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(54) CONTAINER CONNECTION SYSTEM

(57) The present invention relates to a fluid container connection system for connecting a fluid container (900) to a fluid delivery tube. The system includes a container cap (102) configured to attach to the opening of a container (900), comprising: a side wall (106) having a plurality of protrusions and/or recesses (112, 114); an end wall comprising an aperture (116); and, a pipe (430), having open first and second ends, coupled to the aperture (116) of the end wall. The system also includes a connector for coupling to the container cap (102), comprising: a security cap (100) having a side wall (120) and an end wall, the side wall having a plurality of recesses and/or protrusions (122, 124, 126) configured to engage with the corresponding plurality of protrusions of the container cap (102); and, a fluid conduit (130) extending through the end wall of the security cap, the conduit having a first end and a second end, the second end configured to be coupled to the fluid delivery tube. Upon the plurality of protrusions and/or recesses of the container cap (102) aligning and engaging with the corresponding plurality of recesses and or protrusions of the security cap (100), the first end of the fluid conduit of the security cap is received within the pipe of the container cap to place the fluid delivery tube in fluid communication with the fluid container.

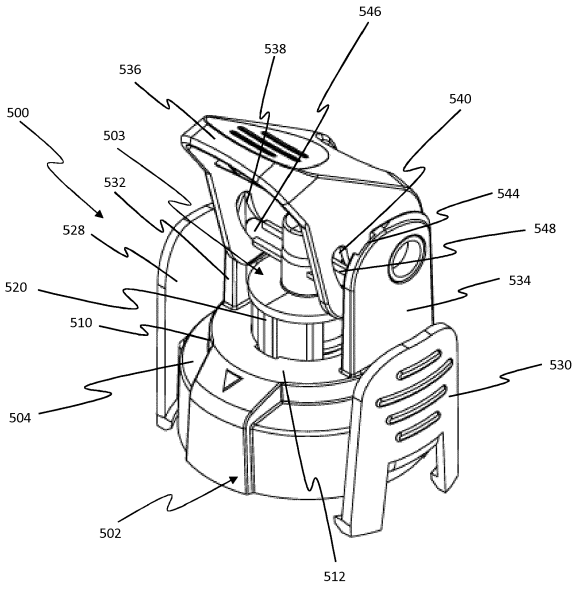

Figure 8

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Description

[0001] The present invention relates to a container connection system for a liquid dispensing apparatus. In particular, the invention relates to a container connection system for containers of chemicals, such as liquid cleaning chemicals.

[0002] Chemicals to be dispensed are often supplied in bottles or bags, whereby they are connected to a dispensing system. Such chemicals are often used in environments such as healthcare facilities, hotels, restaurants and the like. Often a user will require several different chemicals to carry out different cleaning or manufacturing tasks around the environment. Such containers of chemicals are often manufactured by a single company to a single design.

[0003] In known container connection systems, a connection point is provided wherein a tube or pipe is inserted into a container such that liquid may be removed therefrom. In other known container connection systems, a cap is provided along the pipe such that the container may be sealed during dispensing. In yet further known container connection systems, a mounting point is provided which contains apparatus to allow a user to penetrate a container with a pipe and seal the container whilst retaining the container in a suitable location.

[0004] Often, such known systems are capable of connecting to any one of a group of similar containers of different chemicals. In some circumstances, a particular chemical may be inadvertently connected to a dispensing line routed to a location designed to receive a different chemical. This is disadvantageous, as chemicals for use in such environments are typically selected based on their ability to carry out a specific task. Furthermore, certain chemicals if mixed with certain other chemicals, for instance in a dispensing line or at a collection point, can react chemically and be hazardous.

[0005] It is therefore an object of the present invention to provide an improved container connection system preventing a user from connecting a container of one chemical to a dispensing line designed to receive a different chemical.

[0006] According to a first aspect of the present invention, there is provided a fluid container connection system for connecting a fluid container to a fluid delivery tube, comprising: a container cap configured to attach to the opening of a container, comprising: a side wall having a plurality of protrusions and/or recesses comprising a first set comprising one protrusion or one recess, and a second set comprising a plurality of protrusions and/or recesses; an end wall comprising an aperture; and, a pipe, having open first and second ends, coupled to the aperture of the end wall. The system further comprises a connector for coupling to the container cap, comprising: a security cap having a side wall and an end wall, the side wall having a plurality of recesses and/or protrusions configured to engage with the corresponding plurality of protrusions and/or recesses of the container cap, the plurality of recesses and/or protrusions comprising a first set comprising one corresponding recess or protrusion and a second set comprising a plurality of corresponding recesses and/or protrusions; and, a fluid conduit extending through the end wall of the security cap, the conduit having a first end and a second end, the second end configured to be coupled to the fluid delivery tube. The protrusion and recess of the first sets are configured to rotationally align the security cap with the container cap upon engaging with each other such that when the second set of protrusions and/or recesses of the container cap align and engage with the corresponding second set of recesses and/or protrusions of the security cap, the first end of the fluid conduit of the security cap is received within the pipe of the container cap to place the fluid delivery tube in fluid communication with the fluid container.

[0007] Advantageously, providing a container cap having a plurality of protrusions and/or recesses configured to engage with corresponding recesses and/or protrusions on a security cap, enables each different chemical to be dispensed to be provided with protrusions and/or recesses disposed on the caps in unique, coded, positions. In this way, a security cap coded to use chemical A, cannot be coupled to a container cap coded as chemical B because the protrusions and recesses would not align, thus preventing the security cap from engaging with the container cap.

[0008] By providing a first recess on the security cap, and a corresponding protrusion on the container cap, or vice versa, which are configured to engage with each other, the rotational orientation of the security cap to the container cap can be ensured. The first set of protrusions or recesses preferably has a width greater than the width of the second set of protrusions or recesses. This may ensure that the security cap can only engage with the container cap in one rotational orientation. As used herein, the term width refers to the dimension along the circumferential direction.

[0009] As will now be appreciated, the container cap may comprise a set of protrusions, or a set of recesses, or a combination of both recesses and protrusions. However, in a preferred embodiment, the container cap comprises a plurality of protrusions, and therefore the security cap comprises a plurality of corresponding recesses.

[0010] Each of the second sets preferably comprise two protrusions and/or recesses. It has been found that providing two protrusions and corresponding recesses enables a secure coded security cap to be provided while still allowing a sufficient number of variations of coded positions. Each of the two protrusions and /or recesses of each second set are preferably provided in one of a plurality of predefined positions disposed annularly about said caps. In particular, each of the two protrusions and /or recesses of each second set are preferably provided in one of between 3 and 10 predefined positions disposed annularly about said caps. In one embodiment, each of the two protrusions and /or recesses of each second set are provided in one of 7 predefined positions disposed

annularly about said caps. As will be appreciated, arranging two protrusions and/or recesses in one of 7 positions provides 21 unique combinations.

[0011] The second sets of protrusions and/or recesses are preferably configured such that they only align with each other upon the security cap being rotationally aligned with the container cap. In addition, the security cap and the container cap may only be engaged upon the positions of protrusions and/or recesses on the security cap matching the positions of recesses and/or protrusions on the container cap.

[0012] The first set comprising a protrusion or recess of the security cap preferably has a first longitudinal length, and the second set comprising a plurality of protrusions and/or recesses of the security cap preferably have a second longitudinal length, the first length being greater than the second length. In this way, the first sets engage and rotationally align the security cap to the container cap before second sets begin to engage. Advantageously, this prevents misalignment of the caps and reduces the risk of a user from attempting to use excessive force to engage mismatched caps.

[0013] The fluid conduit, of the connector, is preferably linearly slidable relative to the security cap. The fluid conduit is preferably linearly slidable along a longitudinal axis of the fluid conduit. Advantageously, this enables the security cap to be coupled to the container cap independently from the fluid conduit being engaged with the pipe of the container cap.

[0014] The connector preferably comprises means for removably coupling to the container cap. The means for removably coupling preferably comprises first and second cantilever snap-fit projections, the container cap comprising corresponding projections configured to engage with the cantilever projections.

[0015] The first and second cantilever projections are preferably hingedly mounted to the connector, and movable between a first position in which the cantilevers are engageable with the projections on the container cap and a second position in which the cantilevers are not engageable with the projections. The cantilever projections are preferably integrally formed with the connector. A proximal end of each cantilever projection preferably engages with a corresponding projection on the container cap. The proximal end of each cantilever is preferably tapered such that upon engaging the connector with the container cap, the proximal ends are spread apart to enable the cantilever projections to engage with the corresponding projections on the container cap.

[0016] The means for removably coupling are preferably configured such that the security cap may only be coupled to the container cap after the plurality of protrusions and/or recesses have engaged.

[0017] The connector preferably further comprises a lever movable from a first position, in which the first end of the fluid conduit is not engaged with the pipe, to a second position in which the first end of the fluid conduit is engaged with the pipe.

[0018] The lever is preferably pivotably coupled, adjacent a first end, to the security cap, the lever having an arcuate track configured to engage with a projection on the fluid conduit, such that the fluid conduit is movable between a first position in which it is not engaged with the pipe, and a second position in which it is engaged with the pipe. The projection on the fluid conduit is preferably configured to slidably engage with a linear track on the connector.

[0019] The lever and arcuate track are preferably configured such that the maximum displacement of the fluid conduit in a direction towards engagement is at a location along the track between a first end of the track corresponding to the lever being the first position and the second end of the track corresponding to the lever being in the second position. Advantageously, this enables the lever to "lock" the fluid conduit in fluid communication with the container upon the lever being in the second position. This is because the force required to move the lever from the second position to the first position increases as the lever approaches the location of maximum displacement of the fluid conduit in a direction towards engagement, before decreasing as the fluid conduit is then moved in a direction away from engagement.

[0020] Alternatively, the means for removably coupling may comprise an annular snap-fit projection, the container cap comprising a projections configured to engage with the annular projection. In this alternative, the connector may be removed by compressing the connector in one axis, perpendicular to the axis comprising the projections, such that the connector is deformed, releasing the annular snap-fit coupling.

[0021] The container cap preferably comprises an annular channel, disposed about the aperture, the connector comprising an annular projection configured to be received within said annular channel upon the security cap engaging with the container cap. The annular projection of the connector is preferably disposed about, and coupled to, the fluid conduit. The annular projection is preferably integral to the fluid conduit. The first end of the fluid conduit is preferably configured such that it is within the cavity formed by the annular projection. An outer wall of the annular projection preferably comprises a seal for sealing the annular projection within the annular channel. The seal may comprise at least one o-ring, the or each o-ring provided in a groove in the outer wall of the annular projection.

[0022] The container cap preferably further comprises: an inner cap for direct attachment to a container, the inner cap comprising the aperture; and an outer cap comprising the two or more protrusions and/or recesses, the outer cap comprising a further aperture. The further aperture is disposed adjacent the aperture of the inner cap. The outer cap is preferably freely rotatable about the longitudinal axis of the inner cap. In this way, the outer cap may rotate to enable the connector to engage with the container without the requirement of the container being provided in a specific rotational alignment. The outer cap

may be coupled to the inner cap using an annular snap-fit arrangement.

[0023] The inner cap preferably further comprises a frangible film arranged to seal the aperture of the inner cap. The first end of the fluid conduit is preferably configured to pierce the frangible film upon the first end of the fluid conduit being received within the pipe of the container cap. The first end of the fluid conduit may be formed to have at a sharp end. For example, the first end may be cut at an angle other than perpendicular to the longitudinal axis. The first end may be cut at an angle between 30 degrees and 60 degrees.

