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(54) **LID ASSEMBLY FOR A BEVERAGE CONTAINER**

(57) A lid assembly is provided for liquid-tightly sealing off a beverage container, comprising a lid body with a connection element for connection with the beverage container, wherein the lid body comprises a first through hole and a sealing member, hingedly connected to the lid body and is hingeable between an open state and a closed state. In this lid, in the open state, the sealing member allows a fluid flow through the first through hole, and in the closed state, a sealing surface comprised by the sealing member and the lid body form a liquid-tight seal such that the fluid flow through the first through hole is blocked. The sealing surface of this lid assembly is free of silicone elastomer. No separate inserts comprising silicone elastomer are required for the liquid-tight seal between the sealing member and the lid body. A separate insert may be disadvantageous for hygienic reasons.

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Description

TECHNICAL FIELD

[0001] The aspects and embodiments thereof relate to the field of lids for beverage containers.

BACKGROUND

[0002] Beverage containers can be provided with a lid. By virtue of the lid, it may be prevented that the beverage content inside the beverage container spills out.

[0003] Such lids often comprise a drink hole and a vent hole. Using the drink hole, a user can drink via the lid, and by virtue of the vent hole, a pressure inside the beverage container can be equalised with the ambient pressure.

[0004] To liquid-tightly seal the drink hole and the vent hole, a sealing member can be provided, which sealing member is hingedly connected to the lid body. Such sealing members can be hinged between a closed state and an open state. In the closed state, a first sealing surface is formed between the sealing member and the lid body such that fluid flow through the drink hole is blocked, and a second sealing surface is formed between the sealing member and the lid body such that fluid flow through the vent hole is blocked.

[0005] Both the first sealing surface and the second sealing surface comprise a silicone elastomer. Silicone elastomer as a material is widely and commonly used for liquid-tight sealing surfaces, for example for its nonreactive, stable, and temperature resistant properties. The silicone elastomer may be comprised by the lid body, by the sealing member, or by both.

SUMMARY

[0006] It is preferred to provide a lid for a beverage cup which may be more easy to manufacture, by for example requiring less assembling steps, requiring less components, and/or comprising less different types of materials.

[0007] An aspect of the invention provides a lid assembly for liquid-tightly sealing off a beverage container, comprising a lid body with a connection element for connection with the beverage container, wherein the lid body comprises a first through hole; and a sealing member, which is hingedly connected to the lid body and is hingeable between an open state and a closed state. In this lid, in the open state, the sealing member allows a fluid flow through the first through hole, and in the closed state, a sealing surface comprised by the sealing member and the lid body form a liquid-tight seal such that the fluid flow through the first through hole is blocked. The sealing surface of this lid assembly is free of silicone elastomer.

[0008] When the sealing surface is free of silicone elastomer, no separate inserts comprising silicone elastomer are required to create the liquid-tight seal between the sealing member and the lid body. Such a separate insert may be disadvantageous for example for hygienic reasons. A space between the insert and the lid body may be harder to clean and/or the insert itself may be a breeding ground for micro-organism. Furthermore, when no separate insert is required, one less assembly step is required for assembling the lid assembly. Also, when the lid body does not comprise silicone elastomer, the sealing surface can be made from the same material as the rest of the lid body.

[0009] The general inventive concept of the aspect may thus be seen as providing a liquid-tightly sealing lid assembly, wherein the sealing surface between the lid body and the sealing member is free of silicone elastomer.

[0010] Silicon elastomers are also known as silicone rubbers, polysiloxanes or polydimethylsiloxanes. Silicon elastomers may be defined as polymers containing silicium, oxygen, hydrogen, and carbon.

[0011] A beverage container may in examples be a beverage cup or bottle. The beverage container may be used for containing cold and/or hot beverages, such as tea, coffee, sports drinks and water.

[0012] A sealing member being hingedly connected to a lid body implies that the sealing member may rotate or swivel relative to the lid body. The hinge may in embodiments be a living hinge, a barrel hinge or a pivot hinge. In embodiments, the sealing member and the lid body may be shaped complementary to each other such that an axis of rotation is provided to the sealing member relative to the lid body.

[0013] Preferably, the rotation is the only degree of freedom for the sealing member relative to the lid body. To significantly prevent movement of the sealing member relative to the lid body other than the rotation that allows the sealing member to hinge relative to the lid body, the lid body may comprise one or more chambers for receiving one or more parts of the sealing member. The one or more chambers and one or more parts may be shaped complementary to allow rotation of the parts in the chambers, but to block or restrict other movements, such as a translation of the sealing member relative to the lid body..

[0014] The connection element for connection with the beverage container comprised by the lid body may comprise one or more threads for coupling with one or more threads comprised by a beverage container. Additionally or alternatively, the connection element may be a skirt part comprised by the lid body and arranged to form a snap-fit connection or press-fit connection with a beverage container. For the snap-fit or press-fit connection, at least one of the skirt part and the beverage container may deform radially complementary to each other to for a liquids-tight connection between the skirt part and the beverage container. In further embodiments, by virtue of the connection element, a liquid tight connection may be achieved between the beverage container and any part of the lid body.

[0015] The first through hole may be a drink hole, a

vent hole, or a combination thereof. The sealing member may be at least partially complementary to the first through hole. The first through hole provides a fluid connection between a container side of the lid body and a drinking side of the lid body, such that beverage may be poured through the through hole from inside the beverage container for example to a drinking user or for pouring beverage out of the beverage container.

[0016] When a through hole is blocked, no or substantially no beverage can pass through the through hole. In particular, a through hole being blocked implies that no beverage can pass from the container side of the lid body through the through hole and subsequently past the liquid-tight sealing surface. Hence, a small volume may be present between the through hole and the sealing member in the closed state, depending for example on the particular shape of the lid body around the through hole.

[0017] The lid assembly may consist of the lid body and the sealing member. The lid assembly is such a case is defined as the assembly of all components which are required for forming a liquid-tight seal for a beverage container and/or all components required for forming a liquid-tight lid body. Any additional components, such as a carrying member for convenient carrying of the lid body is not considered part of the lid assembly.

[0018] The lid body may in embodiments be a monolithic body. Additionally or alternatively, the sealing member may be a monolithic body. Monolithic may be defined as being formed or composed of material without joints or seams, being cast as a single piece, being one rigid whole piece, and/or any combination thereof. A monolithic part can for example by formed in a casting, injection moulding, machining, additive manufacturing, or extrusion process. In particular embodiments, both the lid body and the sealing member may be formed in a single manufacturing step.

[0019] In embodiments, one or both of the lid body and the sealing member may consist of a single material composition. In particular, the lid body may consist of the same single material composition as the sealing member, or the lid body may consist of a different single material composition than the sealing member.

