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(54) DEVICE FOR CLOSING CONTAINERS, SUCH AS BOTTLES, CANS OR THE LIKE

(57) Closing device for containers, such as bottles, cans, or the like, comprising a stable coupling element (220) at a dispensing opening (201) of said container (200) and a removable closing element (230), to close said dispensing opening, comprising engaging members (233) of said closing element (230) in said closing position, wherein,
the stable coupling element (220) at a container opening consists of a cylindrical capsule which peripherally delimits at least one dispensing duct (224) open at the two ends of said capsule,
said capsule (220) having a stable coupling end to be coupled to the wall (201) that surrounds an opening of said container (200),
said capsule (220) having an end opposite the container (200) and provided with removable coupling members (227) to be removably coupled to a closing element (230);
a closing element (230) shaped as a cylindrical cup and having coupling members (233) intended to engage the coupling members (227) at the opposite-to-the-container end of said capsule (220),
characterized in that
said closing element (230) has an axial annular extension (240) at the head end facing the container (200), the annular extension (240) being connected to the said closing element (230) by a number of bridges (245) of material spread along its circumference,
said axial extension (240) of the closing element (230) being provided with axial and/or circumferential retaining members cooperating with retaining members integral with said capsule (220), so that upon removal of said closing element (230), the bridges of material (245) are cut due to a relative circumferential and/or axial movement between said closing element (230) and said ring (240) .

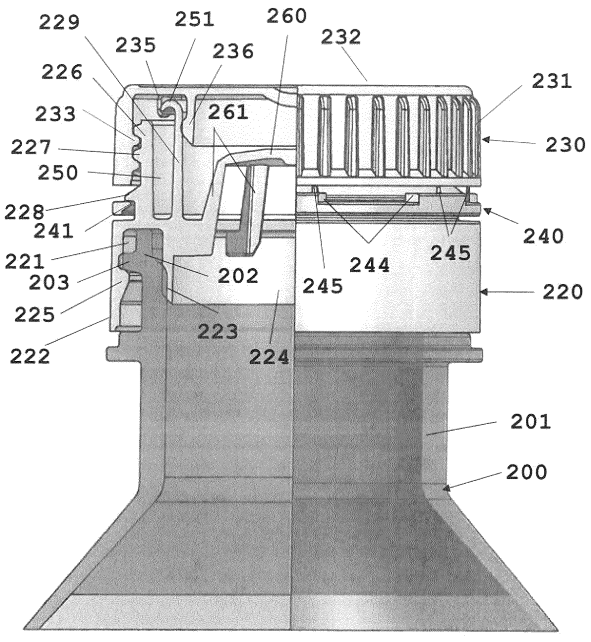

Fig. 3

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Description

[0001] The present invention concerns a closing device for containers, such as bottles, cans, or the like, comprising a stable coupling element at a dispensing opening of said container and a removable closing element, to close said dispensing opening, comprising engaging members of said closing element in said closing position.

[0002] In the state of the art, for example in document US4,299,328, there are known closing devices for containers which are intended to cooperate with the dispensing mouths of containers such as bottles or the like and which are provided with anti-breaking and entering sealing systems or with systems for signaling the opening.

DESCRIPTION OF THE STATE OF THE ART

[0003] The document US4299328 shows, as depicted in figure 1, a section according to a diametric plane of a closing device for a bottle. In this known example, the mouth of the bottle is provided with an outer thread 14 extending for a given length from the terminal length of the neck of the bottle. An annular outer radial widening, denoted by 11, under the outer thread, with reference to the upright position of the bottle and in particular to the vertical position of the axis of the opening at the end of the neck of the bottle, is provided. A closing cap has a cylindrical closing/opening element with an upper base closed by a wall 3 and with a shell wall provided with an inner thread 8 cooperating with the outer thread 14 on the neck of the bottle. The lower open end of the cylindrical shell wall of the cap extends downwardly towards the bottom of the bottle with a fastening ring 7 at the neck of the bottle. This fastening ring has an annular inner radial shoulder whose inner diameter is less than the outer diameter of the annular outer radial widening 11 of the neck of the bottle, while the diameter of the fastening ring 7, in the position next to said annular outer radial widening 11 of the neck of the bottle, is greater than the outer diameter thereof. The fastening ring 7 connects by means of at least one couple, preferably a plurality, of material bridges 13 at the lower annual edge of the shell wall of the cap, said material bridges constituting weakening zones to separate the cap from the fastening ring by means of predetermined breaking zones. The axial sizes of the fastening ring 7, cap and material bridges of the annual outer radial widening 11 of the neck of the bottle are selected so that, in a mounted condition of the assembly of the fastening ring 7 and cap fixed thereto by means of the material bridges, the annular inner radial widening 10 on the fastening ring 7 is positioned behind the annular outer radial widening 11 on the neck of the bottle by stably restraining said assembly on the bottle itself with the thread 8 of the cap engaged in the thread 14 of the neck of the bottle. When unscrewing the cap open for the first time, the material bridges are broken thanks to the relative rotation between the cap and ring 7 and to the simultaneous relative axial translation of the cap with respect to the fastening ring 7, thus allowing to remove the cap and to position it in a sealingly condition several times by means of the repeated unscrewing and screwing of the cap on the neck of the bottle.

[0004] According to the embodiment shown, the cap and fastening ring assembly is made like a capsule that is mounted by elastic force fitting on the terminal end of the neck of the bottle. In order to facilitate this, in a condition before the mutual interlocking, the facing surfaces of the thread(s) and/or of the annular inner narrowing of the fastening ring 7 and of the outer radial widening of the neck of the bottle are made conically tilted in a concordant direction and operate as pilot surfaces during the coupling step by interlocking.

[0005] According to an alternative embodiment, when the container does not have a dispensing mouth constituted by a cylindrical mouth or spout, but the dispensing opening is provided in a wall, such as for example in the case of cans or the like, the fastening ring is constituted by a pouring element which has an interlockingly coupling end by elastic force fitting in the dispensing opening. In this case, the fastening ring is constituted by a pouring element provided with coupling crown to sealingly couple with the edge of the delivering hole in the wall of the container and with a dispensing lip or mouth provided with removably and sealingly fastening members of a cap. Such as solution is known for example by the document IT1232510 (IT12572A/89) of the same applicant of the present patent application.

Object of the Invention

[0006] As described above, in US4299328, the fastening ring 7 constitutes a safety sealing ring for the cap which signals whether or not the bottle was opened by acting on the cap itself. In the known closing devices that operate similarly to that which is described in US4299328, the fastening ring with the safety sealing function remains constrained to the bottle once it is opened. In many cases, this ring, which is relatively deformable, tends to easily separate from the neck of the bottle by overcoming the restraint constituted by the annular outer radial shoulder and is thus dispersed in the environment.

[0007] From a constructive point of view, the use of closing devices such as the one described in US4299328 requires that the neck of bottle to be shaped in a particular way and corresponding to the fastening ring so that to ensure the functionalities described above.

[0008] According to a first aspect, the invention concerns a closing device for containers, such as bottles, cans, or the like, comprising a stable coupling element at a dispensing opening of said container and a removable closing element, to close said dispensing opening, comprising engaging members of said closing element in said closing position, wherein

the stable coupling element at a container opening consists of a cylindrical capsule which peripherally delimits

at least one dispensing duct open at the two ends of said capsule,
said capsule having a stable coupling end to be coupled to the wall that surrounds an opening of said container,
said cylindrical capsule having an end opposite the container and provided with removable coupling members to be removably coupled to a closing element;
a closing element shaped as a cylindrical cup and having coupling members intended to engage the coupling members at the opposite-to-the-container end of said capsule;
said closing element having an axial annular extension at the head end facing the container, the annular extension being connected to the said closing element by a number of bridges of material spread along its circumference,
said axial extension of the closing element being provided with axial and/or circumferential retaining members cooperating with retaining members integral with said capsule, so that upon removal of said closing element, the bridges of material are cut due to a relative circumferential and/or axial movement between said closing element and said axial extension ring.

[0009] According to an embodiment, said axial extension of the closing element is provided with one or more inner radial recesses intended to be arranged behind one or more outer radial protrusions on the cylindrical capsule, with reference to the direction of the closing element's removal from the cylindrical capsule.

[0010] According to a preferred embodiment, the coupling members on the cylindrical capsule and those on the closing element consist of an outer thread on a cylindrical wall delimiting the dispensing opening of the capsule and an inner thread on the shell wall of the cylindrical closing element, the threads cooperating with each other by rotating the closing element relative to the capsule.

[0011] An embodiment provides that the axial extension ring of the shell wall of the closing element has a crown of inner radial recesses or a continuous annular inner radial shoulder.

[0012] An embodiment, which can be provided in any combination with the preceding embodiments, provides that said one or more outer radial projections of the shell wall delimiting the dispensing opening are constituted by a crown of radial teeth or by a continuous annular inner radial shoulder.

[0013] The stable coupling of the capsule with the container can occur in different ways.

[0014] According to a preferred embodiment variant, the coupling of the capsule with the opening of the container occurs by interlocking means by elastic force fitting said capsule on at least one strip of the wall surrounding said dispensing opening of the container.

[0015] In an embodiment variant, wherein the container is in the form of a bottle or the like, that is to say, it has a cylindrical dispensing spout delimiting a dispensing opening, said capsule has on the coupling end to be coupled to said dispensing spout a cylindrical annular seat having preset thickness and engaging a certain axial length of an annular band of shell wall of said spout at the dispensing end of the container and/or at the container mouth.

[0016] The thickness of said seat is commensurate to the thickness of said shell wall of the dispensing mouth of the container, so that to generate the reciprocal locking force between said capsule and said mouth.

[0017] Still according to an embodiment in combination with a container having a cylindrical dispensing mouth and which mouth has a plurality of outer radial ridges distributed along the shell surface at a predetermined distance from the dispensing mouth, i.e. from the dispensing end of said mouth, or a continuous radial fin or a continuous annular outer radial widening, said capsule has, at a corresponding axial position with reference to the axial extension of said axial engagement seat, a plurality of radial fins and/or a continuous annular radial shoulder respectively intended to be hooked behind said plurality of outer radial ridges of said mouth, or behind said continuous radial fin, or a continuous annular outer radial shoulder of said mouth, with reference to the slipping off direction of the element closing and disengaging or axially spacing said capsule from said mouth.

[0018] According to an embodiment, when in combination with a container having a cylindrical dispensing mouth, said mouth has at least one or a plurality of outer radial ridges or axial knurl distributed along a strip of the shell surface at a predetermined distance from the dispensing mouth, i.e. from the dispensing end of said mouth, the capsule has, in a position coincident with said strip, respectively at least one tooth, a crown of inner radial teeth or a strip comprising an axial knurl which are intended to radially engage with the corresponding tooth or with the corresponding plurality of teeth or with the strip provided with the axial knurl on said mouth of the container, thus rotatingly constraining said capsule and said mouth to each other.

[0019] Still according to a further characteristic, the cylindrical capsule constituting a dispensing element has a cylindrical section axially extending the dispensing opening of the container and/or the dispensing spout of said container, the cylindrical section having a shell wall provided with the coupling members to be coupled to the closing element, in particular with the outer thread.

[0020] According to a further characteristic, said cylindrical section axially extending the dispensing opening and/or the dispensing spout of the container also carries said one or more outer radial protrusions or the outer annular radial shoulder of the dispensing capsule cooperating with the plurality of inner radial recesses or with the inner continuous radial annular shoulder of the ring axially extending the closing element.

[0021] Still always according to a further characteristic which can be provided in any combination with one or more of the preceding characteristics, the capsule has, on the dispensing end, at least one, preferably a couple of cylindrical shell walls delimiting an annular duct, the

most radially inner cylindrical shell wall delimiting a dispensing duct and projecting beyond the most outer shell wall at the dispensing end.

[0022] According to an advantageous characteristic, said end of the radially most inner shell wall has a drip-stopping end lip which is outwardly and backwardly folded at its end.

[0023] Preferably said end lip is of a rounded cross-section, in particular semicircular or conical.

[0024] Advantageously, said end lip has a radial projection from the outer surface of the radially inner cylindrical shell wall which is shorter than the radial width of the duct whose opening is axially coincident.

[0025] This end drip-stopping lip has the function of preventing the formation of drops that can drip along the capsule, thus compromising a successive pouring during the final and/or initial pouring step.

[0026] Still according to a further characteristic which can be provided in combination with one or more of any of the preceding embodiments, the material bridges are constituted by axial ribs with transversal section with reference to the axis of the extension ring, arched-shaped, in particular semicircular.

[0027] According to an embodiment, the material bridges are symmetrically distributed with respect to a diametric, axial, plane of the extension ring, which plane passes through two material bridges diametrically opposite each other, whereas the material bridges adjacent to said plane of symmetry are obtained with an asymmetrically arched shape having a rectilinear length on the side closest to the plane of symmetry itself.

[0028] An embodiment provides that there is a succession of axial recesses alternated to axial projections of the head edge facing the closing element along the angular extension of the extension ring, said projections being distributed angularly equidistant from each other and having identical angular extension, while the two material bridges are provided in the central zone of an intermediate length between two adjacent axial recesses, which intermediate lengths are diametrically opposite each other and the remaining bridges are provided on each of the longitudinal ends, i.e. in direction of the circumference of the intermediate segments between the further axial recesses.

[0029] An embodiment provides that the inner radial recesses of the extending ring cooperating with the outer radial projections or the outer radial annular shoulder of the dispensing capsule for the retention of the extending ring are provided at the axial recesses and substantially along the angular length thereof.

[0030] Still according to a further characteristic, which can be provided in combination with one or more of any of the preceding embodiments and embodiment variants, the invention can provide that the dispensing opening delimited by the dispensing capsule is provided with a regulator to regulate the delivering flow, which regulator comprises a shielding wall transversal to the axis of the dispensing opening which is restrained at a given axial distance from the side edge delimiting the dispensing opening by means of radial arms, which are angularly distributed around said axis of the dispensing opening and which delimit the sides of at least one, two or more dispensing mouths.

[0031] According to an embodiment variant, the shielding wall and the radial arms, the latter connecting the former to a perimeter band of the dispensing duct, or to the edge of the dispensing opening, are both dimensioned so that the dispensing mouths have a passage port in a radial, and/or axial, and/or circumferential direction, able to generate a fluid meniscus that slows down or prevents the fluid flow in a direction opposite to the spill due to the effect of the surface tension of the fluid itself.