[0024] The outer cap preferably also comprises a removable seal integrally formed within the further aperture. The removable seal preferably comprises a tearing zone of reduced thickness forming the joint between the removable seal and the further aperture. The removable seal advantageously protects the frangible seal of the inner cap, during transport etc. The removable seal may further comprise a ring-pull to enable removal of the seal. The ring pull is preferably attached to the removable seal adjacent an edge of the seal.

[0025] The container cap may further comprise at least one vent-hole. The or each vent-hole is configured to enable the contents of the container to flow out of the container through the fluid conduit without reducing the gas pressure within the container. The or each vent-hole may be positioned, where provided, on a bottom surface of the annular channel of the container cap. Alternatively, or in addition, the or each vent-hole may be positioned adjacent the aperture in the container cap.

[0026] The pipe, of the container cap, may be configured to extend to the bottom of the container. The pipe may comprise two portions, a first portion integrally formed with the container cap, and a second portion removably coupled to the first portion. The second portion may be a flexible pipe.

[0027] The connector may be mounted to a housing, the housing configured to receive a container. The connector may be slidably mounted to the housing. The connector may be slidable in a direction perpendicular to the longitudinal axis of the fluid conduit.

[0028] Any feature in one aspect of the invention may be applied to other aspects of the invention, in any appropriate combination. In particular, method aspects may be applied to apparatus aspects, and vice versa. Furthermore, any, some and/or all features in one aspect can be applied to any, some and/or all features in any other aspect, in any appropriate combination.

[0029] It should also be appreciated that particular combinations of the various features described and defined in any aspects of the invention can be implemented and/or supplied and/or used independently.

[0030] The invention will be further described, by way of example only, with reference to the accompanying drawings in which:

- Figure 1(a) shows a plan view of a security cap for a fluid container connection system of a first embodiment of the present invention;
- Figure 1(b) shows a plan view of a container cap for the fluid container connection system of the first embodiment;
- Figure 2(a) shows a side view of the security cap shown in Figure 1(a);
- Figure 2(b) shows a side view of the container cap shown in Figure 1(b);
- Figure 3(a) shows a perspective view of the security cap shown in Figure 1(a);
- Figure 3(b) shows a perspective view of the container cap shown in Figure 1(b);
- Figure 4(a) shows a perspective view of a container cap for a fluid container connection system of a second embodiment;
- Figure 4(b) shows a perspective view of an inner portion of the container cap shown in Figure 4(a);
- Figure 4(c) shows a cross-sectional view of the container cap shown in Figure 4(a);
- Figure 4(d) shows a perspective cross-sectional view of the container cap shown in Figure 4(d);
- Figure 5(a) shows a cross-sectional view of a connector for the system of the second embodiment;
- Figure 5(b) shows a cross-sectional view of a fluid conduit portion of the connector shown in Figure 5(a);
- Figure 5(c) shows a perspective cross-sectional view of the connector shown in Figure 5(a);
- Figure 5(d) shows a detail perspective cross-sectional view of the connector shown in Figure 5(a);
- Figure 6 shows a detail perspective cross-sectional view of the system of the second embodiment;
- Figure 7 shows an exploded view of the connector of the second embodiment;
- Figure 8 shows a perspective view of the connector of the second embodiment;
- Figures 9(a), 9(b), 9(c) and 9(d) show perspective views of the system of the second embodiment connected to a container.

[0031] Figures 1(a) and 1(b) show plan views of a security cap 100 and a container cap 102, respectively, for a fluid container connection system. Various alternative views of the security cap 100 and container cap 102 are shown in Figures 2(a), 2(b), 3(a) and 3(b).

[0032] The container cap 102 is configured to be couplable to a standard container (not shown), for example by screwing or snapping on to the inlet/outlet of the container; the inner surface 104 of side wall 106 therefore forms a connection with the inlet/outlet of the container. The outer surface 108 of the container cap 102 comprises a first projection 110, a first recess 112 and a second recess 114. In this example, the recesses are substantially semi-circular in cross-sectional shape, but as will be appreciated any suitable cross-sectional shape, such as square or triangular may be provided. The first projection 110 extends for substantially the entire height of

the container cap 100. The first recess 112 and the second recess 114 also extend for substantially the entire height of the container cap 100. The end wall of the container cap 102 comprises an aperture 116.

[0033] The security cap 100 is configured to be couplable to the container cap 102 by slidably engaging over the container cap. The inner surface 118 of side wall 120 comprises a first recess 122, a first projection 124, and a second projection 126. The first recess 122 extends for substantially the entire height of the inner surface 118 of the security cap 102. The first projection 124 and the second projection 126 also extend for substantially the entire height of the inner surface 118 of the security cap 100. In an alternative, the end of the first projection 124 and the end of the second projection 126 are spaced from the bottom edge of the security cap 100. The security cap further comprises an aperture 128, and a fluid conduit 130 extending through the aperture 128.

[0034] The first recess 122 of the security cap 100 is configured to receive the first projection 110 of the container cap 102 upon the security cap engaging with the container cap. The first projection 124 and the second projection 126 of the security cap 100 are configured to engaged with the first recess 112 and the second recess 114 of the container cap 102, respectively. Where the first projection 124 and the second projection 126 have their ends spaced apart from the bottom edge of the security cap, the first recess 122 engages with the first projection 110 before engagement of the first and second projections with the corresponding first and second recesses. This enables the security cap 100 to be placed in rotational alignment with the container cap 102.

[0035] Upon the security cap 100 being coupled to the container cap 102, the fluid conduit 130 is received in the aperture 116 of the container cap. In this way, the fluid conduit is placed in fluid communication with the container cap 100 and therefore in fluid communication with the container itself. The end 132 of the fluid conduit 130 is configured to be connected to a supply pipe for supplying the contents of the container to machinery, or dispensers etc. The end 134 of the fluid conduit 130 has a pipe connected to it (not shown), such that the pipe extends to the bottom of the container to enable the contents of the container to be supplied more effectively.

[0036] The first recess 112, the second recess 114, and the corresponding first projection 124 and second projection 126 may be disposed at any position, relative to the first projection 110 and the first recess 122, about the side walls of the container cap 102 and security cap 100, respectively. In this way, the security cap 100 can be coded to fit only with a correspondingly coded container cap 102. In one example, the projections and corresponding recesses may be provided in one of seven positions about the side walls, such that the two pairs of projections and recesses may be provided in one of 21 combinations. This enables 21 types of fluid containers to be coded to ensure that only the correct fluid is provided.

[0037] The security cap 100 may be configured to be removably attachable to the container cap 102. In this example, the security cap 100 may have one or more snap-fit projections configured to engage with a portion of the container cap 102. For example, the snap-fit projections may extend from the bottom edge of the security cap, and be configured to engage with the bottom edge of the container cap.

[0038] Figures 4(a) - 4(d) show a preferred embodiment of a container cap comprising an outer cap 400 and an inner cap 402, which forms part of a fluid container connection system. The outer cap 400 is configured to snap on to inner cap 402, such that the outer cap 400 can freely rotate around inner cap 402. In this example, the outer cap 400 comprises an annular recess 404 (shown in Figure 4(c) and 4(d)), configured to snap-fit with an annular projection 406 on the inner cap 402. Alternatively, the outer cap 400 can be configured to screw on to the inner cap 402, in configurations where the outer cap 400 does not need to freely rotate.

[0039] Similarly to the container cap 102 described above, the outer cap 400 comprises a side wall 408, and an end wall 410. The end wall 410 further comprises a ring-pull type seal 412 formed from a continuous loop of reduced thickness material in the end wall, and an extruded pulling loop sized to receive a human finger, the pulling loop to enable removal of the seal. The seal 412 is configured to seal the container to which the container cap is connected until use of the container.

[0040] The side wall 408 of the outer cap 400 comprises a plurality of protrusions 414, 416, and 418 disposed longitudinally around the exterior of the side wall. The side wall 408 comprises security protrusions 414 and 416 for engagement in a security cap (described below with reference to Figures 5(a) - 5(d) and Figures 6 to 8), and locating protrusion 418 for aligning the freely rotating outer cap with a security cap, when in use. The locations of the security protrusions 414 and 416 are unique to the outer cap corresponding to a particular chemical, as described in further detail below.

[0041] The side wall 408 of the outer cap 400 further comprises a lateral protrusions 420 and 422 disposed around the circumference, which define two tabs diametrically opposite and extending for approximately 60° around respective portions of the sidewall 408. The tabs are configured to be received by corresponding retaining hooks on a security cap when engaged.

[0042] Inner cap 402 is configured to screw or snap on to the inlet/outlet of a container (not shown). It will be appreciated that for the sake of cross-compatibility, the inner cap can have interior dimensions appropriate for a container inlet/outlet of any size. Therefore, to connect with a container with an inlet/outlet of any size, only the inner cap may be replaced. For example, the outer cap can connect onto a variety of inner caps, each sized to fit a specific container. In other configurations, an adapter may be supplied to adapt the inner cap to connect onto a container inlet/outlet of any size.

[0043] The inner cap comprises an end wall 424. The end wall comprises an outer annular portion, an inner annular recessed portion 426, and an aperture 428 extending to a first portion of pipe 430 creating a fluid path therethrough. The configuration and function of the inner annular recessed portion is described in detail below.

[0044] The first portion of the pipe 430 extending through the interior of the inner cap, and a second portion of the pipe 431 couplable to the first portion are shown in Figure 4(d). A proximal end of the second portion of pipe 431 is configured to overlap and surround an end of the first portion of pipe 430, and a distal end is configured to extend away from the cap. In some configurations the pipe is configured to extend all the way to the bottom of a container. In such configurations, a spike may be fashioned into the distal end of the pipe 431 by cutting the pipe to form an acute angle at the tip. Such a configuration can aid in retrieving the maximum amount of chemical from a container. In other configurations, the pipe is configured to extend only a short distance into a container, for instance where the container is an airtight bag which deflates as liquid is removed. It will also be appreciated that the entire apparatus can be connected to the base of a container, or on the side at the bottom of a container, and not require the second portion of pipe 431, because the apparatus can be gravity fed. The same configuration would be appropriate should the container (and therefore apparatus) be inverted for connection to the apparatus.

[0045] A sealing disk 432 is disposed over the top of the aperture 428, such that chemical within the container cannot exit the container until the seal is removed or pierced, even after the seal 412 is removed. The sealing disk can be made from metal foil, plastic, plastic lined paper, or other flexible chemical-proof material. The sealing disk may be glued to the aperture, or may be secured by a ring of shrink-wrapped plastic. The sealing disk may alternatively be held in place by the outer cap.

[0046] Figures 5(a) to 5(d) and Figures 6 to 8 show a connector 500 for use with the container cap 400. The combination of the container cap 400 and the connector 500 forms a fluid container connection system according to one embodiment of the present invention.

[0047] Connector 500 comprises a security cap 502 and a fluid conduit 503. The security cap 502 has an end wall 504 and side wall 506. The end wall 504 comprises an aperture 508 formed in an annular projection 510, so as to protrude from the exterior of the end wall 504. The interior of the annular projection 510 has guiding portions 512 configured to align with guiding portions of the fluid conduit 503.

