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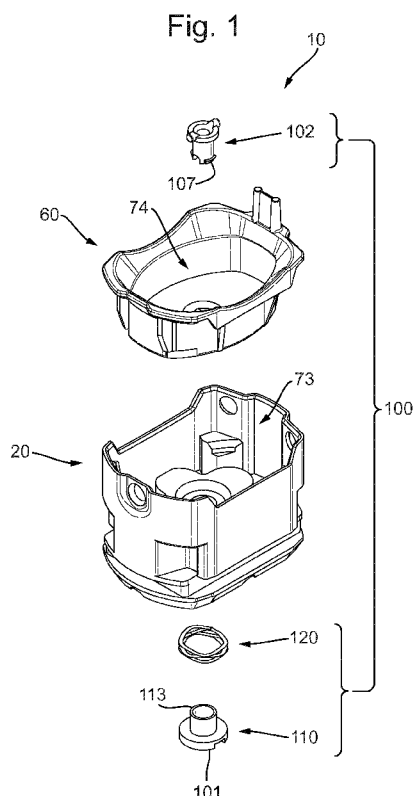
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(54) Title: PUCK FOR HOLDING A PRODUCT CONTAINER



(57) Abstract: A carrier puck (10) comprising a base (20), a removable insert (60), and a coupling (100); the base, which holds the removable insert, including a base sidewall (22) and a platform (24), the removable insert including an insert bottom wall (64), an insert sidewall (62), and an outwardly extending upper rim (80) that engages with the base sidewall; the platform and insert bottom wall each having an aperture (50, 84), the aperture (50) in the platform aligning with the aperture (84) in the insert bottom wall, the coupling extending from beneath the platform aperture into the insert through the aligned apertures, wherein the coupling can be moved to a position that unlocks the removable insert from the base by engaging the coupling from beneath the platform.



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PUCK FOR HOLDING A PRODUCT CONTAINER

Technical Field

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The present disclosure relates to a puck for holding a product container in an orientation for product filling, capping, labeling, and/or other processing as the container moves along an automated line and, in particular, to a puck that includes a removable insert in which a product container is received and held.

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Background

Pucks for holding product containers, herein alternatively referred to as “carrier pucks” or “pucks” are used, typically in automated production lines, to hold containers in a desired orientation, e.g., an upright position. Use of a puck simplifies movement of a container along a production line and is of assistance in regulating line operations.

In automated operations, a container is commonly inserted in a puck in an inbound staging area. The container-bearing puck then moves through one or more processing stations where different operations are performed, among others, one or more of the following: the container may be filled with one or more materials, the container may be subjected to pre- and/or post-filling procedures or treatments, for example, heating and/or cooling, the container may have a tamper-resistant seal and/or a cap affixed thereto, one or more labels or other container indicia may be applied, and/or the container may undergo one or more quality control operations, for example, weight and/or label verification, and the like. When processing is complete, the puck and container are moved to an outbound staging area, the container is removed from the puck and the puck is rerouted back to the inbound staging area, or other designated station. It is not uncommon for an automated production line to have hundreds of pucks in use at a single time.

Many of the pucks used commercially are designed for containers of a particular configuration, i.e., they are container specific. In instances where a production line employs different container configurations for different production runs, having a puck that is adaptable for

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use with containers of a variety of different shapes and sizes can help reduce production costs, including downtime for puck changeovers.

Among the various approaches suggested with respect to providing pucks that may be adapted for use with containers of a variety of different sizes and/or shapes, is the use of separate container-holding and base components. US Pat. No. 8,695,791, for example, discloses a carrier puck that includes a circular lower body on which is mounted an upper body. As therein illustrated, the upper body is mounted to the lower body via a pair of opposing bayonet side mountings. JP5659780 discloses a carrier puck having inner and outer holder components. As illustrated, the inner holder includes a moveable interior wall that can be adjusted to brace a container within the inner holder.

The use of pucks having a base and a separate component for holding a container, more particularly a removable insert, is limited by several real-world considerations. The environment created by automated production can be hard on pucks. In use, there is a tendency for pucks to collide with one another. These collisions can occur with considerable force given the speed at which many automated production operations are run, with collision force being increased when containers are filled and the weight of the container-bearing pucks increased.

A puck having a removable insert should withstand the rigors of automated processing without premature release or displacement of the insert. Conversely, to accommodate container changeover, the puck should facilitate engagement and disengagement of the removable insert. There remains a need for pucks that provide a balance between these competing requirements.

One aspect of this invention is to provide a carrier puck for use in an automated production line, the carrier puck having a removable insert for receiving and holding a product container. Another aspect of this invention is to provide a carrier puck that provides robust engagement of a removable insert. Another aspect of this invention is to provide a carrier puck that resists premature release of a removable insert. A further aspect of this invention is to provide a carrier puck that provides engagement of a removable insert that withstands the vertical pull forces of

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container removal. Another aspect of this invention is to provide a carrier puck that allows for expeditious engagement and disengagement of a removable insert.

One or more of these and other aspects of this invention may be achieved by providing a puck as hereinafter more particularly described.

Summary of the invention

In one embodiment there is provided a carrier puck that comprises:

- 10 A) a removable insert comprising:
 - I) an insert sidewall,
 - II) an insert bottom wall that includes an insert aperture and, optionally, an insert recess in which the insert aperture is located, and
 - III) an upper rim that extends outward from the insert sidewall;
- 15 B) a base comprising:
 - I) a base sidewall,
 - II) a base bottom wall, and
 - III) a platform that includes a platform aperture and, optionally, a platform recess in which the platform aperture is located; and
- 20 C) a spring-loaded coupling that locks the removable insert to the base, wherein:
 - a) the insert aperture aligns with the platform aperture,
 - b) the base sidewall includes an upper end that engages with the upper rim of the removable insert, and
 - 25 c) the coupling is able to be engaged from beneath the platform to unlock the removable insert from the base.

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Brief description of the drawings

The foregoing and other features and advantages of the present invention will become apparent upon consideration of the following description with reference to the accompanying drawings. Drawings are representative only; the present invention is not limited to the embodiments exemplified therein. Unless otherwise indicated, throughout the drawings, like reference numerals refer to like parts.

FIG. 1 is an exploded perspective from above view of one embodiment of a carrier puck according to the present invention;

FIG. 2a is a perspective view from above of the puck of FIG. 1 in an assembled locked configuration;

FIG. 2b is a perspective view from above of the puck of FIG. 1 in an assembled unlocked configuration;

FIG. 3 is a simplified sectional view of the puck of FIG. 1 in an assembled configuration;

FIG. 4 is perspective view from above of the puck FIG. 1 in an assembled configuration, with the coupling affixed to the base, but without the insert;

FIG. 5 is a bottom plan view of the puck of FIG. 1 in an assembled configuration;

FIG. 6 is a perspective view from above of the insert of the puck of FIG. 1;

FIG. 7 is a top plan view of the puck of FIG. 2a;

FIG. 8a is a perspective view from above of the assembled coupling of the puck of FIG. 1;

FIG. 8b is a perspective view from below of the coupling of FIG. 8a;

FIG. 9 is an exploded perspective view from above of the puck of FIG. 1 with a different insert; and

FIG. 10 is a perspective view from above of the puck of FIG. 9 in an assembled configuration and holding a container.