[0020] For example, one or both of the lid body and sealing member may comprise materials based on thermoplastic polymers, for example polyolefins such as polyethylene and polypropylene, acrylonitriles such as styrene-acrylonitrile resin (also known as SAN), polystyrene, Acrylonitrile butadiene styrene (ABS), Polyoxymethylene (POM), Polyether ether ketone (PEEK), polyesters, polyaryletherketone materials, polycarbonates, bio-based polymers such as poly(lactic acid) or any combination thereof.

[0021] A component substantially consisting of a single material composition implies in the context of the present description that the component may be a monolithic part, formed for example in an injection moulding process. A single material composition may consist of a single material, or a mixture of multiple materials which may be a substantially homogenous mixture. Substantially consisting of implies that some part of the component may comprise another material. For example, when ink is printed on the component, this component still substantially consist of a single material although the component carries the ink.

[0022] In particular embodiments, the sealing member may be formed as a spout comprising a drinking passage having an inlet and an outlet, which inlet is aligned with the first through hole when the spout is in the open state and is not aligned with the first through hole when the spout is in the closed state. Hence, when the lid assembly is connected to a beverage container, a fluid connection may be provided between the inside of the beverage container via the drinking passage to a user for drinking beverage from the beverage container.

[0023] The sealing surface of the spout as the sealing member may be provided adjacent to the inlet, or may in particular embodiments even fully surround the inlet.

[0024] When the sealing member is formed as the spout, the lid body may comprise a first annular ridge surrounding the first through hole and protruding away from a container side of the lid body, and in the closed state, the liquid tight seal is formed by direct contact between the first annular ridge and the sealing surface of the spout.

[0025] In embodiments, in the closed state as well as in the open state, and in examples also between the closed state and the open state, direct contact is maintained between the spout and the first annular ridge.

[0026] Direct contact in the context of the present description implies that no intermediate part, such as a resilient sealing ring made for example from silicone, is present between the two components that are in direct contact.

[0027] As an option, in the open state, a liquid tight seal may be formed by direct contact between the first annular ridge and the sealing surface of the spout, which seal provides a leak free flow path for beverage through the first through hole and the drinking passage.

[0028] When the sealing member is formed as the spout, the spout comprises a spherical section comprising the sealing surface which is arranged to form the liquid-tight seal with the lid body. The spherical section may be shaped as a part of a complete ball. When the spout comprises a spherical section comprising the sealing surface, the drinking passage may pass through the spherical section. In particular, the inlet may be provided in the spherical section. The inlet may hence be surrounded by the sealing surface.

[0029] To form the liquid-tight seal, the spherical section may provide a higher stiffness than the first annular ridge. In such embodiments, when the spout is connected to the lid body, the first annular ridge may be deformed due to the presence of the spherical section. The deformation may be a substantially radially deformation, in examples an outwardly radially deformation.

[0030] In another embodiment, the lid assembly com-

prises a first plug, and in the closed state, the first plug directly contacts the first through hole for blocking fluid flow through the first through hole. The first plug may be a substantially solid plug, or may be formed by a ridge encircling a hollow chamber.

[0031] The ridge may be a substantially thin-walled ridge, wherein thin-walled may imply that the wall thickness of the ridge is smaller than a height of the ridge. By virtue of the plug being formed by a ridge, the plug may deform substantially radially when plugged into a through-hole.

[0032] When the sealing member if formed as the spout, the spout may be hingeable around a rotation axis. Furthermore, an outer surface of the spherical section, or at least the sealing surface comprised by the spout, may be provided at a substantially constant first radius relative to a centre point on the rotation axis. The first annular ridge may extend to a substantially constant second radius relative to the centre point, wherein the first radius is equal to or larger than the second radius. Preferably, the first radius is larger than the second radius. By virtue of the first radius being equal to or larger than the second radius, the liquid tight seal may be achieved between the spout as the sealing member and the first annular ridge as part of the lid body.

[0033] When the sealing member is formed as the spout, a plug may extend from the spout in a direction substantially perpendicular to the drinking passage.

[0034] In general, a lid body may comprise any number of through-holes, such as one through-hole, two through-holes, three through-holes, or even more than three through-holes. As such, the sealing member may comprise any number of plugs and any number of spherical sections, wherein any number may also imply zero. In particular, embodiments of a sealing member may comprise two plugs for sealing two separate through-holes, or a spherical section and a plug for sealing two separate through-holes.

[0035] The person skilled in the art will appreciate that the general concept of the aspect can be applied to many different embodiments of lids. Two particular embodiments will be elaborated on in the figures, which both make use of the single general inventive concept of providing a liquid-tightly sealing lid assembly, wherein the sealing surface between the lid body and the sealing member is free of silicone elastomer.

BRIEF DESCRIPTION OF THE FIGURES

[0036] In the figures,

Figs. 1A and 1B show a particular embodiment of a lid assembly;

Figs. 2A and 2B show a cross-section view of the lid assembly of Figs. 1A and 1B;

Figs. 3A and 3B depict another embodiment of a lid assembly;

Figs. 4A and 3B depict the lid assembly of Figs. 3A and 3B in a top view;

Figs. 5A and 5B show a cross-section view of the lid assembly of Figs. 3A and 3B;

Fig. 5 C shows a cross-section of the lid assembly in open position; and

Fig 5 D shows a close-up of Figure 5 C.

DETAILED DESCRIPTION OF THE FIGURES

[0037] Figs. 1A and 1B show a particular embodiment of a lid assembly 100, comprising the lid body 102 and a sealing member 200. The sealing member 200 is arranged to hinge around a rotation axis 202 relative to the lid body 102. In particular, the sealing member 200 is hingeable between the closed state shown in Fig. 1A, and the open state shown in Fig. 1B.

[0038] As an example, the rotation axis 202 is provided near or through a centre line 103 of the lid body 102. In other examples, the rotation axis 202 can be provided further away from the centre line 103 of the lid body. In this particular embodiment, the sealing member 200 is hingeable over an angle approximately between 160 degrees and 180 degrees, which angle corresponds to the shape of the lid body 102.

[0039] As depicted in Figs. 2A and 2B, a surface of the lid body 102 through which the through holes are provided may be at an angle relative to another surface of the lid body 102 through which no through holes are provided. The angle of rotation of the sealing member 200 may correspond to the angle between these two surfaces.

[0040] In the open state, a drink hole 104 as an example of a through hole comprised by the lid body 102 becomes accessible. Furthermore, a vent hole 106 as another example of a through hole comprised by the lid body 102 becomes accessible. As an option, both the drink hole 104 and the vent hole 106 comprise bevelled edges 108 in a transition between a top surface 110 of the lid body 102 and the respective through hole. The bevelled edges 108 may allow easier insertion of a plug compared to a through-hole with a sharp edge.

[0041] The top surface 110 is in the embodiment shown in Fig. 1B a substantially flat surface. In particular, the part of the top surface 110 surrounding the drink hole 104 is a flat surface with no protruding or extending parts protruding or extending away from the top surface 110. The sealing member 200 may comprise a plug surface 217 corresponding to the top surface 110, wherein the plug surface 217 is said surface from which plugs of the sealing member 200 protrude.