[0048] Fluid conduit 503 comprises an "L" shaped tubularfluid path. At a first end of the conduit 514 there is disposed a set of lateral ridges to secure a dispensing line to the conduit 503. Alternatively, no ridges may be provided, and a dispensing line may be secured by way of an industry standard clip, such as a jubilee clip or cable tie. At the second end of the conduit 503 there is a spike 516 formed by cutting the pipe at an angle at the tip. Coaxially disposed about the spiked portion of the fluid conduit 503, a sealing tube 518 is provided.

[0049] Sealing tube 518 comprises an upper portion which has guiding portions 520 configured to align with guiding portions 512 on the interior of the annular projection 510. Sealing tube 518 further comprises a lower portion which has a plurality of circumferential recesses 522. The circumferential recesses 522 are configured to receive O-rings 524. O-rings 524 may be formed of PTFE, EPDM, Viton, Nitrile, Rubber or Silicon. Sealing tube 518 and O-rings 524 are configured to be received within the inner annular recessed portion 426 of the end wall 424 of the inner cap 400, thereby making a liquid-tight seal.

[0050] The fluid conduit 503 is linearly slidable, along a longitudinal axis, from a first position (shown in Figure 8, for example) to a second position (shown in Figure 5(a), for example) within the security cap 502. In the first position, a flange 525 engages with the inner surface of the annular projection 510, preventing further movement. In the second position, a flange 526 engages with the outer surface of the annular projection 510, preventing further movement.

[0051] As described above, the outer cap 400 of the container cap comprises a plurality of protrusions 414, 416, and 418. The security cap 506 comprises a plurality of corresponding recesses 600, 602, and 604. The recess 604 is configured to receive the protrusion 418, and is configured to rotationally align the security cap 502 to the outer cap 400. The recesses 600 and 602 are configured to receive the protrusions 414 and 416. The recesses are positioned about the inner surface of the side wall 506 such they only align with a correspondingly coded container cap.

[0052] Referring in particular to Figure 6, the various positions in which the protrusions and corresponding recesses of the container cap and security cap respectively, are shown. In this example, seven positions are envisaged and are labelled A - G. The projections 418 is merely provided to ensure rotational alignment between the security cap and the container cap. In this present example, two projections and corresponding recesses are envisaged, which provides for 21 combinations of positions. As such, 21 different containers, each containing a different fluid, can be coded for. If, for example three projections were used, the number of combinations would increase to 35. If yet further "codes" are required, the number of possible positions may be increased. For example, 10 possible positions used with 5 projections would result in 252 "codes".

[0053] The connector 500 may be releasably coupled to the container cap by a pair of cantilever snap-fit connectors 528 and 530. Each cantilever snap-fit connector is flexibly attached to the side wall 506 of the security cap 502. The connectors 528 and 530 are diametrically opposite each other, and are configured to engage with the tabs defined by the lateral protrusions 422 and 420 respectively. The distal ends of the cantilever connectors

528 and 530 are tapered such that pressing the security cap onto the outer cap spreads the distal ends and enables the security cap to be connected to the container cap. The cantilever connectors are configured such that they can only be connected to the container cap upon the protrusions 414, 416, and 418 being aligned with each of the recesses 600, 602, and 604 respectively.

[0054] The proximal ends of the cantilever connectors 528 and 530 extend to form push-tabs for a user to operate. Biasing of the push tabs together will separate the hooks at the distal end of the snap-fit connector, thereby releasing the security cap from the outer cap.

[0055] The end wall 504 of the security cap 502 further comprises two extruded brackets 532 and 534 extending upwards. The brackets 532 and 524 each comprise locating holes for hingably mounting a lever 536 such that the lever 536 can rotate from a first, substantially horizontal forward facing, position to a second, substantially vertical position. The lever comprises a pair of arcuate channels 538 and 540, effectively defining cam surfaces, configured to act on the fluid conduit 503 and displace it from the first position to the second position, upon the lever being moved from the first position to the second position. The interior, or centre facing surface, of each bracket comprises an elongate channel 542 and 544, extending longitudinally.

[0056] Referring again to the fluid conduit 503, it can be seen that a pair of diametrically opposed cylindrical projections 546 and 548 are provided. The cylindrical projections are configured to act as followers for the arcuate channels 538 and 540, which are acting as cam surfaces. As such, the cylindrical projections are configured to follow the arcuate channels upon the lever being moved from the first position to the second position, or vice versa. In addition, the cylindrical projections 546 and 548 are configured to slide within the elongate channels 542 and 544 to ensure that the fluid conduit 503 moves linearly between the first and second positions.

[0057] Referring now to Figure 9(a), 9(b), 9(c) and 9(d), it will be readily apparent that three stages of connection of the fluid container connection system are shown, together with a cross-sectional view of the connection stage shown in Figure 9(c). Figure 9(a) shows the container cap, including the inner cap 402 and outer cap 400 connected to a container 900. In this figure, the seal 412 has been removed, and so the outer cap is ready to receive the connector 500. As will be appreciated, the seal 412 is only removed immediately prior to connection of the connector 500. The connector is coupled to a fluid line (not shown) by the fluid conduit 503.

[0058] Figure 9(b) shows the connector 500 coupled to the outer cap 400 by the cantilever snap-fit projections. The lever 536 is in the first position, and as such the fluid conduit is in the first position (as also shown in Figure 8), and so is not in fluid communication with the aperture 428.

[0059] Figure 9 (c) shows the connector coupled to the outer cap 400, and with the lever 536 in the second position. As such, the fluid conduit has been moved to the second position and is not in fluid communication with the aperture 428. Figure 9(d) shows a cross-sectional view of the connector coupled to the outer cap 400, and with the lever 536 in the second position. As can be seen, the conduit 514 is in fluid communication with the bottom of the container 900, via the second portion of pipe 431.

[0060] Further details of the operation of the connector system are provided below.

[0061] The connection system may be located in a housing (not shown). Alternatively, the connection system may be stand-alone and configured to be attached to a container at the container's stored location. Where containers are of the type of intermediate bulk containers (IBCs), it may be advantageous to have a stand-alone connection assembly which can be attached at the stored location of the IBC. The stand-alone connection assembly may not be attached to a fluid dispensing line, and may have a dispensing line connection point of a size suitable for connection with the appropriate dispensing line. The stand-alone connection assemblies configured to connect to caps of containers containing different products may have different sized dispensing line connection points in the manner explained above.

[0062] A housing for the connection system offers advantages in that the housing can be located within the usage environment in a location designated to store such containers. In the circumstance where the container is a non-rigid bag, the housing can include features to support the non-rigid bag.

[0063] The housing may have a base and side walls for containment of the container. The housing may also have a partly circular clip to retain the neck or other art of a rigid container or non-rigid bag. The housing may have a lockable front cover to prevent access to the container, or to prevent unauthorized connection of a container. Such a lockable cover may provide a point at which the system can be locked out for maintenance. For instance, a user can remove a container and lock the housing so that no fluid can be delivered down the dispensing line.

OPERATION

[0064] In preparation for use, a first party such as a container manufacturer connects the container cap assembly to a container 900. In certain configurations, connection of the container cap assembly to the container 900 consists of attaching a second portion of pipe 431 of suitable length to the first portion of pipe 430 in the inner cap 402. In other configurations, second portion of pipe 431 is omitted, as described above. Connection to the container 900 may further consist of screwing the inner cap 402 attached or not to a second portion of pipe 431 onto the container 900. The same party may then connect the outer cap 400 to the inner cap 402 using the annular snap-fit, as described above.

[0065] Alternatively, a first party may not connect the outer cap 400 to the inner cap 402, and the outer cap

400 may be connected by a second party, such as a storeman or purchaser for a company of the usage environment.

[0066] When the container 900 is to be connected to a dispensing line, an end user removes the ring-pull seal 412 from the outer cap 400 connected to the container 900. The user then rotates the outer cap 400, or container 900 if the outer cap 400 is not free to rotate, until the recesses 600, 602 and 604 in the security cap 502 align with the protrusions 414, 416, and 418 in the outer cap 400. The user is then free to mate the security cap 502 over the outer cap 400 until the cantilever snap-fit projections 532 and 534 engage with the tabs 420 and 422 on the outer cap 400.

[0067] In this manner, an outer cap 400 with a particular coded set of projections can only be connected to a connector 500 with a complementary coded set of recesses. This prevents accidental or deliberate connection of a container to an incorrect dispensing line.

[0068] Once the connector 500 is connected to the outer cap 400, the lever 536 is rotated from the first position to the second position. This action biases the fluid conduit into engagement with the aperture 428 of the inner cap. In addition, the sealing tube 518 is received within the annular channel 426, the o-rings 524 affecting a seal, and the spiked second end of the fluid conduit 503 pierces the frangible seal 432. Fluid can then be pumped, or gravity fed from the container 900 to a dispensing location.

[0069] The relative dimensions of the connection system are such that the spike 516 provided at the second end of the fluid conduit 503, cannot pierce the frangible seal 432 and engage with the aperture 428 unless the security cap 502 is properly engaged with the container cap.

[0070] Upon the container being depleted, the connector 500 is removed from the container 900 by biasing the proximal ends of the cantilever snap-fit projections towards each other.

Claims

1. A fluid container connection system for connecting a fluid container to a fluid delivery tube, comprising:

   a container cap configured to attach to the opening of a container, comprising:

   a side wall having a plurality of protrusions and/or recesses comprising a first set comprising one protrusion or one recess, and a second set comprising a plurality of protrusions and/or recesses;
   an end wall comprising an aperture; and,
   a pipe, having open first and second ends, coupled to the aperture of the end wall;

   and,

   a connector for coupling to the container cap, comprising:

   a security cap having a side wall and an end wall, the side wall having a plurality of recesses and/or protrusions configured to engage with the corresponding plurality of protrusions and/or recesses of the container cap, the plurality of recesses and/or protrusions comprising a first set comprising one corresponding recess or protrusion and a second set comprising a plurality of corresponding recesses and/or protrusions; and,
   a fluid conduit extending through the end wall of the security cap, the conduit having a first end and a second end, the second end configured to be coupled to the fluid delivery tube;

   wherein, the protrusion and recess of the first sets are configured to rotationally align the security cap with the container cap upon engaging with each other such that when the second set of protrusions and/or recesses of the container cap align and engage with the corresponding second set of recesses and/or protrusions of the security cap, the first end of the fluid conduit of the security cap is received within the pipe of the container cap to place the fluid delivery tube in fluid communication with the fluid container.

2. A fluid container connection system according to Claim 1, wherein each of the second sets comprise two protrusions and/or recesses.

3. A fluid container connection system according to Claim 2, wherein each of the two protrusions and /or recesses of each second set are provided in one of a plurality of predefined positions disposed annularly about said caps.

4. A fluid container connection system according to Claim 3, wherein each of the two protrusions and /or recesses of each second set are provided in one of between 3 and 10 predefined positions disposed annularly about said caps.

5. A fluid container connection system according to any of Claims 1 to 4, wherein the second sets of protrusions and/or recesses are configured such that they only align with each other upon the security cap being rotationally aligned with the container cap.

6. A fluid container connection system according to any of the preceding claims, wherein the first set of the security cap has a first longitudinal length, and the second set of protrusions and/or recesses of the security cap have a second longitudinal length, the first

length being greater than the second length.

7. A fluid container connection system according to any of the preceding claims, wherein said fluid conduit is linearly slidable relative to the security cap.

8. A fluid container connection system according to any of the preceding claims, wherein the connector comprises means for removably coupling to the container cap.

9. A fluid container connection system according to Claim 8, wherein the means for removably coupling comprises first and second cantilever snap-fit projections, the container cap comprising corresponding projections configured to engage with the cantilever projections.

