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(54) **RESERVOIR SYSTEMS FOR HAND-HELD SPRAY GUNS**

(57) A reservoir system for use with a spray gun. The system includes a cup receptacle and a lid. The lid includes a lid body and a collar. The lid body provides a spout and a platform surrounding the spout. At least a portion of the platform forms a partial helical shape revolving about a central axis of the spout. The collar is rotatably connected to the lid body. Further, the collar includes a lid connector structure configured to connect the lid to the cup receptacle. In some embodiments, the reservoir system further includes one or more of an adaptor, a plug and a shaker core.

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Description

Background

[0001] The present disclosure relates to liquid spraying apparatuses, such as spray guns. More particularly, it relates to reservoir systems used to contain and supply liquid to a spray gun.

[0002] Liquid spray guns are commonly used to spray coating such as stains, primers, paints, sealers and the like onto surfaces. For example, spray guns are widely used in vehicle body repair shops when re-spraying a vehicle that has been repaired following an accident. In the known spray guns, the liquid is contained in a reservoir or cup attached to the gun from where it is fed to a spray nozzle. The liquid may be gravity fed or suction fed or, more recently, pressure fed by an air bleed line to the reservoir from the compressed air line to the spray gun, or from the spray gun itself.

Summary

[0003] Traditionally, the liquid is contained in a rigid reservoir or pot removably mounted on the spray gun. In this way, the pot can be removed for cleaning or replacement. Previously, the pot was secured to the gun empty and provided with a removable lid by which the desired liquid could be added to the pot while attached to the gun. On completion of spraying, the pot can be removed and the gun and pot cleaned for re-use.

[0004] More recently, reservoir systems have been developed that enables painters to mix less paint and drastically reduce the amount of technician time required for gun cleaning. The PPS™ Paint Preparation System available from 3M Company of St. Paul, MN provides a reservoir that eliminates the need for traditional mixing cups and paint strainers. The PPS™ Paint Preparation System reservoir includes a reusable outer container or cup, an open-topped liner, a collar and a lid. The liner is a close fit in the outer container, and paint (or other liquid) that is to be sprayed is contained within the liner. The lid is assembled to the liner and provides a spout or conduit through which the contained paint is conveyed. In use, the liner collapses as paint is withdrawn and, after spraying, the liner and lid can be removed allowing a new, clean liner and lid to be employed for the next use of the spray gun. As a result, the amount of cleaning required is considerably reduced and the spray gun can be readily adapted to apply different paints (or other sprayable coatings) in a simple manner.

[0005] The PPS™ Paint Preparation System is one example of a reservoir system used to contain and supply liquid to a spray gun. In addition to the reservoir or cup, reservoir systems can include one, two or more components that may or may not be directly employed for a particular application. For example, regardless of exact format, the reservoir or pot incorporates one or more connection features that facilitate removable assembly or attachment to the spray gun. In many instances, the spray gun and reservoir are designed in tandem, providing complementary connection formats that promote direct assembly of the reservoir to the spray gun. In other instances, the corresponding reservoir system will include an adaptor that is employed between the reservoir and spray gun. The adaptor has a first connection format at one end compatible with the spray gun inlet and a second connection format at an opposite end compatible with the reservoir outlet. With either approach, releasable connection between the spray gun and reservoir was conventionally achieved via a standard screw thread connection format.

[0006] Any improvements to the adaptor or connector formats are desirable. In addition, users desire improvements to other components of the reservoir system, either alone or in combination with one another. For example, the cup receptacle, the lid, connection between the lid and cup receptacle, along with auxiliary components intended to be used apart from the spray gun are all subject to potential improvement.

[0007] The inventors of the present disclosure recognized that a need exists for spray gun reservoir systems that overcome one or more of the above-mentioned problems.

[0008] Some aspects of the present disclosure are directed toward a lid for a spray gun reservoir system. The lid includes a lid body comprising a spout, a platform and a wall. The platform at least partially surrounds the spout, and defines a major plane and a partial helical shape. The partial helical shape declines with respect to the major plane and revolves about a central axis of the spout. The wall includes an outer face adjoining the platform and including a portion that declines with respect to the major plane of the platform. In this regard, the partial helical shape interrupts the declining portion of the outer face of the wall. In some embodiments the outer face of the wall comprises a dome shape or a conical shape. In other embodiments, a first end of the partial helical shape is proximate a transition zone to the major plane and a second end of the partial helical shape interrupts the declining portion of the outer face of the wall.

[0009] Other aspects of the present disclosure are directed toward a lid for a spray gun reservoir system. The lid includes a lid body and a collar. The lid body provides a spout and a platform surrounding the spout. At least a portion of the platform forms a partial helical shape revolving about a central axis of the spout. The collar is rotatably connected to the lid body. Further, the collar includes a lid connector structure configured to connect the lid to the cup receptacle.