[0032] A preferred embodiment provides that said one, two or more dispensing opening are constituted by dispensing slits or slots with a axial width smaller than their length in a circumferential direction, such width being determined according to the surface tension of the type of fluid intended to be contained inside the container and so that to form a meniscus of fluid that slows down or essentially reduces the fluid flow coming into the container as a result of said surface tension.

[0033] Still according to an embodiment variant, which can be provided in combination with or separately from the preceding, the device has at least two dispensing openings or at least two groups of adjacent dispensing openings or combinations of at least one of these dispensing openings with at least one of these groups, each of the at least two openings or the at least two groups or the combinations of at least one dispensing opening and at least one group of openings having an overall passage port different from each other and each of the openings and/or the groups of openings with a different overall passage port being arranged at a different angular position with respect to the axis of the dispensing duct.

[0034] This allows to make a fluid flow come out through the dispensing openings that have a different flow rate depending on the slope of the container on which the device is mounted in direction of one of said openings and/or one of said opening assemblies.

[0035] An embodiment variant can provide that said at least two openings and/or said at least two opening assemblies or the combination of at least one opening and at least one opening assembly having different global passage ports can be arranged in a position diametrically opposite from each other and generate dispensing flows of different flow rate thanks to the different global passage ports.

[0036] Still according to a possible characteristic, on a part of an outer surface of the device and in a position radially coincident with each of said at least two openings or each of said at least two groups of openings or the at least one opening and the group of openings of the combination of an opening and a group of openings, quantitative indications of the respective flow rate of the fluid through the corresponding opening or the corresponding

group of openings are provided, preferably indications of the respective fluid flow rate through an opening or group of openings with respect to the fluid flow rate through the at least one additional opening and/or the at least one additional group of openings.

[0037] According to an embodiment, the closing device according to one or more of the preceding characteristics relative to the passage port of the fluid flow provides, in a first angular position, a first dispensing opening whose passage port corresponds to the minimum rate provided for the fluid flow being delivered, whereas, in at least one further different angular position, there is a further dispensing opening having a passage port corresponding to a whole multiple of the passage port of said first opening or an assembly of passage openings adjacent to each other, each of which has a passage port corresponding to the passage port of said first dispensing opening.

[0038] Still in an embodiment variant, it is possible to provide different dispensing openings and/or dispensing opening assemblies and/or combinations of dispensing openings and opening assemblies that are different from one another for a different fluid flow passage port and which are distributed, starting from a first dispensing opening having a passage port corresponding at a minimum fluid rate in a circumferential direction, angularly spaced from each other, each angular space pitch corresponding to a pitch increasing the passage port with respect to that of the preceding dispensing opening or opening assembly.

[0039] An embodiment could provide four dispensing openings or four dispensing opening assemblies or combinations of dispensing openings and opening assemblies that are arranged in angularly spaced positions of 90° from each other and each of which has a different passage port and respectively greater than that of the preceding opening or opening assembly, starting from a first opening having a passage port of a minimum extent with respect to the others.

[0040] According to an embodiment which can be provided in any combination with one or more of the preceding embodiments and embodiment variants, the shielding wall is provided embedded in an intermediate position of the dispensing duct provided in the cylindrical capsule and at a given distance from the end of said capsule opposite the opening of the container.

[0041] In an embodiment variant, in which the capsule has on the dispensing end a couple of cylindrical shell walls delimiting an annular duct, said shielding wall is provided coaxial to the most radially inner cylindrical shell wall and at a distance from the dispensing end thereof.

[0042] An embodiment provides that the flow regulator and thus the shielding wall have a rotational symmetry with reference to the axis of the dispensing opening and/or of the cylindrical capsule and of the dispensing duct provided therein.

[0043] A further variant, which can be provided in any combination with one or more of the preceding ones, provides that the shielding wall of the flow regulator has a smaller radial extension at a predetermined extent of the radial extension of the edge delimiting the dispensing duct present inside the capsule at the point where the inner diameter of said duct is smaller. Such radius difference can be very small and such as to form an annular slot or slit in a plan view projection in direction of the axis of said duct.

[0044] Still according to a characteristic, which can be provided in any combination with one or more of the preceding embodiments and/or embodiment variants, the removable closing element has a top constituted by a wall transversal to the axis of the dispensing opening and/or of the dispensing duct present in the cylindrical capsule, sealing members of the dispensing opening, cooperating with the wall(s) delimiting said opening, departing from the inner side of this top.

[0045] Different variants are possible relatively to the characteristic mentioned above.

[0046] Two embodiment variants provide, alternatively or in combination with each other, an annular sealing lip departing from the side of the top of the movable closing element and which is intended to sealingly adhere against the inner edge of the wall delimiting the dispensing opening and/or dispensing duct present inside the capsule, an annular, cylindrical rib departing from the top of said movable closing element and which is elastically forced with a predetermined force against the drop-stopping lip in the ending screwing step, preferably against the annular part projecting outside of said drop-stopping lip, the inner diameter of said annular rib being slightly less than the maximum outer diameter of said drop-stopping lip.

[0047] An embodiment provides that the aforesaid annular sealing lip according to the first alternative described above has a rounded convex widening at its free end opposite the top of the removable closing element and that it tapers to form a conical surface for piloting the engaging at said end.

[0048] In combination with a cylindrical capsule of the type wherein the capsule has on the dispensing end a couple of cylindrical shell walls delimiting an annular duct, said sealing lip is coaxial to the most radially inner cylindrical shell wall and has a diameter according to the inner diameter of the most radially inner shell wall so that to be inserted therein and to generate, with the progressive screwing, a radial contact compression of the outer convex widening, within the intrinsic elasticity of said lip and said shell wall, which compression generates a sealing contact strip between said lip and the inner surface of said most radially inner shell wall.

[0049] A similar shape is also possible in an embodiment variant in which a duct is not provided, but in which the capsule extends beyond the end of the mouth of the container or of the neck of the container with a single shell wall delimiting the dispensing duct.

[0050] Also in this case, when the symmetry is rotational with reference to the axis of the dispensing opening and/or dispensing duct present inside the capsule, the

sealing lip is cylindrical and coaxial to the axis of the removable closing element and to the axis of the dispensing opening or duct.

[0051] Still according to a characteristic of the present invention, which can be provided in any combination with the preceding embodiments, limit stop members are provided for the screwing of the removable closing element on said stable coupling element at the opening of a container, i.e. said cylindrical capsule, such members being provided in part on the cylindrical capsule and in part on the removable closing element and are thus constituted respectively by a radial limit stop wall integral with said stable coupling element and by at least a cooperating radial fin projecting inwardly from the wall of the top and/or shell of the removable closing element.

[0052] In an embodiment, the radial tooth combined with the stable coupling element, i.e. with said capsule, is constituted by the radial front of an axial recess of the cylindrical shell wall bearing the outer thread cooperating with the inner thread of the removable closing element.

[0053] The object of the invention concerns a closing device intended to be coupled with a dispensing opening or mouth of a container of any type.

[0054] The object of the invention also concerns a combination of a closing device with a container of the bottle type or of the type provided with a cylindrical dispensing mouth delimiting a dispensing duct of the container.

[0055] An embodiment variant instead provides a combination of the closing device with a container of the can type or similar, in which a dispensing opening is provided in a zone of an essentially flat wall of said container.

[0056] In this case, as is immediately clear to the technician of the field, the coupling end of the capsule for coupling with the container is made according to a variant with respect to the embodiment illustrated below, by way of example according to one or to a combination of the embodiments described in one or more of the documents IT113343, IT1180803, IT1180804, IT12205818 and/or IT1232510 of the same holder of the present patent application, as far as the coupling end of the capsule for coupling with the edge delimiting the dispensing opening in said wall of the container is concerned.

BREIF DESCRIPTION OF THE FIGURES

[0057] These and further characteristics and advantages of the present invention will become clearer in the following description of some exemplary embodiments shown in the accompanying drawings, in which:

Figures 1A and 1B show a closing device according to the known art in section according to transversal plane and limitedly to a part of the neck of a bottle.

Figures 2 to 5 show different views of a first embodiment of the closing device according to the present invention in a condition mounted on the neck of a bottle, i.e. on the cylindrical dispensing mouth of a container.

Figure 6 shows a section according to a diametric plane parallel to the axis of the dispensing opening of the closing device according to the embodiment of figures 1 to 5 in a condition separated from the container.

Figures 7 and 8 show a perspective view and a plan view of the cylindrical capsule of an embodiment of the device according to the present invention.

Figures 9 and 10 show sections of the capsule according to figures 7 and 8 along a sectional plane diametric and parallel to the axis of the dispensing opening and respectively along the lines A-A and B-B of figure 8.

Figures 11 and 12 show a perspective view and a plan view from above of the removable closing element according to the embodiment of figures 7 to 10.

Figures 13 and 14 show respectively a sectional view according to a plane diametric and parallel to the axis of the dispensing opening along the line A-A of figure 15 and a side elevation view of the removable closing element according to figures 11 and 12.

Figure 15 shows a view of the removable closing element in direction of the axis of the dispensing opening, in which the cylindrical part with the closed top was omitted and only the fastening ring with the material bridges, each of which is shown with an enlarged corresponding particular, is visible.

Figures 16 to 18 show an embodiment variant of the device according to the present invention, in which the passage ports of the dispensing openings are made like slots or slits having a width such as to prevent or substantially slow down the filling flow of the container by effect of the surface tension of the fluid.

Figures 19 to 21 show a further embodiment variant in which dispensing openings, that allow different dispensing rates flow, are provided, in particular a greater and a minor flow rate depending on the direction towards which the container is tilted when pouring.

Figure 22 shows respectively limit stop members for the screwing of the removable closing element on the capsule coupled with the container and anti-rotation locking members of the capsule for locking the rotation on the mouth or neck of the container in the same embodiment, but without constituting a combination commitment of said two characteristics.

DETAILED DESCRIPTION OF THE FIGURES

[0058] The embodiment examples shown in the figures comprise combinations of the different characteristics that were described as embodiments or embodiments optional and/or alternative between each other or combined with each other. The fact that all of the aforesaid characteristics are shown together in the figures must not be considered as limiting with respect to the possibility of providing sub-combinations of these characteristics

according to the introductory part of the present description. With regard to the aforesaid characteristics, the technician of the field is perfectly able to unambiguously understand which of these is essential and which is instead optional and to draw inspiration from the combinations of the embodiments shown in the figures in order to provide sub-combinations or intermediate generalizations of the technical characteristics. Thus, the fact that the description of the detailed embodiment examples shows all of the characteristics together must not be understood as limiting with respect to the generalizations that only provide part of these, since the technician of the field is perfectly able to understand which of the characteristics of every possible sub-combination are essential.

[0059] A container 200 of the type corresponding to a bottle and which provides a neck zone constituted by a cylindrical dispensing mouth denoted by 201 is shown in figure 1. At the terminal end of the mouth 201, there is a closing device according to an embodiment of the present invention, which device comprises a stable coupling element to couple the closing device with the mouth 201 of the bottle 200, which is formed by a cylindrical capsule 220 of which only the lower end coupling with the mouth 201 is visible. A removable closing element 230, which has a cylindrical shape with a shell wall 231 and a closed head wall 232, is removably fixed on the end of the capsule 220 opposite the container 200. The cylindrical shell wall 231 extends axially at the open end of the closing element 230 with a sealing ring 240 that, as will be shown and described in more detail below, has axial restraining members against a rotation thereof relatively to the shell wall 231 of the closing element 230, while said ring is fastened at the head edge of the shell wall 231 on the open side of the closing element by means of a plurality of material bridges 245 constituting predetermined breaking zones.

[0060] As will become clear in the further figures 3 to 15, the coupling end of the cylindrical capsule 220 has an annular throat 221 which is outwardly delimited by a cylindrical shell wall 222 surrounding, at a given radial distance, a coaxial more radially inner cylindrical shell wall 223 and which delimits a dispensing duct 224 coaxial to the dispensing duct or to the dispensing opening defined by the mouth or by the neck of the bottle or container.

[0061] According to a further characteristic, the most radially outer shell wall 222 outwardly delimiting the annular throat 221 has, in a predetermined axial position relatively to the axial extension of said wall 222, an inner radial shoulder 225. This can be constituted by a crown of inner radial teeth departing from the inner surface of said wall 222 or by a continuous annular inner radial shoulder departing from said wall 222.

[0062] Said inner radial shoulder 225 has, on the side facing the open end of the annular throat 221, a conically tapered surface widening towards said end, starting from a zone of maximum radial projection of said shoulder 225, while the opposite head side forms a steeper front. The function of the conically tapered front is that of a conical pilot surface and the function of the opposite front is that of forming an abutment step for interlockingly coupling an outer radial shoulder 203 provided at an end length 202 of the dispensing mouth 201 of the container 200.

[0063] The most radially inner wall 223 delimiting on the inner side of the annular throat 221 and defining the dispensing duct 224 has, on the head end facing the container, a conically tapered edge in a way opposite the front of the radially most outer wall 222. Said wall 223 has an axial extension such as said wall overlaps the inner surface of said mouth for a determined axial length in a condition of the capsule coupled with the end of the dispensing mouth 201 of the container 200.

[0064] Advantageously, the annular inner shoulder 225, the annular throat 221 and the radially most inner wall have sizes such as to simultaneously generate, for a predetermined standard thickness of the shell wall of the dispensing mouth 201 of a container, both a mechanical coupling stably restraining in position, at least relatively to an axial slipping off of said capsule 220 on said mouth 201, and a seal at least between the radially most inner wall 223 of the capsule 220 and the inner surface of the dispensing mouth 201 of the container.

[0065] Such a seal is advantageously also generated between the most radially outer walls 222 of the capsule 220 and the outer surface of the mouth 201, and in particular between the annular inner shoulder 225 of this wall 222 and the mouth, i.e. the outer radial shoulder 203 of said dispensing mouth 201.

[0066] According to an optional characteristic, the most radially inner wall can have, on the side facing the throat 221, at least one radial tooth or more radial teeth or a crown of radial teeth, which is/are intended to engage in corresponding notches provided in the facing inner side of the wall of the mouth 201.

[0067] In an embodiment, the most radially inner wall 223 delimiting the annular throat 221 with respect to the dispensing duct 224 cooperates with a narrowing of the inner wall of the mouth 201. This narrowing can be obtained thanks to a thickening of the wall of the mouth 201 of the container 200 or thanks to a folding similar to an inner radial step of said wall changing over from a greater diameter to a smaller diameter in the zone in which it is intended to cooperate with the most radially inner wall 223 of the capsule 220, and which smaller diameter is commensurate with the diameter on the outer side of said radially most inner wall 223, i.e. with the surface of said wall 223 facing the throat 221.