10. A fluid container connection system according to any of Claims 8 or 9, wherein the connector further comprises a lever movable from a first position, in which the first end of the fluid conduit is not engaged with the pipe, to a second position in which the first end of the fluid conduit is engaged with the pipe.

11. The fluid container connection system of any of the preceding claims, wherein the container cap comprises an annular channel, disposed about the aperture, the connector comprising an annular projection configured to be received within said annular channel upon the security cap engaging with the container cap.

12. The fluid container connection system according to any of the preceding claims, wherein the container cap further comprises:

an inner cap for direct attachment to a container, the inner cap comprising the aperture; and
an outer cap comprising the two or more protrusions and/or recesses, the outer cap comprising a further aperture.

13. The fluid container connection system according to claim 12, wherein the outer cap is freely rotatable about the longitudinal axis of the inner cap.

14. The fluid container connection system according to any of claims 12, or 13, wherein the inner cap further comprises a frangible film arranged to seal the aperture in the inner cap.

15. The fluid container connection system according to any of the preceding claims, wherein the connector is mounted to a housing, the housing configured to receive a container.

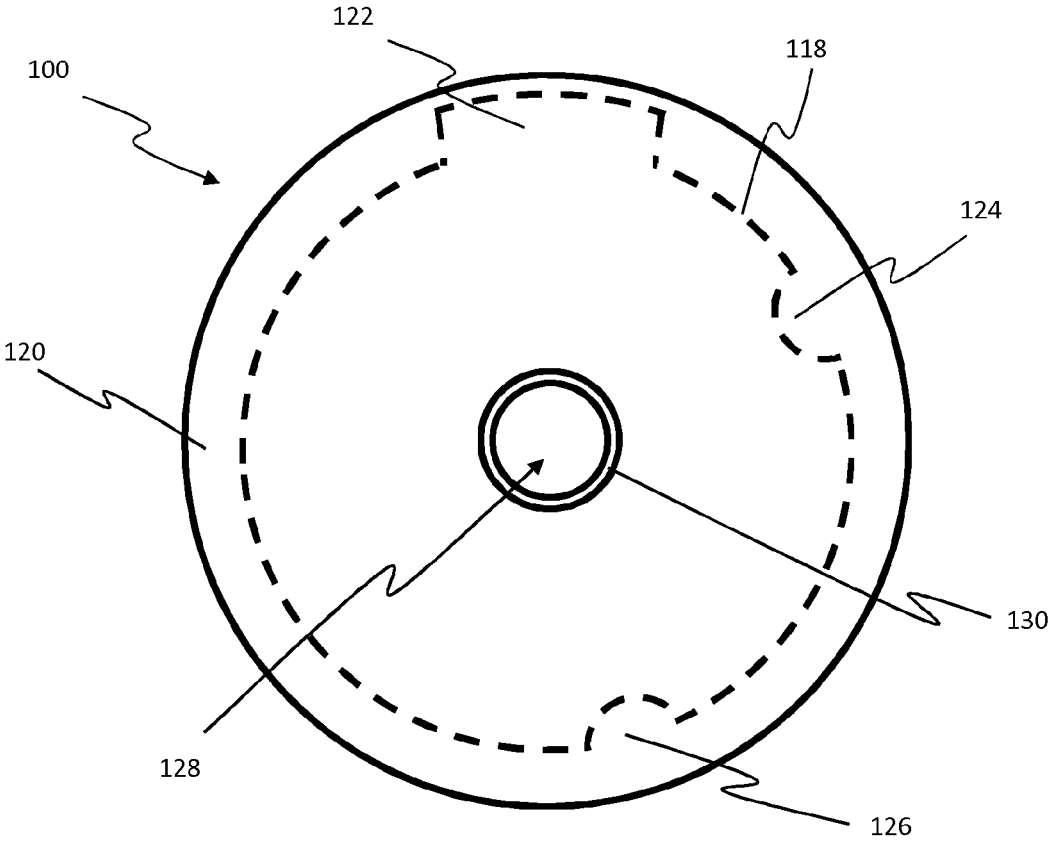


Figure 1(a)

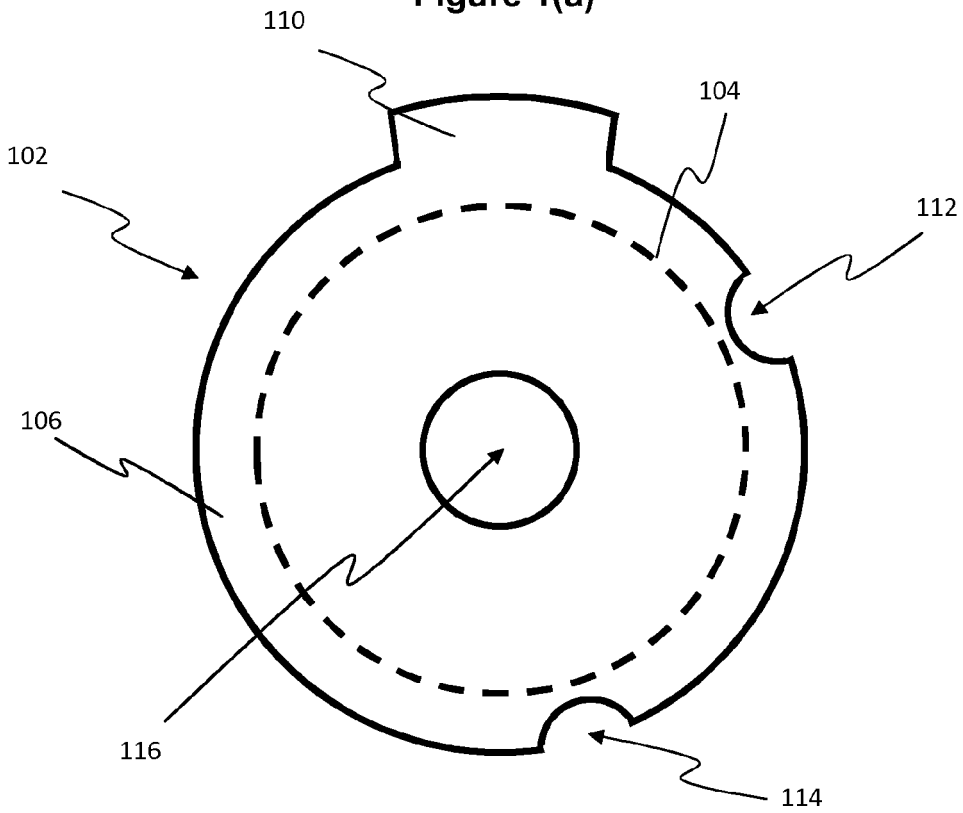
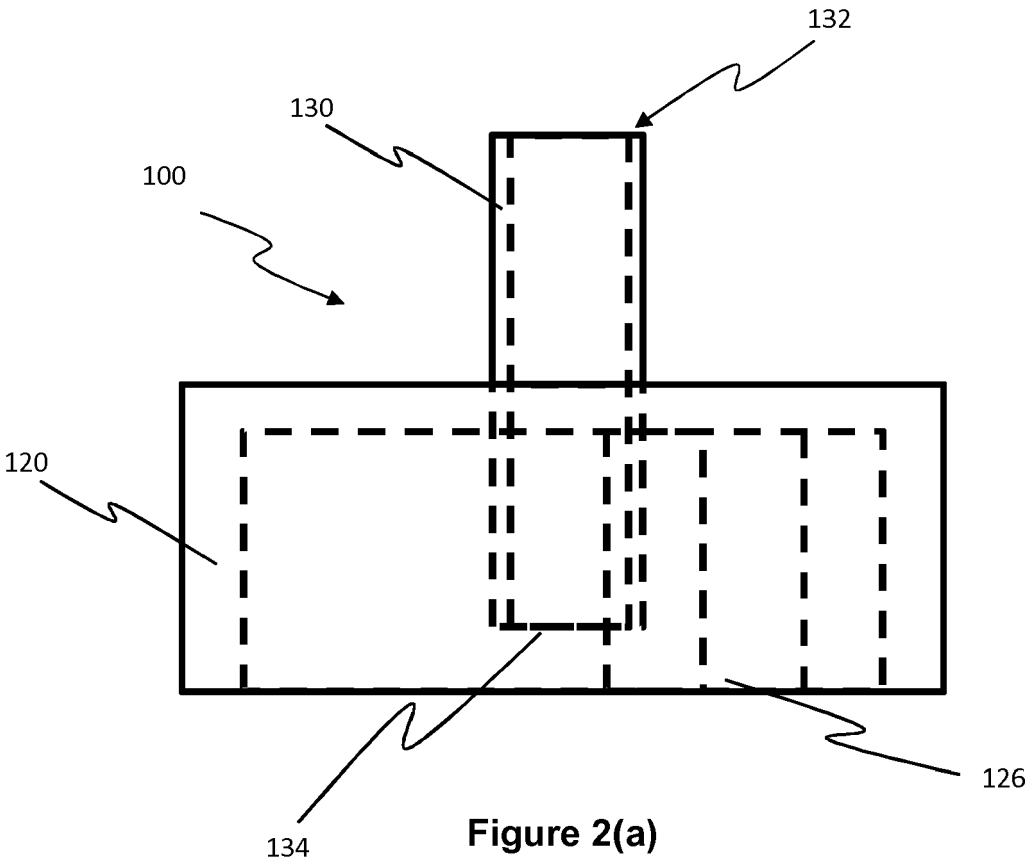


Figure 1(b)



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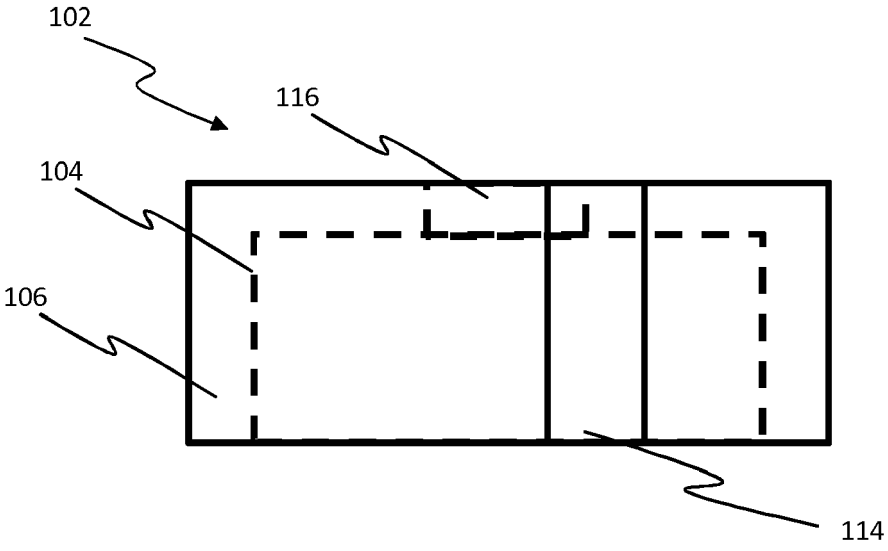