Detailed description of the invention

Except as otherwise indicated, throughout this specification, in relation to the instant puck or its components, features or assemblies, the terms "upper" and "lower" are used in relation to

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an orientation in which the upper end of the carrier puck is at the top and the lower end of the carrier puck is at the bottom; such an orientation is shown, for example, in FIGS. 2a and 2b. Other terms of reference such as "above" and "below" are also applied in relation to the above described orientation. The terms "downward" and "downwardly" are used interchangeably in relation to the
5 above described orientation, in reference to a direction that generally extends away from a puck feature or component, or away from a position of a puck feature or component, toward a lower point or position. The terms "upward" and "upwardly" are used interchangeably in relation to the above described orientation, in reference to a direction that generally extends away from a puck feature or component, or away from a position of a puck feature or component, toward a higher
10 point or position. Except as otherwise indicated, in relation to the description of components or other features that define an interior space, the term "interior surface" is used in relation to a surface that generally faces into the interior space.

All numerical ranges employed in this description ought to be understood as modified by
15 the word "about". Where the puck of the subject invention or components or other features thereof are described as "including" or "comprising" specific elements, narrower embodiments that "consist essentially of" or "consist of" the recited elements are also contemplated.

The carrier puck of the subject invention combines a number of features that together
20 enable the production of container holding/transport device having a removable insert and a separate base. By changing out the removable insert, the puck is adaptable for use with containers of different configuration.

The subject puck comprises a removable insert (alternatively referred to as "insert"), a
25 base for holding the removable insert, and a coupling that fastens the insert to the base.

The insert comprises an insert sidewall and an insert bottom wall that together generally define a cavity, the insert cavity, for holding a container. To assist in standardizing in-line use, it may be desirable to configure the cavity of different sets of inserts to provide consistent fill heights
30 for the containers that the inserts are designed to hold.

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5 An insert aperture is located in the insert bottom wall. In one embodiment, the insert aperture is located in what is generally the center of the insert bottom wall; alternative configurations in which the insert aperture is offset from the center of the insert bottom wall are also possible. For purposes of alignment, the location of the insert aperture is generally dictated by the location of the platform aperture.

10 In one embodiment, the insert bottom wall further includes an insert recess in which the insert aperture is located. The insert recess may, for example, be provided as depression, concavity, hollow or sink in the insert bottom wall. In one embodiment, the insert further includes a locking ridge proximate to the insert aperture; when an insert recess is present, the insert recess may include the locking ridge. Optionally, the insert includes an insert collar that extends downward from the insert bottom wall proximate to the insert aperture; in one embodiment, the insert collar may be an extension of the insert recess.

15 The insert includes an upper rim (alternatively referred to as "insert rim" or "rim") that extends outward from the insert sidewall. In one embodiment, the rim generally defines the perimeter of the upper end of the insert. The rim may be continuous or may include one or more gaps or regions of discontinuity, i.e., the rim may be discontinuous.

20 Optionally, the rim includes a downwardly extending skirt (alternatively referred to as "rim skirt"). When present, the rim skirt may extend downward from the rim as a full skirt; alternatively, the skirt may extend downward from one or more portions of the rim.

25 Optionally, one or more container support arms (alternatively referred to as "support arms") may extend upward from the insert rim and/or insert sidewall. In one embodiment, the insert is provided with first and second support arms positioned on opposing sections of the insert rim and/or insert sidewall.

30 To reduce the space needed to store the inserts when not in use on pucks, it may be desirable to taper or otherwise configure the insert sidewall and, when present, features such as

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support arms, to enable the inserts to be stacked or nested one within the other. Providing inserts that are able to be stacked or nested aids in their organization and handling.

Optionally, the insert includes one or more projections that extend outward from the insert
5 sidewall and engage with an interior surface of the base sidewall. The inclusion of such projections may help to stabilize and/or support the removable insert in the base. Optionally, the insert includes one or more spacers that extend downward from the insert bottom wall and engage with the interior platform. The spacers allow for a gap between the insert bottom wall and interior platform; such gap may be of assistance in separating the removable insert from the base.

10 The base comprises a base sidewall and a base bottom wall that, together, generally define a cavity, the base cavity, for holding the removable insert. The base has a perimeter (the "base perimeter") that, in one embodiment, is generally defined by the base sidewall. In an orientation where the upper end of the base is at the top and the lower end of the base is at the
15 bottom, the base sidewall is, one embodiment, generally parallel to the central vertical axis (CVA) of the base. In one embodiment, the base sidewall is of varying height; i.e., the base sidewall is higher in some places and lower in other places. Excluding appendages that extend above and generally do not define the base cavity, the height of the base sidewall at a given location is commonly the vertical distance between the top of the base sidewall and the bottom of the base
20 sidewall. In one embodiment, the base sidewall may have a stepped or castellated appearance.

The base sidewall includes an upper end (in one embodiment, such upper end is an upper edge) that engages with the insert rim. The configuration of the upper end of the base sidewall and the insert rim may be such that these components fit together in complementary fashion, i.e.,
25 the insert rim mates with the upper end, in one embodiment the upper edge, of the base sidewall. Providing a base sidewall of varying height and a mating insert rim, particularly a rim, at least a portion of which includes a downwardly extending skirt, may assist in aligning the insert with the base and, particularly when the base sidewall is of varying height, may contribute to a robust insert/base attachment.

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The base further includes a platform. The platform may extend upward from the base bottom wall and/or inward from base sidewall. In one embodiment, the platform defines a space that opens into the bottom of the base. In one embodiment, the platform forms a portion of the base bottom wall.

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The platform includes a platform aperture and, optionally, a platform recess in which the platform aperture is located. The platform recess may be provided as a depression, concavity, hollow or sink in the platform. Optionally, the platform further includes a downwardly extending platform collar proximate to the platform aperture; such collar may be an extension of the platform recess.

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In one embodiment, the platform comprises a platform top wall and a platform sidewall, with the platform aperture located in the platform top wall, and the platform top wall optionally comprises a platform recess in which the platform aperture is located.

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In one embodiment, the platform is positioned interior to the base sidewall and below the upper end thereof. In one embodiment, a portion of the platform may be integral with the base sidewall. In one embodiment, the platform may be formed as one or more ledges that project inward from the base sidewall. In one embodiment, the platform is closer to the base bottom wall than to the upper end of the base sidewall. In one embodiment the platform is positioned in what is generally the center of the base perimeter.

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When the insert and base are assembled, the insert aperture aligns with the platform aperture. In one embodiment, the insert bottom wall includes an insert recess, the platform includes a platform recess, and the insert recess extends into the platform recess. Configuring the puck with an insert recess that extends into a platform recess may contribute to robust engagement of the insert and base. Additionally, the inclusion of an insert recess may allow the upper end of the coupling to be recessed in a manner that avoids interference with a container.

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The puck further comprises a spring-loaded coupling that fastens the removable insert to the base through the aligned insert and platform apertures. The coupling is able to be engaged

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from beneath the platform to unlock the insert from the base. In one embodiment, the coupling is also engaged from beneath the platform to lock the insert to the base. Engagement of the coupling from beneath the platform may be achieved using a tool that accesses the coupling by extending upward into the bottom of the base. One such tool for accessing the coupling is a driver operated, for example, by an automated stepper motor.

In one embodiment, the coupling may be engaged in synchronous manner with insert placement or removal. More particularly, as the coupling is being engaged from beneath the platform, a suitable tool for lifting the insert onto or off the base may be in place and engaged with the insert. This is of assistance in reducing insert changeover times, particularly in systems where insert changeover is frequent. In one embodiment, the inclusion of an insert recess and/or downwardly extending insert collar provides a site of access for a lifting tool to engage with the insert.