[0042] When the top surface 110 is substantially flat, the plug surface 217 of the sealing member 200 may thus also be substantially flat. When the top surface 110 of the lid body 102 is not substantially flat and for example comprises one or more curved sections and/or protrusions, the plug surface 217 may be shaped complementary to the one or more curved sections and/or protrusions.

[0043] The sealing member 200 comprises a drink hole

plug 204 and a vent hole plug 206. In the closed state, both the drink hole plug 204 and the vent hole plug 206 substantially extend towards a container side of the lid body 102.

[0044] For the sealing member 200 to be hingeable around the rotation axis 202 relative to the lid body 102, as an example shown in Figs. 3A and 3B, the sealing member 200 comprises two cams 208 protruding parallel to the rotation axis 202. Each cam 208 extends into a hinge opening of the lid body 102. Alternatively, the cams may be comprised by the lid body, and the hinge openings may be comprised by the sealing member 200. Preferably, by virtue of the hingeable connection, the only degree of freedom for the sealing member 200 relative to the lid body 102 is the rotation around the rotation axis 202.

[0045] As shown in Fig. 1B, the drink hole plug 204 is formed by a thin-walled ridge surrounding a drink hole plug chamber 214. When the drink hole plug 204 is inserted into the drink hole 104, the drink hole plug 204 may deform to correspond better to the shape of the drink hole 104. In particular, at least part of the thin-walled ridge may be elastically deformed inwards into the drink hole plug chamber 214.

[0046] Figs. 2A and 2B show a cross-section view of the lid assembly 100 of Figs. 1A and 1B. The lid body 102 comprises an optional outer skirt 144 and an optional inner skirt 154. The inner skirt 154 is provided with a thread 105 as a connection element for connection with the beverage container. The thread 105 protrudes from an outer wall of the inner skirt 154 away from the centre line 103.

[0047] In the particular embodiment of Fig. 2A, the inner skirt 154 extends further away from the lid body 102 than the outer skirt 144. In other embodiments, the outer skirt 144 extends further away from the lid body 102 than the inner skirt 154, or the outer skirt 144 extends substantially as far away from the lid body 102 as the inner skirt 154.

[0048] Between the outer skirt 144 and the inner skirt 154, a chamber 155 is defined for receiving a rim of the beverage container. In particular, when screwing the lid assy 100 onto the beverage container using the thread 105, the rim may be forced into the chamber 155. By virtue of at least one of a material comprised by the rim and/or by the outer skirt 144, and the shape of the rim and/or the outer skirt 144, a liquid-tight seal may be achieved between the rim and the outer skirt 144.

[0049] More specifically, a sealing surface may be formed between the rim of the beverage container and a part of the outer skirt 144 facing into the chamber 155. This sealing surface may be free of silicone elastomer, whereas in known lid assembly 100, a silicone elastomer ring is provided inside the chamber 155 for forming the sealing surface with the rim of the beverage container.

[0050] In the closed state shown in Fig. 2A, the drink hole plug 204 is plugged into the drink hole 104, and a sealing surface 104' is formed between the thin-walled ridge comprised by the drink hole plug 204 and the drink hole 104. The thin-walled ridge may at least partially be elastically deformed, wherein the ridge is deformed into the hollow chamber 214 to correspond better to the shape of the drink hole 104.

[0051] In particular, when the deformation of the thin-walled ridge is elastic, a force is exerted by the ridge against an inner wall of the drink hole 104 by virtue of the elasticity of the deformed material of the ridge. This may ensure a liquid-tight seal between the drink hole plug 204 and the drink hole 104, without requiring silicone elastomer to ensure that the seal in liquid-tight.

[0052] The vent hole plug 206 is as an example a solid plug, and is in the closed state of Fig. 2A shown plugged into the vent hole 106 to form a liquid-tight sealing surface 106'. The vent hole plug 206 may be elastically deformed when plugged into the vent hole 106, such that the vent hole plug 206 exerts a radial force onto the vent hole 106. This may ensure that a liquid-tight seal is achieved, without using silicon elastomer to form the sealing surface 106'.

[0053] Figs. 3A and 3B depict another embodiment of a lid assembly 300 for liquid-tightly sealing off a beverage container in an isometric view. The lid assembly 300 comprises a lid body 302, with an outer skirt part 304 as a connection element for connecting with the beverage container.

[0054] The lid assembly 300 further comprises a spout 400 as a sealing member. The spout 400 is hingedly connected to the lid body 302, such that the spout 400 can rotate around a rotation axis 402. In particular, the spout 400 can be hinged between the closed state shown in Fig. 3A and the open state shown in Fig. 3B. The rotation angle of the spout 400 between the closed state and the open state may be approximately between 70 degrees and 110 degrees, or even between 80 degrees and 100 degrees. The spout 400 comprises a drinking passage 401.

[0055] Figs. 4A and 4B depict the lid assembly 300 of Figs. 3A and 3B in a top view. In Fig. 4A, the spout 400 is shown in the closed state, and in Fig. 4B, the spout 400 is shown in the open state. In the open state, a vent hole 406 provides a fluid connection through the lid body 400. In particular, the rotation axis 402 is shown in Figs. 4A and 4B.

[0056] As shown in Figs. 4A and 4B, the spout 400 may comprise as an option a set of extending hinge parts 440, which when the lid assembly 300 is assembled, rotate in hinge chambers 340. The hinge parts 440 may be locked up in the hinge chambers 340, such that only the rotation around the rotation axis 402 is allowed, and any other translation is in normal use of the lid assembly 300 prevented.

[0057] In one embodiment, the hinge chambers 340 comprise a wall substantially perpendicular to the angle of rotation of the spout 400. The hinge parts 440 are locked by virtue of a snap-fit connections, provided by a shape of the hinge chambers 340 that narrows from the

top of the lid body 302 and subsequently widens to a shape substantially equivalent to a shape of the hinge parts 440.

[0058] In another embodiment, the hinge chambers 340 comprise a cavity for receiving the hinge parts 440. In this embodiment, the walls of the hinge chambers 340 are not flush; a first distance between the walls of the hinge chambers 340 is at the top of the lid body 302 smaller than a second distance between the walls of the hinge chambers 340 at the bottom of the hinge chambers 340 or in any case at the location of the hinge chambers 340 where the hinge parts 440 are in operation to be located. The cavity may be provided by a gradual increase from the first distance to the second distance or by means of a step function, providing a substantially abrupt transition from the first distance to the second distance.

[0059] This embodiment, with the cavity in the hinge chambers, provides a more reliable, tighter and/or secure fixation of the spout 400 to provide better sealing between the spout 400 and the lid body 302, which will be discussed below in further detail.

[0060] Figs. 5A and 5C depict the lid assembly 300 of Figs. 3A and 3B in a cross-sectional view. Figs. 5B and 5D show a detail of the lid assembly 300 of Figs. 5A and 5C, respectively.

