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(54) CLOSURE DEVICE COMPRISING A CAP WITH INCREASED INTERNAL SURFACE AREA

(57) The present invention provides a closure device for a package which reduces risk of spilling by providing a hinged cap with a lid portion displaying a plurality of protruding structures on the internal side of the lid portion, thereby increasing the internal surface are of the lid portion for better retainment of a liquid adhered thereto.

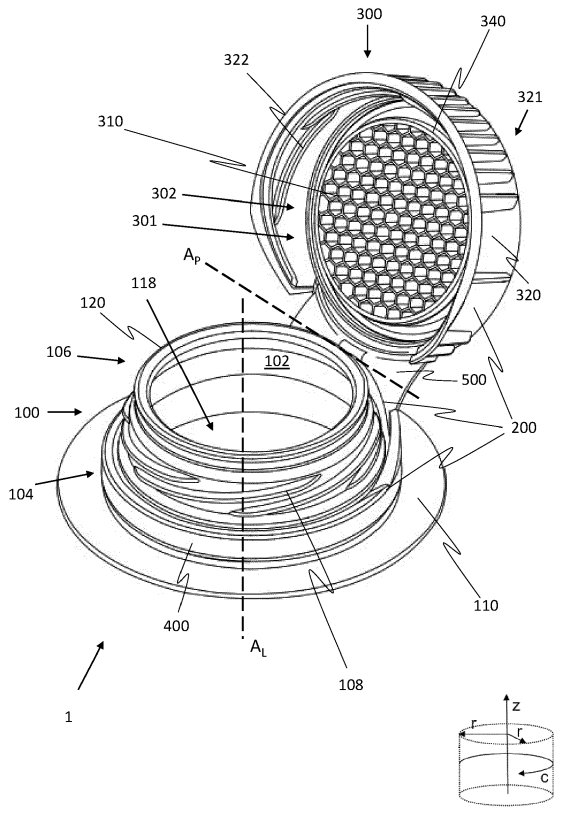

FIG. 1

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Description

Technical field

[0001] The present invention relates to a closure device comprising a pour spout with a through-opening and a cap which has an increased internal surface area. The pour spout can be fixed to an outer surface of a container. In particular the present invention relates to a closure device were the cap is attached to the pour spout via a hinged portion for retaining the cap in an up-right position to the pour spout when the cap is opened, and where the cap comprises structural protrusions on the side of the cap facing the pour spout through-opening when the cap is closed. The structural protrusions are for retaining a fluid.

[0002] The invention also relates to an assembly comprising a package and the closure device comprising a pour spout with a through-opening and a cap which has an increased internal surface area. In particular the present invention relates to a closure device were the cap is attached to the pour spout via a hinged portion for retaining the cap in an up-right position to the pour spout when the cap is opened, and where the cap comprises structural protrusions on the side of the cap facing the pour spout through-opening when the cap is closed.

Background for the invention

[0003] A package or carton is typically produced from a laminate packaging material, which typically comprises a multi-ply paper or paperboard sheet on which is laminated one or a plurality of barrier layers for holding the pourable product, e.g. a liquid, and/or prevent migration of air and flavour degrading substances through the paper or paperboard sheet.

[0004] Recently a growing environmental focus has seen manufacturers taking steps towards avoiding loose plastic caps. Using a hinge closure device on a package prevents users from misplacing and losing the lid portion when operating the package, e.g. when pouring liquid from the package.

[0005] Within the art, different types of hinge closure devices are known.

[0006] WO 2019/238988 A1 discloses a collapsible cap for containers comprising a lower ring connected to a cap via an extendable hinged portion. The cap portion is configured to stay connected to the container via the hinge portion when the cap is opened.

[0007] US 2012/298,666 A1 discloses a stopper/hinge closure device for a packaging container having a long neck portion. The cap is kept at the side of the container when the cap is in an open position.

[0008] A disadvantage seen with these kind of closure devices is that liquid product may adhere to the internal side of the cap. When the cap is in an open position where the cap is retained to the container via a hinge it is likely that any adhered liquid product may start to flow, due to gravity, from the cap and onto for example a hinge portion of the closure device or the container itself. This is especially the case when the liquid product is a semi viscous or viscous fluid such as drinking yogurt or yogurt which will typically have a tendency to adhere to the cap for a limited time before starting to flow off the cap and onto the hinge portion or the container when the container is resting on a planar surface or handled by a consumer, thus causing undesired spilling of the liquid content of the container.

[0009] An object of the present invention is to provide a closure device comprising a cap which is attached to a pour spout which when in an open position reduces the problems of spilling liquid product.

[0010] A second object of the present invention is to provide a closure device which is simple and economical to manufacture.

[0011] A third object of the present invention is to provide an assembly comprising a package or carton and a closure device which reduces the problems of spilling liquid product.

Summary of the invention

[0012] The present invention provides a hinged closure device for a paper or paperboard-based container comprising a pour spot and a cap which is possible to flip open. A hinge portion is provided between a lid portion and a retainment portion attached to the pour spout to ensure that these parts are kept together even when the cap is flipped and pivoting away from the spout.

[0013] Further, the lid portion is provided with an increased internal surface for retaining fluid when the cap is flipped and pivoted away from the pour spout and while the container is being handled.

[0014] According to one example aspect the present invention provides

a closure device for a paper or paperboard-based package,
the closure device comprising a pour spout and a cap,
the pour spout having a longitudinal center axis A_L defining an axial direction z,
a circumferential direction c and a radial direction r of the pour spout,
the pour spout comprising:

- an annular longitudinal neck portion extending along the axial direction z from a first axial end to a second axial end defining a dispensing opening, the neck portion further comprising at least one external structure,
- an annular flange portion for attaching the closure device to the package, the annular flange portion extending in the radial direction r outwardly from the second axial end of the neck portion;

the cap comprising;

- a lid portion comprising an annular longitudinal skirt having at least one internal structure configured to releasably interact with said external structure;
- a retainment portion being rotatably retained around said neck portion; and
- a hinge portion permanently connecting the lid portion to the retainment portion, the hinge portion having a pivot axis A_L about which the lid portion is pivotally movable.

[0015] The lid portion is operable between a first position in which the lid portion sealingly covers said opening of the pour spout and a second position in which the lid portion is located at least partly at a side of the opening.

[0016] The lid portion further comprising;

- a lid internal side arranged perpendicular to the axial direction z and facing the opening when the lid portion is in said first position.

[0017] The lid portion further comprising;

- a plurality of protrusions covering a lid internal area portion and extending outwards at least 0,5 mm from the lid internal side for increasing the surface area of the lid internal side.

[0018] The effect of the increased surface area is enhanced retention of any liquids that may be adhered to the lid internal side for example if the package is shaken before opening the closure device. An advantage of the enhanced retention is that it prevents spilling of liquid which typically would flow down from the lid portion and onto the hinge portion, the package or other place when the liquid is affected by gravity.

[0019] In one aspect the fluid to be retained is semi viscous or viscous and has a centipoise rating between 70-2200 cps.

[0020] As used herein poise is the unit for dynamic viscosity. The metric prefix centi- is added to provide centipoise abbreviated cps.

[0021] In another example aspect of the closure device the plurality of protrusions extends 0,5 mm - 10 mm, 0,6 mm - 8 mm, 0,8 mm - 6 mm, 0,9 mm - 4 mm or 1,0 mm - 2 mm perpendicularly from the lid internal side. The protrusions may extend substantially perpendicular to the lid internal side. The protrusions may also extend at an angle of between 80°-90° or 85°-90° or 86°, 87°, 88° or 89° from the lid internal side.

[0022] In another example aspect of the closure device the plurality of protrusions covers at least 20%, at least 40%, at least 50%, at least 60%, at least 70%, at least 80% or at least 90% of the area of the lid internal side. The plurality of protrusions may for example cover a maximum of 95% of the area of the lid internal side.

[0023] Materials for production of the cap may be saved if only a part of the lid internal side is covered by protrusions.

[0024] In another example aspect of the closure device the lid internal side comprises

- an internal side central area located centrally on the lid internal side where the plurality of protrusions extends less from the lid internal side than the plurality of protrusions located concentrically outside of the internal side central area, and

wherein the internal side central area has a diameter of 5%-50%, 10%-40%, 20%-30% or 25% of the total diameter of the lid internal area portion.