Pneumatic grippers, vacuum grippers, and mechanical grippers are examples of tools for lifting the insert onto or off the base. Pneumatic grippers include, but are not limited to, pneumatic picking heads. A pneumatic picking head includes a bellows that can be inserted into and expanded in the insert such that the expanded bellows conforms to an interior surface of the insert, enabling the insert to be lifted and otherwise moved. Mechanical grippers include, but are not limited to, tools with mechanically expandable fingers, or other picker configurations. A vacuum gripper applies a suction force to lift and/or otherwise transport the insert.

In one embodiment, the spring-loaded coupling comprises:

- I) a generally tubular housing that includes a lower housing ledge, in one embodiment, a lower housing ledge that extends outward from the lower end of the housing,
- II) a fastener that includes at least one outwardly extending upper locking member, and
- III) a spring,

wherein:

- a) a portion of the housing above the lower housing ledge extends upward from beneath the platform into the insert aperture,

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- b) a portion of the fastener below the upper locking member extends downward into the housing,
- c) the fastener engages with the housing, and
- d) the spring is positioned over the tubular housing above the lower housing ledge and below the platform.

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With reference to such spring-loaded coupling, in a locked configuration, the spring is compressed between the lower housing ledge and the platform. The spring may also be compressed, but to a lesser extent, in an unlocked configuration. Optionally, one or more washers may be positioned on the housing above and/or below the spring; the inclusion of washers may aid in extending coupling life.

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To assist in engaging the fastener with the housing, the fastener may further comprise a feature, in one embodiment, a lower outwardly extending fastener ledge, that engages with the lower housing ledge. The fastener may further comprise an outwardly extending upper fastener ledge that engages with the upper end of the housing. In one embodiment, the upper locking member of the fastener extends outward from an upper fastener ledge. In one embodiment, the fastener snap fits to the housing. The engaged fastener and housing fastener form a coupling assembly that is able to be moved as a single unit.

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The coupling assembly is able to be moved upward or downward in relation to the insert aperture and the platform aperture, while the platform is stationary in relation to the spring. The spring exerts a downward compression force on the lower housing ledge, drawing the upper rim of the insert downward on the base. To unlock the coupling, an upward force is applied to the coupling assembly sufficient to overcome the downward compression force exerted by the spring, and the upper locking member is moved upward and out of engagement with the insert. Combining this upward force with a rotational movement allows the upper locking member to be moved to a position that enables the insert to be freed from the base.

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In one embodiment, the coupling is captive on the base. In one embodiment, in a locked configuration, the upper locking member of the fastener engages with the insert via a locking ridge

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proximate to the insert aperture, the locking ridge optionally including a locking niche that assists in securing the upper locking member to the locking ridge. In one embodiment, the fastener is configured as a shaft that includes at least one outwardly extending upper locking member. In one embodiment, the insert aperture and, when present, the locking ridge, include a passage
5 area with which the locking member can be aligned to allow the insert to clear the locking member when placing the insert on or removing the insert from the base. To lock the insert to the base, the locking member is moved out of the passage area and into positive engagement with the insert.

10 Alternative spring-loaded coupling configurations are possible, including, for example, spring-loaded tab and slot couplings.

The puck includes components that may be molded from plastic materials. Plastic materials that may be considered for molding puck components include, for example, polyacetal,
15 polyamide, polyarylate, polyarylsulfone, polyolefin, polyester, butadiene-styrene and acrylonitrile-styrene-butadiene copolymers, and the like. Moldable components include the base, removable insert and one or more parts of the coupling. Material selection depends on factors that include the configuration of a component and the mechanical and/or physical requirements thereof, e.g., hardness, impact strength, modulus, flexural strength, dimensional stability, chemical and/or heat
20 resistance and the like, as well as requirements related to mold design and/or mold fill. For example, while the material employed in the base of the puck will typically need to provide sufficient toughness and impact strength to withstand the collision forces and other requirements of an automated production line, it may be desirable that the material from which the insert is fabricated is more elastic and flexible, with tactile characteristics that enable it to better grip a
25 container. In one embodiment, the use of thermoplastic resins is of particular interest. In one embodiment, it is desirable that the insert and/or base are fabricated from a polyolefin such as, for example, polyethylene or polypropylene.

The puck may be configured for use with containers for a variety of consumer, commercial,
30 industrial and institutional products. Non-limiting examples of such products are personal care products, household care products, beverages and other foodstuffs, pharmaceuticals,

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neutraceuticals, automotive products, marine products, veterinary products, industrial products, and the like.

5 The puck is adaptable to many different sizes and configurations, depending upon factors that include, for example: the dimensions, configuration and weight of the container the puck is intended to hold; the material the container is intended to hold and the fill volume thereof; the center of gravity of the container and its contents; and production line considerations, including, for example, line bends, curves, gradients, drops, discontinuities, speeds, collision forces, guide rail dimensions, and the like, as well as puck positioning, transport and handling requirements
10 related thereto.

In one embodiment, the puck comprises a base having a length of from 50mm to 300mm and a width of from 50mm to 300mm. In another embodiment, the puck comprises a base having a length of from 70 to 200 mm and a width of from 50 to 200mm. In yet another embodiment, the
15 puck comprises a base having a length of from 80 to 150mm and a width of from 50 to 120mm. In yet another embodiment the puck comprises a base having a length of from 90 to 150mm and a width of from 70 to 110mm. Larger or smaller base dimensions are possible, depending upon the containers with which the pucks are to be used. In one embodiment, the base has a generally rectangular perimeter.

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Non-limiting embodiments of the subject puck and components thereof are described in further detail with reference to the appended drawings which are furnished by way of illustration only and should not be construed as limiting the invention to the embodiments so depicted. Unless otherwise indicated, throughout the drawings, like reference numerals refer to like parts.

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One embodiment of a puck according to the present invention, or components thereof, is shown in one or more of FIGS. 1 to 8 (FIG. 8 being shown as FIGS. 8a and 8b). As illustrated in one or more of these Figures, puck **10** includes base **20**, removable insert **60**, and coupling **100**. Puck **10** has an upper end **16** and a lower end **18**. Base **20** has an upper end **36** and a lower end
30 **38**, and insert **60** has an upper end **66** and a lower end **68**.

Base **20** includes base sidewall **22**, platform **24** and base bottom wall **26**. Base sidewall **22** forms what is generally the perimeter of base **20**; from a top plan view, such perimeter is generally rectangular in shape with eased corners. Base sidewall **22** is shown as having a pair of opposing short walls sections and a pair of opposing wall sections. Base sidewall **22** includes
5 upper end **40** and upper edge **42**. Base sidewall **22** and base bottom wall generally form base cavity **73** for holding an insert.

Platform **24** extends upward from base bottom wall **26** and includes platform sidewall **27**, platform top wall **28**, platform recess **30**, and platform aperture **50**. In FIG 3, platform **24** is shown
10 to include platform collar **56** that extends downward from platform recess **30**.

In FIG. 5, bottom wall collar **25** is shown to extend downward from base bottom wall **26**. The inclusion of a bottom wall collar may be helpful in holding, positioning and/or orienting a puck. The perimeter of bottom wall collar **25** shown in FIG. 5 is of similar shape to the perimeter of
15 platform **24** shown in FIG. 4.

As illustrated, base sidewall **22** includes grip ports **86**, guide ridges **92** and orientation slots **94**. Grip ports may provide a point of access for an automated claw or similar implement to engage with and move the puck from one location to another. The presence of guide ridges is of
20 particular interest when the production line includes guide rails in one or more regions thereof. Commonly, the guide rails are a pair of opposing rails or bars that the puck fits between. Orientation slots may provide another site for gripping, holding and/or positioning the puck.