[0061] The lid body 302 comprises the optional outer skirt 344, and a further optional inner skirt 354. Both the outer skirt 344 and the inner skirt 354 protrude from the lid body 302 towards a container side of the lid assembly 300. The outer skirt 344 comprises a thread 305, which extends from an inner wall of the outer skirt 344. The thread 305 may be used as the connection element for connection with the beverage container, wherein the beverage container comprises a complementary thread to the thread 305 of the lid body 302.

[0062] In the particular embodiment of Fig. 5A, the outer skirt 305 extends further away from the lid body 302 than the inner skirt 354. In other embodiments, the inner skirt 354 extends further away from the lid body 302 than the outer skirt 305, or the outer skirt 305 extends substantially as far away from the lid body 302 as the inner skirt 354.

[0063] Between the outer skirt 344 and the inner skirt 354, a chamber 355 is defined for receiving a rim of the beverage container. In particular, when screwing the lid assembly 300 onto the beverage container using the thread 305, the rim may be forced into the chamber 355. By virtue of at least one of a material comprised by the rim, by the inner skirt 354 and/or by the outer skirt 344, and the shape of the rim, the inner skirt 354 and/or the outer skirt 344, a liquid-tight seal may be achieved between the rim and the lid body 302.

[0064] More specifically, a sealing surface may be formed between the rim of the beverage container and a part of the outer skirt 344 and/or the inner skirt 354 facing into the chamber 355. This sealing surface may be free of silicone elastomer, whereas in known lid assemblies, a silicone elastomer ring is provided inside the chamber 355 for forming the sealing surface with the rim of the beverage container. By virtue of the thread 305, the lid body 102 may be forced onto the beverage container, which may cause elastic deformation of at least one of the lid body 102 and the beverage container. In particular, at least one of the outer skirt 344 and the inner skirt 354 may be elastically deformed in a radial direction to better correspond to a shape of the beverage container to create a liquid-tight seal.

[0065] In the particular embodiment of Figs. 3, 4, and 5, the spout 400 comprises a spherical section 408. Preferably, the spherical section 408 has a substantially constant radius relative to a centre point, which centre point lays on the rotation axis 402. The spherical section 408 is not necessarily a full sphere, but may only be part of a full sphere.

[0066] Figs. 5B and 5D show a detailed view of the lid assembly 300 of Figs. 5A and 5C, respectively, showing part of the spherical section 408. Also visible in Figs. 5B and 5D is a first annular ridge 361 and an optional second annular ridge 362. In particular, embodiments of the lid body 302 are envisioned comprising only one annular ridge. Further embodiments of the lid body 302 comprise two annular ridges, three annular ridges, or even four or more annular ridges.

[0067] In Figs. 5B and 5D, the substantially constant radius r of the outer surface of the spherical section 408 relative to a centre point which lays on the rotation axis 402 is shown. Furthermore, preferably, the annular ridge or annular ridges comprised by the lid body are provided at a constant radius r' relative to the centre point which lays on the rotation axis 402.

[0068] For example, when the radius r' defining the distance between the first annular ridge 361 and the rotation axis 402 is smaller than the radius r defining the outer radius of the spherical section 408, a liquid tight seal may be obtained between the first annular ridge 361 and the spherical section 408. The difference between radius r and radius r' may be small, for example smaller than the height of the annular ridge.

[0069] When the lid body comprises a further annular ridge next to the first annular ridge, a radius between such a further annular ridge may be different than the radius r' defining the distance between the first annular ridge 361 and the rotation axis 402. In particular, such a radius may be larger than the radius r', smaller than the radius r', or may in other embodiments be substantially equal to radius r'.

[0070] In particular, when the spherical ridge 408 provides a higher stiffness than the first annular ridge 361, the first annular ridge 361 may be deformed elastically complementary to the spherical ridge 408. With this deformation, a sealing surface 404' is formed between the spout 400 and the lid body 302, forms a substantially liquid-tight seal. Multiple annular ridges may be used to provide multiple liquid-tight sealing surfaces and may thus act as supplementary annular ridges in case one of

the annular ridge does not form a completely liquid-tight seal.

[0071] The difference in stiffness may depend on at least one of: the material comprised by the spherical section 408, the material comprised by the first annular ridge 361, the shape of the first annular ridge 361 and in particular a height and thickness of the first annular ridge 361, the connection between the spout 400 and the lid body 302, the shape of the lid body 302 and in particular the shape of the part of the lid body 302 from which the first annular ridge 361 extends, the shape of the spherical section 408, or any combination thereof.

[0072] As shown in Figs. 5C and 5D, in the open state, a leak free flow path 451 is provided through the drinking passage 401 by virtue of the sealing surface 401' between the first annular ridge 361 and the spherical section 408 of the spout.

[0073] An annular ridge may be a thin-walled annular ridge, wherein thin-walled implies that a height of the ridge is higher than a width of the ridge. In particular embodiments, the height of the ridge may be 1.25 times or more larger than the width of the ridge, 1.5 times or more larger, or even 2 times or more larger. The ratio between the height and the width of a ridge may be chosen for example depending on the material composition of the ridge, of the lid body, and/or of the spout.

[0074] The spout 400 further comprises the vent hole plug 406 arranged to be at least partially inserted into the vent hole 306 and to form a liquid-tight surface with the lid body 302. The vent hole 306 may be a tapered through-hole, tapered towards the container side of the lid body 302. The vent hole plug 406 may hence also be tapered complementary to the vent hole 306.

[0075] In particular, the tapering of the vent hole 306 may be formed by virtue of a chamfering, bevelling, honing, or other manufacturing step which causes a decrease in diameter of the vent hole 306 towards the container side of the lid body 302. The vent hole plug 406 may hence be substantially conical, frusto-conical, dome-shaped, or otherwise tapered, wherein a diameter of the vent hole plug 406 decreases in a direction away from the spout 400. Hence, the sealing surface between the vent hole plug 406 and the vent hole 306 may be a line contact where the diameter of the vent hole plug 406, in elastically deformed or un-deformed state, corresponds to a diameter of the vent hole 306.

Claims

1. Lid assembly for liquid-tightly sealing off a beverage container, comprising:

   - a lid body with a connection element for connection with the beverage container, wherein the lid body comprises a first through hole; and
   - a sealing member, which is hingedly connected to the lid body and is hingeable between an open state and a closed state;

   wherein in the open state, the sealing member allows a fluid flow through the first through hole, and in the closed state, a sealing surface comprised by the sealing member and the lid body form a liquid-tight seal such that the fluid flow through the first through hole is blocked, and wherein the sealing surface is free of silicone elastomer.

2. Lid assembly according to claim 1, wherein the lid assembly consists of the lid body and the sealing member.

3. Lid assembly according to claim 1 or 2, wherein the lid body is a monolithic body.

4. Lid assembly according to any of the preceding claims, wherein the lid body consists of a single material composition.