[0010] Other aspects of the present disclosure are directed toward a reservoir system for use with a spray gun. The system includes a cup receptacle and a lid. The lid includes a lid body and a collar. The lid body provides a spout and a platform surrounding the spout. At least a portion of the platform forms a partial helical shape revolving about a central axis of the spout. The collar is

rotatably connected to the lid body. Further, the collar includes a lid connector structure configured to connect the lid to the cup receptacle. In some embodiments, the cup receptacle includes a side wall forming an aperture for viewing contents of an inner cavity, and the aperture has a non-uniform circumferential width. In some embodiments, the lid body includes an outer face defining a continuous dome shape, and the platform defines a ramp surface projecting into the dome shape. In some embodiments, the reservoir system further includes an adaptor configured to connect the reservoir with a spray gun inlet port. In related embodiments, the lid and the adaptor provide complementary connection formats. In some embodiments, the reservoir system further includes a plug for sealing the spout. In related embodiments, the plug can include a plug side wall with a stepped outer diameter. In some embodiments, the reservoir system further includes a shaker core useful, for example, in mounting the reservoir to a shaker machine. In related embodiments, the shaker core can define opposing, first and second ends, with an inner diameter of the shaker core at the first end being less than a diameter of the shaker core at the second end.

[0011] Exemplary embodiments according to the present disclosure also include, but are not limited to, the embodiments listed below, which may or may not be numbered for convenience. Several additional embodiments, not specifically enumerated in this section, are disclosed within the accompanying detailed description.

Embodiments:

[0012]

1. A lid for a spray gun reservoir system comprising:

    a lid body comprising:

        a spout;
        a platform at least partially surrounding the spout, wherein the platform defines a major plane and a partial helical shape declining with respect to the major plane and revolving about a central axis of the spout; and
        a wall comprising an outer face adjoining the platform and comprising a portion that is declining with respect to the major plane of the platform;

    wherein the partial helical shape interrupts the declining portion of the outer face of the wall.

2. The lid of Embodiment 1, wherein the declining portion of the outer face of the wall comprises a dome shape.

3. The lid of Embodiment 1, wherein the declining portion of the outer face of the wall comprises a conical shape.

4. The lid of any of Embodiments 1-3, wherein a first end of the partial helical shape is proximate a transition zone to the major plane and a second end of the partial helical shape interrupts the declining portion of the outer face of the wall.

5. The lid of Embodiment 4, wherein the second end of the partial helical shape terminates at a retention feature.

6. The lid of any of Embodiments 1-5, further comprising a collar rotatably connected to the lid body.

7. The lid of Embodiment 6, wherein the collar includes a lid connector structure configured to connect the lid to a compatible cup receptacle.

8. A lid for a spray gun reservoir system comprising:

    a lid body comprising a spout and a platform at least partially surrounding the spout, wherein at least a portion of the platform forms a partial helical shape revolving about a central axis of the spout, and
    a collar rotatably connected to the lid body;
    wherein the collar includes a lid connector structure configured to connect the lid to a compatible cup receptacle.

9. The lid of Embodiment 8, wherein the platform defines a major plane and the partial helical shape declines with respect to the major plane, and further wherein the lid body includes a wall comprising an outer face adjoining the platform and comprising a portion that is declining with respect to the major plane of the platform, and even further wherein the partial helical shape interrupts the declining portion of the outer face of the wall.

10. The lid of Embodiment 9, wherein the declining portion of the outer face of the wall comprises a dome shape.

11. The lid of Embodiment 9, wherein the declining portion of the outer face of the wall comprises a conical shape.

12. The lid of any of Embodiments 9-11, wherein a first end of the partial helical shape is proximate a transition zone to the major plane and a second end of the partial helical shape interrupts the declining portion of the outer face of the wall.

13. The lid of Embodiment 12, wherein the second end of the partial helical shape terminates at a retention feature.

14. A reservoir system for use with a spray gun, the system comprising:

    a cup receptacle; and
    a lid including:

        a lid body providing a spout and a platform surrounding the spout, wherein at least a portion of the platform forms a partial helical shape revolving about a central axis of the

spout, and
a collar rotatably connected to the lid body;

wherein the collar includes a lid connector structure configured to connect the lid to the cup receptacle.

