqq 70°$.

6. The closure of any one of claims 1 to 5 wherein the angle β of inclination of the second portion (34) to the first portion (32) is $0° < \beta \leqq 90°$.

7. The closure of claim 6 wherein the inclination angle is $0° < \beta \leqq 70°$.

8. The closure of claim 7 wherein the inclination angle is $5° \leqq \beta \leqq 45°$.

9. The closure of any one of claims 1 to 8 wherein a bending line (30) between the first portion (32) and the second portion (34) extends downwardly while being inclined away from the inner surface of the piler-proof bottom portion (20) at the place where the base edge (28) of the flap (26) meets the pilfer-proof bottom portion.

10. The closure of claim 9 wherein the angle γ of inclination of the bending line (30) to the direction away from the inner surface of the pilfer-proof bottom portion (20) is $5° \leqq \gamma \leqq 80°$.

11. The closure of claim 10 wherein the inclination angle γ is $10° \leqq \gamma \leqq 60°$.

12. The closure of claim 11 wherein the inclination angle γ is $20° \leqq \gamma \leqq 50°$.

13. The closure of any one of claims 1 to 11 wherein the upper edge (38) of the first portion (32) extends radially inwardly while being inclined downwardly, and the upper edge (40) of the second portion (34) extends nearly horizontally.

14. The closure of claim 13 wherein the upper edge (38) of the first portion (32) forms a gentle curve.

15. The closure of any one of claims 1 to 14 wherein the lower edge (42) of the first portion (32) and the lower edge (44) of the second portion extend inwardly while being inclined upwardly.

16. The closure of any one of claims 1 to 15 wherein an axial breaking line (48) is formed in the pilfer-proof bottom portion (20) extending downwardly from the upper end of the pilfer-proof bottom portion (20) but being non-existent in at least a greater portion of the pilfer-proof bottom portion (20), and at least a greater portion of the base edge (28) of each of the engaging flaps (20) is positioned in the part of the pilfer-proof bottom portion (20) in which the axial breaking line (48) does not exist.

17. The closure of claim 16 wherein an upper part of the pilfer-proof bottom portion (20) has a relatively large thickness, and a lower part has a relatively small thickness, and the axial breaking line (48) extends to the lower end of said upper part or to a point slightly below it.

18. The closure of claim 16 or 17 wherein the axial breaking line (48) is a slit or score, and at its lower end portion, the thickness of the remaining material is progressively increased as it extends downwardly.

19. The closure of claim 17 wherein the relatively thin lower part of the pilfer-proof bottom portion (20) has a thickness t_1 of 0.05 to 0.75 mm.

20. The closure of claim 19 wherein the thickness t_1 is 0.20 to 0.50 mm.

21. The closure of any one of claims 16 to 20 wherein the circumferential breakable line (46) is comprised of a plurality of circumferentially spaced and circumferentially extending slits (50) and a plurality of bridging portion (52) located between the circumferential slits; at least one of the bridging portions is a high strengh bridging portion (52A) having higher strength than the other bridging portions (52); and the axial breaking line (48) is located adjacent to the circumferential end of the high strength bridging portion (52A) as viewed circumferentially.