[0068] In combination with this embodiment, the engaging notches of the radial tooth/teeth provided according to a preceding embodiment, is/are open on the step-like narrowing face of the wall of the mouth 201, thus when coupling the corresponding outer radial teeth on the side of the most radially inner wall 223 facing the throat 221, they can be engaged in said notches thanks

to a travel of axial connection.

[0069] Still according to an embodiment variant, which can be provided in any combination with one or more of the preceding embodiments or embodiment variants, one or more radial teeth can also be provided on the annular shoulder 203 projecting from the outer side of the shell wall of the dispensing mouth 201 of the container 200.

[0070] With regard to the embodiments that provide radial teeth and cooperating radial notches, it is also possible that the radial teeth are internal respectively provided on the inner surface of the mouth 201 and on the inner surface of the most radially outer wall 222, while the engaging notches are provided respectively on the cooperating most radially inner wall 223 delimiting the connecting throat 221 and on the radially outer annular shoulder 203 of the mouth 201 of the container 200.

[0071] As is clear in the figures, the capsule 220 extends beyond the end of the mouth 201 with a cylindrical extension length 226 of the capsule being provided with a thread 227 on the outside.

[0072] The cylindrical length 227 has, on its end connecting to the most radially outer wall 222 and in an intermediate position between said outer thread 227 and the connecting end of the most radially outer wall 222, an outer radial shoulder 228.

[0073] This shoulder is intended to at least axially restrain the sealing ring 240 and cooperates with a radial inner shoulder 241 of said ring.

[0074] As shown in the figures, and in particular in figures 2, 3, 4, 5, 2, 11 to 15, this inner radial shoulder 241 is constituted by a crown of inner radial teeth.

[0075] According to an embodiment, said teeth are tapered at the ends in a circumferential direction and so that the head walls at said ends converge with each other in direction of the central axis of the ring 240.

[0076] According to a further characteristic, between said sealing ring 240 and the capsule 220, anti-rotation counterchecking parts relatively to said ring 240 with respect to the capsule can also be provided and constituted by a radial stop wall cooperating with at least one of the head walls of one of the radial teeth forming the shoulder 241. In alternative, it is possible to provide a stop wall for at least some of said radial teeth or for each of them.

[0077] Still according to an alternative, it is possible that the outer radial shoulder 228 of the threaded 227 cylindrical wall 226 can be constituted by a plurality of notches shaped correspondingly to the inner radial teeth of the ring 240, which notches are distributed along the circumference in a position coincident with the inner radial teeth of the ring 240.

[0078] Still according to a characteristic which can be present or not in combination with the preceding characteristic, in a position coincident with the segments of the ring provided between two successive radial teeth of the crown of radial teeth 241, said ring has axial extensions of said segments forming a crown of axial teeth 244.

[0079] Said axial teeth have head walls at the circumferential ends which can also possibly cooperate with anti-rotation counterchecking parts of the ring, which can be constituted by radial fins projecting in a position adjacent to a head side of one or some or all axial teeth 244.

[0080] As shown in the figures, an optional embodiment can provide that also the head walls at the circumferential ends of the axial teeth 244 are tilted correspondingly to the tilt of the head walls of the inner radial teeth of the ring 240.

[0081] In an embodiment shown in figure 15, the material bridges 245 connecting the sealing ring 240 to the open end of the closing element 230 are distributed according to a predetermined scheme that provides, at two axial teeth 244 diametrically opposite each other, a material bridge 245 positioned in the central zone of said axial tooth, thus said material bridges 245 are also diametrically opposite each other.

[0082] The remaining material bridges are provided in the zone of each end of said axial teeth 244.

[0083] And in a symmetric position with respect to a plane of symmetry coincident with the diametric axis passing through two material bridges diametrically opposite each other and as shown by the line E-E in figure 15. This characteristic is also shown in the different views of figures 2 to 14, when visible in the view itself.

[0084] Still according to a further characteristic, said material bridges 245 consist of arched axial walls. Two types of material bridges are present in figure 15. A first type has a cylindrical arch and the wall is semicircular. This is valid for the bridges 245. A second type is provided for the bridges 245', which are bridges directly adjacent to the plane of symmetry and which have an asymmetric arched shape with a rectilinear terminal end on the side facing the plane of symmetry, from which a length with cylindrical segment section departs.

[0085] Figures 2, 3, 5, 6 and 11 to 14 show different views of the closing element 230 both in a condition separated from the capsule 220 and with or without the sealing ring 240 still fixed thereto.

[0086] The inner radial teeth 241 of the sealing ring and the annular outer shoulder 228 are provided with facing tilted pilot surfaces that allow, upon the first mounting of the removable closing element 230 provided with the sealing ring 240, to screw said removable closing element 230 on the outer thread 227 of the shell wall 226 and to contextually force, without breaking the material bridges, the sealing ring into the condition in which the inner radial teeth 241 of the sealing ring 240 are arranged behind the shoulder 228, with reference to an axial separation direction of the closing element from the capsule 220.

[0087] With reference to the figures, said removable closing element 230 is shaped like a closed cylinder by a wall 232 at an upper base and open at the side opposite said base. The cylindrical shell wall 231 has an inner thread 233 intended to cooperate with the thread 227 on the wall 226 of the capsule 220.

[0088] According to a further characteristic, from the

inner side of the wall 232 of the upper base or top of the closing element 230, one or two ridges 235, preferably a crown of ridges 235 intended to abut against the head end of the wall 226 on which the closing element 230 is screwed, depart axially towards the open end.

[0089] As is clear in the figures, the relative axial arrangement of the top wall 232, the shell wall 231, the inner thread, the sealing ring and the corresponding inner radial teeth with respect to each other and to the axial extension of the wall 226, at the position of the outer thread 227 thereon, as well as at the axial position of the outer annular shoulder 228 are such as that, in a completely screwed condition of the closing element, the radial teeth 241 of the sealing ring are engaged with the annular shoulder 228, while the limit stop ridges for the screwing 235 substantially abut against the end of the wall 226.

[0090] As will be clear in more detail also by the embodiment of figure 22. In addition to and in combination or in alternative to axial limit stops constituted by the fins 235, the same fins 235 and other fins 350 can form a limit stop for the angular screwing movement of the removable closing element 230.

[0091] Still according to a characteristic, a cylindrical sealing lip 236 intended to cooperate with the wall delimiting the extension of the dispensing duct beyond the end of the mouth 201, which wall is denoted by 229, departs from the wall of the upper base 232.

[0092] As will be described in more detail below, this shell wall 229 is a coaxial wall radially more inner than the shell wall 226 on which the closing element 230 is screwed. This since in the embodiment example, said two walls delimit an anti-dripping annular throat 250.

[0093] This could also not be present and, in this case, the inner surface with which the cylindrical sealing lip 236 cooperates could be the inner surface of the wall 226 itself on which the closing element 230 is directly screwed.

[0094] In the embodiment shown, said sealing lip 236 has an annular widening at its end and an axial length such as, in a screwed condition of the closing element, said cylindrical sealing lip 236 is forcefully engaged inside the wall 229 it delimits on the radially inner side the anti-dripping throat 250, generating a sealing strip between said wall of the closing element 230 thanks to the outer radial widening.

[0095] Still according to a further characteristic, the shell wall 229 delimiting on the radially inner side the anti-dripping throat 250 extends in a predetermined extent beyond the wall 226 on which the closing element 230 is screwed and which forms the radially outer wall of the anti-dripping throat 250, while a terminal strip of said wall 229 is folded, is preferably radially curved outwardly and towards the inside of the anti-dripping throat 250 forming a pilot edge 251 directing the drops to fall in the throat 250.

[0096] An advantageous embodiment provides that the radius of curvature of said pilot edge 251 is such as it radially projects outwardly to a lesser extent than the radial width of the throat 250.

[0097] As shown in the figures, the axial sizes of the walls 226 and 229 and of the annular sealing lip 236 are such as, in a completely screwed condition of the closing element, the conditions already described above occur, while the sealing lip 236 penetrates forcedly in the duct delimited by the wall 229 so that to generate the seal as described above.

[0098] Still according to a further characteristic that can be provided in combination with any of the embodiment variants described above, a flow regulator is provided in the dispensing duct 224 delimited by the capsule 220.

[0099] In the figure, it consists of a shielding wall 260 oriented transversely to the axis of the dispensing duct and which is restrained in position by a plurality of arms 261.

[0100] In the embodiment shown, the shielding wall 260 is provided in the length of the dispensing duct 224 coincident with the wall 229 delimiting the inside of the anti-dripping throat 250 and is restrained in position by L-shaped arms 261 which are distributed angularly along the circumference of the port of said duct 224 and which have an L-shape with a radial branch and an axial branch with reference to the axis of said duct.

[0101] Still according to a characteristic, the shielding wall 260 has a diameter identical or preferably slightly smaller than the smallest inner diameter of the dispensing duct 224 so that to form an annular slot in axial projection, while, thanks to the L-shaped arms 261, a crown of dispensing openings is formed, the axis of the ports thereof being essentially radially oriented with respect to the axis of the dispensing duct 224.

[0102] With reference to figures 16 to 18, an embodiment, in which the passage port of the dispensing openings is denoted by 300, is shown.

[0103] The passage ports of said dispensing openings are sized according to the characteristics of surface tension of the fluid contained inside the container with which the closing device is combined and so that to exploit the surface tension in order to form, for at least part of the passage port of the opening and/or for the entire port thereof, a meniscus of fluid that at least partially obstructs the opening to slow down or fully prevent the passage of fluid in the filling direction of the container.

[0104] The choice made in the embodiment shown is that of making the passage openings in the form of thin slots elongated in a circumferential direction of the capsule and of the dispensing duct 224.

[0105] The truncated conical shape of the shielding wall 260 and of the radial arms also contributes to generate a condition of greater drag to the filling flow.

[0106] Identical reference numbers are used in figures 16 to 18 for equal parts or parts having the same functions as those shown and described with reference to the preceding figures.

[0107] A precise sizing of the dispensing openings 300 is possible thanks to simple empirical tests and the sizes are different depending on the type of fluid, thus it is not

possible to give quantitative indications for general application.

[0108] In the embodiment shown, the shielding wall 260 is housed in the cylindrical extension of the dispensing duct 224 defined by the cylindrical wall 229, thus the filling would be extremely slow since it would be necessary to fill the extension every time and to wait for the slow outflow of fluid inside the container.

[0109] In a variant, in which an extending cylindrical wall 229 should not be provided or should be axially very low, the slowing down effect of the flow in the filling direction would be even more extreme.

[0110] Figures 19 to 21 show a further embodiment variant. It can be provided in any combination or subcombination with one or more of the preceding embodiment variants described and/or shown above and provides that at least two dispensing openings having different fluid passage ports and such as to generate different dispensing flow rates are distributed along the circumference of the dispensing duct 224.

[0111] In the preferred embodiment shown, a first dispensing opening 301, whose passage port is such as to allow a first minimum dispensing flow rate, is provided in a first angular position relatively to the circumferential extension of the dispensing duct 224. In a position diametrically opposite the first dispensing opening 301, an assembly of three dispensing openings 302, 303, whose overall passage port is equal to a multiple of the passage port of the first dispensing opening 301 and thus greater, is provided. Thus, the dispensing flow of this assembly of passage openings 302, 303 has a greater dispensing flow with respect to the one possible from the opening 301.

[0112] In particular, according to a further possible characteristic, in the present case, the dispensing opening assembly opposite the first dispensing opening has three openings of which a central one 302 exactly diametrically opposite the first dispensing opening 301 and two side ones 303 arranged symmetrically with respect to the central one 303. The two side dispensing openings 303 have an identical passage port and less than the one of the central dispensing opening 302.

[0113] As already specified in the introductory part of the present description, countless embodiment variants are possible and provide different passage port ratios and thus different dispensing flows and a different number of dispensing openings or dispensing opening assemblies or combinations of dispensing openings and opening assemblies with respect to the only two ones shown, this greater number being distributed in angular positions different from each other.

[0114] Thanks to this implementation, when the container is tilted in direction of one of the dispensing openings or dispensing opening assemblies, a dispensing flow is generated through said opening and/or said assembly with the corresponding flow rate.

[0115] In particular, by tilting the container in direction of the dispensing opening 301, a fluid flow with a minimum flow rate is generated, while by tilting the container towards the opening assembly 302, 303, a dispensing flow of a greater flow rate is generated.

[0116] Still according to a further characteristic to make this function clear for the user, it is possible to provide on the outer wall 222 of the capsule 220 indications 305 corresponding to the flow rate that can be delivered by tilting the container in direction of said indications, in a position radially coincident with the corresponding dispensing opening or with the corresponding dispensing opening assembly and in a position visible from the outside.

[0117] Advantageously, the indication corresponds to a relative value between the different possible dispensing flow rates.

[0118] Such indications are denoted by 305 and 351 in figures 20 and 21 and made, for example, in the form of one or more drops depending on the lesser or greater flow rate that can be obtained by tilting the container in direction thereof.

[0119] Within the scope of this example, figure 22 shows embodiment variants that can also be provided independently of each other and each in any combination with one or more of the preceding embodiment variants.

[0120] A first embodiment variant provides that limit stop members for the screwing are provided between the removable closing element 230 and the capsule 220.

[0121] These members can consist in one or more inner radial fins 350 departing from the top and/or side shell wall of the closing element 230 and cooperating with one or more radial limit stop abutments 360 provided on the cylindrical wall 226 of the capsule 220 bearing the outer thread 227.

[0122] This embodiment shows the one or more radial fronts formed by axial recesses of the annular edge at the end of the wall 226.

[0123] In particular, the limit stop position is determined thanks to the axial and radial size of the fins 350 and/or 235 and of the abutments 360 so that, in an limit stop condition, the seal between the closing element 230 and the capsule 220 is also generated thanks to one or more of the previously described members provided for generating this seal.

[0124] According to the further characteristic, rotatingly coupling members, which in a coupled condition of the capsule 220 on said mouth 201 prevent the relative rotation of these two parts, are provided between the capsule 220 and the mouth 201 of the container 200.

[0125] In particular, along the annular strip 221 of the capsule 220 and on the inner side thereof, one or more radial ridges, a crown of radial ridges or a knurl 370, which are intended to be engaged with corresponding one or more outer radial ridges, with a corresponding crown of outer radial ridges or with an outer knurl on the mouth 201, when the capsule 220 is stably coupled with said mouth, can be provided.