5. Lid assembly according to any of the preceding claims, wherein the sealing member is a monolithic body.

6. Lid assembly according to any of the preceding claims, wherein the sealing member consists of a single material composition.

7. Lid assembly according to any of the preceding claims, wherein the sealing member is formed as a spout comprising a drinking passage having an inlet and an outlet, which inlet is aligned with the first through hole when the spout is in the open state and is not aligned with the first through hole when the spout is in the closed state.

8. Lid assembly according to claim 7, wherein the lid body comprises a first annular ridge surrounding the first through hole and protruding away from a container side of the lid body, and in the closed state, the liquid tight seal is formed by direct contact between the first annular ridge and the sealing surface of the spout.

9. Lid assembly according to claim 8, wherein in the open state, a liquid tight seal is formed by direct contact between the first annular ridge and the sealing surface of the spout, which seal provides a leak free flow path for beverage through the first through hole and the drinking passage.

10. Lid assembly according to any of the claims 7-9, wherein the spout comprises a spherical section comprising the sealing surface which is arranged to form the liquid-tight seal with the lid body.

11. Lid assembly according to claim 10, wherein the inlet

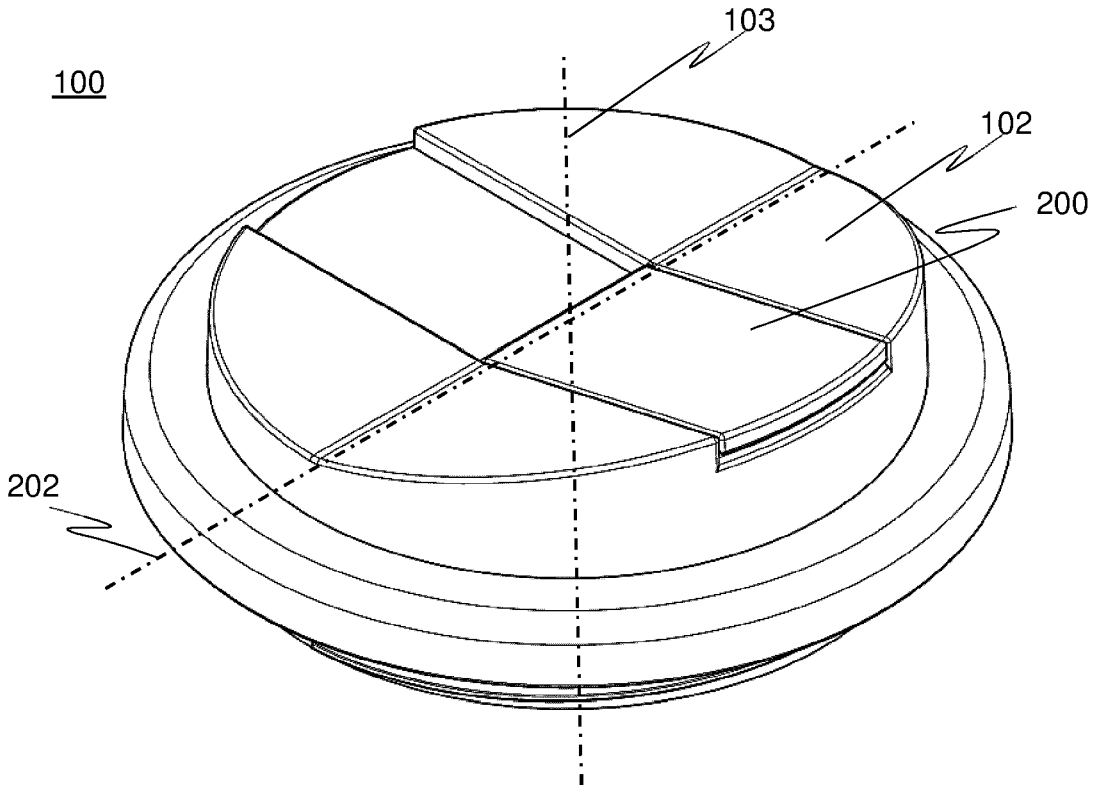
is provided in the spherical section.

12. Lid assembly according to claim 10 or 11, to the extent dependent on claim 8, wherein the spherical section provides a higher stiffness than the first annular ridge.

13. Lid assembly according to any of the claims 10-12, wherein the spout is hingeable around a rotation axis, an outer surface of the spherical section is provided at a substantially constant first radius relative to a centre point on the rotation axis, and the first annular ridge extends to a substantially constant second radius relative to the centre point, wherein the first radius is equal to or larger than the second radius.

14. Lid assembly according to any of the preceding claims, wherein the sealing member comprises a first plug, and in the closed state, the first plug directly contacts the first through hole for blocking fluid flow through the first through hole.

15. Lid assembly according to claim 14, wherein the plug is formed as a ridge encircling a hollow chamber.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202