[0025] If the internal central area is provided with protrusions extending less than the surrounding protrusions, the central area may retain a droplet of fluid effectively.

[0026] In another example aspect of the closure device the plurality of protrusions extends further from the lid internal side towards the hinge portion side of the cap creating a wedged shape.

[0027] In another example aspect of the closure device the plurality of protrusions extends progressively further from the lid internal side towards the hinge portion side of the cap creating a wedged shape.

[0028] Such a wedge shape may help effectively retaining a liquid when the lid portion is in the open second position since the lid portion may then be arranged in a substantially up-right position. The wedge shape will then provide a barrier for the liquid to overcome before spilling onto the hinge portion or other undesired places.

[0029] In one aspect of the closure device the pour spout comprises;

- a sealing lip, and

the lid internal side comprises

- a bore seal extending from the lid internal side, defining a perimeter, the bore seal being configured for sealingly interacting with the sealing lip when the lid portion is in the first position, wherein

the plurality of protrusions are located within the perimeter.

[0030] When all protrusions are located within the perimeter, the risk for any liquid being spilled at the side of the pour spout when the closure device is closed after previously being opened is reduced.

[0031] In another example aspect of the closure device the bore seal extends between 1 mm - 15 mm, 1,5 mm - 8 mm, 1,8mm- 6 mm, 1,9 mm - 4 mm, 2,0 mm - 3,0 mm from the lid internal side.

[0032] In another example aspect of the closure device the bore seal extends further from the lid internal side at the hinge portion side of the cap than the at the opposite side, such as between 2 mm - 6 mm at the hinge portion

side and between 1 mm - 3 mm on the opposite side. Or 4 mm - 8 mm at the hinge portion side and between 2 mm - 4 mm on the opposite side or 6 mm - 10 mm at the hinge portion side and between 3 mm -5 mm on the opposite side or 8 mm - 15 mm at the hinge portion side and between 4 mm - 10 mm on the opposite side.

[0033] The bore seal may in this configuration further contribute to the retainment of liquid.

[0034] In one aspect of the closure device the plurality of protrusions extends less than 95 %, less than 90 %, less than 80 %, less than 70 %, less than 50 %, less than 40 % or less than 30% of the extent of the bore seal from the lid internal side.

[0035] When the protrusions extend less than the bore seal the liquid may even more effectively be retained within the perimeter of the bore seal and reduce the risk of spilling of liquid, especially when re-closing a previously opened lid portion.

[0036] In one aspect of the closure device the plurality of protrusions has a hexagonal honeycomb shape.

[0037] Using a hexagonal or honeycomb shape for the plurality of protrusion allows for efficient use of material due to the sharing of side walls of the protrusions. This results in minimal use of materials and thus a low weight and cost-effective production is achieved.

[0038] In one aspect of the closure device the plurality the plurality of protrusions has a triangular, rectangular, circular, oval or square shape.

[0039] In one aspect of the closure device the plurality of protrusions are hollow and open at the end distal from the lid internal side.

[0040] Without being bound by theory it is also contemplated that capillary effect contributes to retainment of liquid within the plurality of protrusions shown.

[0041] In one aspect of the closure device the plurality of protrusions has a pin shape. When pin shaped, the protrusions may be spaced apart.

[0042] In one aspect of the closure device the plurality of protrusions are arranged in concentrical rings.

[0043] In one aspect of the closure device the plurality of protrusions are arranged in a spiral or an Archimedean spiral.

[0044] In one embodiment the invention is related to an assembly comprising a paper or paperboard-based package and a closure device as described above.

[0045] Above-discussed preferred and/or optional features of each aspect and embodiment may be used, alone or in appropriate combination, in the other aspects and embodiments of the invention.

Brief description of the figures

[0046]

Fig. 1 shows a perspective view of the closure device including the pour spout, hinged cap and a plurality of protrusions extending from the internal side of the lid. The protrusions have a hexagonal honeycomb shape.

Fig. 2 shows a front view of the closure device with protrusions having a hexagonal shape.

Fig. 3 shows a front view of the closure device with protrusions having a pin shape.

Fig. 4 shows a front view of the closure device with protrusions having a square shape

Fig. 5 shows a front view of the closure device with protrusions having a triangular shape

Fig. 6 shows a front view of the closure device with protrusions having a pin shape covering a central area of the lid internal side.

Fig. 7 shows a side cut view where the protrusions extend less than the bore seal.

Fig. 8 shows a side cut view where the protrusions extend more at the hinge portion side of the lid portion.

Fig. 9 shows a side cut view where the protrusions extend less in a central area of the lid portion than concentrically outside of the central area.

Fig. 10 shows a side cut view where the bore seal extends more on the hinge portion side of the lid portion than on the opposite side.

Fig. 11 shows an assembly of the closure device and a package.

Detailed description of the invention

[0047] In the following, embodiments of the invention will be described in more detail with reference to the drawings. However, it is specifically intended that the invention is not limited to the embodiments and illustrations contained herein but includes modified forms of the embodiments including portions of the embodiments and combinations of elements of different embodiments as come within the scope of the following claims.

[0048] It is appreciated that certain features of the invention, which, for clarity, have been described above in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which, for brevity, have been described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination. In particular, it will be appreciated that features described in relation to one particular embodiment may be interchangeable with features described in relation to other embodiments.

[0049] In the following an embodiment of a closure de-

vice 1 according to the invention will be discussed in more detail with reference to Figs. 1 to 11.

[0050] Fig. 1 shows a first embodiment of the closure device 1. The closure device 1 generally comprises a pour spout 100 and a cap 200.

[0051] The pour spout 100 comprises a longitudinal center axis A_L defining an axial direction z, a circumferential direction c, and a radial direction r.

[0052] The pour spout 100 comprises an annular neck portion 102 with a first axial end 104 and a second axial end 106. The first axial end 104 comprises an annular flange portion 110 extending in the radial direction outwards from the pour spout 100. The annular flange portion 110 is for attaching the pour spout 100 to a paper or paper board container 50.

[0053] The neck portion 102 comprises at least one external structure 108 located on the outside surface of the neck portion 102. The at least one external structure 108 may be a thread or multiple threads.

[0054] The second axial 106 end is arranged opposite to the first axial end 104. The internal perimeter of the second axial end 106 defines a dispensing opening 118 through which contents may be poured or accessed. The longitudinal center axis A_L runs between the first axial end 104 and the second axial end 106.

[0055] The second axial end 106 may comprise a sealing lip 120 extending in the radial direction r into the dispensing opening.

[0056] The cap 200 may comprise a retainment portion 400 circumferentially arranged around the pour spout 100, a lid portion 300 and a hinge portion 500 for permanently connecting the lid portion 300 to the retainment portion 400.

[0057] The lid portion 300 is open at its bottom end and closed at its top end by an endwall 321, at the outer periphery of which an annular longitudinal/tubular skirt 320 extends axially from the end wall 321. The skirt 320 may comprise at least one internal structure 322 for interacting with the external structure 108 of the neck portion 102 for releasably securing the lid portion 300 to the pour spout 100. The at least one internal structure 322 may be a thread.

[0058] Other kinds of internal structure 322 and external structure 108 may be envisaged, for example corresponding protrusions and recesses configured for interaction with each other for providing a so-called snap closure.

[0059] Fig. 1 illustrates the closure device 1 in an open position where, when the closure device 1 is attached to a package 50 (not shown in fig. 1), the contents within the package 50 can be accessed or poured through the dispensing opening 118.

[0060] The hinge portion 500 may permanently connect the lid portion 300 to the retainment portion 400 and may allow the lid portion to pivot around a pivot axis A_P.

[0061] The lid portion 300 may sealingly cover the dispensing opening 118. The lid portion 300 is then in a first position (not shown in fig. 1).

[0062] Fig. 1 illustrates that the lid portion 300 is pivoting away from the dispensing opening 118 such that the lid portion 300 is located at the side of the pour spout 100. The lid portion 300 is not covering the dispensing opening 118 and the lid portion 300 is thus in a second position where the closure device 1 is open.

[0063] The hinge portion 500 allows the lid portion 300 to be operable between the first position and the second position while also being retained to the pour spout 100 by the retainment portion 400.

[0064] The lid portion 300 comprises a lid internal side 301 and a skirt 320 extending from the lid internal side 301.