Claims

1. Closing device for containers, such as bottles, cans, or the like, comprising a stable coupling element (220) at a dispensing opening (201) of said container (200) and a removable closing element (230), to close said dispensing opening, comprising engaging members (233) of said closing element (230) in said closing position, wherein,
the stable coupling element (220) at a container opening consists of a cylindrical capsule which peripherally delimits at least one dispensing duct (224) open at the two ends of said capsule,
said capsule (220) having a stable coupling end to be coupled to the wall (201) that surrounds an opening of said container (200),
said capsule (220) having an end opposite the container (200) and provided with removable coupling members (227) to be removably coupled to a closing element (230);
a closing element (230) shaped as a cylindrical cup and having coupling members (233) intended to engage the coupling members (227) at the opposite-to-the-container end of said capsule (220),
characterized in that
said closing element (230) has an axial annular extension (240) at the head end facing the container (200), the annular extension (240) being connected to the said closing element (230) by a number of bridges (245) of material spread along its circumference,
said axial extension (240) of the closing element (230) being provided with axial and/or circumferential retaining members cooperating with retaining members integral with said capsule (220), so that upon removal of said closing element (230), the bridges of material (245) are cut due to a relative circumferential and/or axial movement between said closing element (230) and said ring (240) .

2. Device according to claim 1, wherein said ring (240) that axially extends the closing element (230) has one or more inner radial recesses (241) intended to be arranged behind one or more outer radial protrusions (228) on the cylindrical capsule, with reference to the direction of the closing element's removal from the cylindrical capsule.

3. Device according to claim 1 or 2, wherein the coupling members on the capsule (220) and those on the closing element (230) consist of an outer thread (227) on a cylindrical wall (226) delimiting the dispensing opening or of a dispensing duct (224) of the capsule (220) and an inner thread (233) on the shell wall (231) of the closing element (230), respectively, the threads cooperating with each other by rotating the closing element relative to the capsule.

4. Device according to claim 2 or 3, wherein the ring (240) axially extending the shell wall (231) of the closing element (230) has a crown of inner radial recesses (241) or a continuous inner radial annular shoulder, whereas said one or more outer radial protrusions (228) of the shell wall (226) that delimits the dispensing duct (224) of the capsule (220) consist of a crown of radial teeth or consist of a continuous outer radial annular shoulder (228).

5. Device according to one or more of the preceding claims, wherein the coupling of the capsule to the opening of the container takes place by interlocking means (221, 222, 223, 225) elastically forcing the interlock of said capsule (220) on at least one wall band surrounding said dispensing opening (201) of the container (200), anti-rotation members being optionally provided to prevent the capsule (220) and the container (200) from rotating relative to each other.

6. Device according to claim 5, wherein, in an embodiment variation wherein the container is in the form of a bottle or the like, that is to say, it has a cylindrical dispensing spout (201) delimiting a dispensing opening, said capsule (220) has on the coupling end to be coupled to said dispensing spout (201) a cylindrical annular seat (221) having preset thickness and engaging a certain axial length of an annular band of shell wall of said spout (201) at the dispensing end of the container and/or at the container mouth.

7. Device according to claim 6, wherein, in combination with a container (200) having a cylindrical dispensing spout (201), the spout having either a plurality of outer radial reliefs (203) spread along the shell surface at a predetermined distance from the dispensing mouth, i.e. from the dispensing end of said spout, or a continuous radial fin or else a continuous outer annular radial widening, said capsule (220) has, at a corresponding axial position with reference to the axial extension of said axial engagement seat, a plurality of radial fins and/or a continuous radial annular shoulder (225) that are respectively intended to mate the rear of said plurality of radial external reliefs of said spout, or behind said continuous radial fin or a continuous outer radial annular widening (203) of said spout (201), with reference to the direction of pulling out the closing element and disengaging or axially spacing said capsule from said spout.

8. Device according to claims 6 or 7 wherein the capsule (220) delimiting a dispensing duct (224) has a cylindrical section axially extending the dispensing opening of the container and/or the dispensing spout (201) of said container, the cylindrical section having a shell wall (226) provided with the coupling members (227) to be coupled to the closing element (230),

in particular with the outer thread (227).

9. Device according to one or more of the preceding claims, wherein said cylindrical section axially extending the dispensing opening and/or the dispensing spout (201) of the container also carries said one or more outer radial protrusions or the outer annular radial shoulder (228) of the dispensing capsule (220) cooperating with the plurality of inner radial recesses or with the inner continuous radial annular shoulder (241) of the ring (240) axially extending the closing element (230).

10. Device according to one or more of the preceding claims wherein the capsule (220) has, at the end of the dispensing duct (224), a pair of cylindrical shell walls (226, 229) delimiting an annular duct (250), the radially innermost cylindrical shell wall (229) that delimits the dispensing duct (224) projecting beyond the outermost shell wall (226) at the dispensing end.

11. Device according to one or more of the preceding claims, wherein the bridges of material (245) consist of axial ribs whose cross section, with reference to the axis of the extending ring (240), has arched, in particular semicircular, and/or asymmetrical shape.

12. Device according to one or more of the preceding claims, wherein along the angular extent of the extending ring (240) a succession of axial recesses (241) alternated with axial protrusions (244) of the head edge facing the closing element (230) is provided, said recesses being spread angularly equidistant from each other and having identical angular extent, at least one material bridge (245) or two or more material bridges (245) branching off from said intermediate sections (244) between the axial recesses (241).

13. Device according to claim 12, wherein the inner radial recesses of the extending ring (240) cooperating with the outer radial projections or the outer radial annular shoulder (228) of the capsule (220) for the retention of the extending ring (240) are provided at the axial recesses and substantially along the angular length thereof.

14. Device according to one or more of the preceding claims, wherein the dispensing opening of the dispensing duct (224) delimited by the capsule (220) is provided with a regulator (260, 261) of the dispensing flow, the regulator comprising a shielding wall (260) transverse to the axis of the dispensing duct (224) that is held at a certain axial distance from the side delimitation edge of the dispensing opening of the dispensing duct (224) by means of radial arms (261), which are angularly spread around said axis of the dispensing duct and laterally delimit two or more dispensing mouths.

15. Device according to one or more of the preceding claims, wherein the shielding wall (260) and the radial arms (261), the latter connecting the former to a perimeter band of the dispensing duct (224) or to the edge of the dispensing opening, are both dimensioned so that the dispensing mouths (300) have a passage port in a radial, and/or axial and/or circumferential direction, able to generate a fluid meniscus that slows down or prevents the fluid flow in a direction opposite the spill due to the effect of the surface tension of the fluid itself.

16. Device according to one or more of the preceding claims, wherein the device has at least two dispensing openings (301, 302, 303) or at least two groups of adjacent dispensing openings (301, 302, 303) or combinations of at least one of these dispensing openings (301) with at least one of these groups (302, 303), each of the at least two openings or the at least two groups or the combinations of at least one dispensing opening and at least one group of openings having an overall passage port different from each other and each of the openings and/or the groups of openings with a different overall passage port being arranged at a different angular position with respect to the axis of the dispensing duct.

17. Device according to claim 16, wherein on a part of an outer surface of the capsule (220) and in a position radially coincident with each of said at least two openings (301) or each of said at least two groups of openings (302, 303) or the at least one opening (301) and the group of openings (302, 303) of the combination of an opening and a group of openings, quantitative indications (305) of the respective flow rate of the fluid through the corresponding opening or the corresponding group of openings are provided, preferably indications of the respective fluid flow rate through an opening or group of openings with respect to the fluid flow rate through the at least one additional opening and/or the at least one additional group of openings.

18. Device according to one or more of the preceding claims wherein the removable closing element (230) has a top (232) consisting of a wall transverse to the axis of the dispensing opening and/or the dispensing duct (224) that is in the capsule (220), a sealing annular lip (235) extending from the inner side of this top, i.e. from the side facing said dispensing duct (224), and being intended to tightly adhere to the inner edge of the wall (229) delimiting the dispensing opening and/or the dispensing duct (224) that is in the capsule (220).