FIG 1A

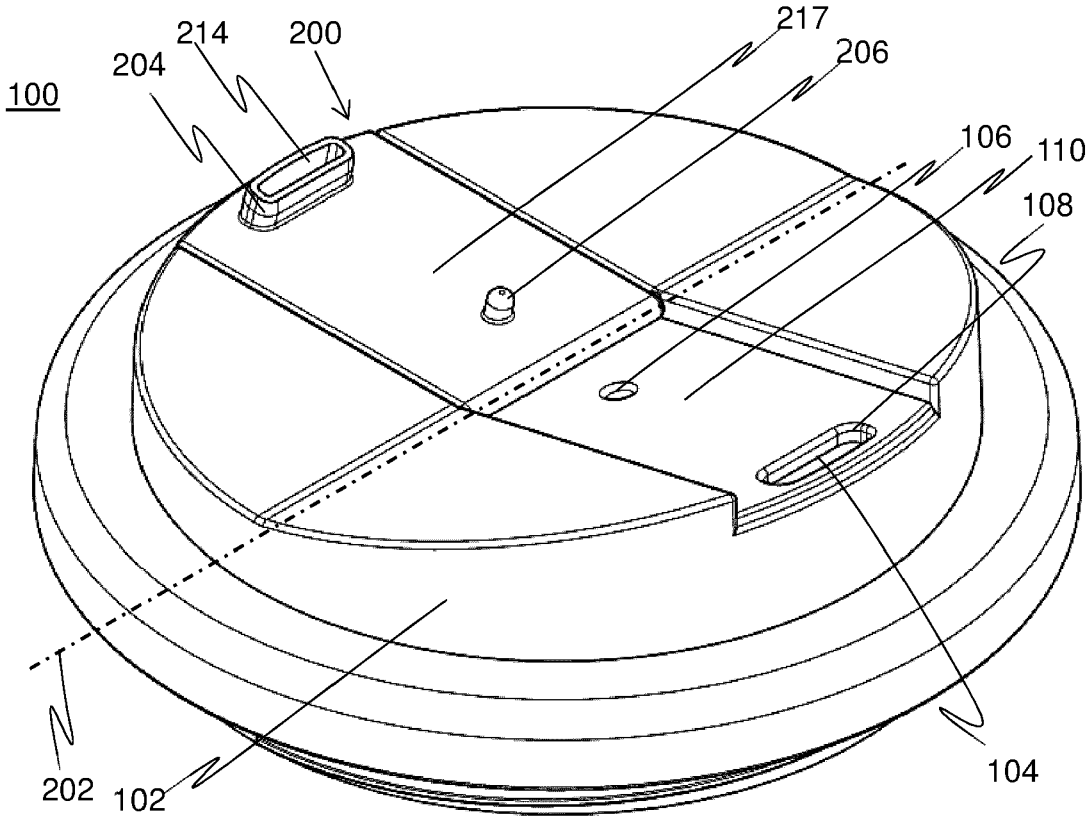
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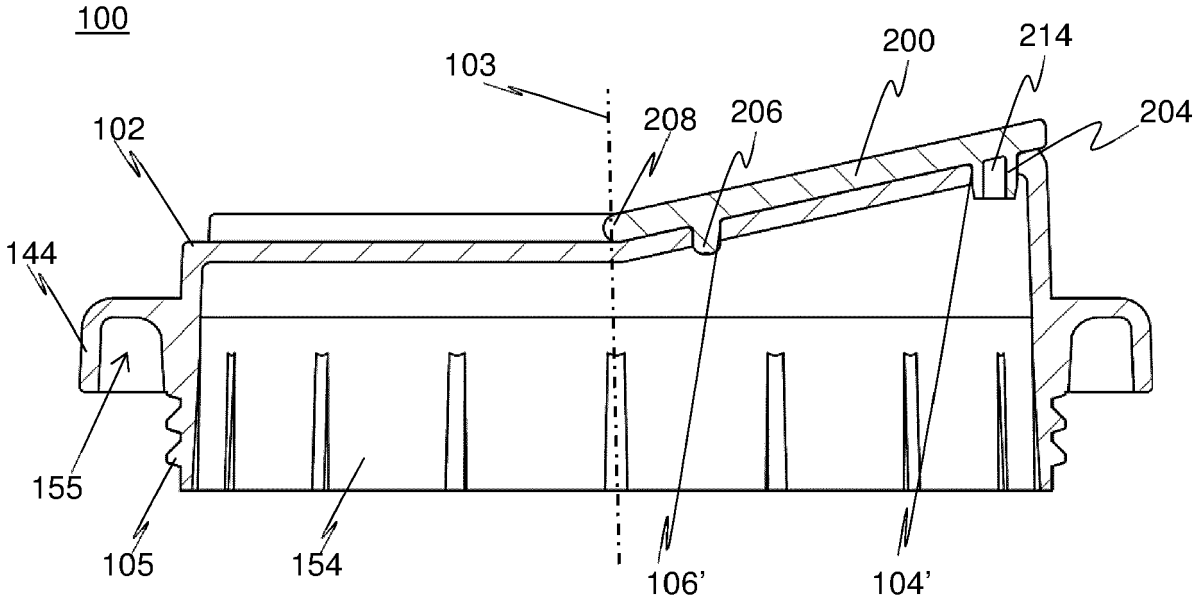
FIG 1B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106'
104'

FIG 2A

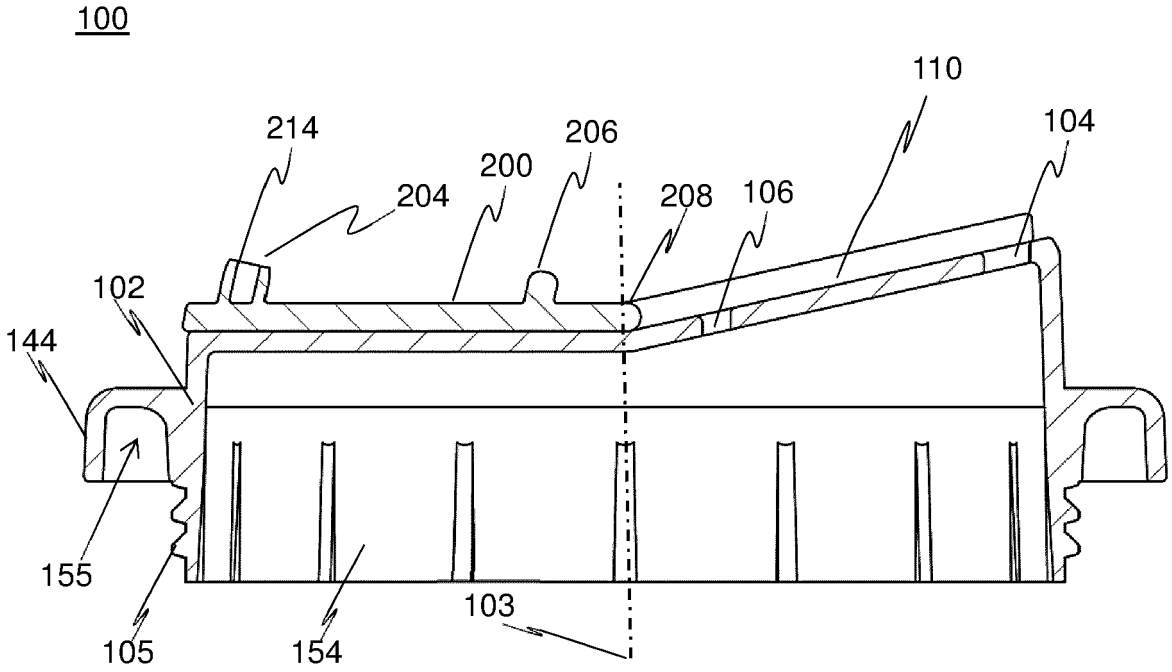
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FIG 2B