[0065] The lid internal side 301 faces the dispensing opening 118 when the lid portion 300 covers said dispensing opening 118, i.e. when the lid portion 300 is in the first position.

[0066] The lid internal side 301 may comprise an annular longitudinal bore seal 340 that extends axially from the lid internal side 301. The bore seal 340 is configured concentrically and within the skirt 320. The bore seal is circular and defines a perimeter 342. The bore seal 340 is configured to interact with the sealing lip 120 when the lid portion 300 is in the first position for providing a sealing of the dispensing opening 118 such that liquid content will not pass therethrough. As shown in fig. 1 the bore seal 340 extends the same height from the lid internal side 301 around the entire bore seal 340.

[0067] The lid internal side 301 further comprises a plurality of protrusions 310 extending outwards from the lid internal side 301. The plurality of protrusions 310 covers an internal area portion 302 of the lid internal side 301. As shown in fig. 1 the plurality of protrusions 310 may cover the area within the perimeter 342.

[0068] The plurality of protrusions 310 may extend an equal length of the bore seal 340. Further the plurality of protrusions 310 may extend to the same length over the entire area 302 they cover. However, it is also envisaged that the plurality of protrusions 310 may extend to a varying extent over the area they cover. This will be explained in further detail below.

[0069] The plurality of protrusions 310 may be hollow and open at the end distal from the lid internal side 301.

[0070] The plurality of protrusions 310 shown in fig. 1 displays a hexagonal or honeycomb shape where hexagonal protrusions extend from the lid internal side, the protrusions being closed at the protrusion ends proximal to the lid internal side 301 by said lid internal side 301. The plurality of protrusions 310 shown in fig. 1 are arranged adjacent to one another and sharing side walls, while they are open at the end distal from the lid internal side 301.

[0071] The plurality of protrusions 310 provides the lid internal side 301 with an increased surface area compared to a lid internal side which has a smooth surface. The effect of this is that any liquids that is accumulated onto the lid internal side 301 may be retained within the lid portion 300 due to the surface tension of the liquid for

a longer period of time than for a smooth surface. A consumer may thus avoid spilling any liquid while the lid portion 300 is in the open position.

[0072] Without being bound by theory it is also contemplated that capillary effect contributes to retainment of liquid within the plurality of protrusions shown in fig. 1.

[0073] Using a hexagonal or honeycomb shape for the plurality of protrusion allows for efficient use of material due to the sharing of side walls of the protrusions. This results in minimal use of materials and thus a low weight and cost-effective production is achieved.

[0074] Fig. 2 shows a front view of the same embodiment as fig. 1.

[0075] Fig. 3 shows a front view of another embodiment of the closure device 1 where the lid portion displays a plurality of protrusions 310 in the shape of pins. The pins are arranged within the perimeter 342 defined by the bore seal 340. The pins may extend the same length from the lid internal side 301 as the bore seal 340. The pins may be arranged in a pattern of concentrical rings. The plurality of protrusions 310 shown in fig. 3 is arranged with space between each individual protrusion. The plurality of protrusions 310 arranged as pins also increase surface area in order to retain liquid on the lid internal side 301.

[0076] Fig. 4 shows a front view of an embodiment of the closure device 1, where the plurality of protrusions 310 are of a square shape. Other types of rectangular shapes may also be envisaged.

[0077] Fig. 5 shows a front view of an embodiment of the closure device 1, where the plurality of protrusions 310 are of a triangular shape. Protrusions 310 of an oval shape may also be envisaged.

[0078] Fig. 6 shows a front view of another embodiment of the closure device 1 where the lid portion displays a plurality of protrusions 310 in the shape of pins covering a central area of the lid internal side where an area concentrically outside of the covered central area is free of protrusions 310.

[0079] Fig. 7 shows a side view cut of an embodiment of the closure device 1 where the plurality of protrusions 310 extends less from the lid internal side 301 than the bore seal 340 extends from the lid internal side 301. All shapes of protrusions mentioned herein are suitable for the configuration shown in fig. 7.

[0080] Fig. 8 shows a side view cut of an embodiment of the closure device 1 where the protrusions 310 extends further from the lid internal side 301 at the side of the lid portion where the hinge portion 500 is located. As shown in fig. 7 in this arrangement the plurality of protrusions 310 may form a wedge shape. All shapes of protrusions mentioned herein are suitable for the configuration shown in fig. 8.

[0081] Fig. 9 shows a side view of an embodiment of closure device 1 where the plurality of protrusions 310 extends less from the lid internal side at an internal side central area 305 than the plurality of protrusion 310 located concentrically outside of the internal side central area 305. All shapes of protrusions mentioned herein are suitable for the configuration shown in fig. 9.

[0082] Fig. 10 shows a side view of an embodiment of the closure device 1 where the bore seal 340 extends more from the lid internal side 301 at the side of the lid portion 300 proximal to the hinge portion 500 than on the side of the lid portion 300 distal to the hinge portion 500.

[0083] Figure. 11 shows an assembly of a package 50 with the closure device 1 attached thereto. Note that the lid portion 300 covers the dispensing opening 118 (not shown). Hence, the lid portion 300 is shown in the closed first position.

List of references

1	Closure device
50	Package
100	Pour spout
102	Neck portion
104	First axial end
106	Second axial end
108	External structure
110	Annular flange portion
118	Dispensing opening
120	Sealing lip
200	Cap
300	Lid portion
301	Lid internal side
302	Lid internal area
305	Lid internal side central area
310	Protrusions
320	Skirt
321	End wall
322	Internal structure
340	Bore seal
342	Perimeter
400	Retainment portion
500	Hinge portion

Claims

1. A closure device (1) for a paper or paperboard-based package (50),

the closure device (1) comprising a pour spout (100) and a cap (200),
the pour spout (100) having a longitudinal center

axis (A_L) defining an axial direction (z), a circumferential direction (c) and a radial direction (r) of the pour spout (100), the pour spout (100) comprising:

- an annular longitudinal neck portion (102) extending along the axial direction (z) from a first axial end (104) to a second axial end (106) defining a dispensing opening (118), the neck portion (102) further comprising at least one external structure (108),
- an annular flange portion (110) for attaching the closure device (1) to the package (50), the annular flange portion (110) extending in the radial direction (r) outwardly from the second axial end (106) of the neck portion (102);

the cap (200) comprising;

- a lid portion (300) comprising an annular longitudinal skirt (320) having at least one internal structure (322) configured to releasably interact with said external structure (108);
- a retainment portion (400) being rotatably retained around said neck portion (102); and
- a hinge portion (500) permanently connecting the lid portion (300) to the retainment portion (400), the hinge portion (500) having a pivot axis (A_P) about which the lid portion (300) is pivotally movable,

the lid portion (300) being operable between a first position in which the lid portion (300) sealingly covers said opening (118) of the pour spout (100) and a second position in which the lid portion (300) is located at least partly at a side of the opening (118),
the lid portion (300) further comprising;

- a lid internal side (301) arranged perpendicular to the axial direction (z) and facing the opening (118) when the lid portion (300) is in said first position,

characterised by
the lid portion (300) comprising;

- a plurality of protrusions (310) covering a lid internal area portion (302) and extending outwards at least 0,5 mm from the lid internal side (301) for increasing the surface area of the lid internal side (301).

2. The closure device (1) according to claim 1, wherein the plurality of protrusions (310) extends 0,5 mm - 10 mm, 0,6 mm - 8 mm, 0,8 mm - 6 mm, 0,9 mm - 4 mm or 1,0 mm - 2 mm perpendicularly from the lid internal side (301).

3. The closure device (1) according to any of the preceding claims, wherein the plurality of protrusions (310) covers at least 20%, at least 40%, at least 50%, at least 60%, at least 70%, at least 80% or at least 90% of the area of the lid internal side (301).

4. The closure device (1) according to any of the preceding claims, wherein the lid internal side (301) comprises

- an internal side central area (305) located centrally on the lid internal side (301) where the plurality of protrusions (310) extends less from the lid internal side (301) than the plurality of protrusions (310) located concentrically outside of the internal side central area (305), and

wherein the internal side central area (305) has a diameter of 5%-50%, 10%-40%, 20%-30% or 25% of the total diameter of the lid internal area portion (302).