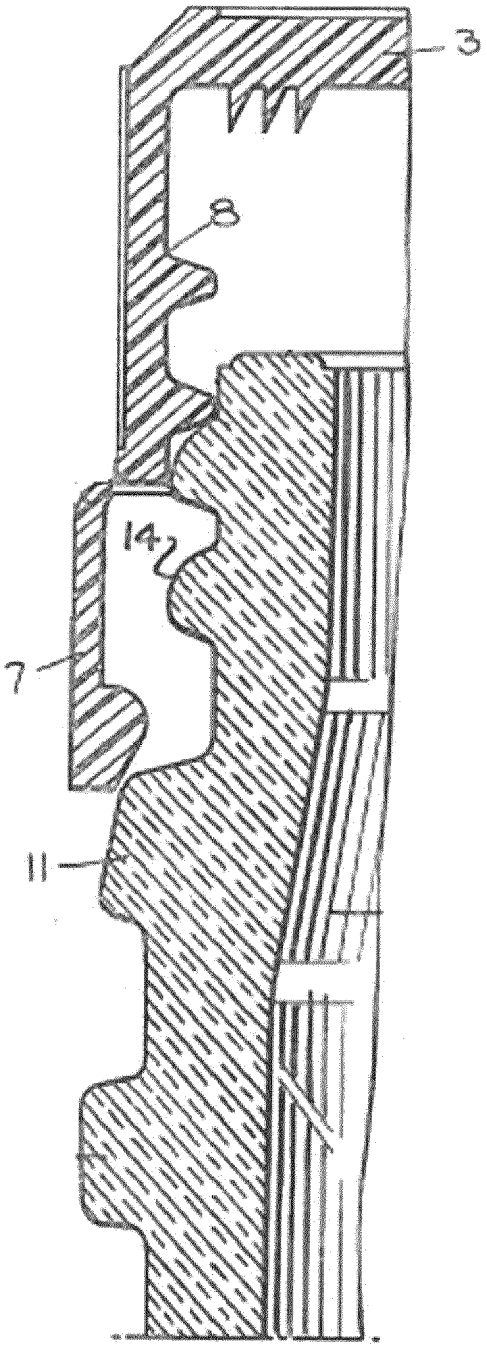

Fig. 1A

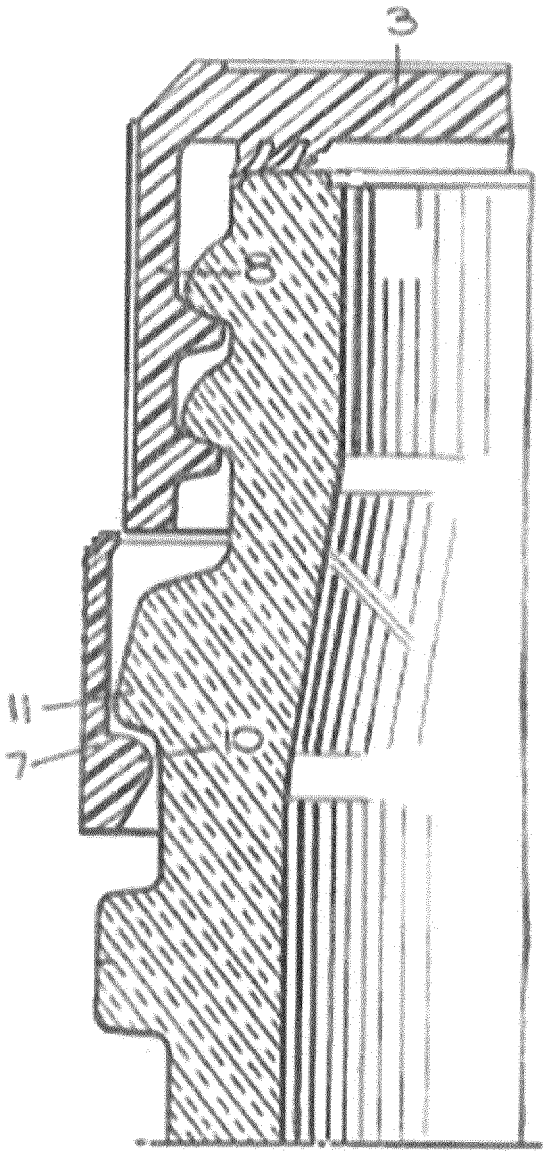

Fig. 1B

State of the art

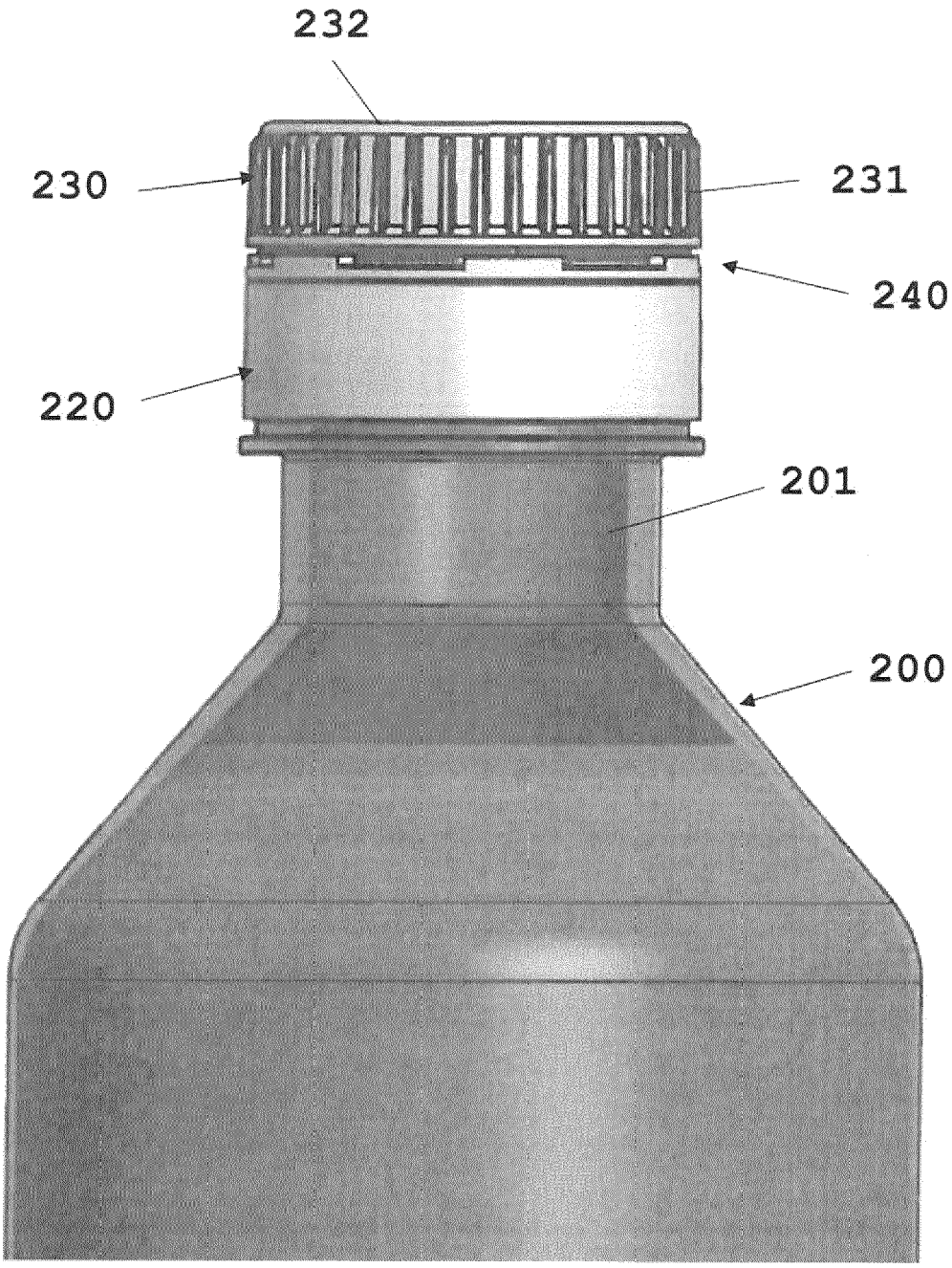

Fig. 2

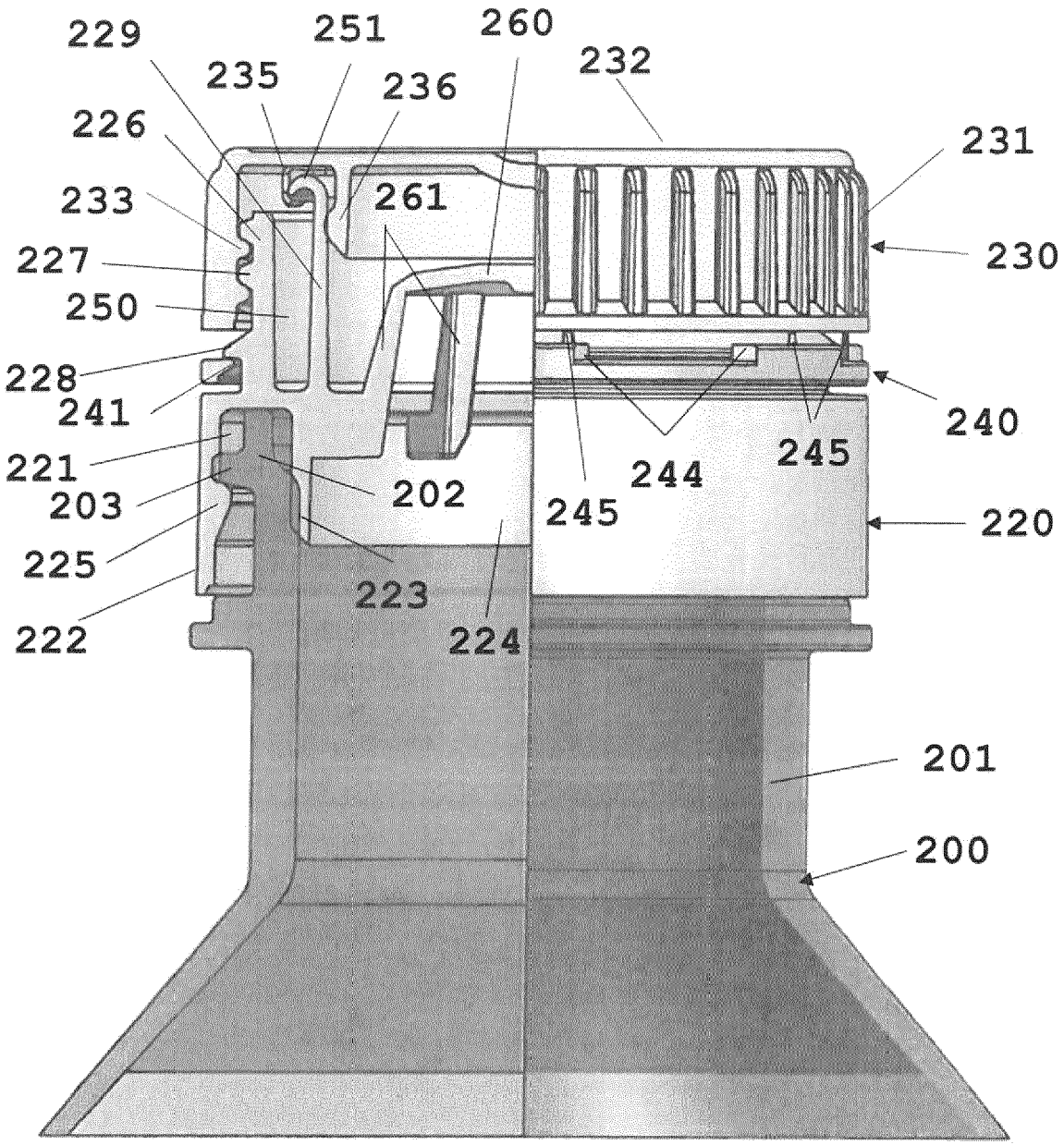
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Fig. 3

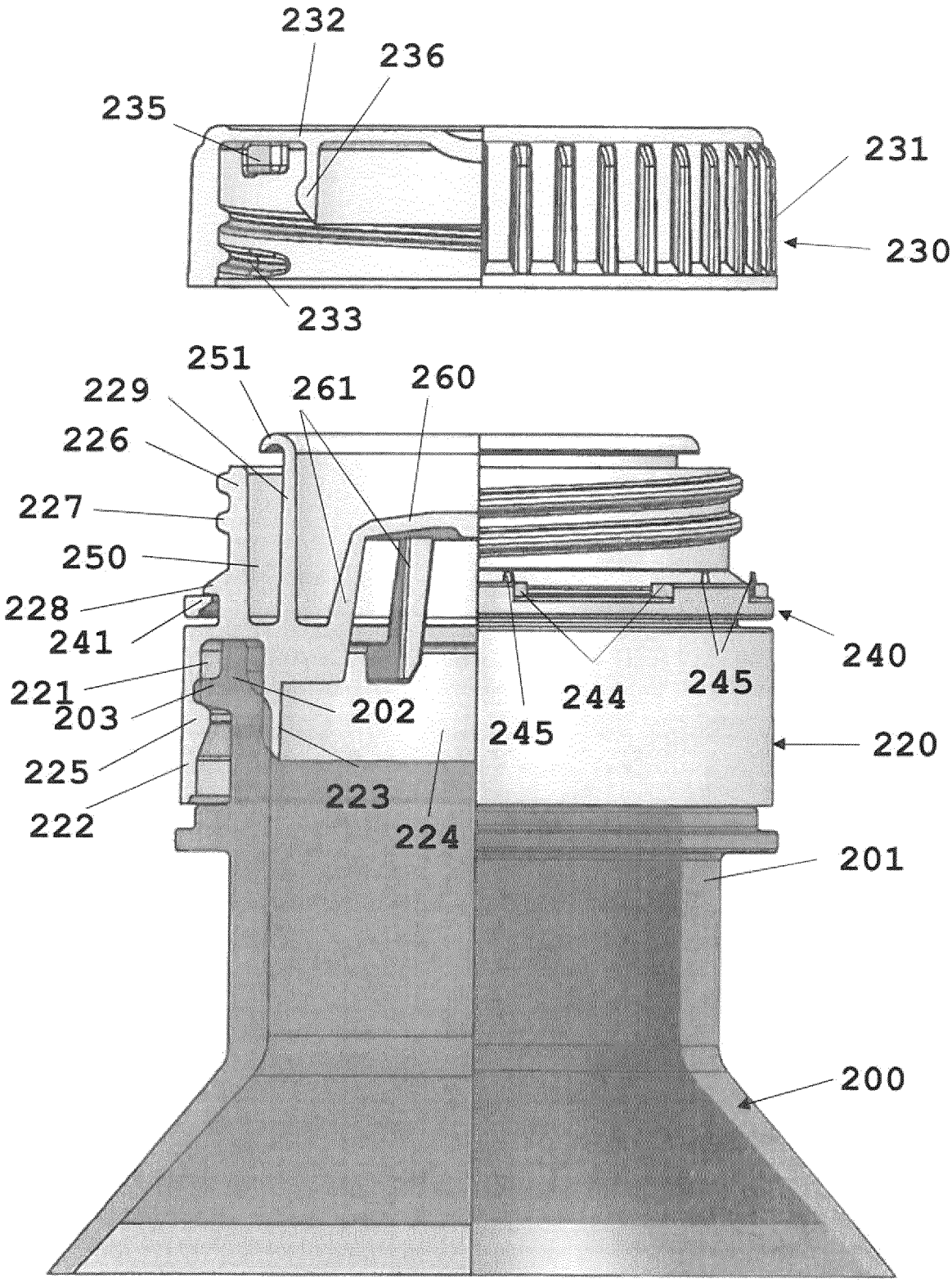
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Fig. 4

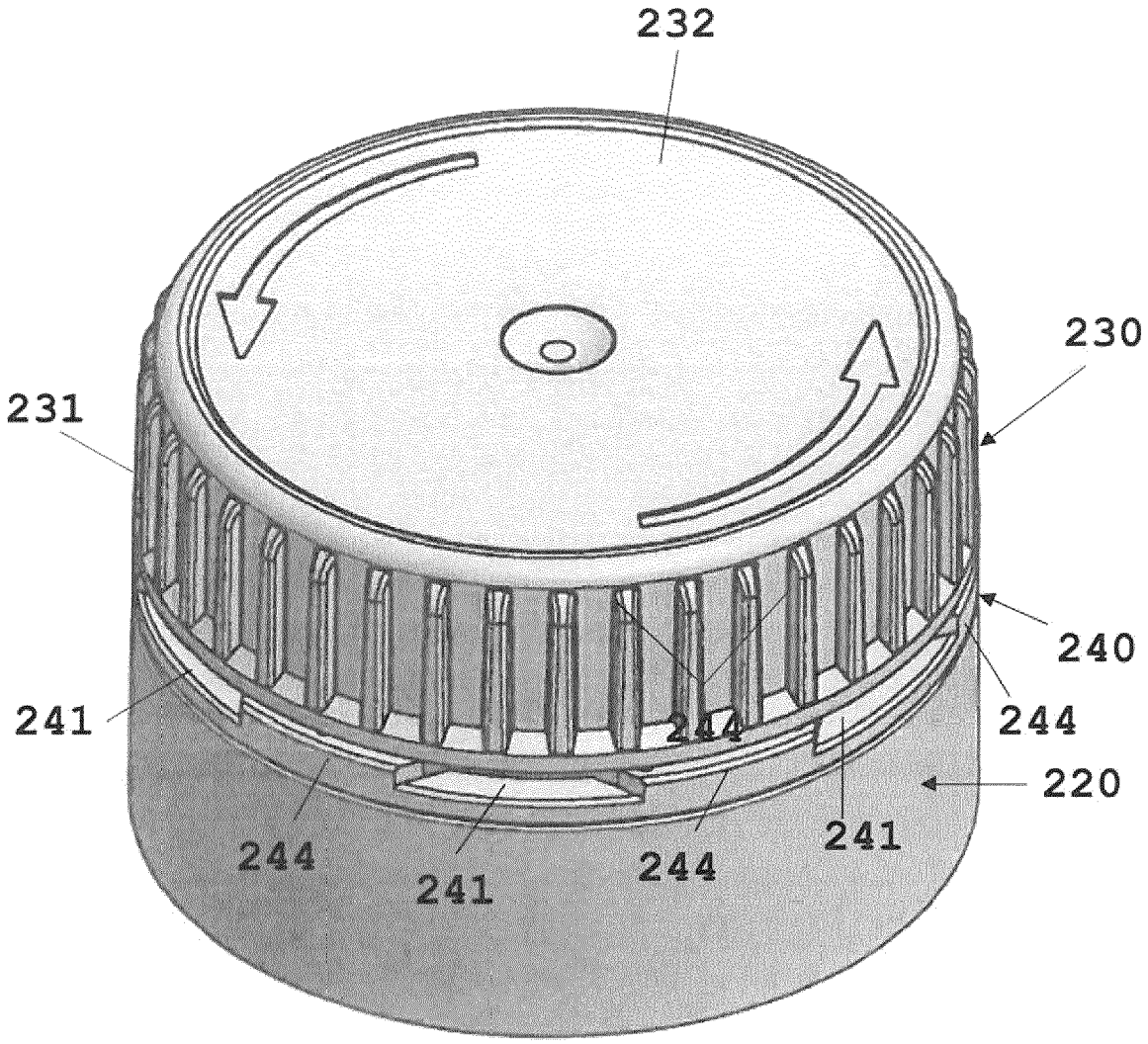

Fig. 5

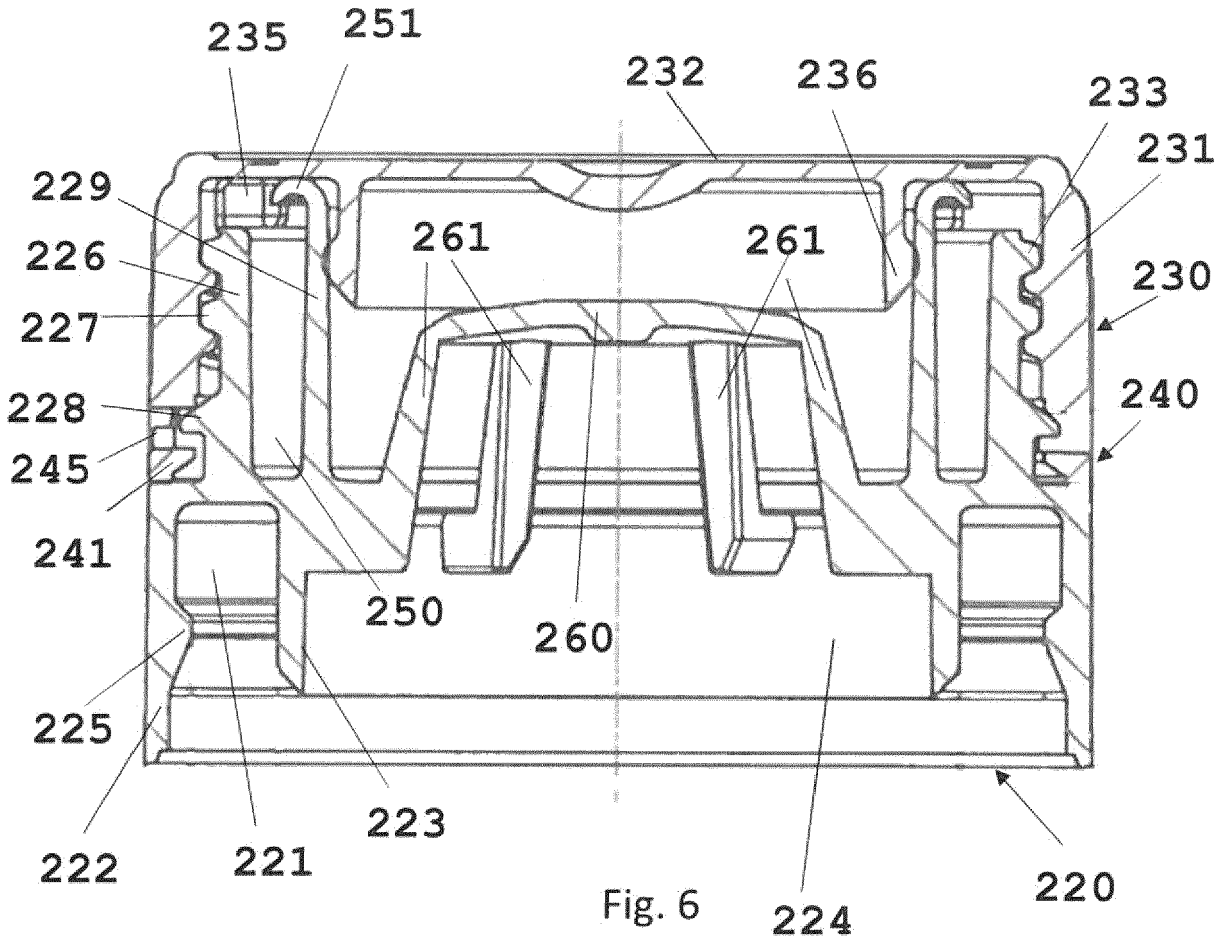
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Fig. 6