The base of a puck optionally includes one or more bumpers. The bumpers may function as end-piece and may be integral with or extensions of the base sidewall. In one embodiment,
25 bumpers positioned on opposing sections of the base sidewall as one or more leading bumper and one or more trailing bumpers. The bumpers may be aligned such that when a plurality of pucks are facing end-to-end on a production line, the trailing bumper of a leading puck engages with the leading bumper of a trailing puck. In one embodiment the bumpers are fabricated of a shock absorbing material such as an elastomeric resin or rubber. The inclusion of bumpers,

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particularly when fabricated of a shock absorbing material, may help to reduce line noise. In FIG. 2a, base sidewall **22** is shown as including bumpers **88**.

Optionally, the base includes a holder, not shown, for a radio-frequency identification detection (RFID) chip. The RFID chip can be used to incorporate information about a container
5 that a puck holds. In use, it may serve as an identifying or tracking tag that allows for the wireless identification or monitoring of a container/puck in a production line.

Insert **60** is shown to include insert sidewall **62** and insert bottom wall **64** in which is located insert recess **83**. Insert cavity **60** includes insert cavity **74**. Insert recess **83** includes insert
10 aperture **84**. In FIG 2b, insert recess is shown to include locking ridge **96** and locking niche **97**. In FIG. 6, passage area **87**, is present on insert aperture **84**; in the illustrated embodiment, passage area **87** is configured as a pair of opposing slots, only one of which is visible in such view.

Insert **60** further includes upper rim **80** which extends outward of insert sidewall **62**. Upper
15 rim **80** includes rim skirt **82**. To assist in directing a container into the insert, the upper rim may angle into the insert cavity and/or may include one or more container easement areas that reduce the clearance height of the puck. Upper rim **80** is shown to angle into insert cavity **74** and to include container easement areas **81**.

Projections **54** are shown to extend outward from insert sidewall **62**. When insert **60** is
20 attached to base **20**, projections **54** engage with corresponding supports **98**, shown as corner supports that extend inward from base sidewall **22** and upward from base bottom wall **26**.

Optionally, the insert includes one or more drainage holes (not illustrated). Drainage
25 holes may assist in removing product that misses or overflows from the container during filling. Where periodic washing or rinsing is part of a puck's maintenance regimen, drainage holes may be an aid to drying. When drainage holes are present, the insert cavity may be configured to channel overflow into such holes.

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Optionally, the puck is equipped with a detection post. A detection post may serve as an aid to determining the arrival of a puck at a processing station and/or otherwise monitoring puck position. A container support arm may, in some embodiments, also function as a detection post. In one embodiment, a detection post extends upward from the insert rim and/or insert sidewall. Alternatively, a detection post may be included on the base. As illustrated in FIG. 2a, detection post **99** extends upward from rim **80** of insert **60**.

Puck **10** further includes coupling **100** that fastens removable insert **60** to base **20**. Coupling **100** includes fastener **102**, housing **110**, and spring **120**. Fastener **102**, configured as a tubular shaft, includes upper fastener ledge **106**, upper locking member **112** (shown as opposing lugs **112a** and **112b** that extend outward of upper fastener ledge **106**) and lower housing ledge **107** (shown as opposing ledge sections **107a** and **107b**). Housing **110** has an upper end **113** and a lower end **101**. Housing **110** includes lower housing ledge **108**. Together, housing **110** and fastener **102** form coupling assembly **124**, with upper fastener ledge **106** engaging with upper end **113** of housing **110** and lower fastener ledge **107** engaging with lower end **101** of housing **110**. As shown in FIG. 3, spring **120** is positioned between lower housing ledge **108**, and platform **24**; spring **120** exerts a compressive force on lower housing ledge **108** that draws upper rim **80** downward on base **20** and, more particularly, draws upper rim **80** downward on base sidewall **22**. In FIGS. 8a and 8b, spring **120** is shown as a torsional spring.

As illustrated, in FIG. 2a, in a locked configuration, coupling assembly **124** does not extend above the uppermost part of insert recess **83**.

Bottom **118** of lower housing ledge **110** includes first housing channel **109** and second housing channel **111**, such channels are shown as being generally perpendicular to one another, with first housing channel **109** dividing housing bottom **118** into opposing sections **118a** and **118b** shown as being chamfered. Lower fastener ledge **107** is shown to include fastener channel **121**. As illustrated, fastener channel **121** is aligned with second housing channel **111**.

Applying sufficient upward force to coupling **124** to overcome the downward force exerted by spring **120** on lower stop **108** further compresses spring **120**, and allows coupling assembly

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124 to be moved upward. Combining this upward movement of coupling assembly **124** with a rotational movement disengages upper locking member **112** from locking niche **97** and allows upper locking member **112** to be moved into alignment with passage area **87**, disengaging the lock between insert **60** and base **20**, and permitting insert **60** to be removed from the base.

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FIGS. 9 and 10 show puck **10** with a different insert (insert **60-1**). In FIG 10, puck **10** is shown in an assembled configuration holding container **200**. As illustrated, insert **60-1** includes container support arms **85**.

10 **Example**

A puck as generally shown by the embodiment illustrated in FIG. 2a was produced. The puck was tested for bottle stability using a swinging pendulum test rig that mimicked collision impact. Robustness and function of the puck were tested using a single head robotic test bed that was run over tens of thousands of cycles to replicate insert insertion and removal.

15 Additionally, the puck was tested in a captive, non-commercial trial on a high speed production line that incorporated the features of bottle loading, labelling, filling, capping and bottle unloading. The puck was found to perform effectively in such testing.

Claims

1. A carrier puck that comprises:
 - A) A removable insert comprising:
 - I) an insert sidewall,
 - II) an insert bottom wall that includes an insert aperture and, optionally, an insert recess in which the insert aperture is located, and
 - III) an upper rim that extends outward from the insert sidewall; and
 - B) a base comprising:
 - I) a base sidewall,
 - II) a base bottom wall, and
 - III) a platform that includes a platform aperture and, optionally, a platform recess in which the platform aperture is located; and
 - C) a spring-loaded coupling that locks the removable insert to the base,

wherein:

 - a) the insert aperture aligns with the platform aperture,
 - b) the base sidewall includes an upper end that engages with the upper rim of the removable insert, and
 - c) the coupling is able to be engaged from beneath the platform to unlock the removable insert from the base.
2. The carrier puck of claim 1 wherein the base sidewall is of varying height.
3. The carrier puck of claim 2 wherein the upper rim of the insert includes a downwardly extending skirt.
4. The carrier puck of claim 1 wherein the spring-loaded coupling fastens the removable insert to the base through the aligned insert aperture and platform aperture.
5. The carrier puck of claim 1 wherein the spring-loaded coupling comprises:
 - I) a generally tubular housing that includes a lower housing ledge,
 - II) a fastener that includes at least one outward extending upper locking member, and

III) a spring,

wherein:

- a) a portion of the housing above the lower housing ledge extends upward from beneath the platform into the insert aperture,
- b) a portion of the fastener below the upper locking member extends downward into the housing,
- c) the fastener engages with the housing forming a coupling assembly,
- d) the spring is positioned over the tubular housing above the lower housing ledge and below the platform.

6. The carrier puck of claim 5 wherein when the coupling assembly can be moved upward and rotated as a single unit.

7. The carrier puck of claim 1 wherein the insert includes a locking ridge proximate to the insert aperture and wherein, in a locked position, the upper locking member of the fastener engages with the locking ridge of the insert.

8. The carrier puck of claim 5 wherein the platform further includes a downwardly extending platform collar proximate to the platform aperture, and wherein the lower housing ledge extends beneath the downwardly extending platform collar.