5. The closure device according to any of the preceding claims 1-3, wherein the plurality of protrusions (310) extends further from the lid internal side (301) towards the hinge portion (500) side of the cap (200) creating a wedged shape.

6. The closure device according to any of the preceding claims, wherein pour spout (100) comprises;

- a sealing lip (120), and

the lid internal side (301) comprises

- a bore seal (340) extending from the lid internal side (301), defining a perimeter (342), the bore seal (340) being configured for sealingly interacting with the sealing lip (120) when the lid portion (301) is in the first position, wherein

the plurality of protrusions (310) are located within the perimeter (342).

7. The closure device according to claim 6, wherein the bore seal (340) extends between 1 mm - 15 mm, 1,5 mm - 8 mm, 1,8mm- 6 mm, 1,9 mm - 4 mm, 2,0 mm - 3,0 mm from the lid internal side (301).

8. The closure device according to any of claim 6-7, wherein the bore seal (340) extends further from the lid internal side (301) at the hinge portion (500) side of the cap (300) than the at the opposite side, such as between 2 mm - 6 mm at the hinge portion (500)

side and between 1 mm - 3 mm on the opposite side.

9. The closure device (1) according to any of claim 6-8, wherein the plurality of protrusions (310) extends less than 95 %, less than 90 %, less than 80 %, less than 70 %, less than 50 %, less than 40 % or less than 30% of the extent of the bore seal (340) from the lid internal side (301).

10. The closure device (1) according to any of the preceding claims 1-9, wherein the plurality of protrusions (310) has a hexagonal honeycomb shape.

11. The closure device (1) according to any of the preceding claims 1-9, wherein the plurality of protrusions (310) has a triangular, rectangular, circular, oval or square shape.

12. The closure device (1) according to claim 10 or 11, wherein the plurality of protrusions (310) are hollow and open at the end distal from the lid internal side (301).

13. The closure device (1) according to any of the preceding claims 1-9, wherein the plurality of protrusions (310) has a pin shape.

14. The closure device (1) according to claim 13, wherein the plurality of protrutions (310) are arranged in concentrical rings.

15. The closure device (1) according to claim 13, wherein the plurality of protrusions (310) are arranged in a spiral or an Archimedean spiral.

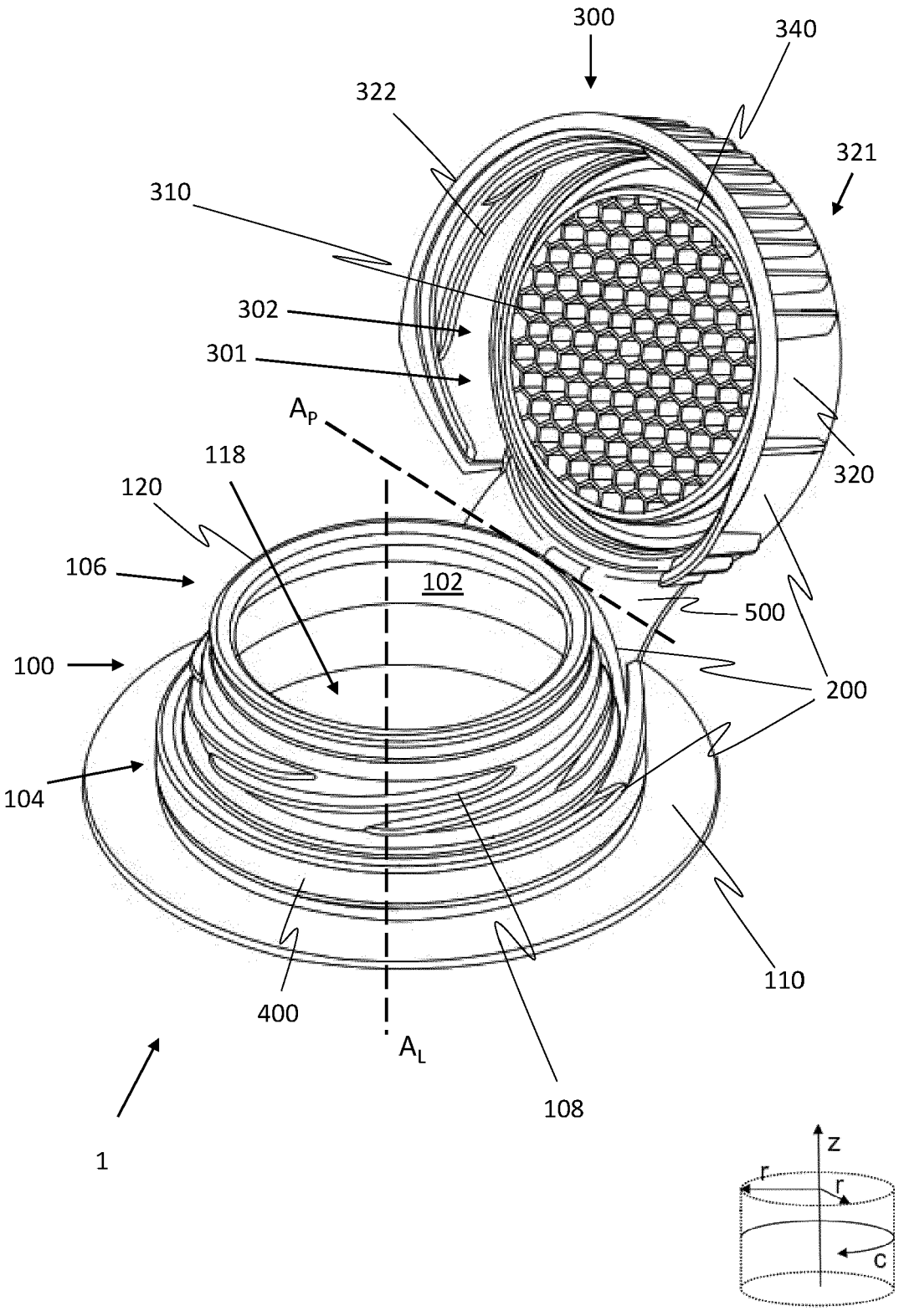
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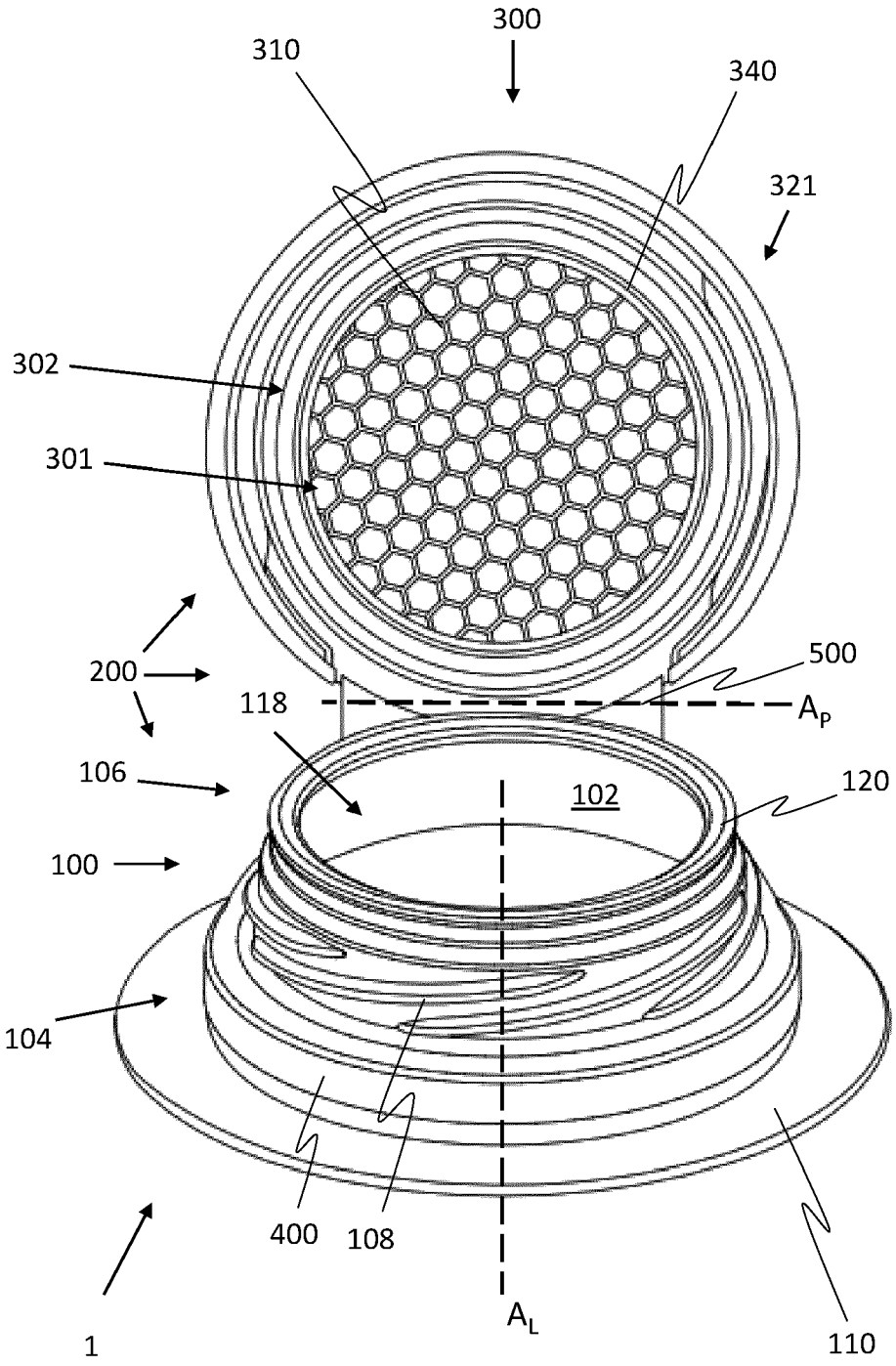
FIG. 1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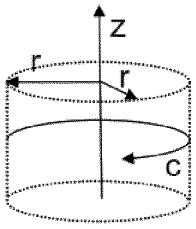
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FIG. 2