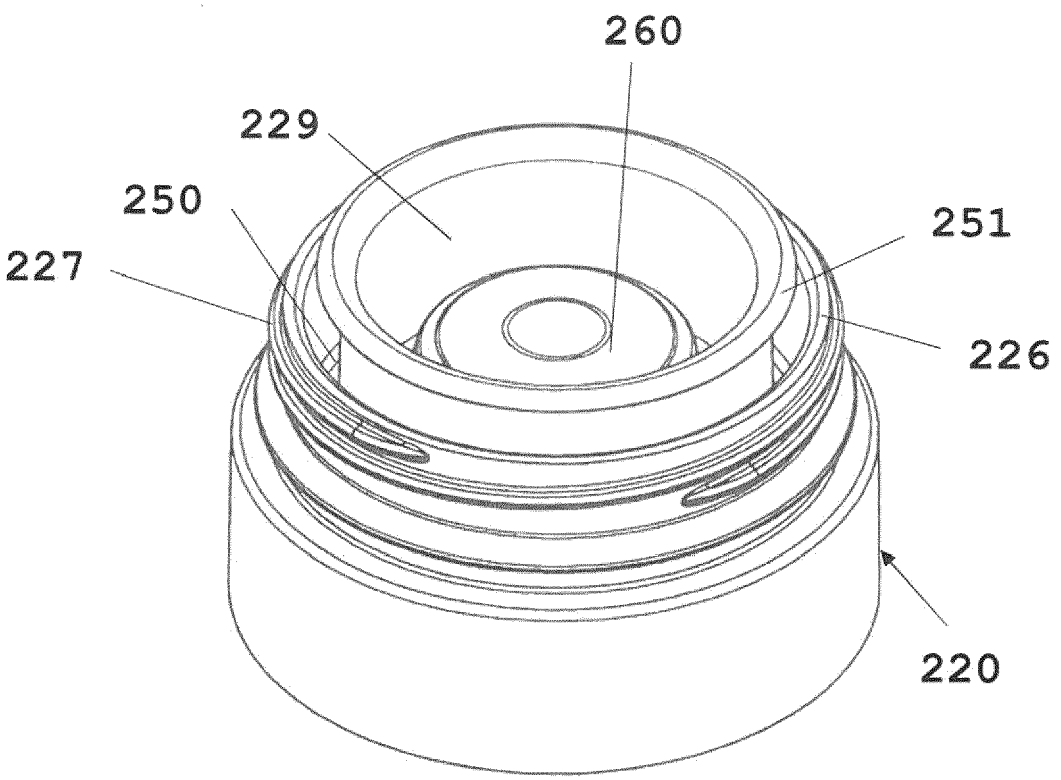

Fig. 7

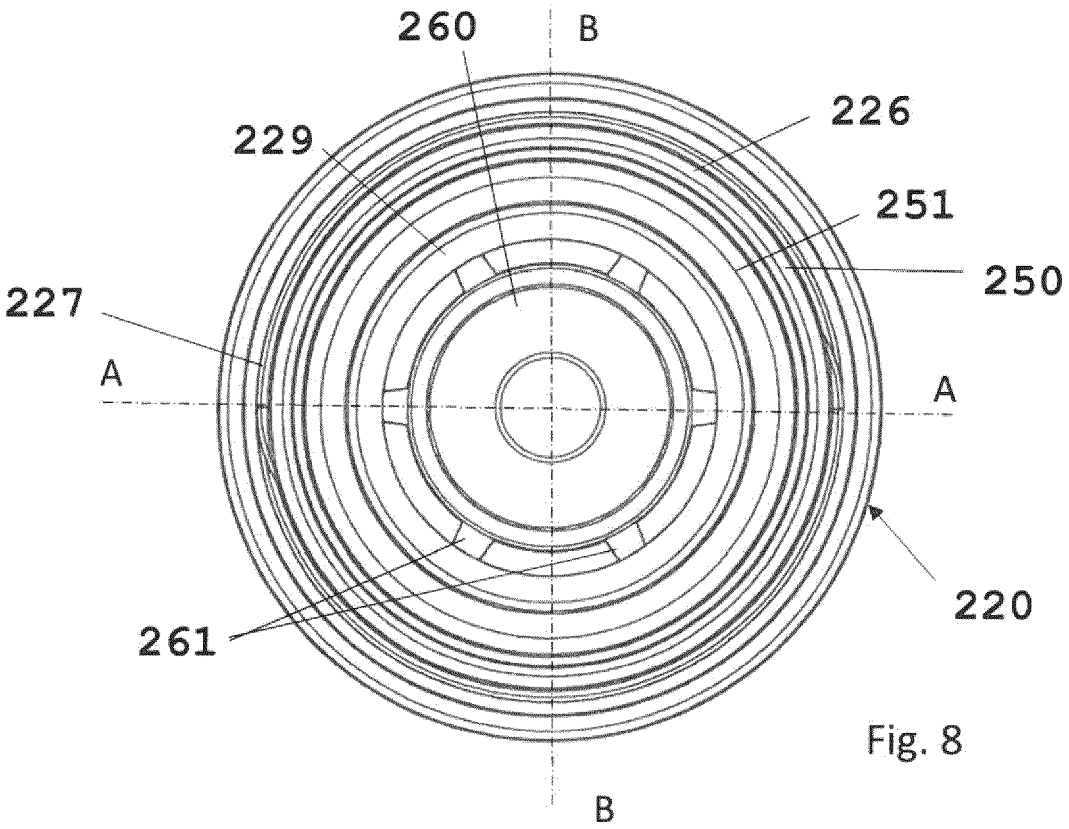

Fig. 8

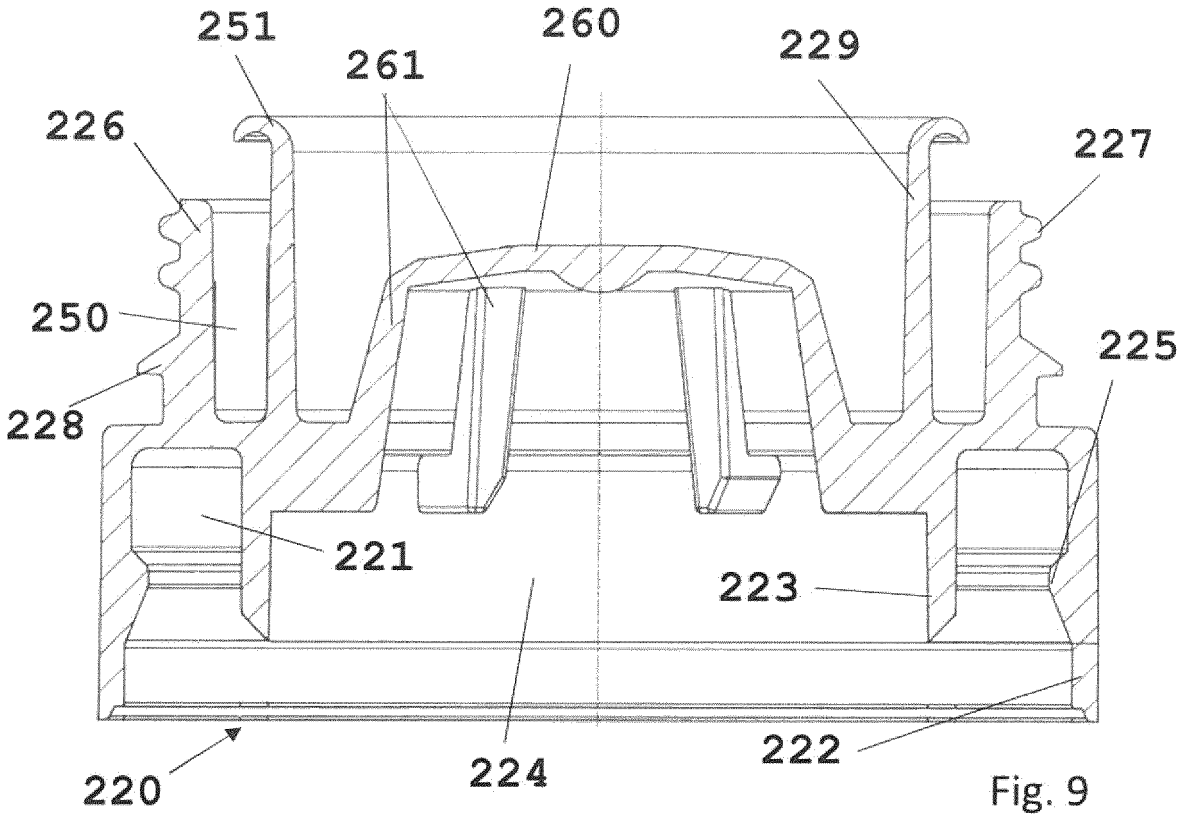
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Fig. 9

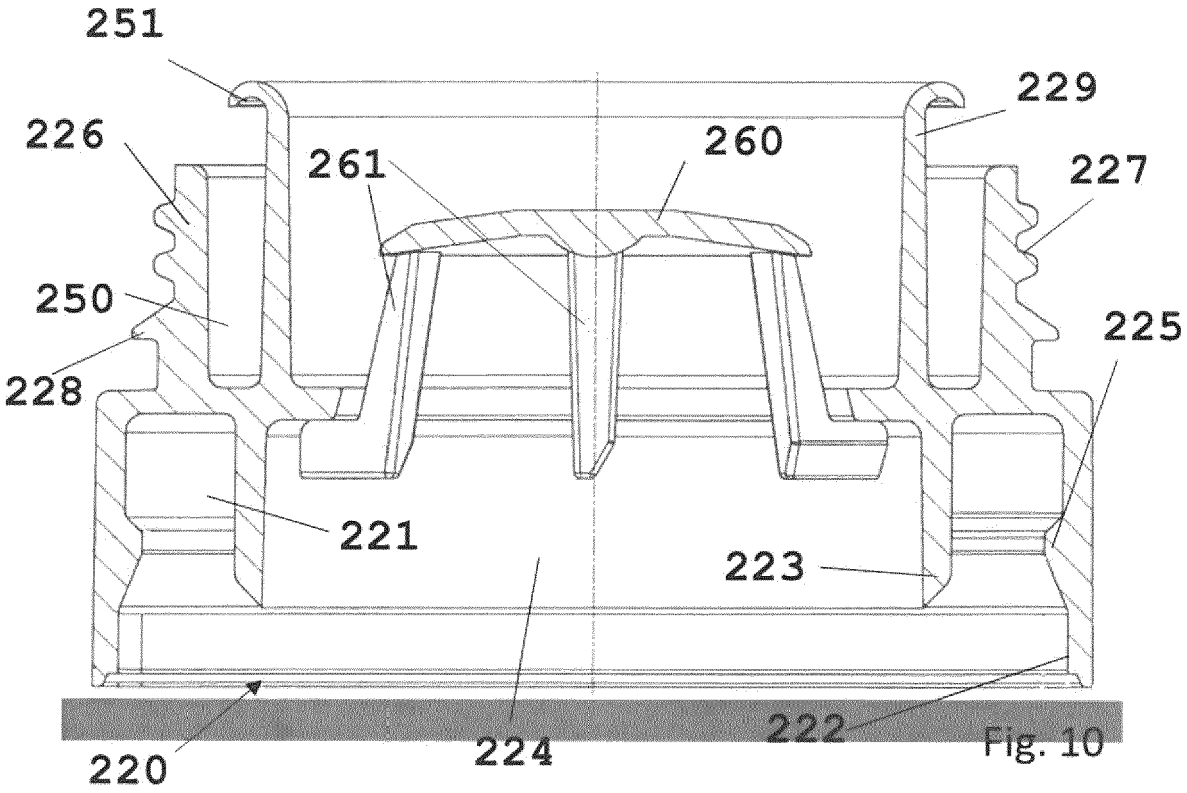
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Fig. 10