9. The carrier puck of claim 1 wherein the base sidewall includes an upper edge, and wherein the insert rim engages with the upper edge of the base sidewall.

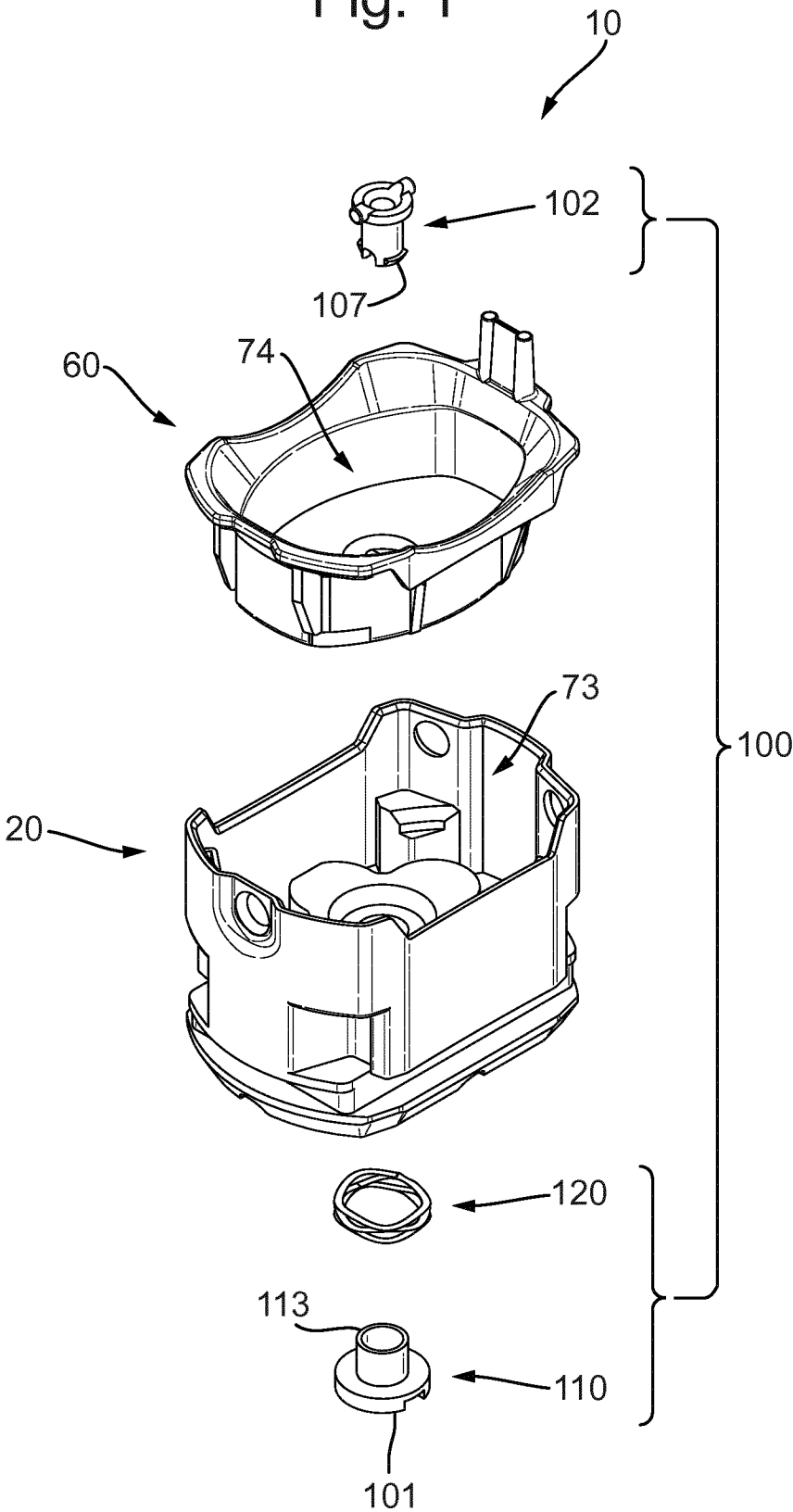
10. The carrier puck of claim 1 wherein the platform further comprise a platform top wall in which the platform aperture is located, and a platform sidewall that extends upward from the base bottom wall.

11. The carrier puck of claim 1 wherein the platform includes a platform recess and the insert includes an insert recess, and wherein the insert recess extends into the platform recess.

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12. The carrier puck of claim 1 wherein the insert further includes at least one upwardly extending container support arm.
13. The carrier puck of claim 3 wherein the downwardly extending skirt engages with the upper end of the base sidewall.
14. The carrier puck of claim 1 wherein the spring-loaded coupling exerts a compression force that draws the upper rim of the removable insert downward onto the base sidewall.
15. The carrier puck of claim 5 wherein the spring-loaded coupling assembly can be moved upward or downward in relation to the insert aperture and the platform aperture.
16. The carrier puck of claim 1 wherein the spring-loaded coupling is captive on the base.