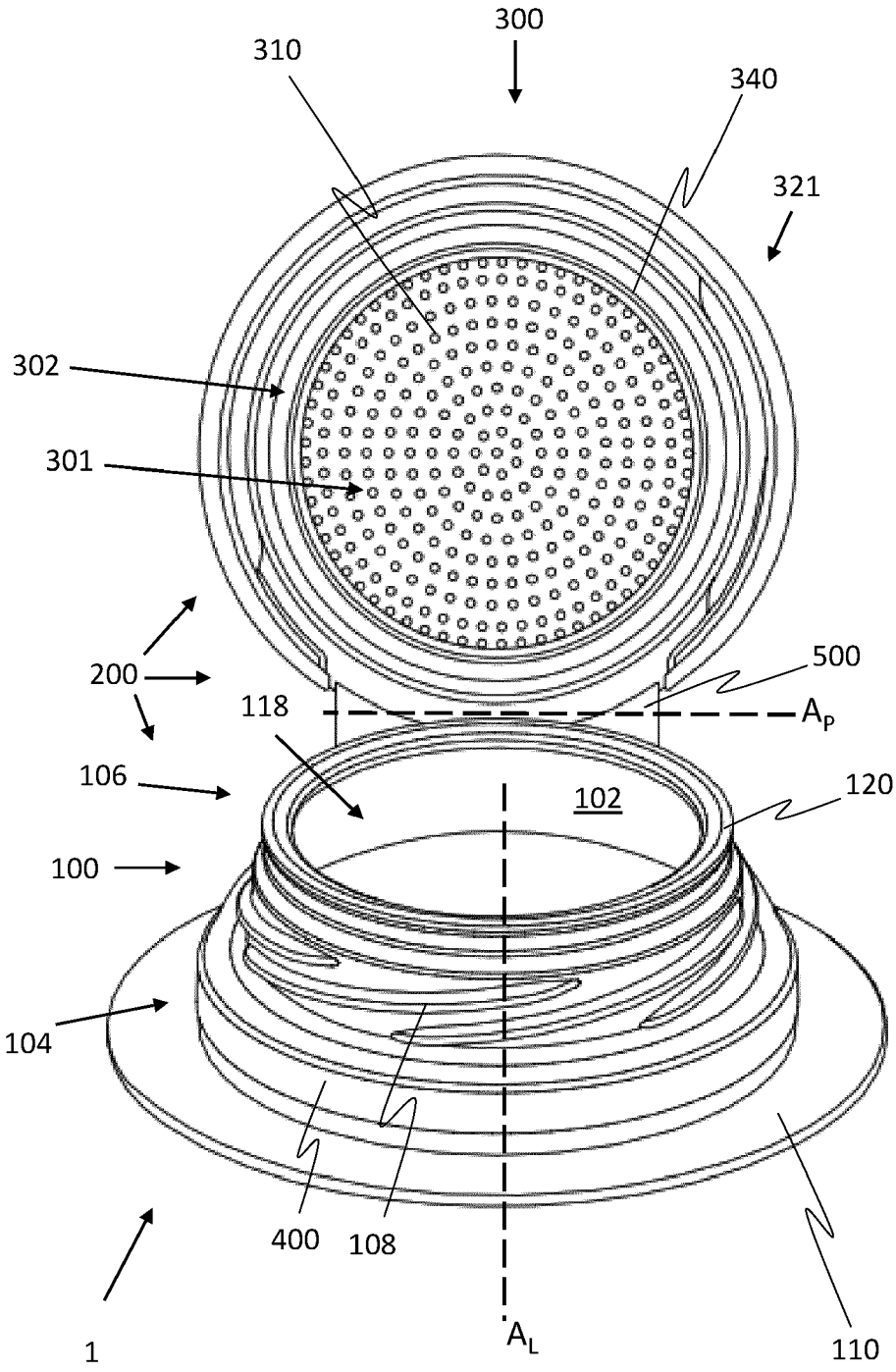
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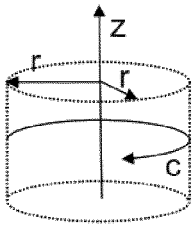
FIG. 3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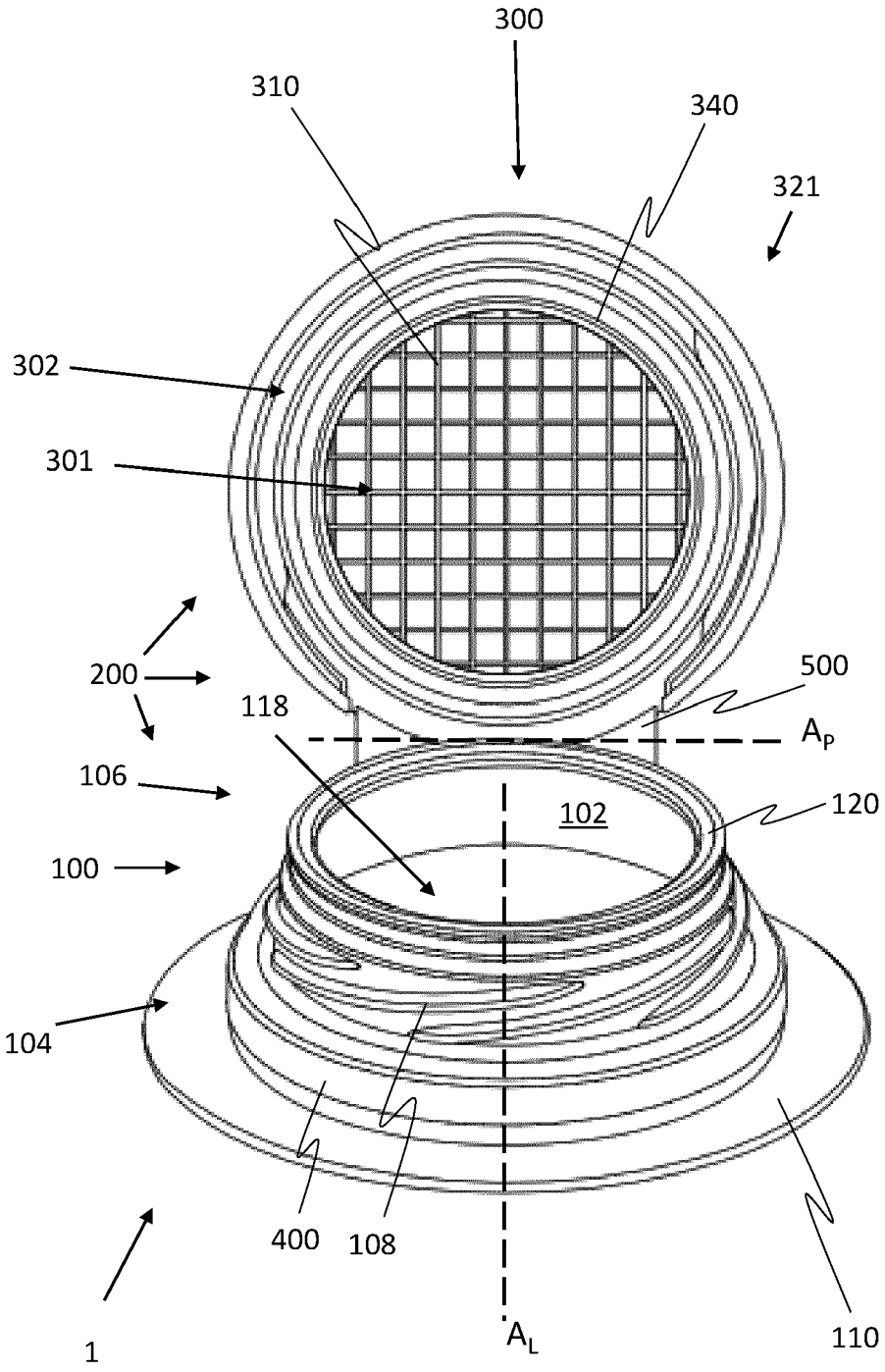
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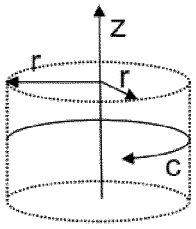
FIG. 4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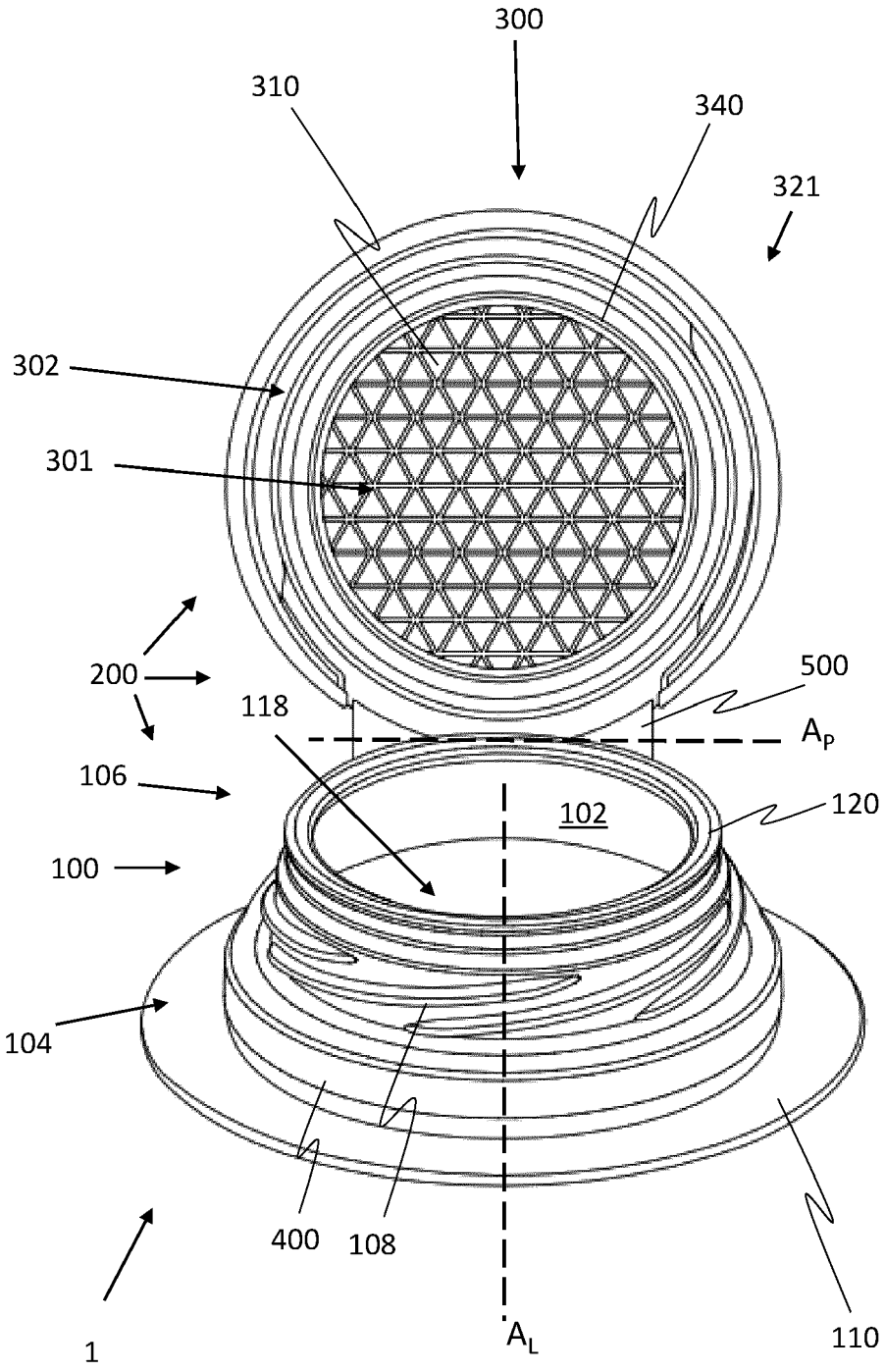