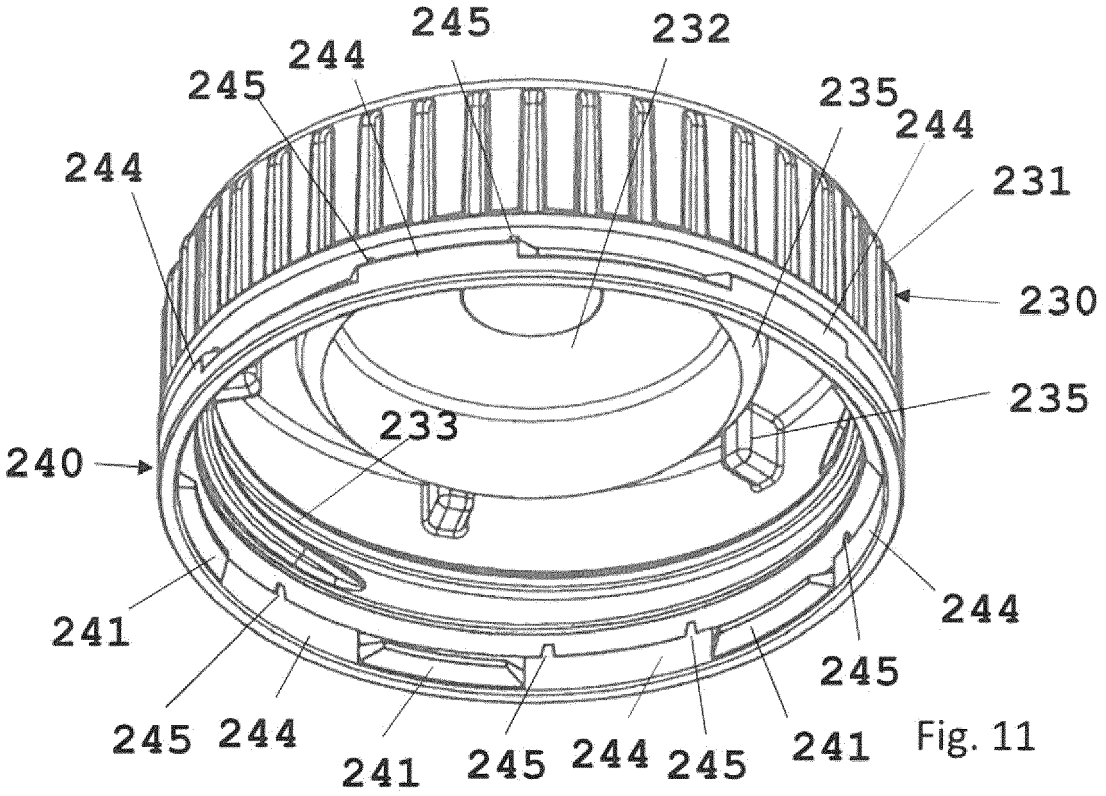
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Fig. 11

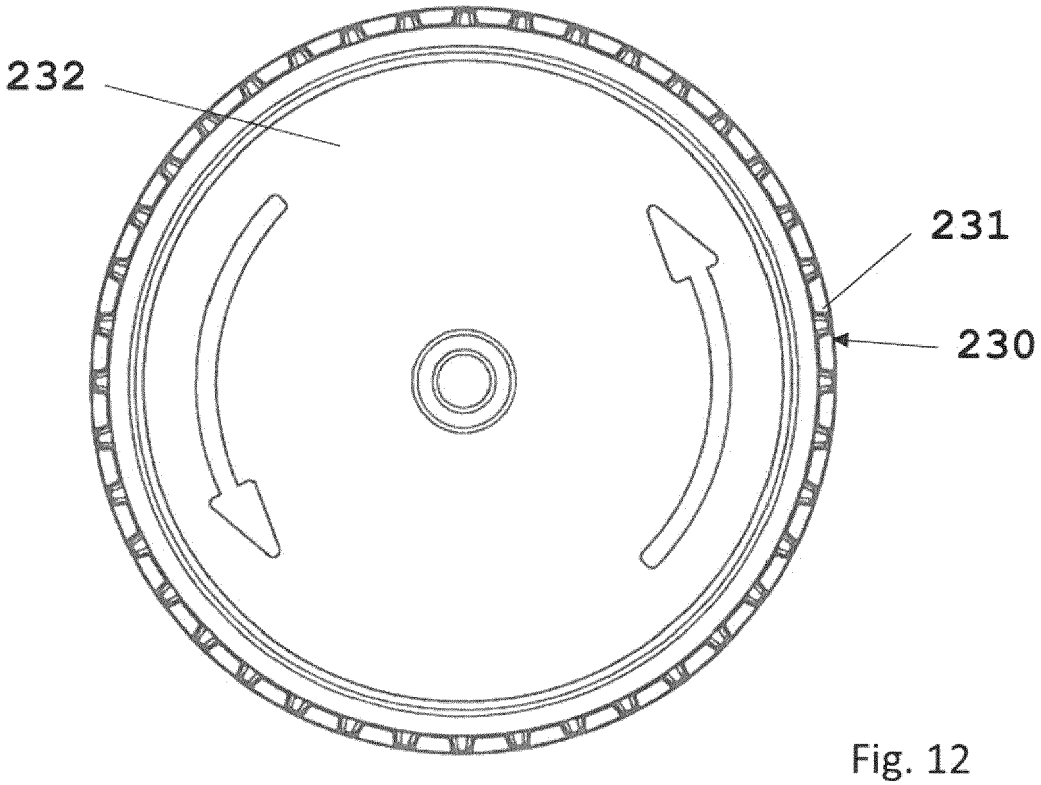
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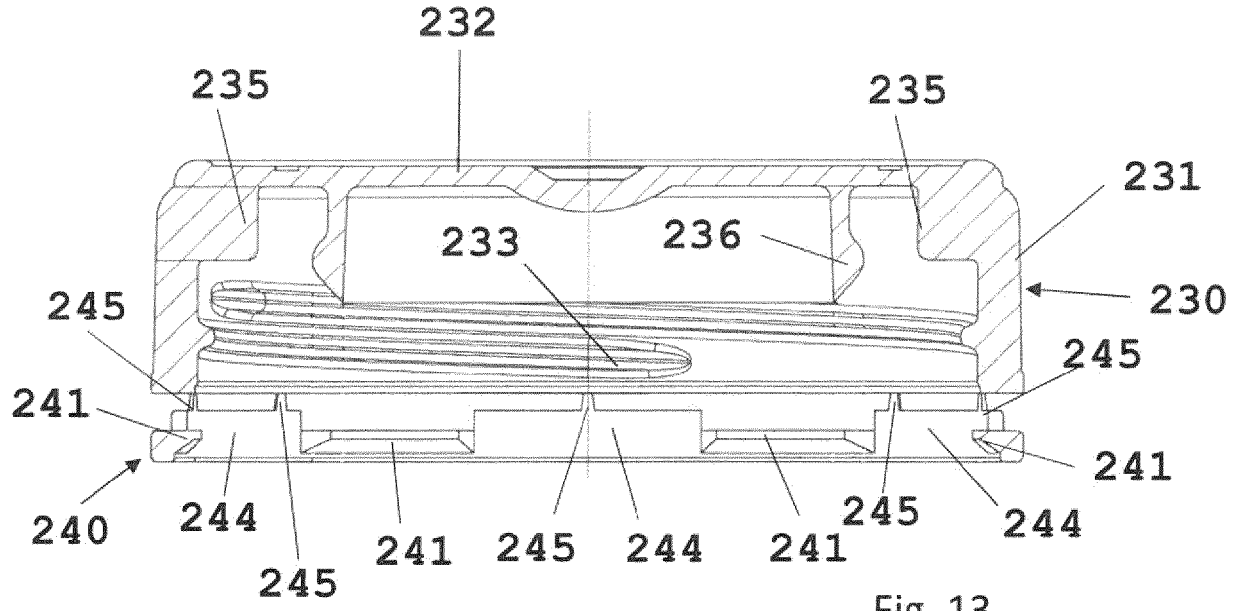
Fig. 12


232
235
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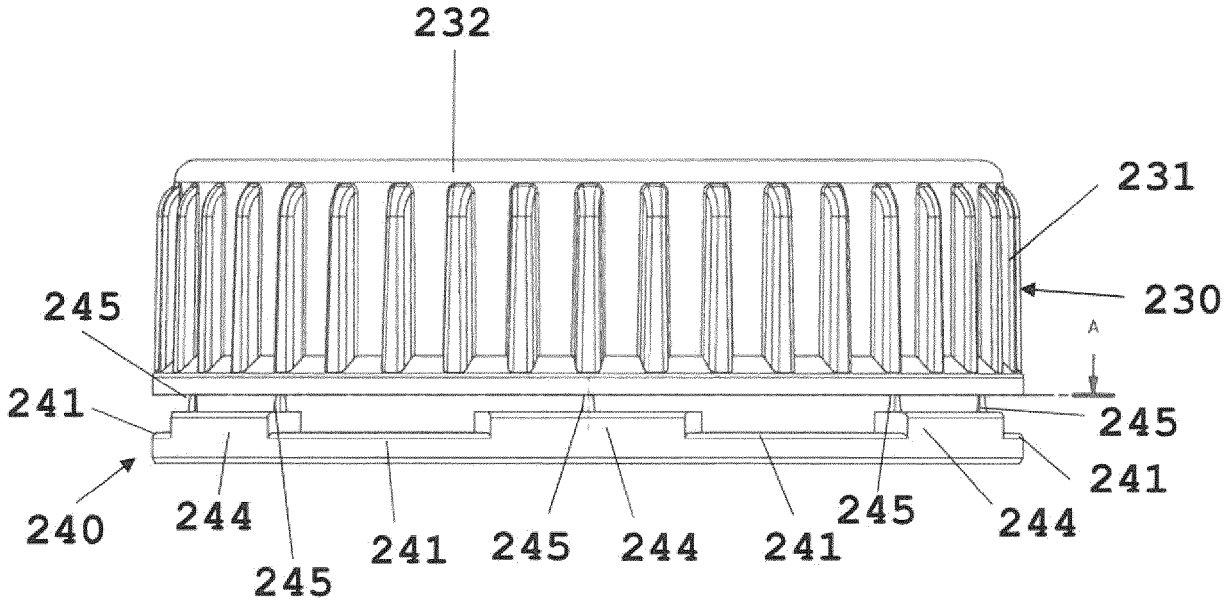
244

Fig. 13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230
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A
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245
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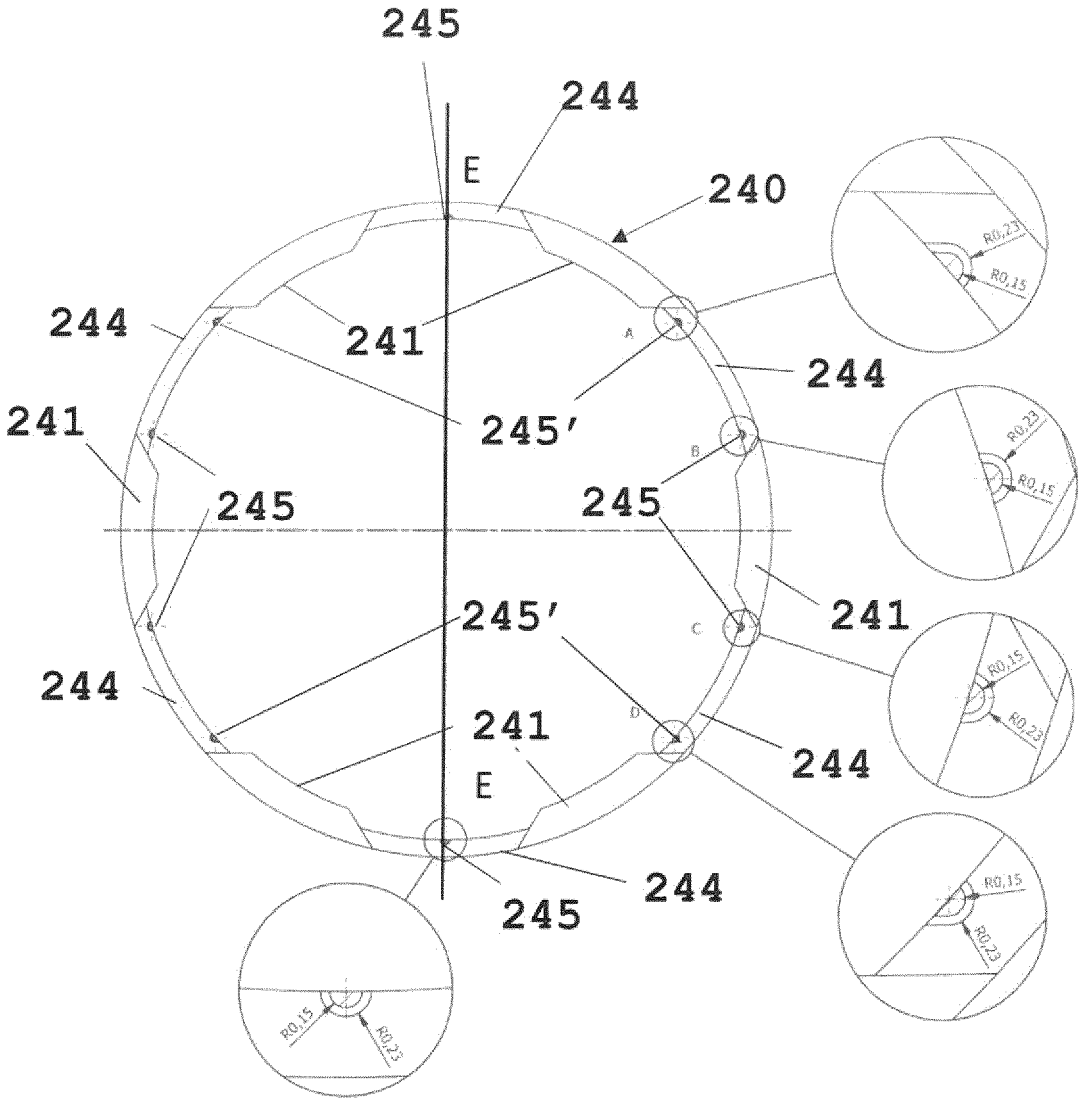
244

Fig. 14


245
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E
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245'
245
245
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241
244
241
E
244
245
R0,23
R0,15