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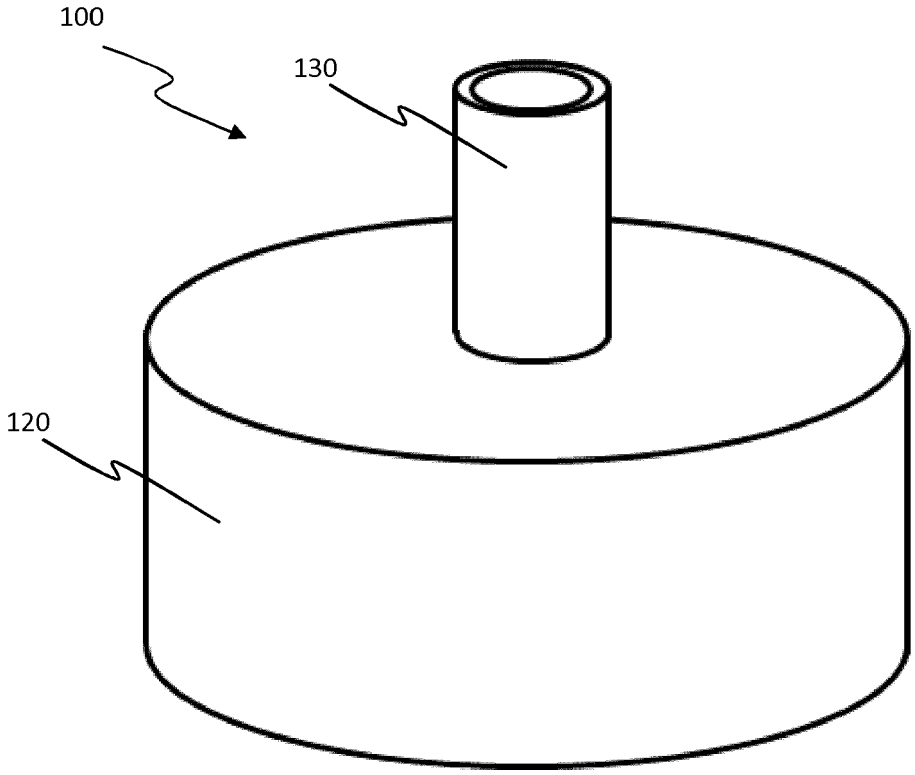


Figure 3(a)

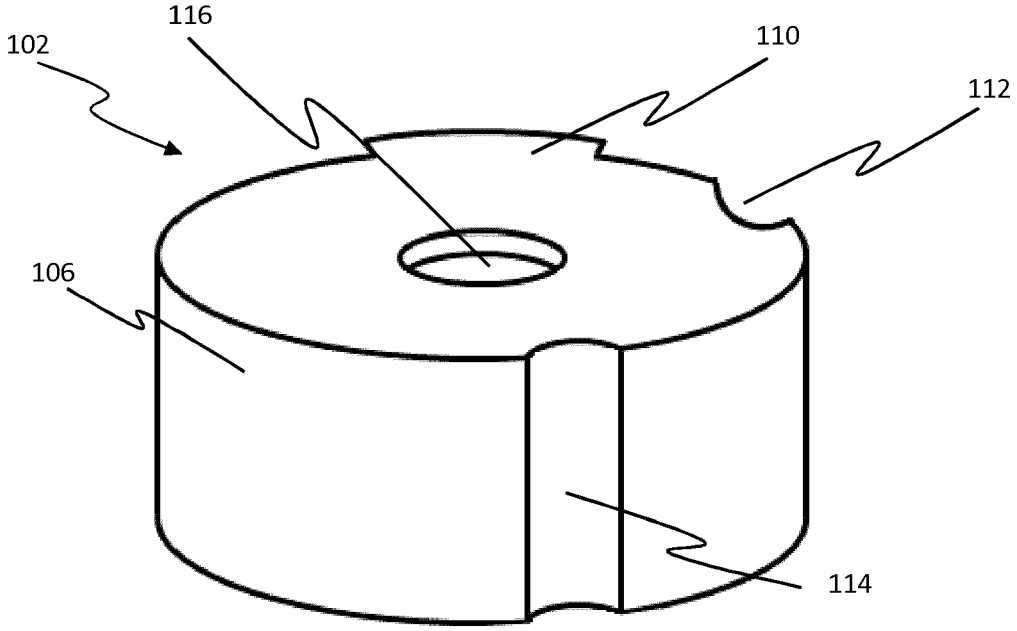


Figure 3(b)

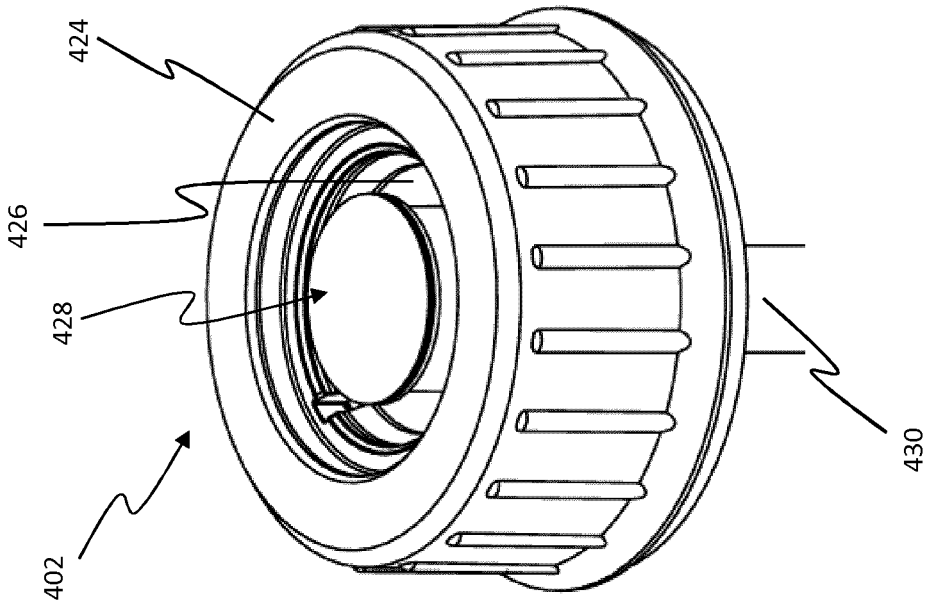


Figure 4(b)

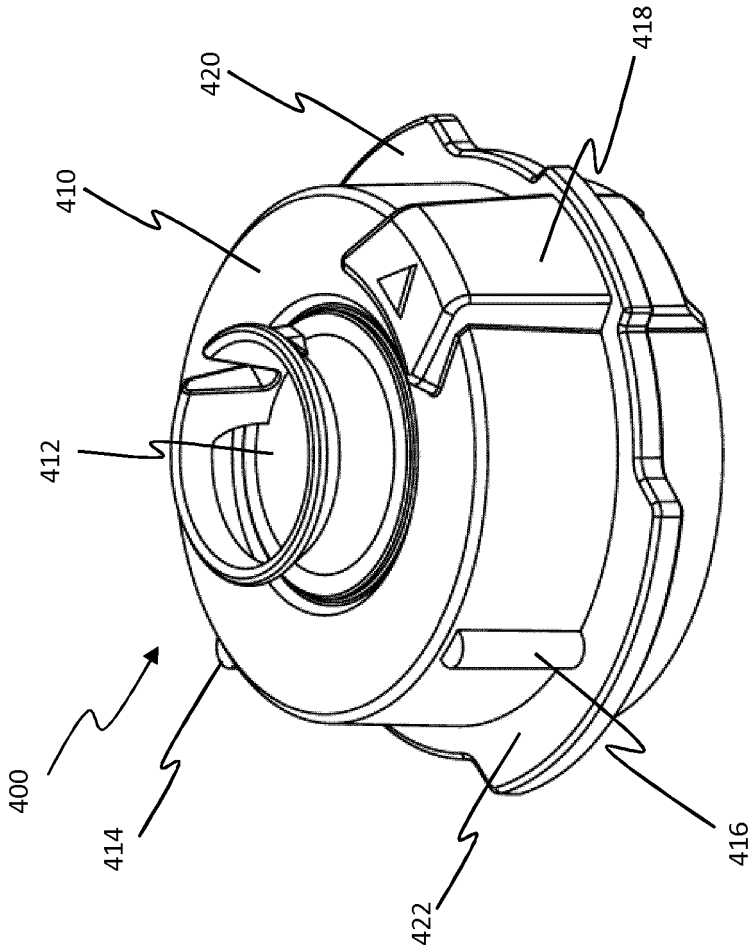


Figure 4(a)

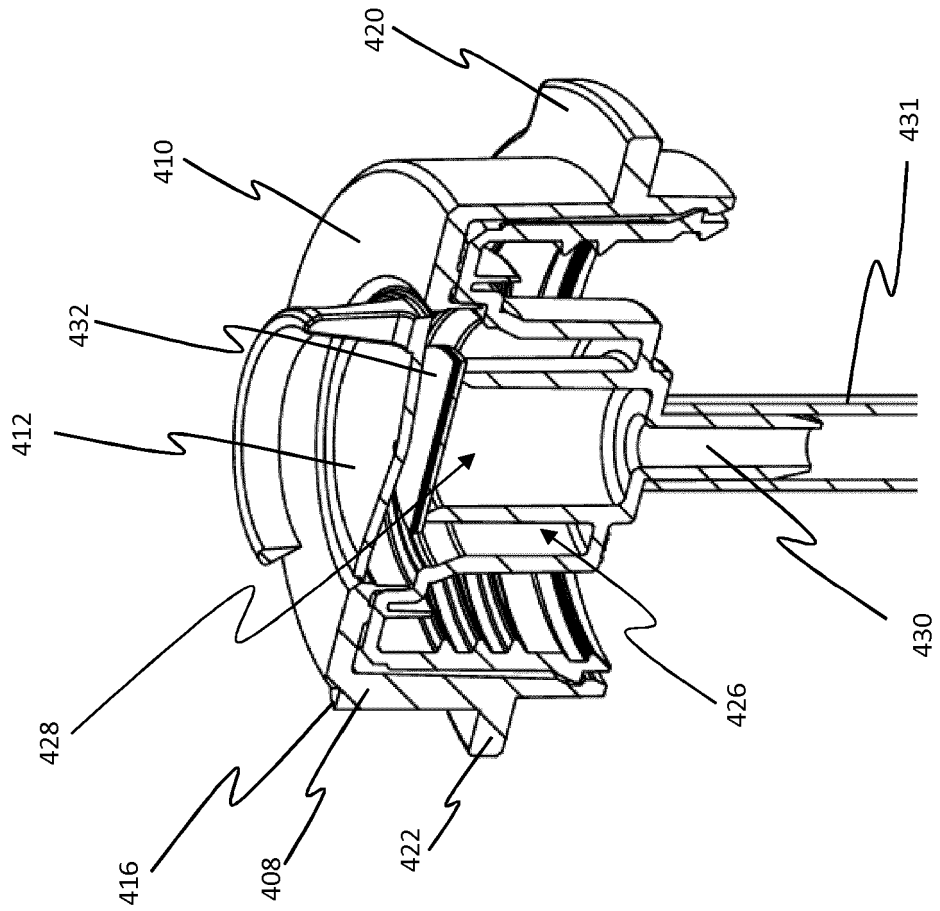
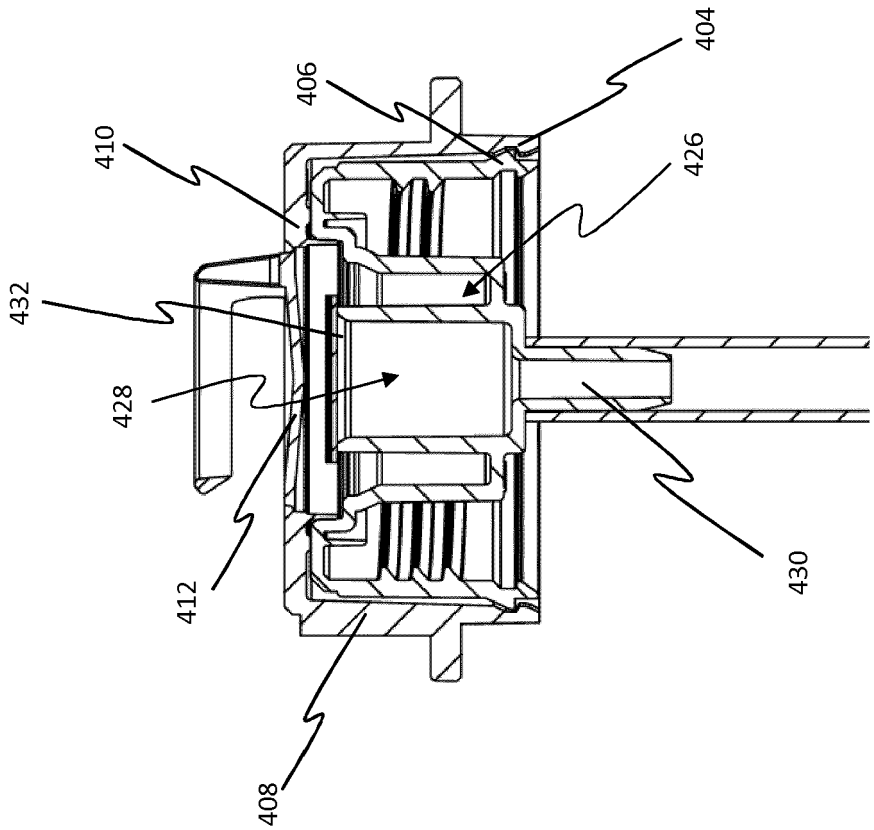