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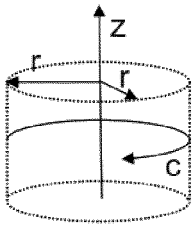
FIG. 5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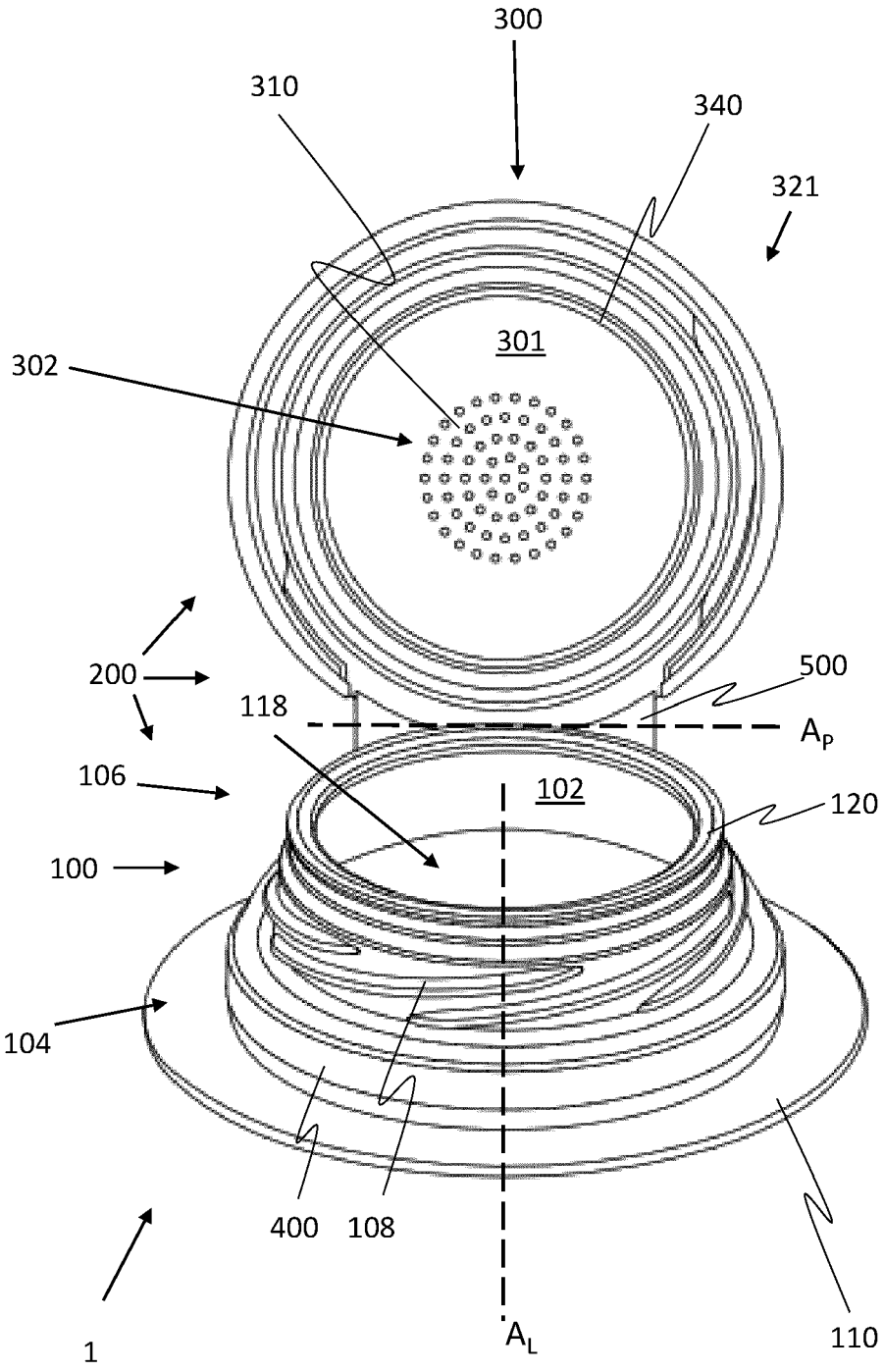
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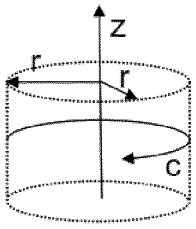
FIG. 6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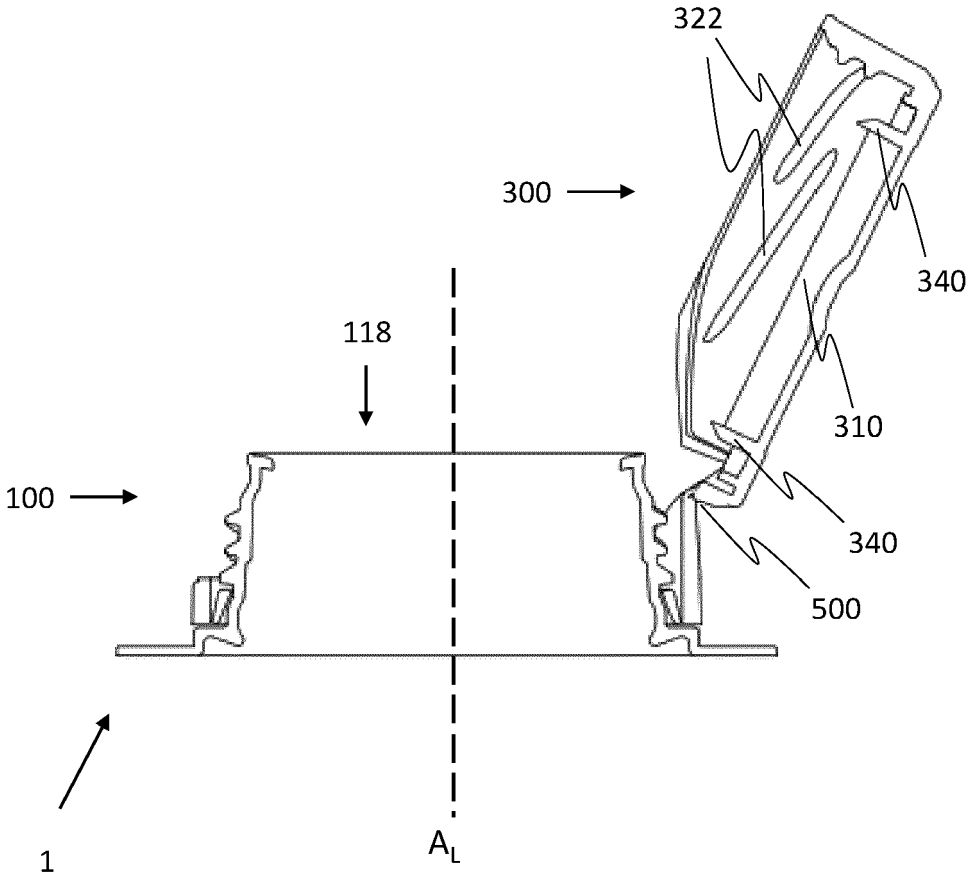