Fig. 1



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Fig. 2a

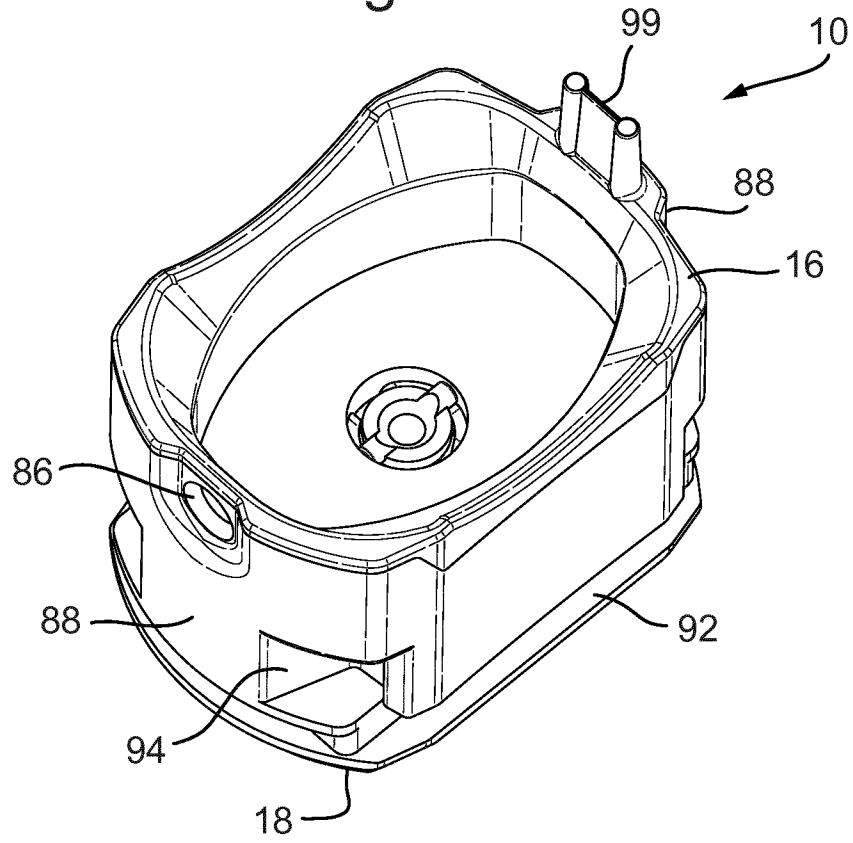
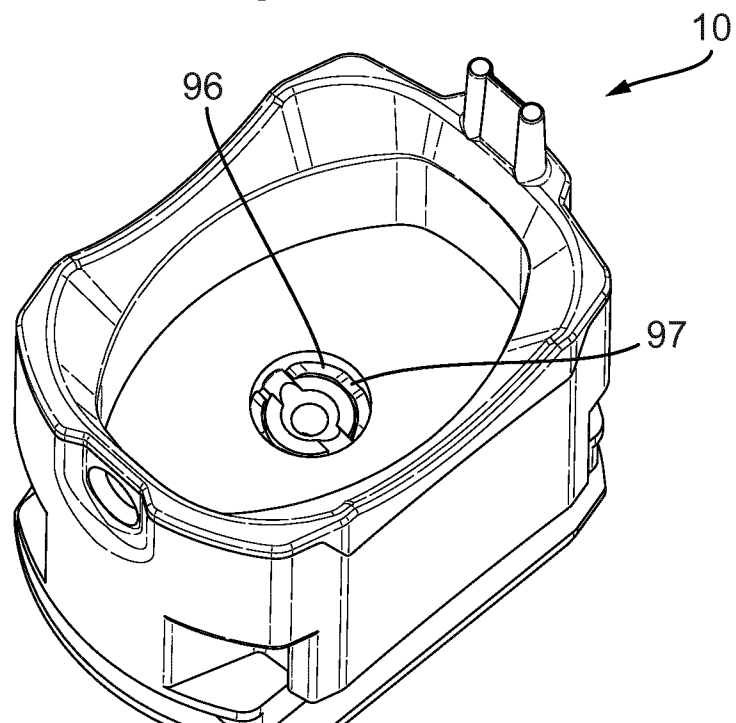
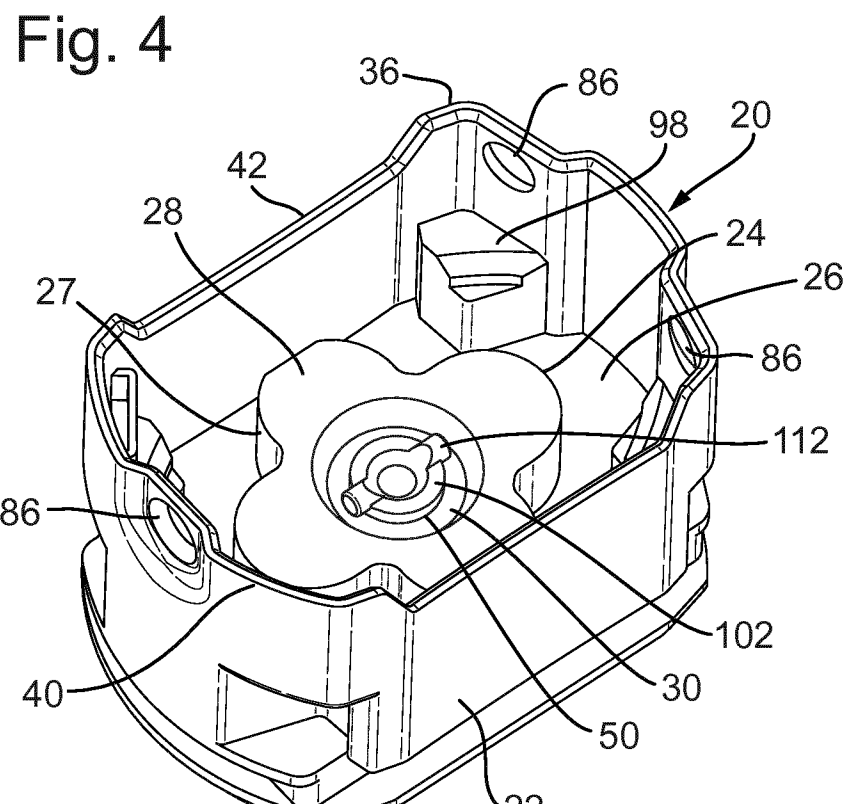
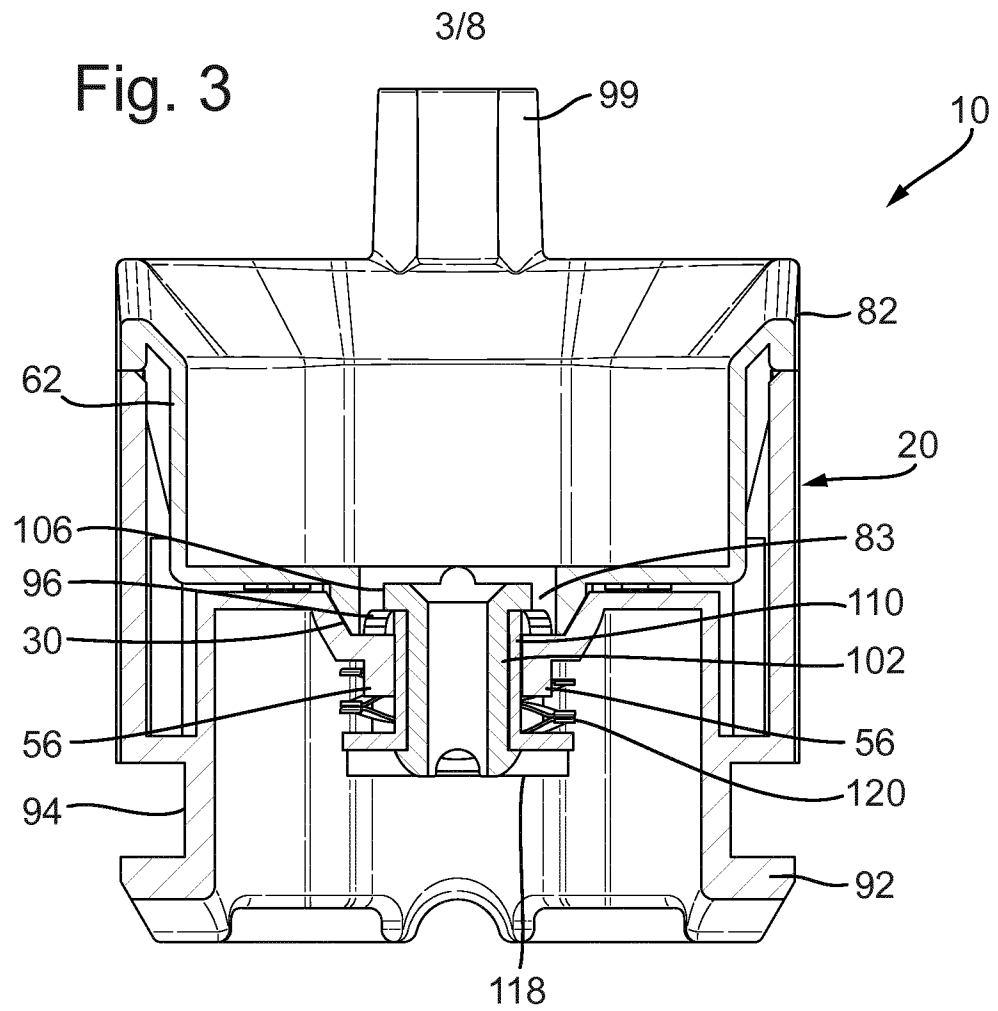