Figure 4(d)



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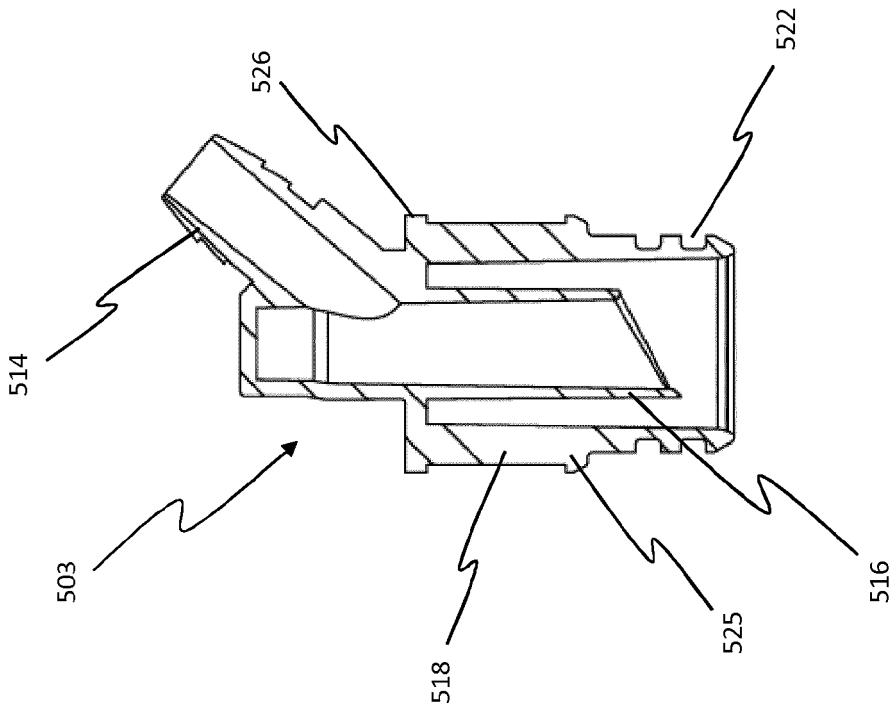


Figure 5(b)

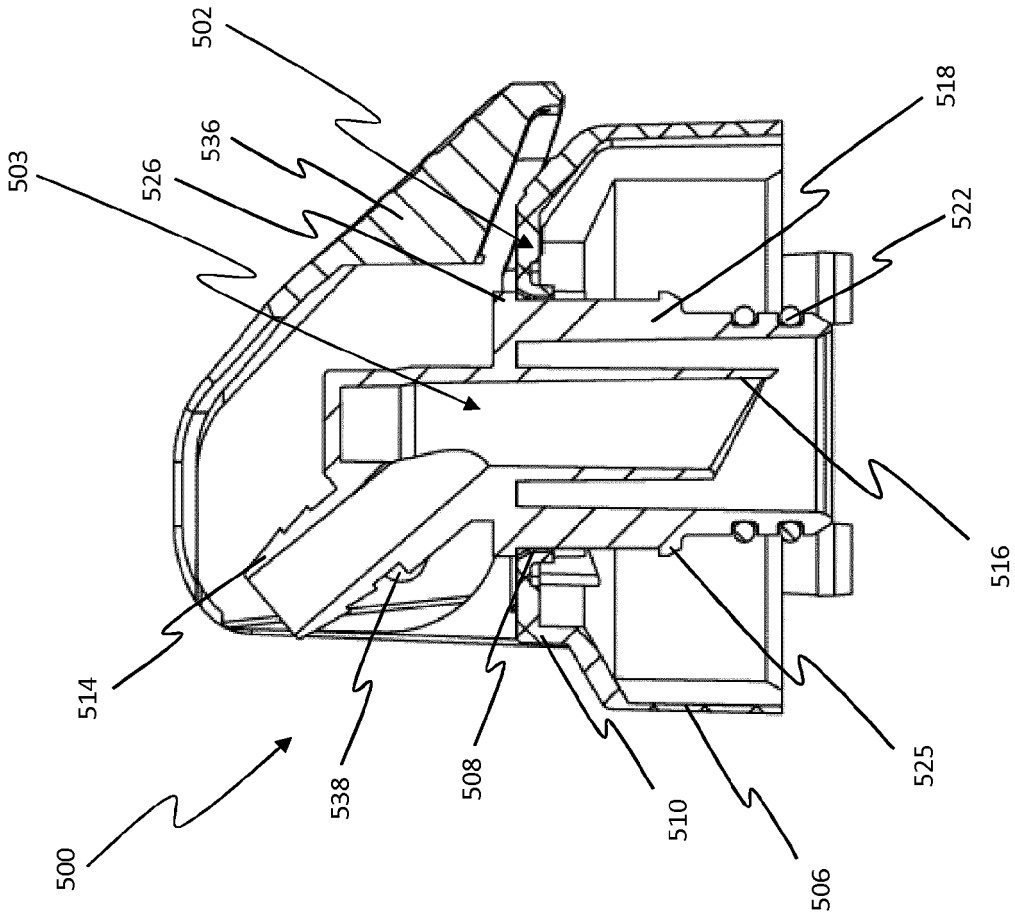


Figure 5(a)

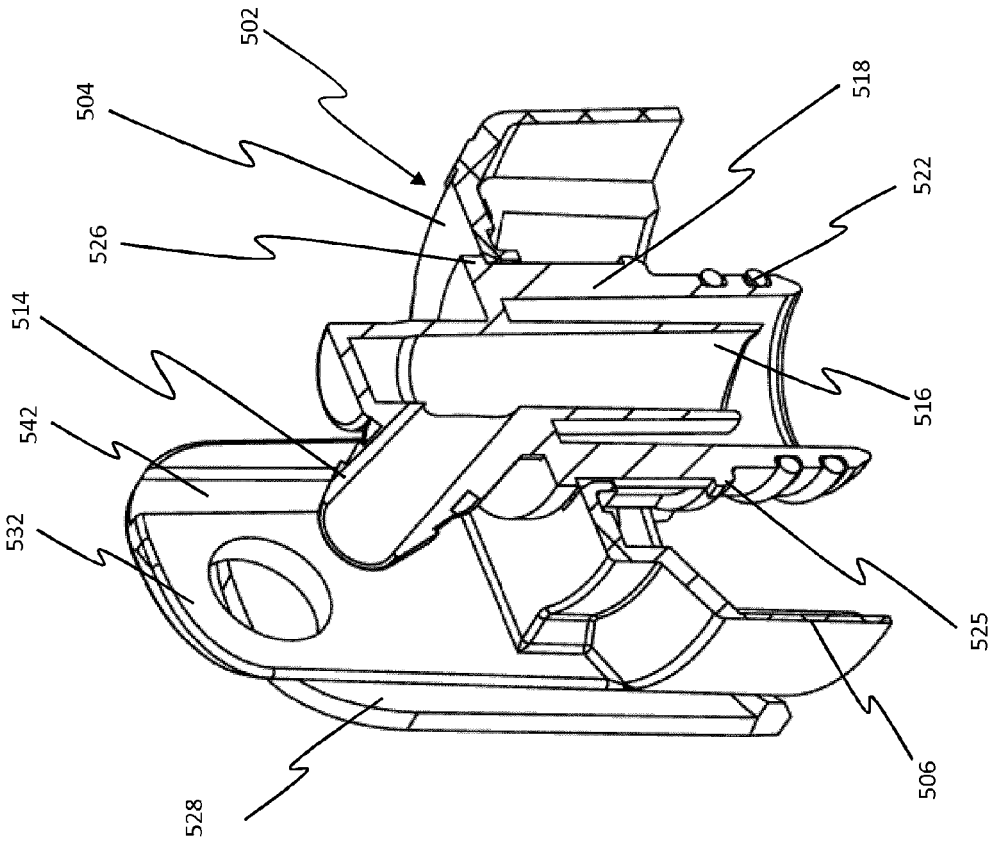
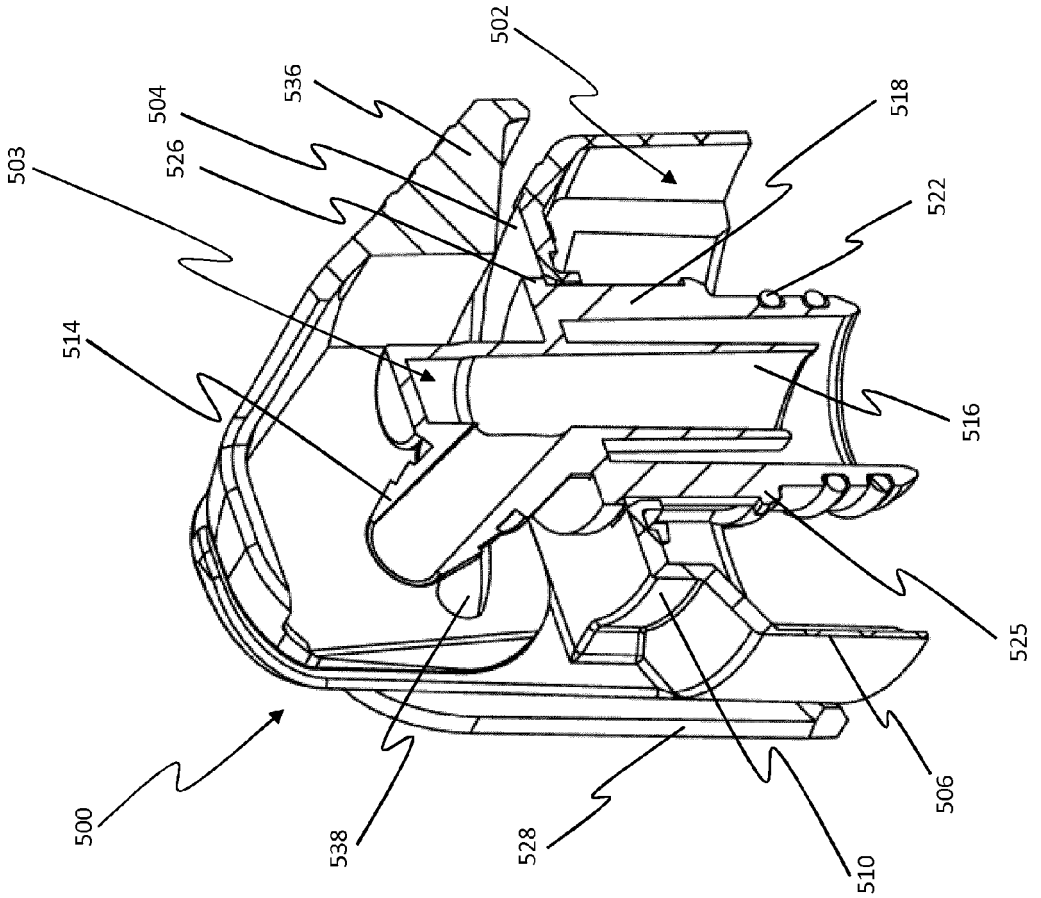