Patentansprüche

1. Pilferproof-Kunststoffverschluß für einen Behälter, der einen Öffnungs-Hals-Abschnitt mit einem auf seiner Außenfläche gebildeten Außengewinde und eine unter dem Außengewinde befindliche Halteklaue aufweist, wobei der Verschluß eine obere tafelartige Wand (4) und einen vom Außenrand derselben nach unten verlaufenden zylindrischen Mantel (6) umfaßt, wobei in dem Mantel (6) eine in Umfangsrichtung verlaufende Bruchlinie verläuft, die den Mantel (6) in einen Hauptteil (12) oberhalb der Bruchlinie und einen Pilferproof-Unterteil (14) unter dem Haputteil unterteilt, wobei der Hauptteil (12) an seiner Innenfläche ein Innengewinde trägt, das mit dem Außengewinde am Öffnungs-Hals-Abschnitt (62) des Behälters in Eingriff bringbar ist, und der Pilferproof-Unterteil (14) an seiner Innenfläche eine Mehrzahl von nach innen vorspringenden Eingriffsklappen (26) in umfangsmäßig beabstandeten Positionen aufweist, dadurch gekennzeichnet, daß jede Einriffsklappe (26) einen ersten Abschnitt (32), der von der Innenfläche des Pilferproof-Unterteils (14) ausgeht, und einen zweiten Abschnitt (34) aufweist, der vom Vorderende des ersten Abschnitts (32) weiter unter einem Neigungswinkel zum ersten Abschnitt (32) in Schließrichtung des Verschlusses zum Befestigen des Verschlusses auf dem Öffnungs-Hals-Abschnitt (62) verläuft.

2. Verschluß nach Anspruch 1, wobei der erste Abschnitt (32) von der Innenfläche des Pilferproof-Unterteils (14) schräg in einer zur Schließrichtung entgegengesetzten Richtung verläuft.

3. Verschluß nach Anspruch 2, wobei der Neigungswinkel α des ersten Abschnitts (32) zur Innenfläche, an der die Basiskante (28) der Klappe des Pilferproof-Unterteils positioniert ist, $5° \leqq \alpha \leqq 85°$ ist.

4. Verschluß nach Anspruch 3, wobei der Neigungswinkel $20° \leqq \alpha \leqq 80°$ ist.

5. Verschluß nach Anspruch 4, wobei der Neigungswinkel $30° \leqq \alpha \leqq 70°$ ist.

6. Verschluß nach einem der Ansprüche 1—5, wobei der Neigungswinkel β des zweiten Abschnitts (34) zum ersten Abschnitt (32) $0° < \beta \leqq 90°$ ist.

7. Verschluß nach Anspruch 6, wobei der Neigungswinkel $0° < \beta \leqq 70°$ ist.

8. Verschluß nach Anspruch 7, wobei der Neigungswinkel $5° \leqq \beta \leqq 45°$ ist.

9. Verschluß nach einem der Ansprüche 1—8, wobei eine Biegelinie (30) zwischen dem ersten Abschnitt (32) und dem zweiten Abschnitt (34) abwärts verläuft, wobei sie von der Innenfläche des Pilferproof-Unterteils (20) an der Stelle, an der die Basiskante (28) der Klappe (26) auf den Pilferproof-Unterteil trifft, weg geneigt ist.

10. Verschluß nach Anspruch 9, wobei der Neigungswinkel γ der Biegelinie (30) zu der von der Innenfläche des Pilferproof-Unterteils (20) wegführenden Richtung $5° \leqq \gamma \leqq 80°$ ist.

11. Verschluß nach Anspruch 10, wobei der Neigungswinkel γ $10° \leqq \gamma \leqq 60°$ ist.

12. Verschluß nach Anspruch 11, wobei der Neigungswinkel γ $20° \leqq \gamma \leqq 50°$ ist.

13. Verschluß nach einem der Ansprüche 1—11, wobei die Oberkante (38) des ersten Abschnitts (32) nach radial innen verläuft und gleichzeitig nach unten geneigt ist, und wobei die Oberkante (40) des zweiten Abschnitts (34) nahezu horizontal verläuft.

14. Verschluß nach Anspruch 13, wobei die Oberkante (38) des ersten Abschnitts (32) eine sanfte Kurve bildet.

15. Verschluß nach einem der Ansprüche 1—14, wobei die Unterkante (42) des ersten Abschnitts (32) und die Unterkante (44) des zweiten Abschnitts nach innen verlaufen und gleichzeitig nach oben geneigt sind.