Fig. 2b





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Fig. 5

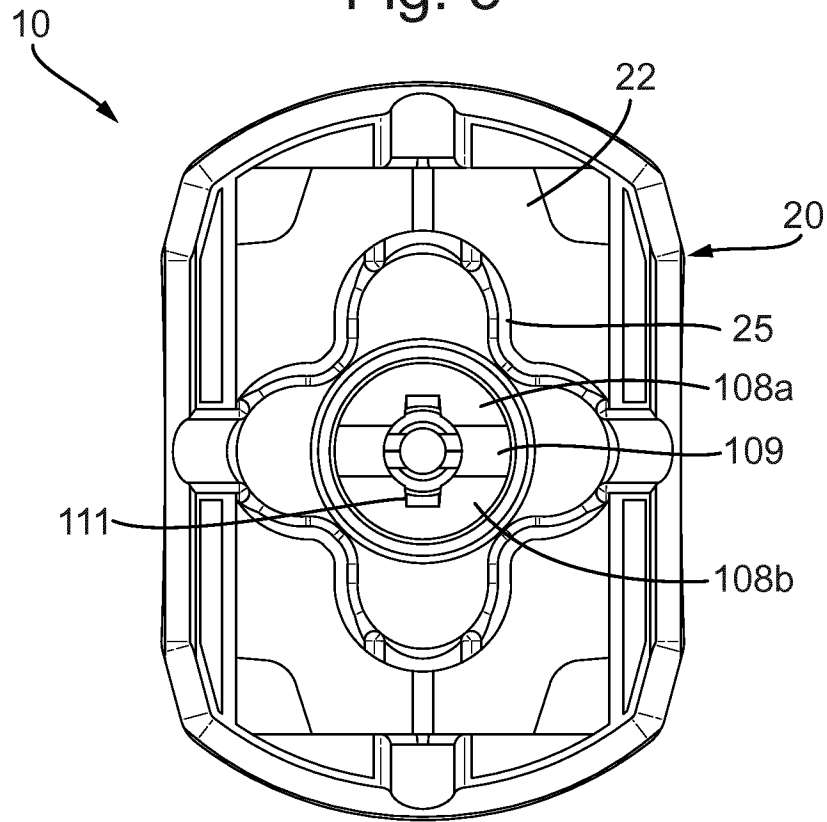
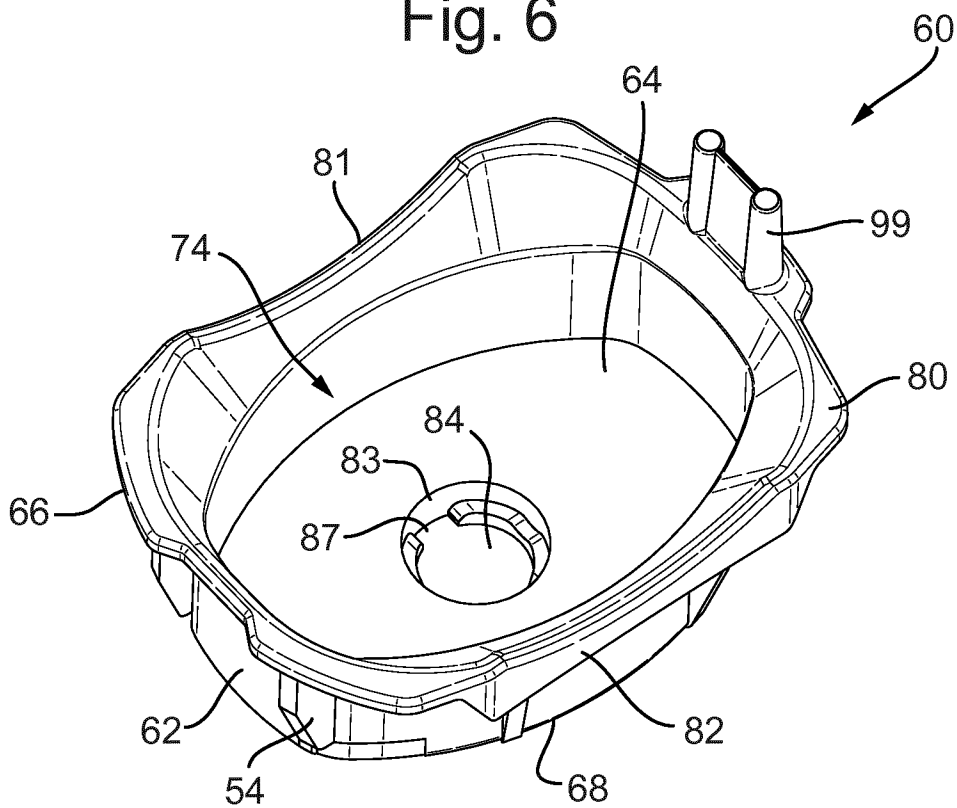
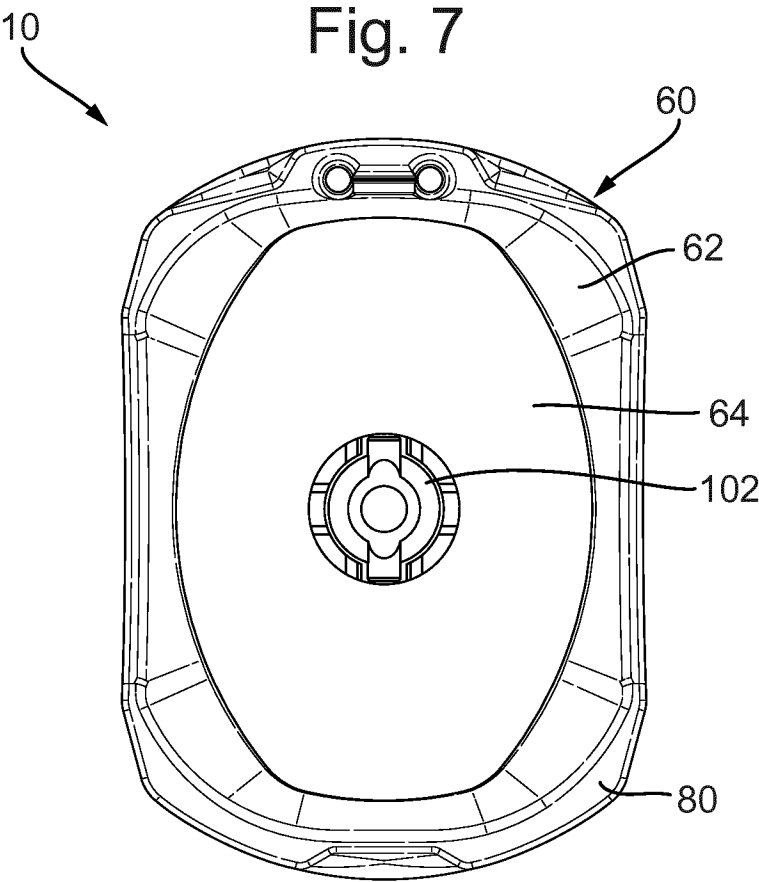