Fig. 15

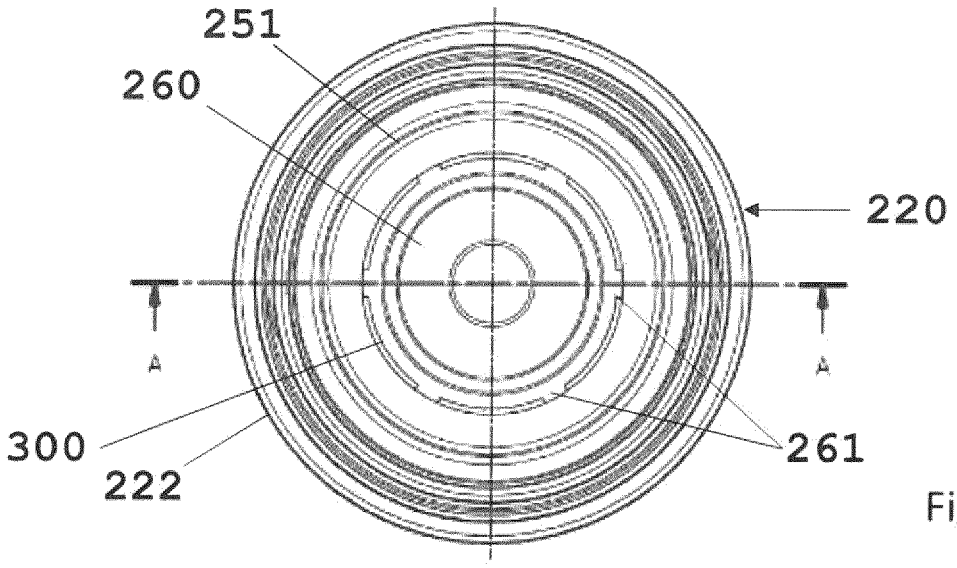

Fig. 16

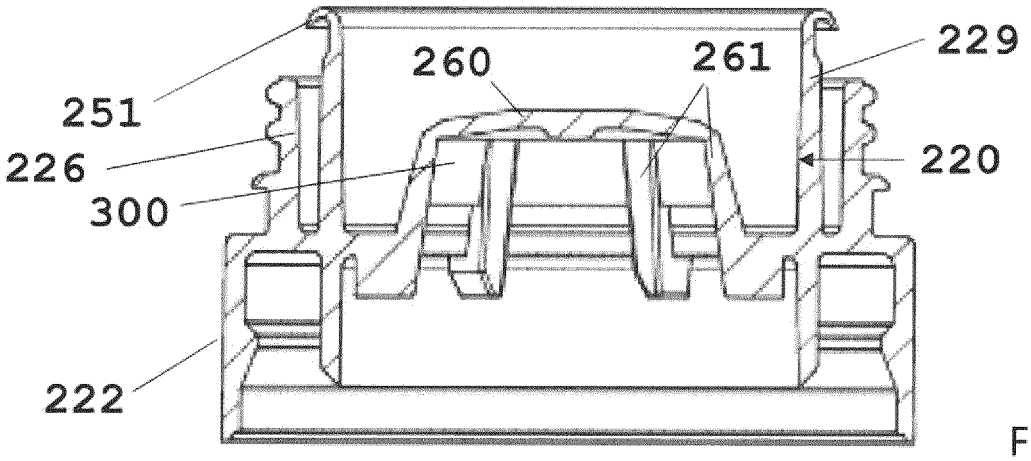

Fig. 17

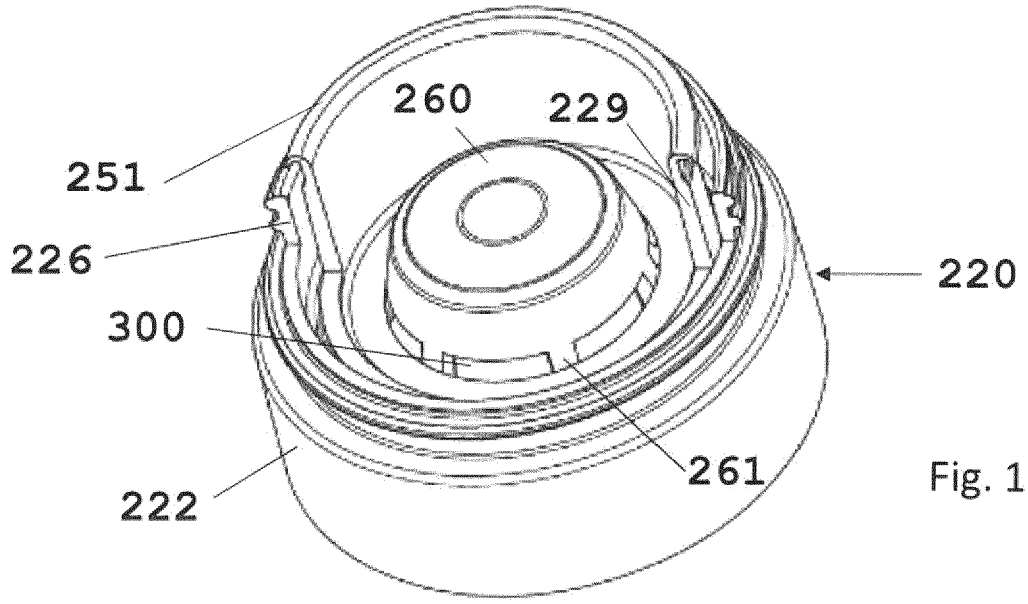

Fig. 18

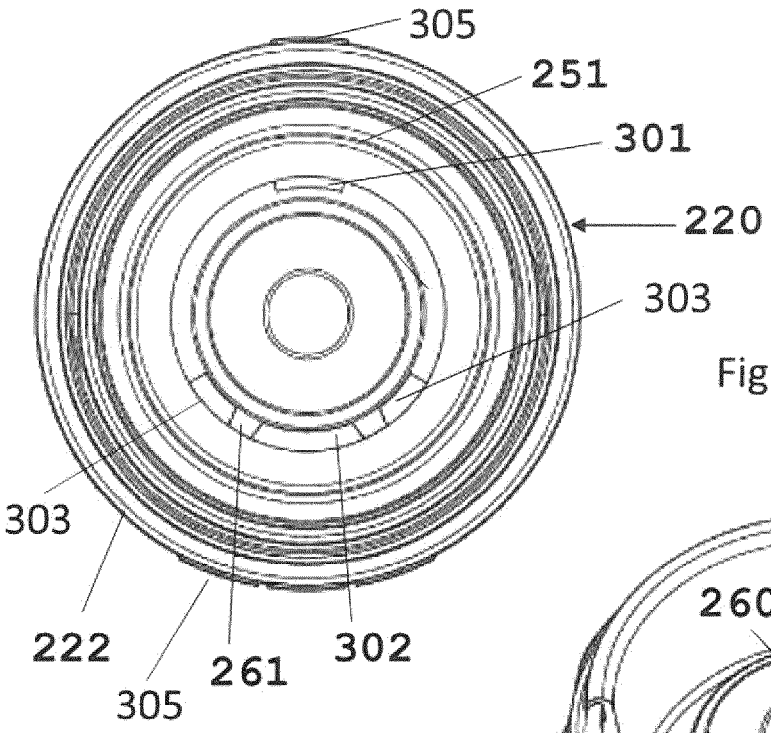

Fig. 19

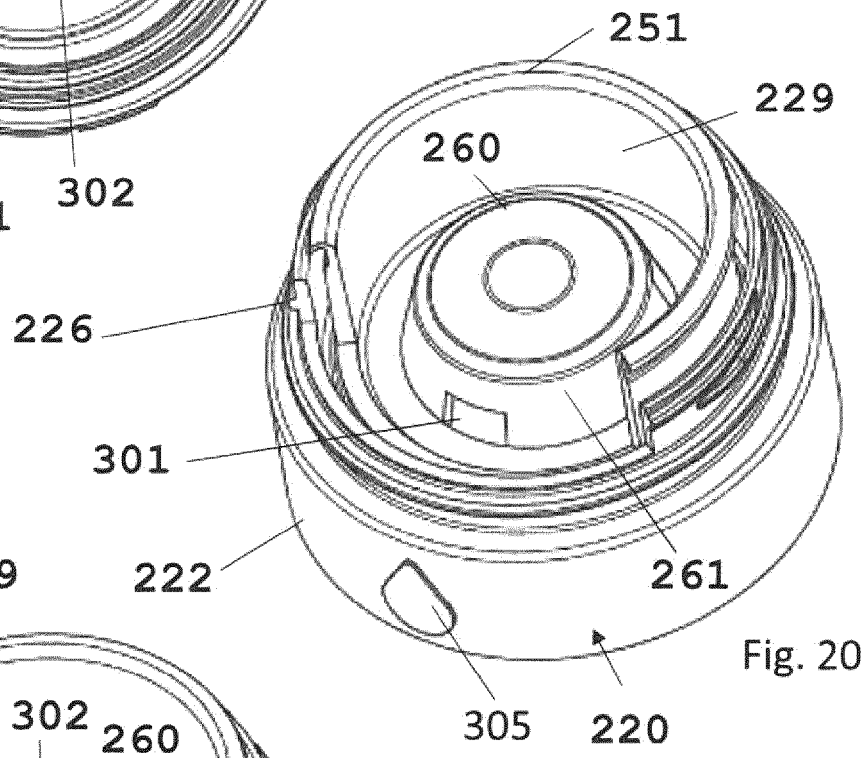

Fig. 20

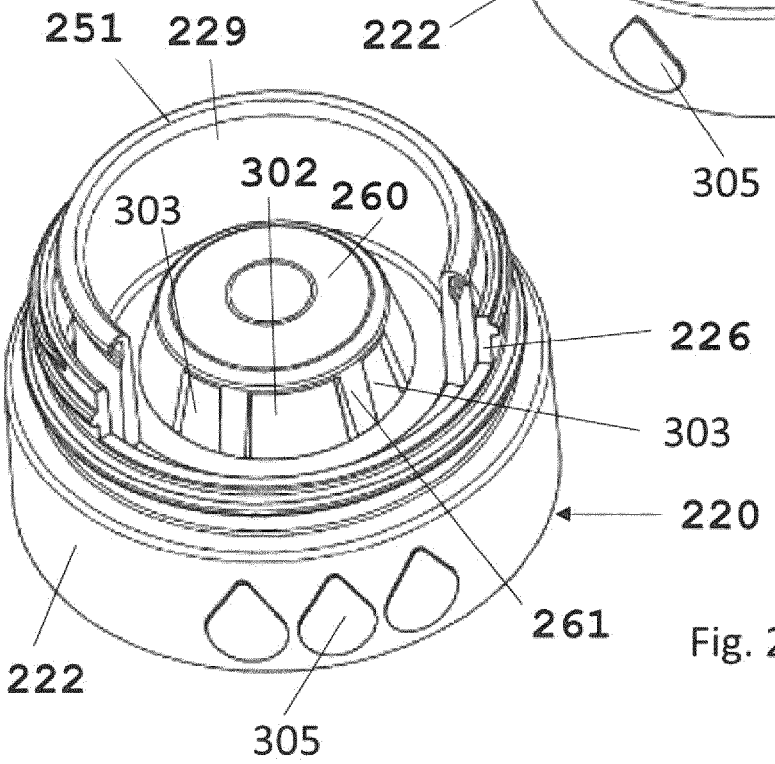

Fig. 21

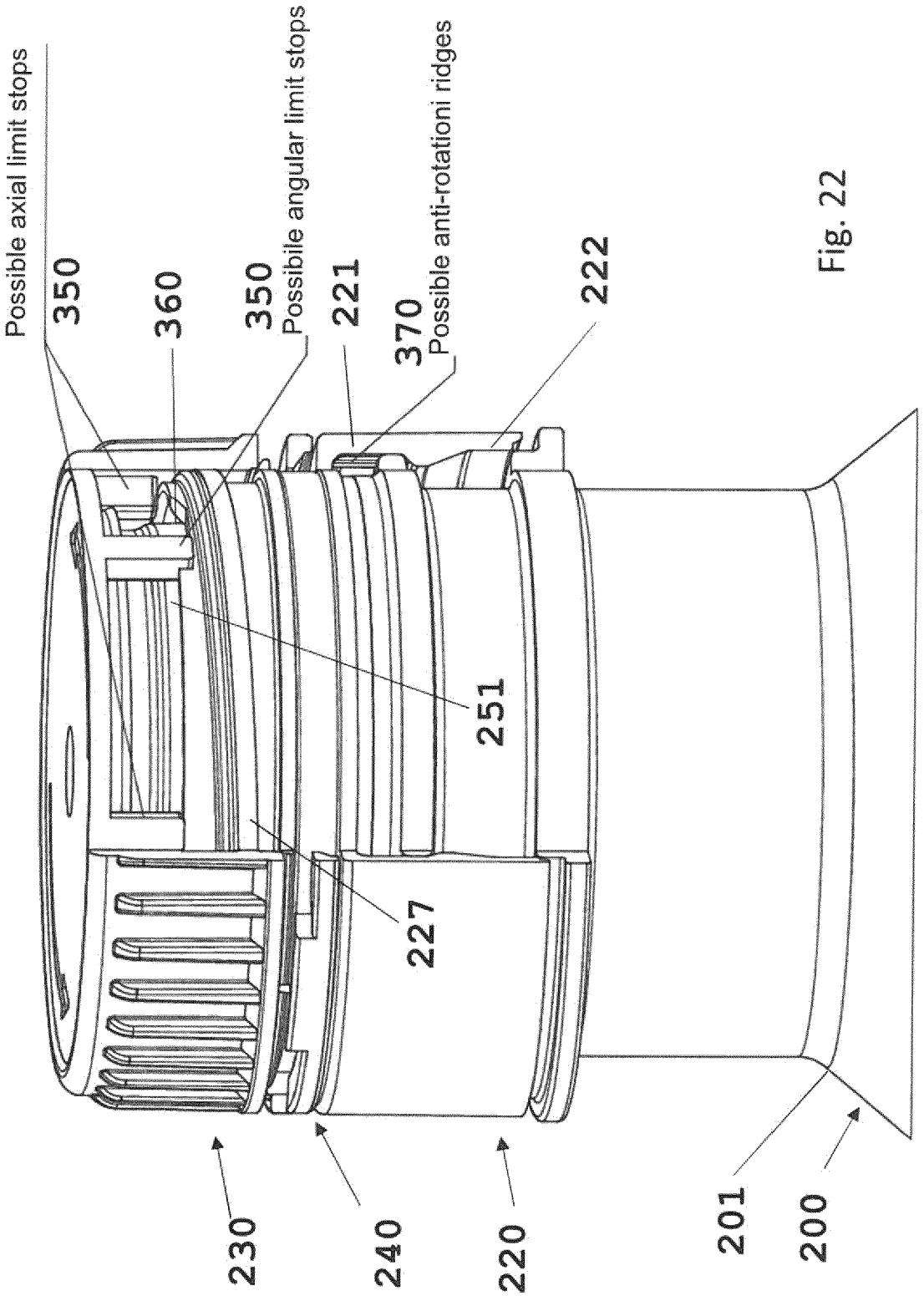
Possible axial limit stops
350
360
350
Possibile angular limit stops
221
370
Possible anti-rotationi ridges
222
251
227
230
240
220
201
200

Fig. 22

REFERENCES CITED IN THE DESCRIPTION

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