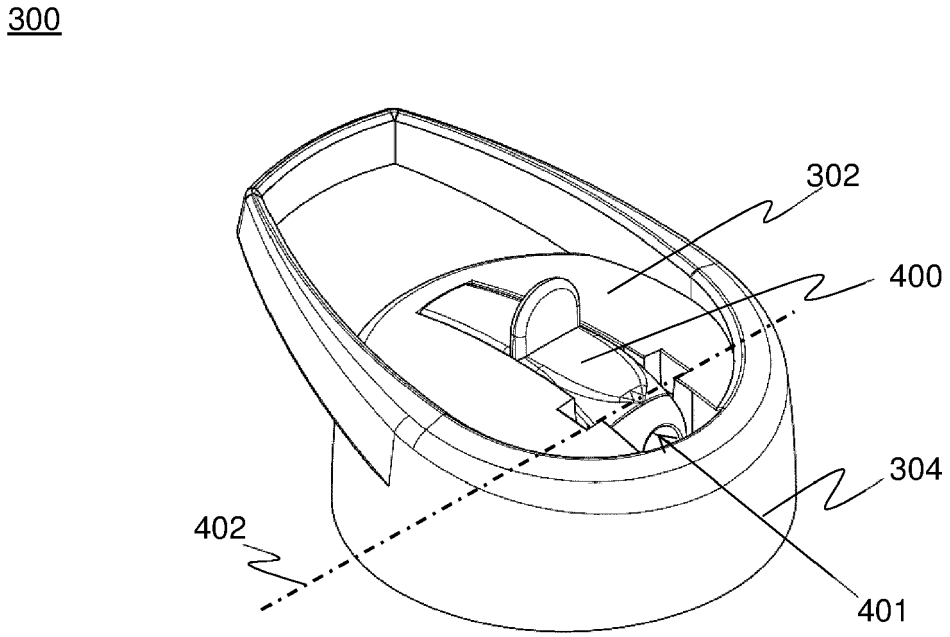

FIG 3A

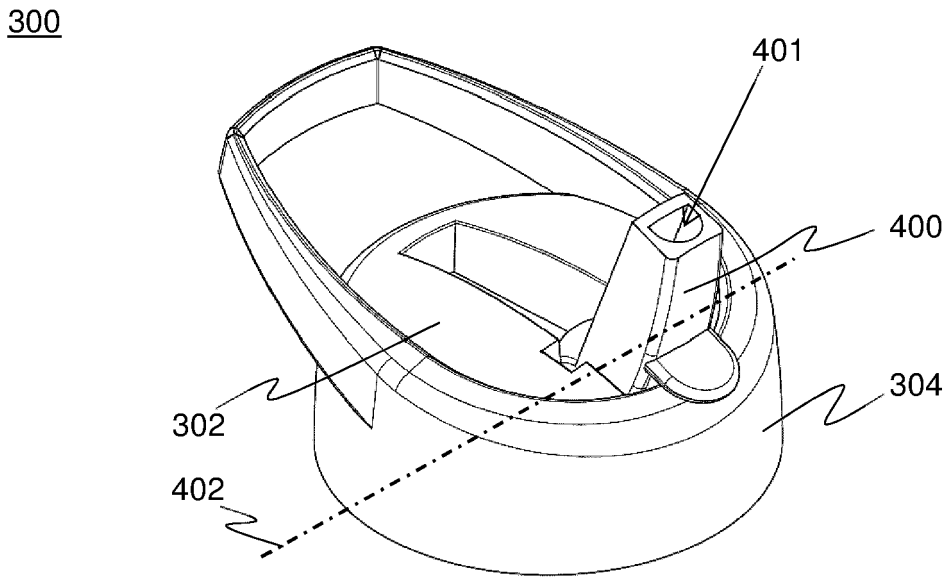

FIG 3B

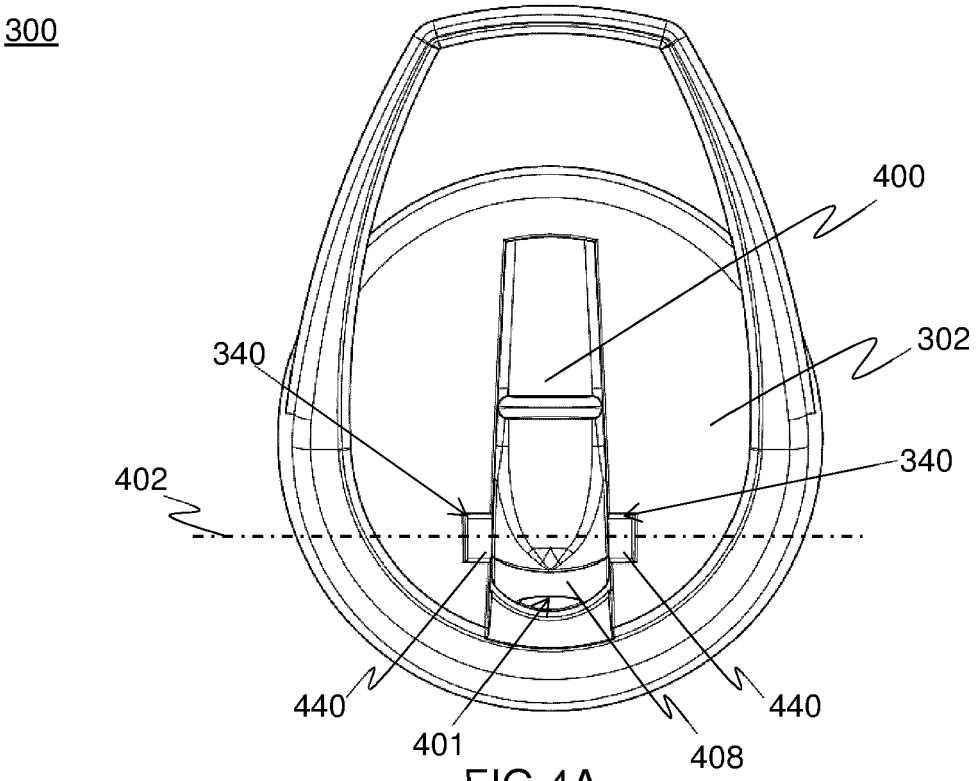
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FIG 4A

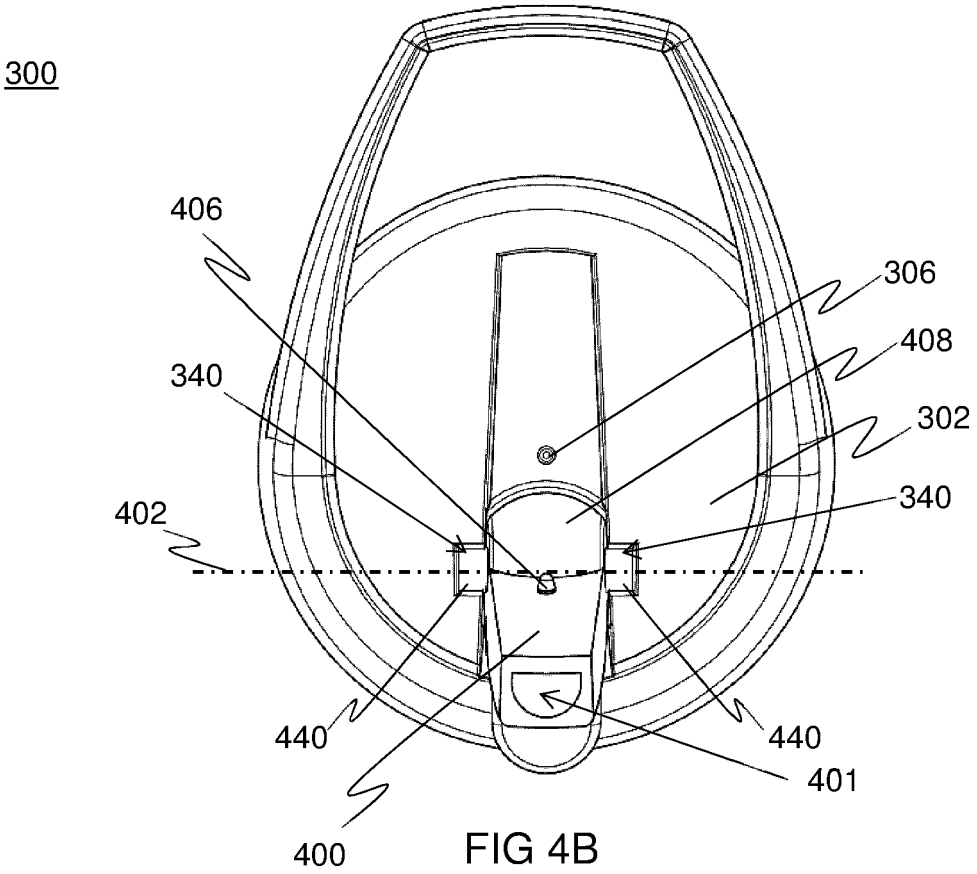
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FIG 4B