Fig. 6





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Fig. 8a

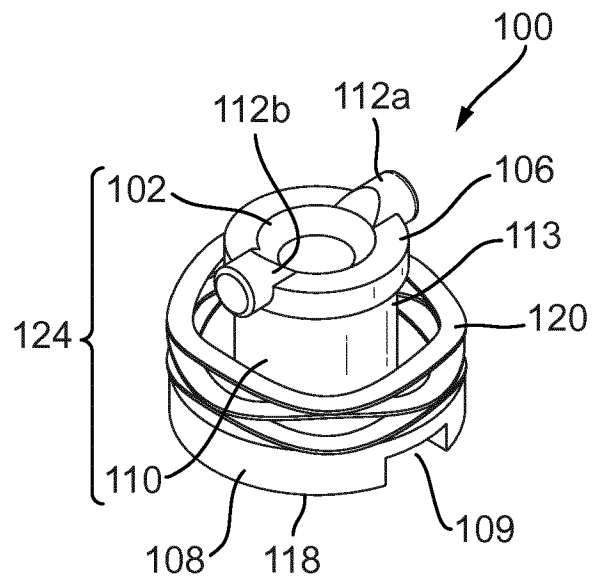


Fig. 8b

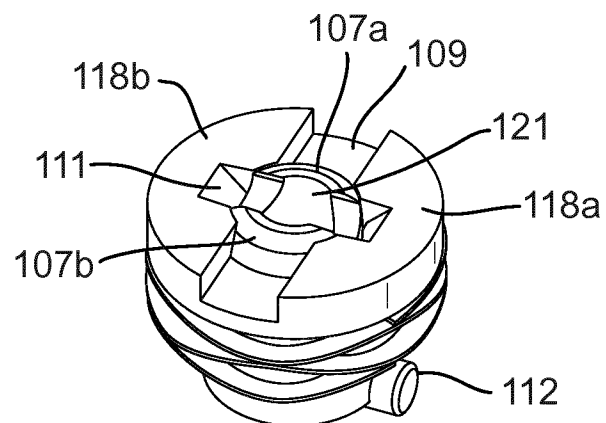


Fig. 9

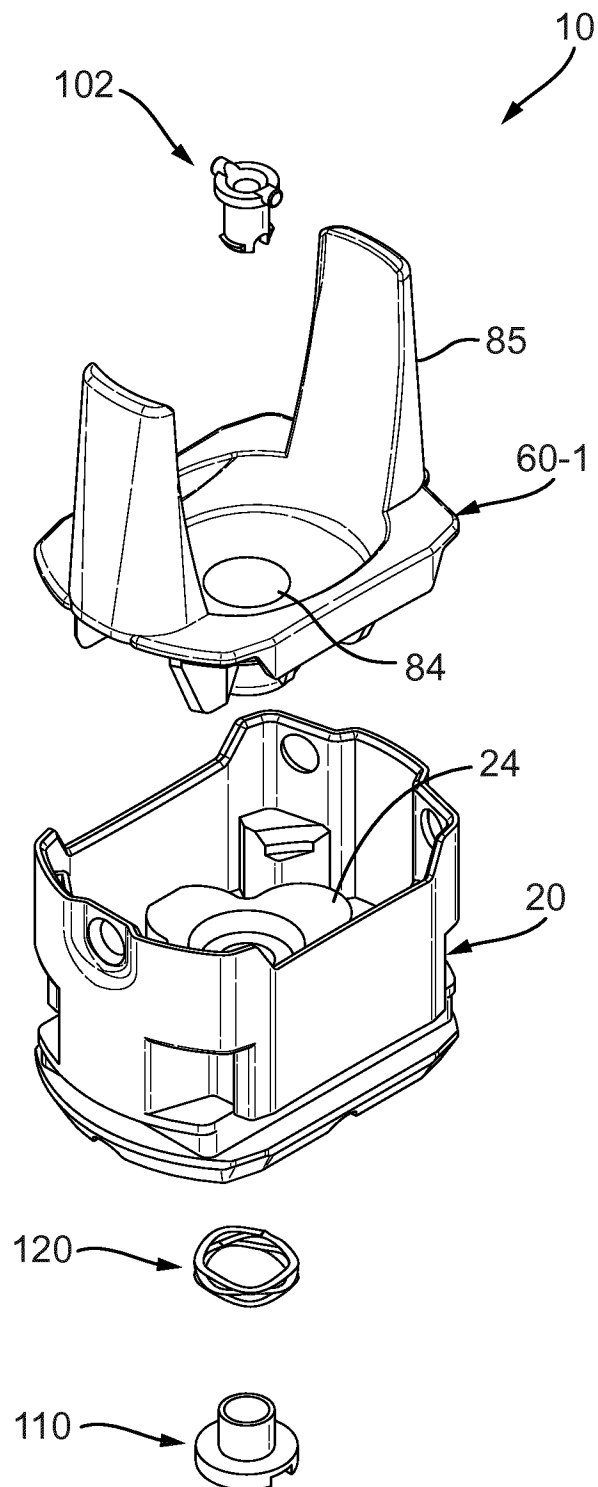
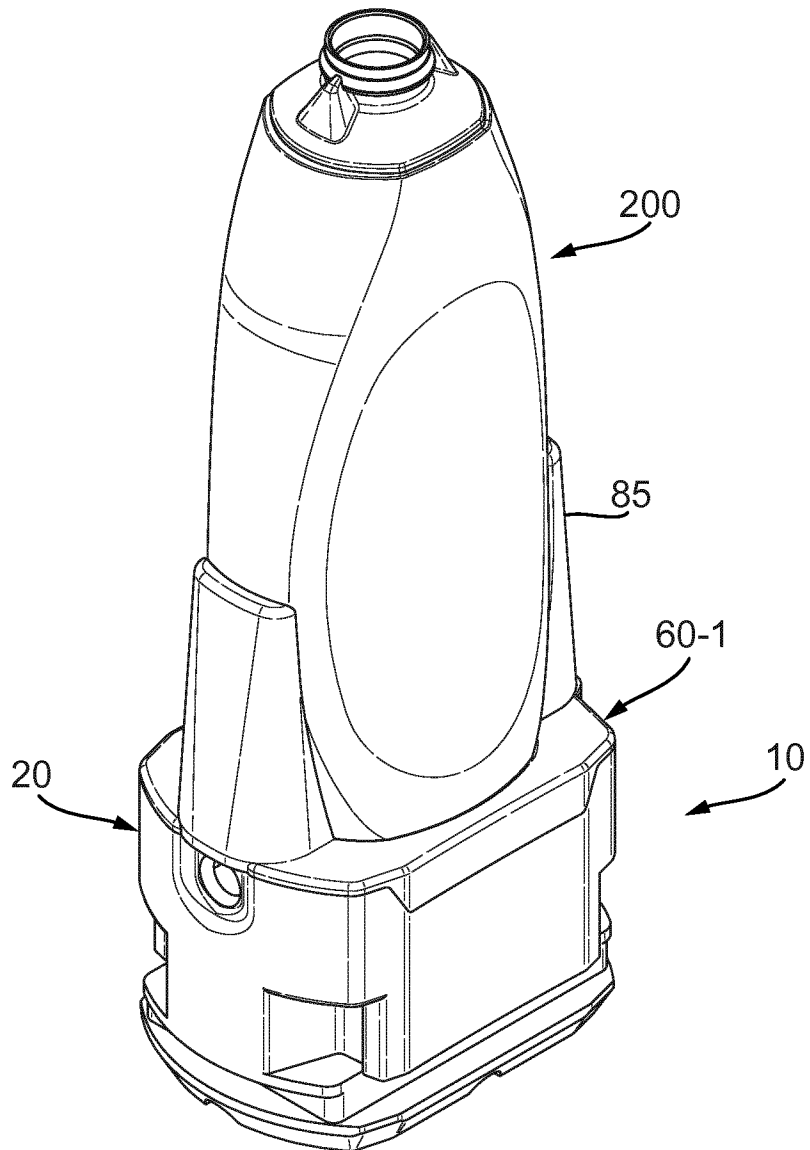


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/054951

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65G17/46
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65G B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2013/214469 A1 (TERZINI ROBERT [US]) 22 August 2013 (2013-08-22) page 3, paragraph 0039 - page 4, paragraph 0047 figures 1-12 -----	1-16
A	US 8 695 791 B2 (OEHRMAN MICHAEL [SE]) 15 April 2014 (2014-04-15) cited in the application column 3, line 61 - column 6, line 39 figures 1,2 -----	1-16
A	JP 2010 271204 A (HITACHI HIGH TECH CORP) 2 December 2010 (2010-12-02) paragraph [0006] - paragraph [0027] figures 1-3 -----	1-16



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/054951

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