Figure 5(d)



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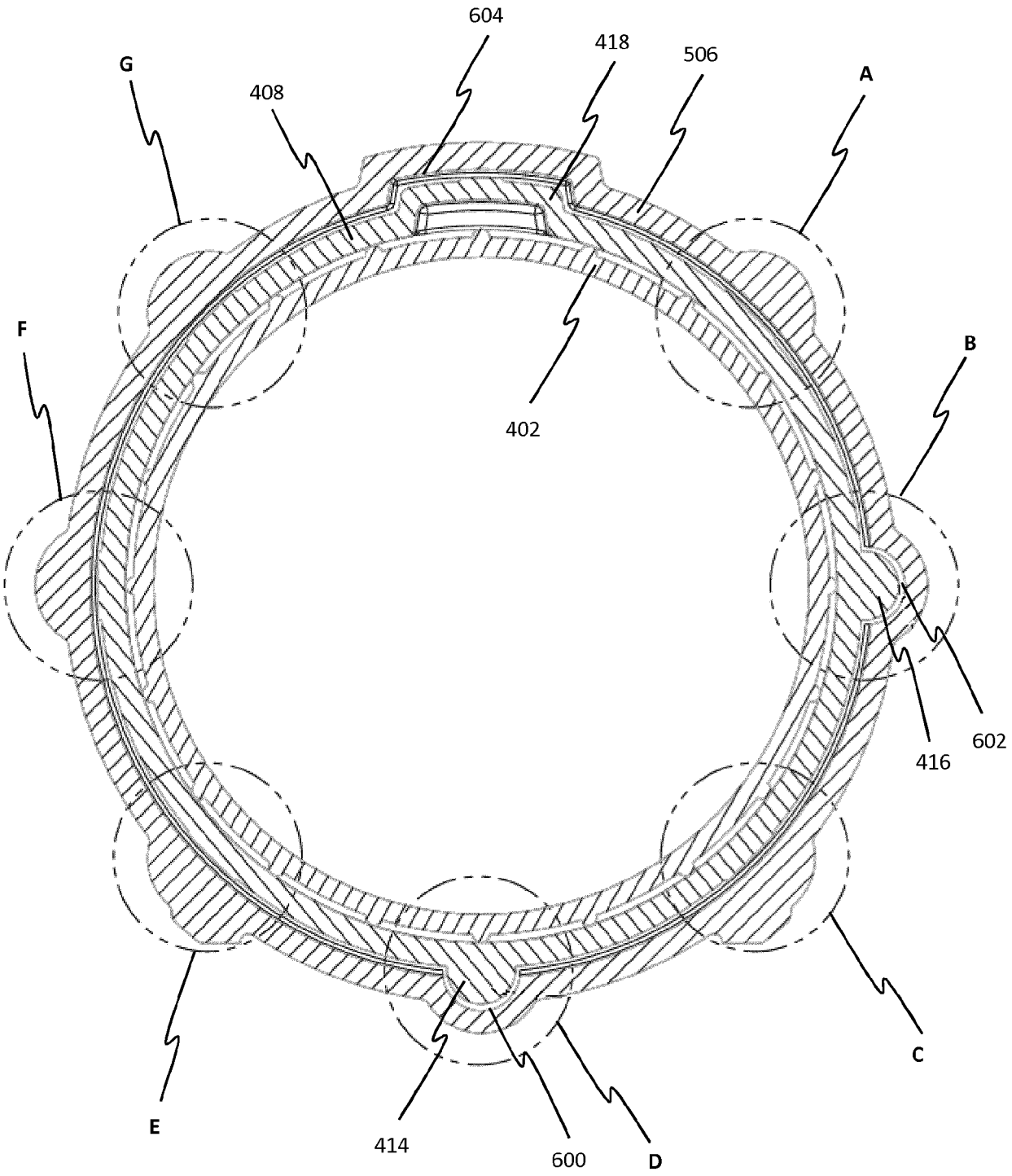

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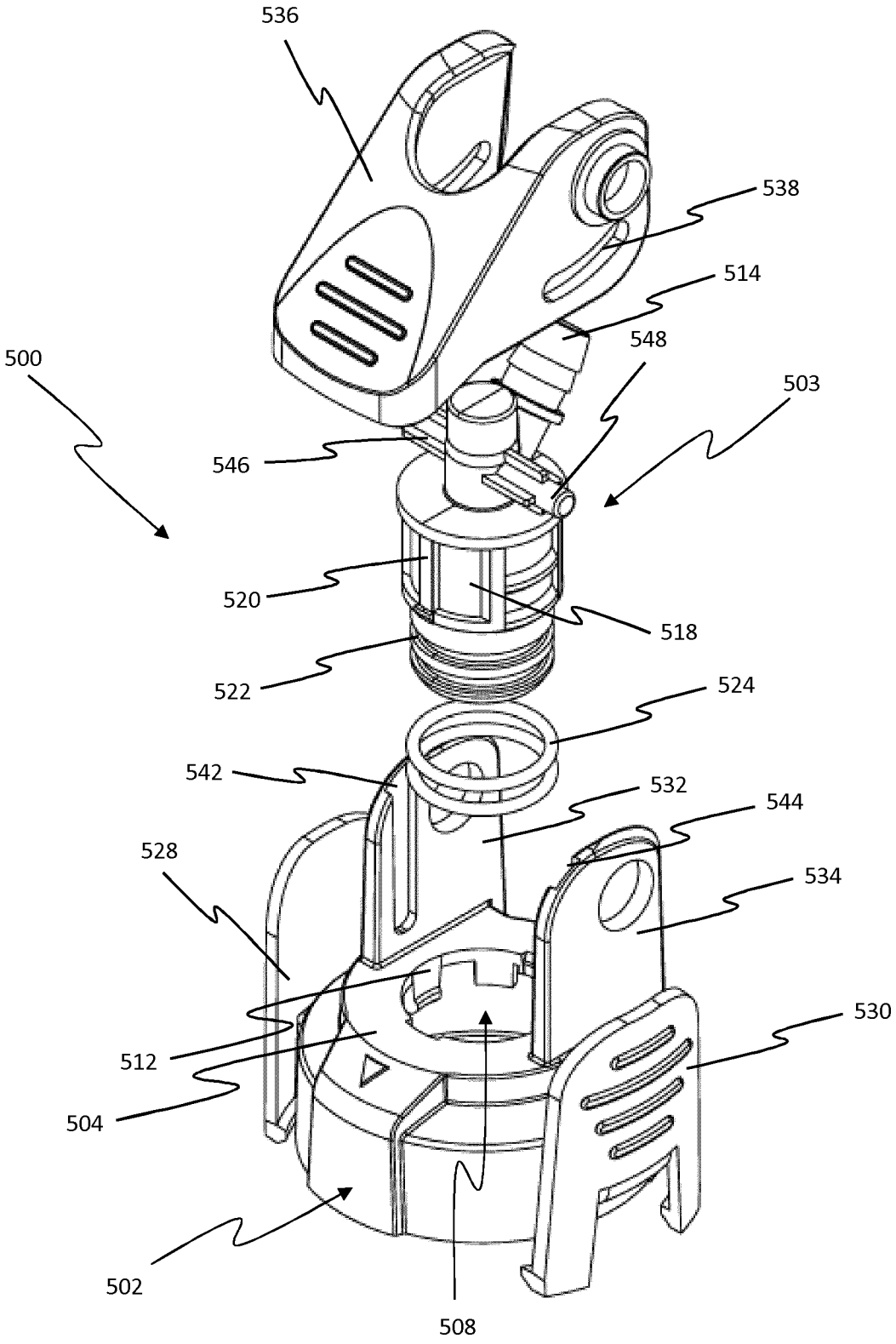
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Figure 7

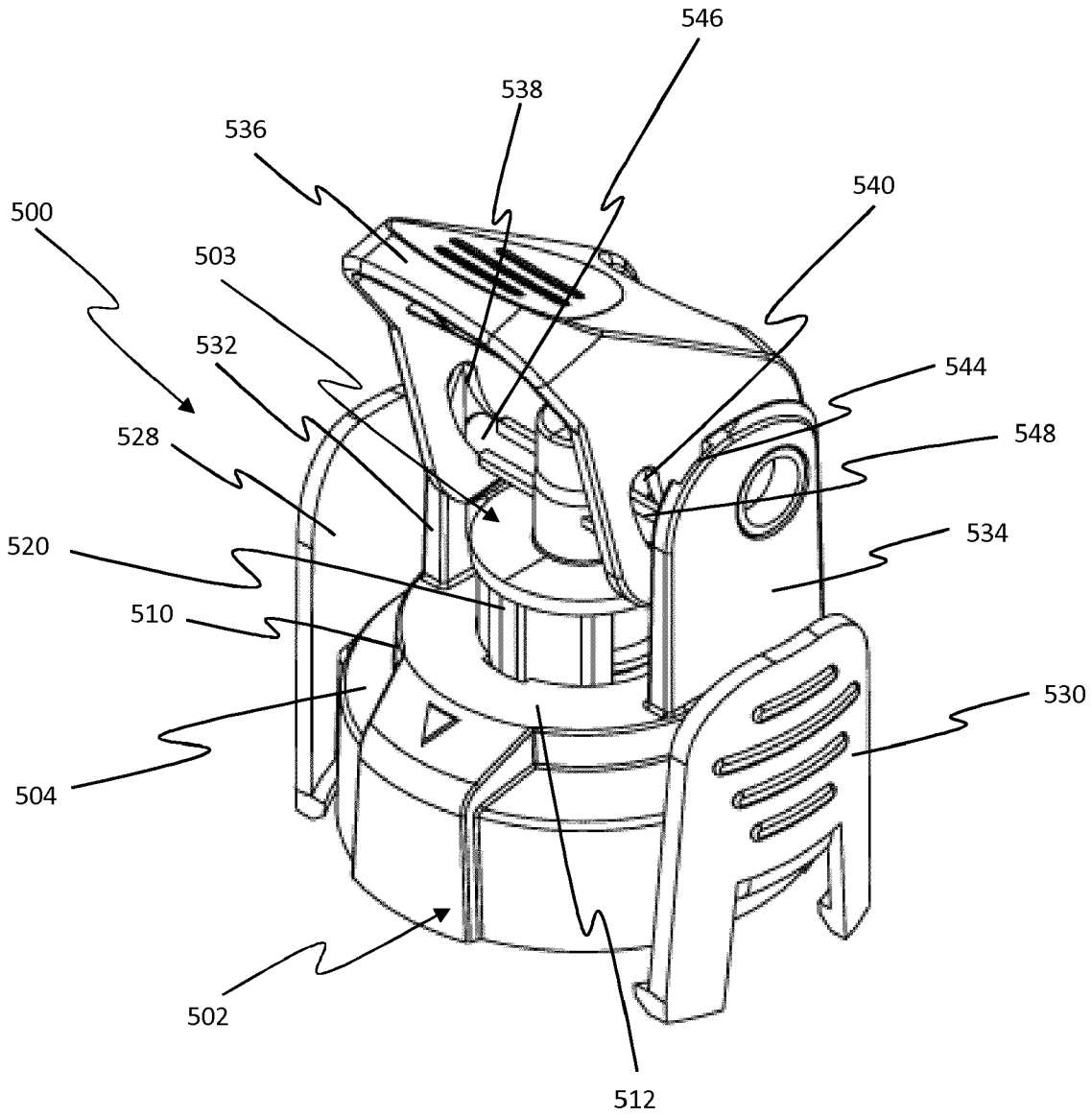
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Figure 8