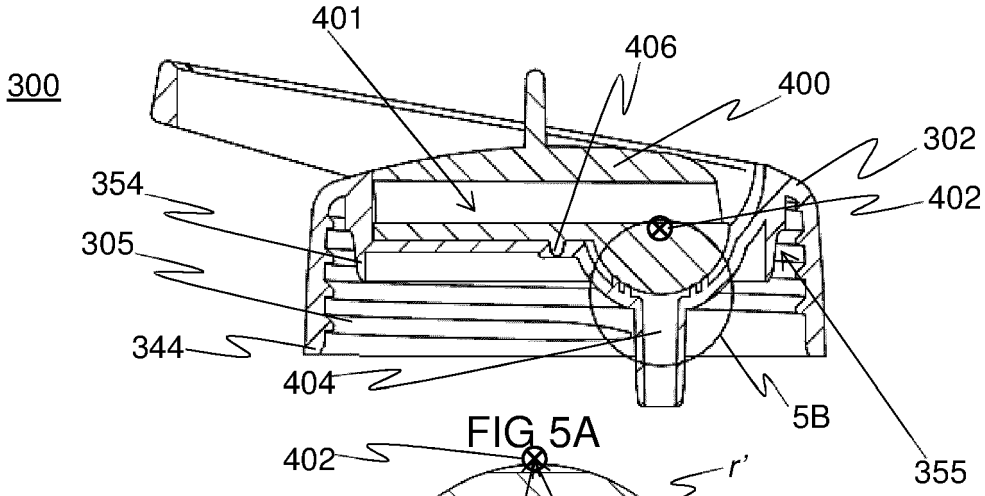

FIG 5A

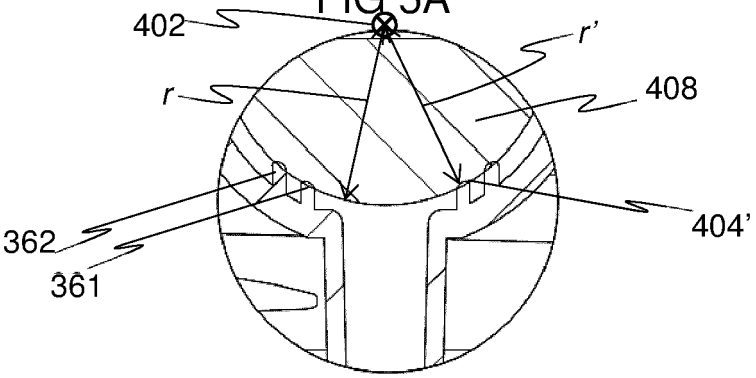

FIG 5B

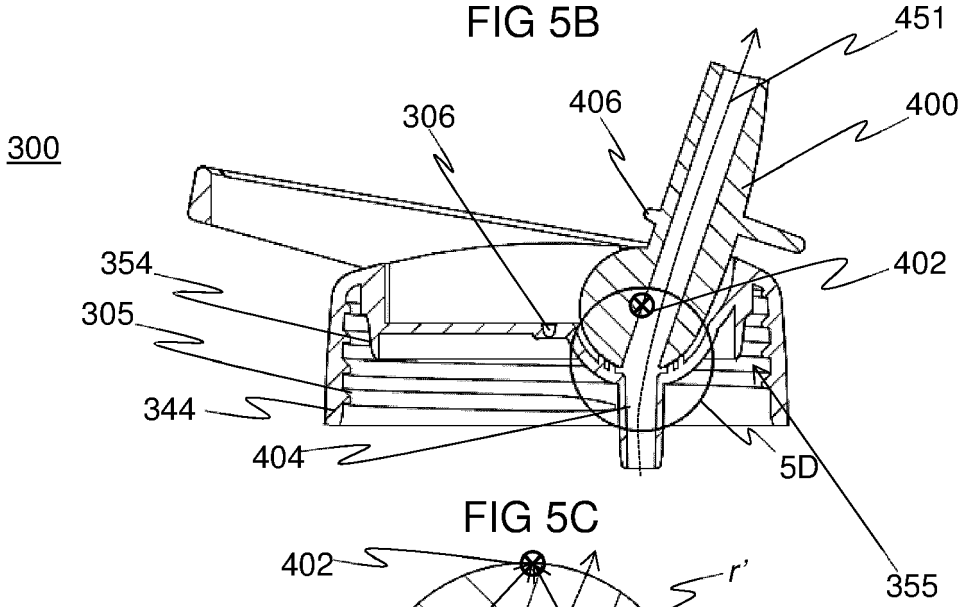

FIG 5C

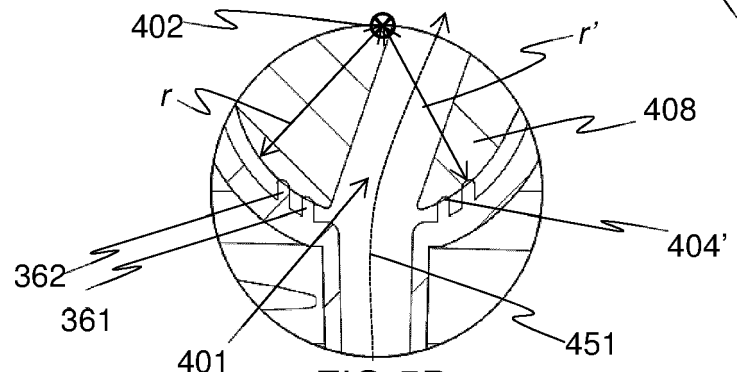

FIG 5D

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 0216

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 2013/063535 A1 (KERSHAW KASEY [US]; MOORE GARY [US]; WINN TRAVIS [US]) 2 May 2013 (2013-05-02) * figure 27 * -----	1-7,10, 11,13-15	
X	US 3 884 392 A (HAZARD ROBERT E) 20 May 1975 (1975-05-20) * ring 52; figure 3 * -----	1-13	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 September 2020	Dominois, Hugo

CATEGORY OF CITED DOCUMENTS

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