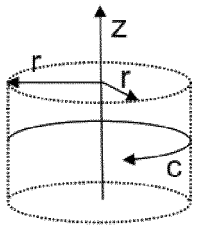
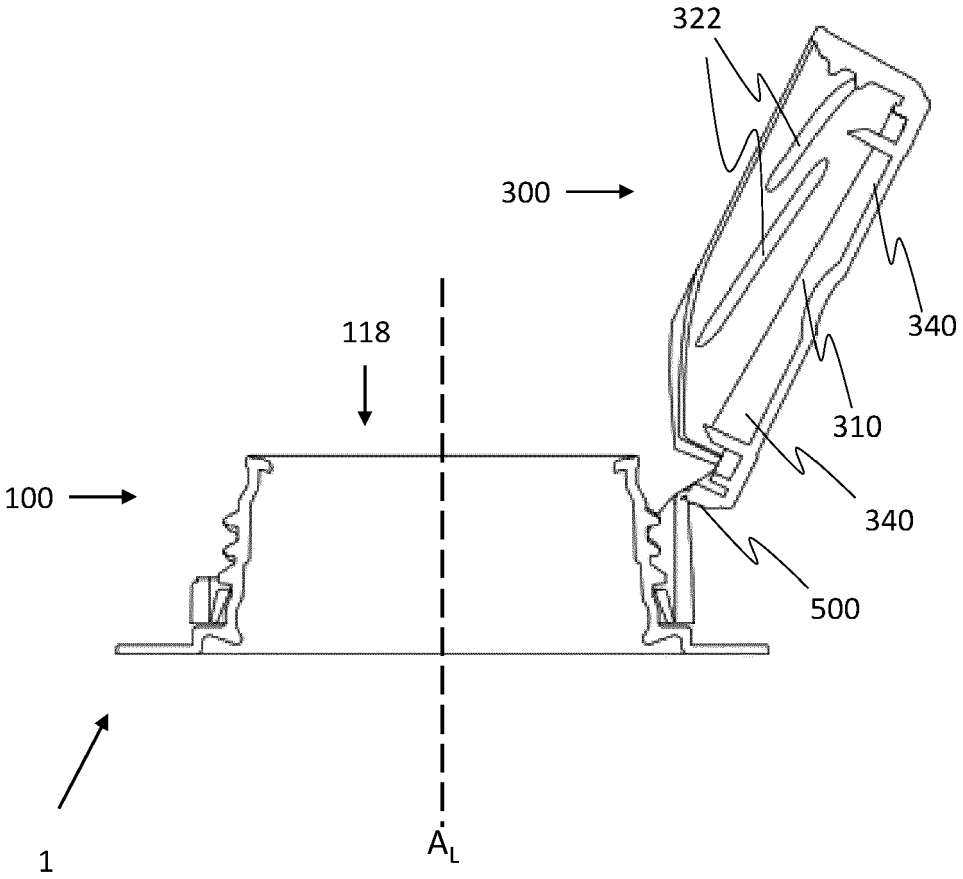