16. Verschluß nach einem der Ansprüche 1—15, wobei eine axiale Bruchlinie (48) in dem Pilferproof-Unterteil (20) gebildet ist, die vom Oberende des Pilferproof-Unterteils (20) nach unten verläuft, aber in wenigstens einem größeren Teil des Pilferproof-Unterteils (20) nicht vorhanden ist, und wobei wenigstens ein größerer Teil der Basiskante (28) jeder Eingriffsklappe (20) in dem unteren Teil des Pilferproof-Unterteils (20) positioniert ist, in dem die axiale Bruchlinie (48) nicht vorhanden ist.

17. Verschluß nach Anspruch 16, wobei ein oberer Teil des Pilferproof-Unterteils (20) relativ große Dicke und ein unterer Teil relativ geringe Dicke hat und die axiale Bruchlinie (48) zum Unterende des oberen Teils oder zu einer geringfügig darunterliegenden Stelle verläuft.

18. Verschluß nach Anspruch 16 oder 17, wobei die axiale Bruchlinie (48) ein Schlitz oder eine Kerbe ist

und die Dicke des übrigen Materials am unteren Endabschnitt im Verlauf der Abwärtserstreckung allmählich zunimmt.

19. Verschluß nach Anspruch 17, wobei der relativ dünne untere Teil des Pilferproof-Unterteils (20) eine Dicke t_1 von 0,05—0,75 mm aufweist.

20. Verschluß nach Anspruch 19, wobei die Dicke t_1 0,20—0,50 mm beträgt.

21. Verschluß nach einem der Ansprüche 16—20, wobei die in Umfangsrichtung verlaufende Bruchlinie (46) eine Mehrzahl von in Umfangsrichtung beabstandeten und umfangsmäßig verlaufenden Schlitzen (50) und eine Mehrzahl von zwischen den Umfangsschlitzen befindlichen Verbindungsabschnitten (52) umfaßt; wenigstens ein Verbindungsabschnitt ein hochfester Verbindungsabschnitt (52A) ist, der größere Festigkeit als als die übrigen Verbindungsabschnitte (52) hat; und die axiale Bruchlinie (48) angrenzend an das umfangsmäßige Ende des hochfesten Verbindungsabschnitts (52A), gesehen in Umfangsrichtung, angeordnet ist.

Revendications

1. Bouchon inviolable en matière plastique pour un récipient doté d'une partie de goulot-col présentant un filetage externe formé sur sa surface périphérique et d'une partie de bourrelet de retenue disposée au-dessous du filetage externe, ledit bouchon comprenant une paroi de panneau suipérieur (4) et une paroi de jupe cylindrique (6) s'étendant vers le bas à partir de la bordure périphérique de la paroi de panneau supérieur (4), une ligne de rupture s'étendant à la périphérie étant formée dans ladite paroi de jupe (6), divisant cette dernière en une partie principale (12) au-dessus de la ligne de rupture et une partie inférieure inviolable (14) au-dessous de celle-ci, un filetage interne étant formé sur la surface intérieure de ladite partie principale (12), pour venir en prise avec le filetage externe de la partie de goulot-col (62) du récipient et plusieurs pattes d'encliquetage (26), en sailie vers l'intérieur, étant formées sur la surface intérieure de ladite partie inférieure inviolable (14), en des emplacements espacés à la périphérie, caractérisé par le fait que chacune desdites pattes d'encliquetage (26) présente une première partie (32) s'étendant à partir de la surface intérieure de la partie inférieure inviolable (14) et une seconde partie (34) se situant dans le prolongement de l'extrémité avant de la première partie (32), en oblique par rapport à la première partie (32) dans le sens de fermeture du bouchon pour l'assemblage du bouchon sur la partie de goulot-col (62).

2. Bouchon selon la revendication 1, dans lequel la première partie (32) s'étend à partir de la surface intérieure de la partie inférieure inviolable (14) en oblique dans une direction opposée audit sens de fermeture.