15. The reservoir system of Embodiment 14, wherein the cup receptacle includes a cylindrical side wall extending from a base end to an open end and defining an inner cavity, and further wherein an aperture is defined in the side wall that is open to the inner cavity for viewing contents of the inner cavity from an exterior of the cup receptacle, and even further wherein the aperture has a non-uniform circumferential width.
16. The reservoir system of Embodiment 15, wherein the aperture extends from a first side proximate the base end to an opposing, second side proximate the open end, and further wherein a circumferential width of the aperture at the first side is greater than a circumferential width of the aperture at the second side.
17. The reservoir system any of Embodiments 14-16, wherein lid body includes an outer face defining a continuous dome shape, and further wherein the platform defines a ramp surface having a first ramp segment extending from a first end to a second end, the first end being longitudinally above the second end relative to an upright orientation of the lid, and even further wherein the ramp surface segment projects into the dome shape of the outer face.
18. The reservoir system of Embodiment 17, wherein the ramp surface further includes a second ramp segment extending from a first end to a second end, the first end of the second ramp segment being adjacent and longitudinally above the second end of the first ramp segment, and further wherein the lid body forms an undercut at an intersection of the first and second ramp segments, the undercut projecting into the dome shape of the outer face.
19. The reservoir system of any of Embodiments 17-18, wherein a radial width of the first ramp segment at the first end is less than a radial width of the first ramp segment at the second end.
20. The reservoir system of any of Embodiments 14-19, wherein the collar includes a ring and a plurality of tabs projecting from an underside of the ring, a portion of the lid connector structure being carried by at least one of the tabs, and further wherein the ring has a variable radial width.
21. The reservoir system of Embodiment 20, wherein circumferentially adjacent ones of the tabs are separated by a circumferential opening, and further wherein a radial width of the ring decreases at a location longitudinally aligned with at least one of the circumferential openings.
22. The reservoir system of any of Embodiments 20-21, wherein the ring defines at least one slot that is aligned with a corresponding one of the tabs.
23. The reservoir system of any of Embodiments 14-22, further comprising an adaptor configured to selectively connect the spout with a spray gun inlet.
24. The reservoir system of Embodiment 23, wherein the lid and the adaptor include complementary connector features for selectively mounting the adaptor to the lid.
25. The reservoir system of any of Embodiments 23-24, wherein the adaptor includes a tubular member and a base projecting from the tubular member, and further wherein the tubular member terminates at an end and the base defines a tracking face opposite the end, and even further wherein at least a portion of the tracking face forms a partial helical shape corresponding with the partial helical shape of the platform.
26. The reservoir system of any of Embodiments 23-25, wherein the adaptor further includes at least one lock structure projecting from an outer face of the base.
27. The reservoir system of Embodiment 26, wherein the at least one lock structure extends from a first end to an opposing second end, and defines an abutment face, an upper face opposite the abutment face, and a guide face opposite the base, and further wherein a geometry of the abutment face in extension from the first end to the second end differs from a geometry of the upper face in extension from the first end to the second end.
28. The reservoir system of Embodiment 27, wherein the upper face defines an insertion section extending from the first end and a locking section extending from the insertion section in a direction of the second end, and further wherein a major plane defined by the insertion section segment is non-coplanar with a major planed defined by the locking section.
29. The reservoir system of Embodiment 28, wherein the upper face further defines a tail section extending from the locking section in a direction of the second end, and further wherein a major plane defined by the tail section is non-coplanar with the major plane defined by the locking section.
30. The reservoir system of Embodiment 29, wherein a shape of the tail section is a partial helix.
31. The reservoir system of any of Embodiments 27-30, wherein the guide face defines a first region extending from the first end and a second region extending from the first region in a direction of the second end, and further wherein the first region defines a uniform radius relative to a centerline of the tubular member, and even further wherein the second region defines a tapering radius relative to the centerline in extension from the first region toward the second end.
32. The reservoir system of any of Embodiments 26-31, wherein the lid further includes at least one

retention structure configured to engage the at least one locking structure upon rotation of the adaptor relative to the lid.

33. The reservoir system of any of Embodiments 14-32, further comprising a plug for selectively sealing the spout, the plug including a plug body and a lip, wherein the plug body defines a closed end opposite a leading end, and further wherein the lip projects radially from the leading end, and even further wherein the lip defines a plurality of grasping tabs.

34. The reservoir system of Embodiment 33, wherein the plurality of grasping tabs are equidistantly spaced from one another.

35. The reservoir system of any of Embodiments 33-34, wherein the plurality of grasping tabs includes exactly three grasping tabs.

36. The reservoir system of any of Embodiments 33-35, wherein the plug body defines a stepped outer diameter in extension from the closed end to the leading end.

37. The reservoir system of any of Embodiments 14-36, further comprising a shaker core configured for selective mounting to the lid, the shaker core having a longitudinal length such that upon mounting to the collar, the shaker core extends beyond the spout.