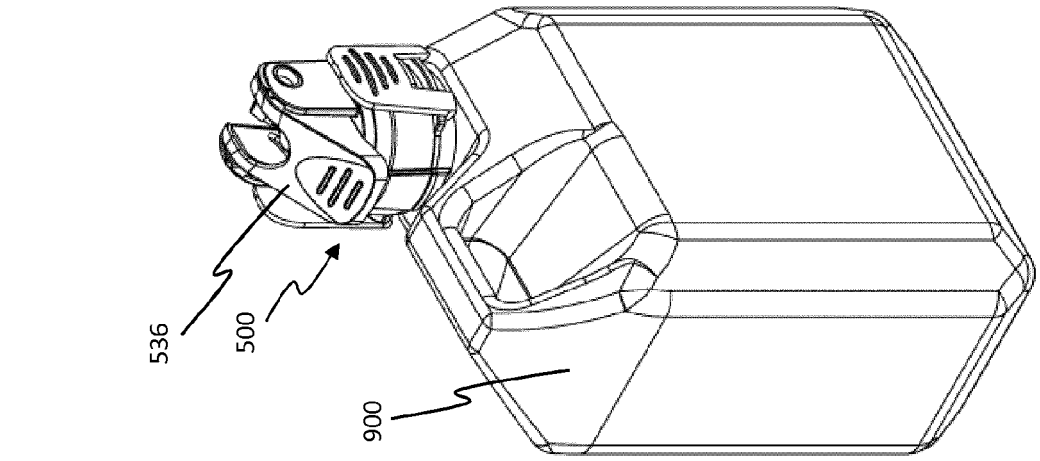

Figure 9(c)

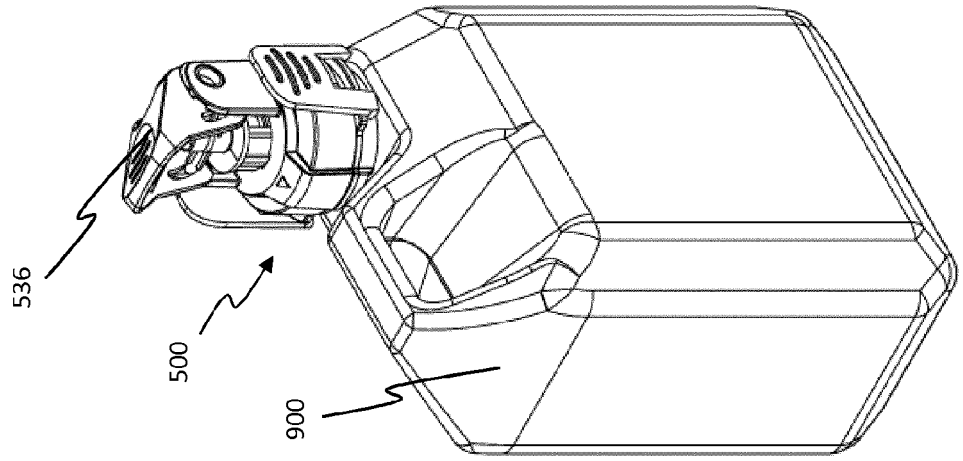

Figure 9(b)

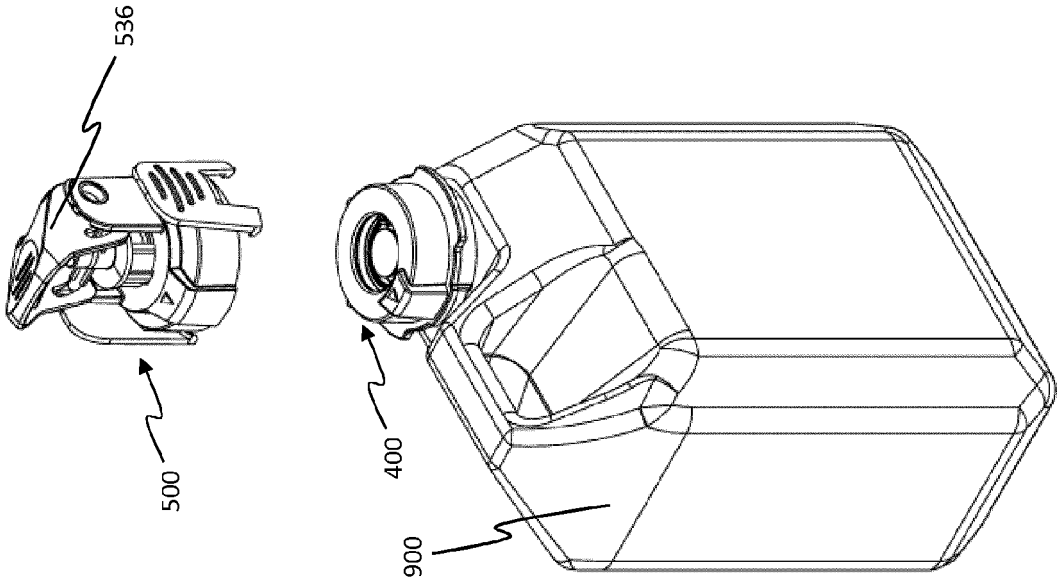

Figure 9(a)

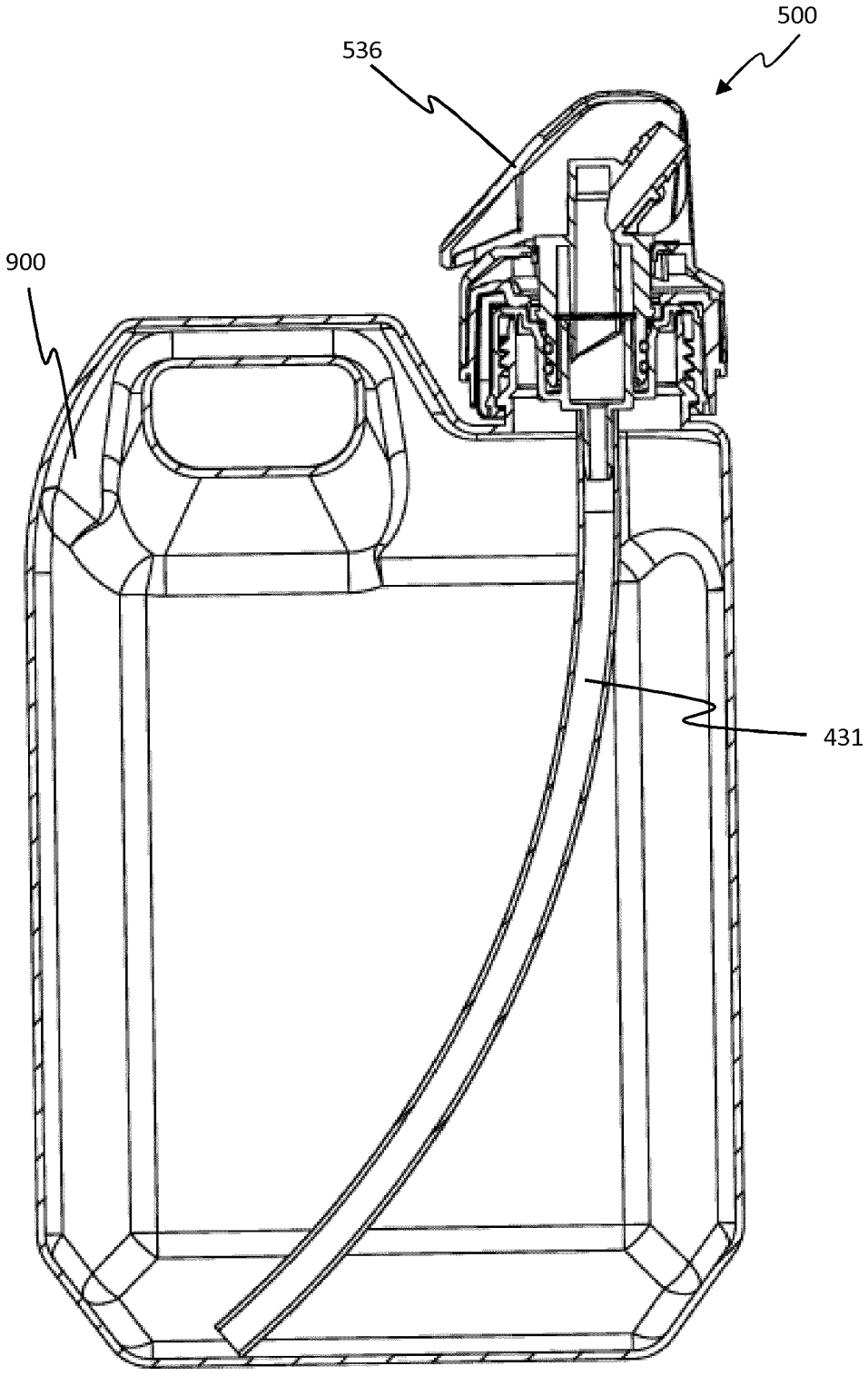

Figure 9(d)

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 2649

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X	WO 96/01226 A1 (NOW TECHNOLOGIES INC [US]) 18 January 1996 (1996-01-18)	1	INV. B67D7/02
Y	* page 3, line 15 - page 12, line 22 * * page 15, line 12 - page 16, line 26 * * page 22, line 13 - page 24, line 20 * * figures 1-6 *	7,9,10	B67D7/34

X	WO 2014/085701 A1 (ENTEGRIS INC [US]) 5 June 2014 (2014-06-05) * page 6, line 24 - page 10, line 23; figures 1-6 *	1	

Y	WO 98/40703 A1 (NOW TECHNOLOGIES INC [US]) 17 September 1998 (1998-09-17)	9	
A	* page 9, line 8 - line 17; figures 6, 8 *	1	

Y	KR 101 779 328 B1 (AICELLO MILIM CHEMICAL CO LTD [KR]) 19 September 2017 (2017-09-19)	7,10	
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B67D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 July 2019	Schultz, Tom

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 16 2649

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