3. Bouchon selon la revendication 2, dans lequel l'angle α d'inclinaison de la première partie (32) par rapport à la surface intérieure de la partie inférieure inviolable où la bordure de base (28) de la patte est positionnée, est $5° \leq \alpha \leq 85°$.

4. Bouchon selon la revendication 3, dans lequel l'angle d'inclinaison est $20° \leq \alpha \leq 80°$.

5. Bouchon selon la revendication 4, dans lequel l'angle d'inclinaison est $30° \leq \alpha \leq 70°$.

6. Bouchon selon l'une des revendications 1 à 5, dans lequel l'angle β d'inclinaison de la seconde partie (34) par rapport à la première partie (32) est $0° < \beta \leq 90°$.

7. Bouchon selon la revendication 6, dans lequel l'angle d'inclinaison est $0° < \beta \leq 70°$.

8. Bouchon selon la revendication 7, dans lequel l'angle d'inclinaison est $5° \leq \beta \leq 45°$.

9. Bouchon selon l'une des revendications 1 à 8, dans lequel une ligne de pliage (30) entre la première partie (32) et la seconde partie (34) s'étend vers le bas tout en étant inclinée à l'opposé de la surface intérieure de la partie inférieure inviolable (20), à l'endroit où la bordure de base (28) de la patte (26) rencontre la partie inférieure inviolable.

10. Bouchon selon la revendication 9, dans lequel l'angle γ d'inclinaison de la ligne de pliage (30) par rapport à la direction opposée à la surface intérieure de la partie inférieure inviolable (20) est $5° \leq \gamma \leq 80°$.

11. Bouchon selon la revendication 10, dans lequel l'angle γ d'inclinaison est $10° \leq \gamma \leq 60°$.

12. Bouchon selon la revendication 11, dans lequel l'angle γ d'inclinaison est $20° \leq \gamma \leq 50°$.

13. Bouchon selon l'une des revendications 1 à 11, dans lequel le bord supérieur (38) de la première partie (32) s'étend radialement vers l'intérieur tout en étant incliné vers le bas, et le bord supérieure (40) de la seconde partie (34) s'étend presque horizontalement.

14. Bouchon selon la revendication 13, dans lequel le bord supérieur (38) de la première partie (32) forme une légère courbe.

15. Bouchon selon l'une des revendications 1 à 14, dans lequel le bord inférieur (42) de la première partie (32) et le bord inférieure (44) de la seconde partie s'étendent vers l'intérieur tout en étant inclinés vers le haut.

16. Bouchon selon l'une des revendications 1 à 15, dans lequel une ligne de rupture axiale (48) est formée dans la partie inférieure inviolable (20) s'étendant vers le bas à partir de l'extrémité supérieure de la partie inférieure inviolable (20), mais n'existant pas dans au moins une plus grande zone de la partie inférieure inviolable (20), et au moins une plus grande partie de la bordure de base (28) de chacune des pattes d'encliquetage (20) est positionnée dans la zone de la partie inférieure inviolable (20) dans laquelle la ligne de rupture axiale (48) n'existe pas.

17. Bouchon selon la revendication 16, dans lequel une partie supérieure de la partie inférieure inviolable (20) présente une épaisseur relativement grande, et une partie inférieure présente une épaisseur

relativement faible, et la ligne de rupture axiale (48) s'étend jusqu'à l'extrémité inférieure de ladite partie supérieure ou jusqu'à un point légèrement au-dessous de celle-ci.

18. Bouchon selon la revendication 16 ou 17, dans lequel la ligne de rupture axiale (48) est une fente ou une entaille, et à sa partie d'extrémité inférieure, l'épaisseur de la matière restante s'accroît progressivement au fur et à mesure qu'elle s'étend vers le bas.

19. Bouchon selon la revendication 17, dans lequel la partie inférieure relativement mince de la partie inférieure inviolable (20) présente une épaisseur t_1 de 0,05 à 0,75 mm.