FIG. 7



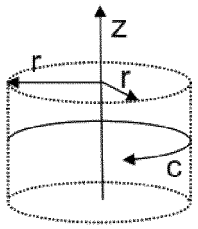
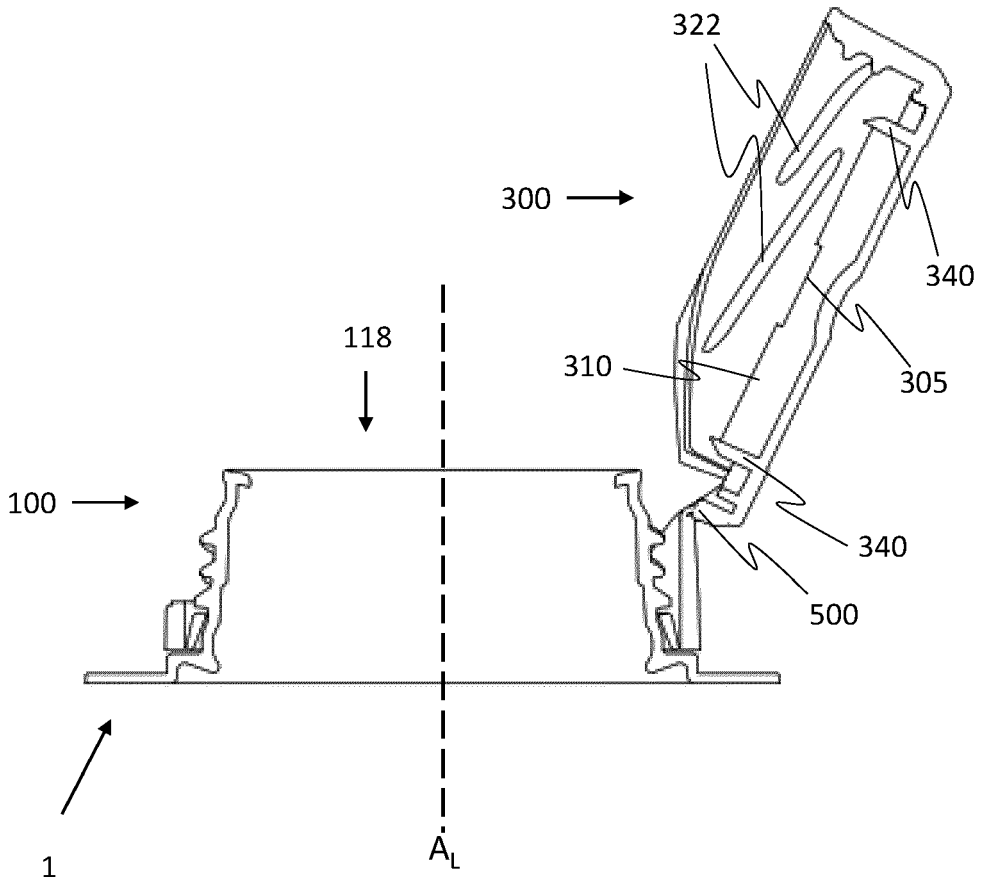


FIG. 8



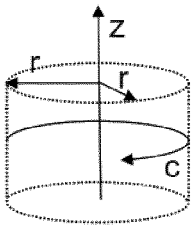
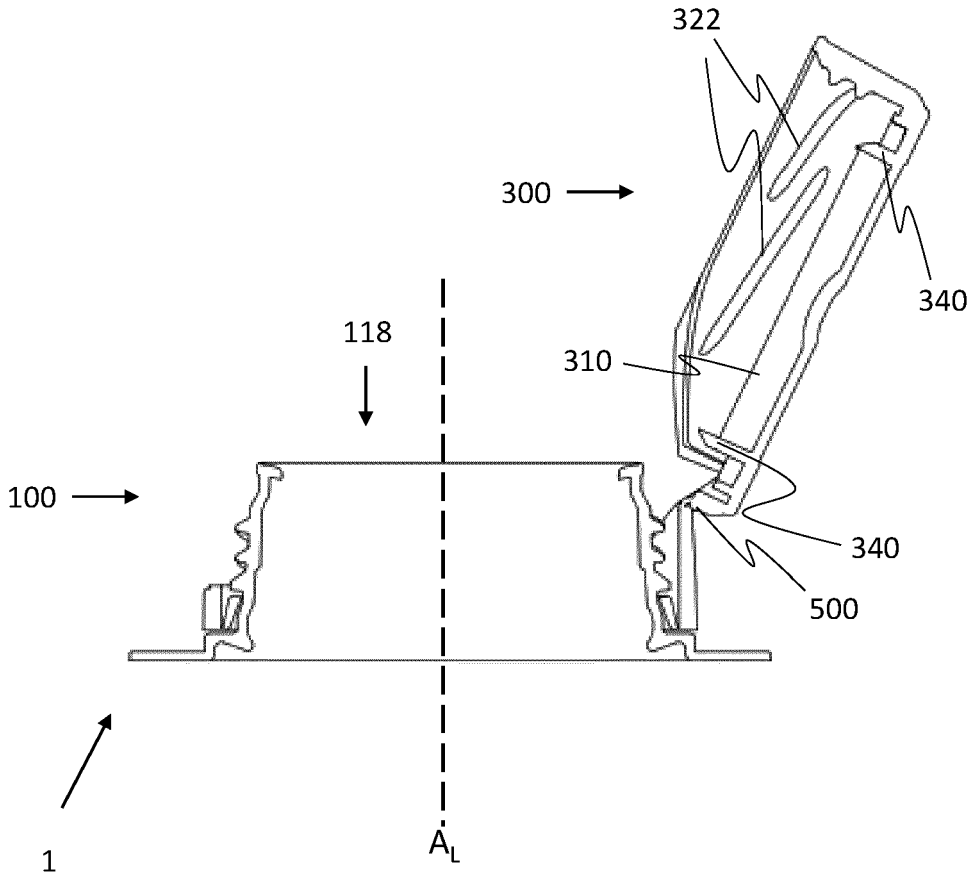


FIG. 9



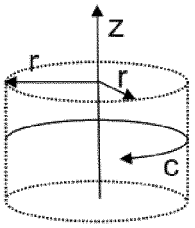


FIG. 10

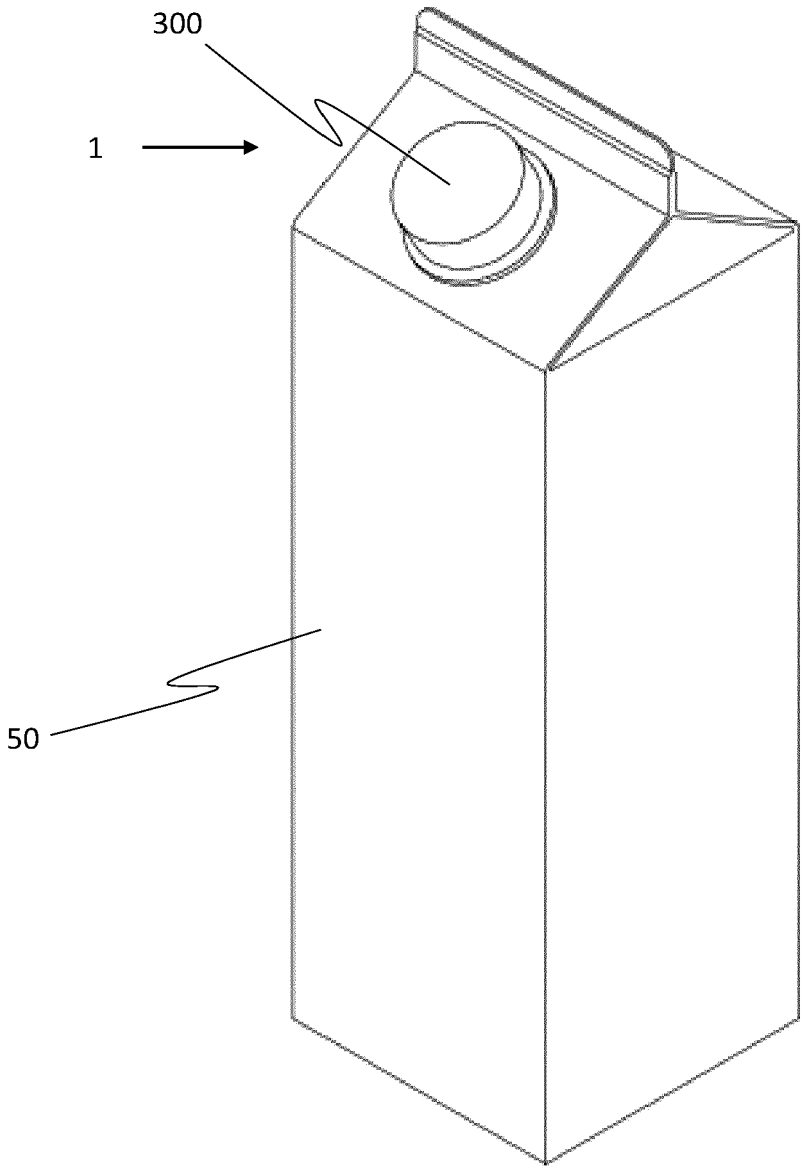


FIG. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 5929

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 July 2023	Pernice, Ciro

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