20. Bouchon selon la revendication 19, dans lequel l'épaisseur t_1 va de 0,20 à 0,50 mm.

21. Bouchon selon l'une des revendications 16 à 20, dans lequel la ligne de rupture périphérique (46) se compose de plusieurs fentes (50) espacées à la prériphérie et s'étendant à la périphérie et de plusieurs parties de pontage (52) disposées entre les fentes périphériques, au moins l'une des parties de pontage étant une partie de pontage (52A) de forte résistance, présentant une résistance supérieure aux autres parties de pontage (52); et la ligne de rupture axiale (48) est disposée en étant adjacente à l'extrémité pariphérique de la partie de pontage (52A) de forte résistance tel qu'observée selon la périphérie.

FIG. 1

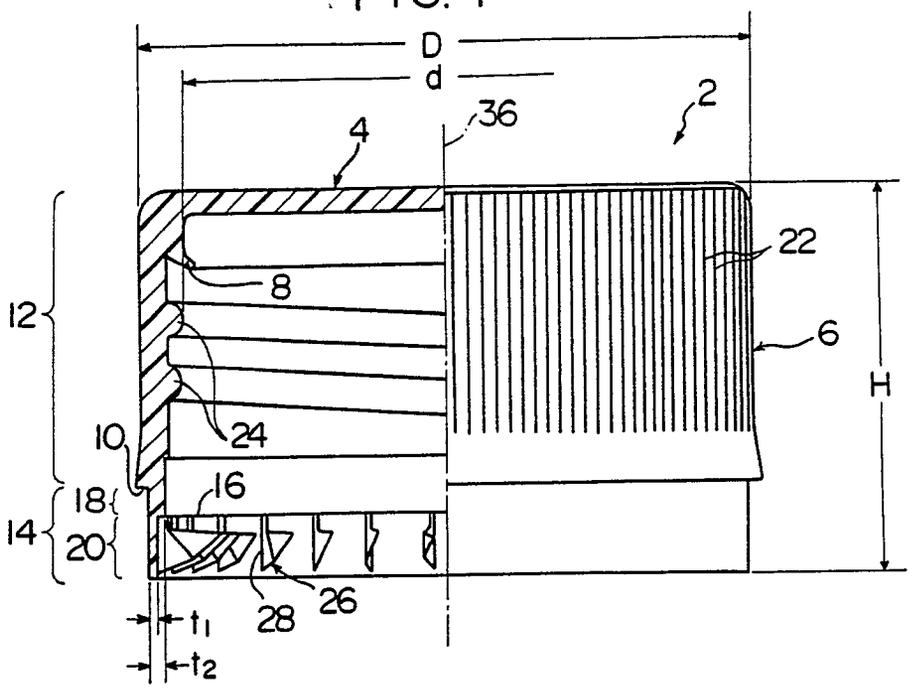
D
d
2
4
36
22
8
6
12
H
24
10
16
18
14
20
26
28
t1
t2

FIG. 4

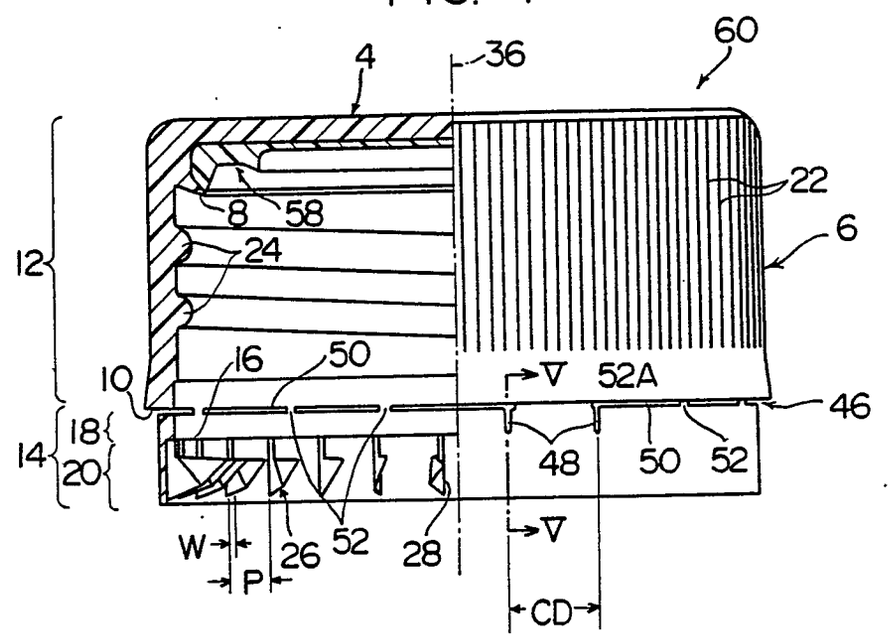
60
4
36
22
8
58
6
12
24
16
50
52A
10
46
18
14
20
48
50
52
W
P
26
52
28
CD

FIG. 2

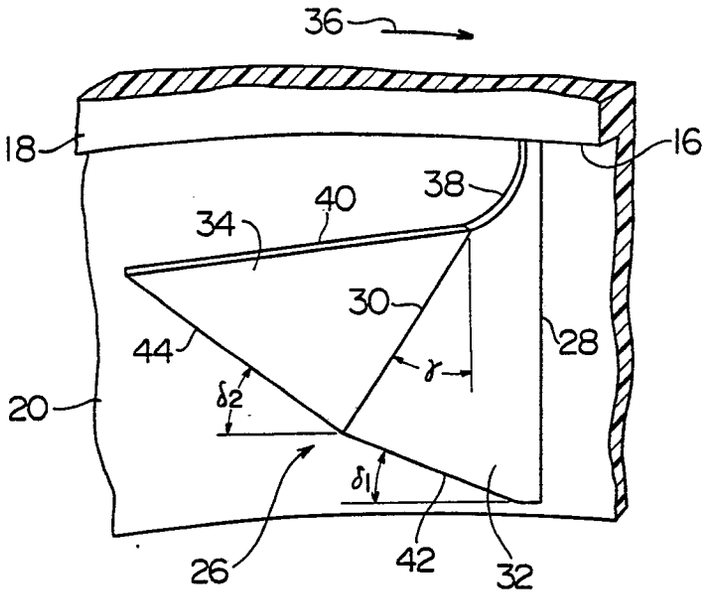
36
18
16
38
40
34
30
28
44
γ
δ2
20
δ1
26
42
32

FIG. 3

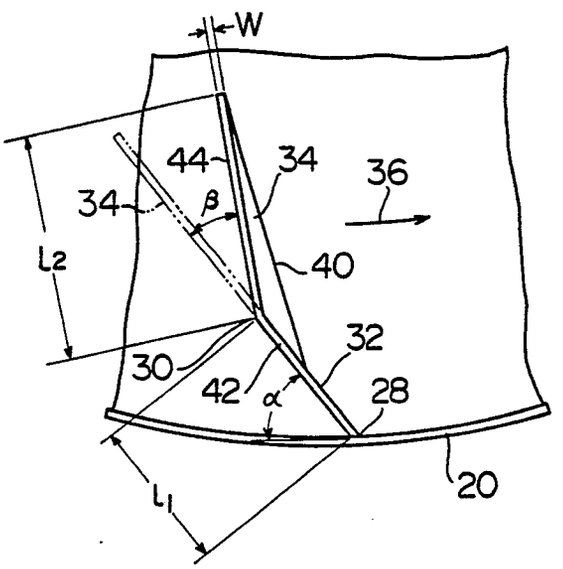
W
44
34
36
34
β
L2
40
32
30
42
α
28
20
L1

FIG. 5