38. The reservoir system of Embodiment 37, wherein shaker core defines opposing, first and second ends, and further wherein an inner dimeter of the shaker core at the first end is greater than an inner diameter of the shaker core at the second end.

39. The reservoir system of Embodiment 38, wherein the shaker core further include an annular shoulder projecting radially inwardly from the hub adjacent the first end, the annular shoulder defining a ledge for abutting a corresponding surface of the collar.

40. The reservoir system of Embodiment 39, wherein the shaker core further includes at least one key body projecting from the ledge in a direction of the first end, wherein the key body is configured to be received within a corresponding notch defined by the collar.

[0013] It should furthermore be understood that, although several Embodiments of reservoir systems described above include components of such system (e.g., a lid, a collar, a cup receptacle, a plug, and/or a shaker core, etc.) in combination, the features of such components in combination are not inextricably linked, such that components may additionally, or in the alternative, be considered as stand-alone embodiments or in other combinations not expressly set forth.

[0014] As used herein, the term "liquid" refers to all forms of flowable material that can be applied to a surface using a spray gun (whether or not they are intended to color the surface) including (without limitation) paints, primers, base coats, lacquers, varnishes and similar paint-like materials as well as other materials, such as adhesives, sealer, fillers, putties, powder coatings, blasting powders, abrasive slurries, mold release agents and foundry dressings which may be applied in atomized or non-atomized form depending on the properties and/or the intended application of the material and the term "liquid" is to be construed accordingly.

Brief Description of the Drawings

[0015]

FIG. 1 is a simplified perspective view of a spray gun assembly including a spray gun and a reservoir;
FIG. 2 is an exploded view of a reservoir system in accordance with principles of the present disclosure, including a reservoir and an adaptor;
FIG. 3 is a perspective view of a receptacle cup useful with the reservoir of FIG. 2;
FIG. 4 is a side view of the receptacle cup of FIG. 3;
FIG. 5 is a perspective view of a collar useful with the reservoir of FIG. 2;
FIG. 6A is a top plan view of the collar of FIG. 5;
FIG. 6B is a longitudinal cross-sectional view of the collar of FIG. 6A, taken along the line 6B-6B;
FIG. 7 is a perspective view of lid body useful with the reservoir of FIG. 2;
FIG. 8A is a perspective view of a lid useful with the reservoir of FIG. 2, including the collar of FIG. 5 assembled to the lid body of FIG. 7;
FIG. 8B is a longitudinal cross-sectional view of the lid of FIG. 8A, taken along the line 8B-8B;
FIGS. 9A-9D illustrate connecting of the lid of FIG. 8A to the cup receptacle of FIG. 3;
FIG. 10A is a top plan view of the lid body of FIG. 7;
FIG. 10B is a side view of the lid body of FIG. 10A;
FIG. 10C is an end view of the lid body of FIG. 10A;
FIG. 11 is a transverse cross-sectional view of the lid body of FIG. 10B, taken along the line 11-11;
FIG. 12 is an enlarged side perspective view of a portion of the lid body of FIG. 10A;
FIG. 13 is a longitudinal cross-sectional view of the lid body of FIG. 10A, taken along the line 13-13;
FIG. 14A is an enlarged, top plan view of a portion of the lid body of FIG. 10A;
FIG. 14B is an enlarged, longitudinal cross-sectional view of a portion of the lid body of FIG. 14A, taken along the line 14B-14B;
FIG. 14C is an enlarged, longitudinal cross-sectional view of a portion of the lid body of FIG. 14B, taken along the line 14C-14C;
FIG. 15A is a top perspective view of the adaptor of FIG. 2;
FIG. 15B is a top plan view of the adaptor of FIG. 15A;
FIG. 15C is a side view of the adaptor of FIG. 15A;
FIG. 15D is an end view of the adaptor of FIG. 15A;
FIG. 15E is a longitudinal cross-sectional view of the adaptor of FIG. 15A;
FIG. 15F is a bottom perspective view of the adaptor

of FIG. 15A;
FIGS. 16-19D illustrate connecting of the adaptor of FIG. 15A to the lid of FIG. 8A;
FIG. 20 is a perspective view of another adaptor in accordance with principles of the present disclosure and useful with the reservoir systems of the present disclosure;
FIG. 21A and 21B illustrate connecting of the adaptor of FIG. 20 to a spray gun inlet port;
FIG. 22 is a perspective view of the adaptor of FIG. 20 connected to the reservoir of FIG. 2;
FIGS. 23A and 23B are perspective views of a spray gun nozzle unit including an inlet port in accordance with principles of the present disclosure;
FIGS. 24A and 24B are perspective views of another spray gun nozzle unit including an inlet port in accordance with principles of the present disclosure
FIG. 25A is a perspective view of a plug in accordance with principles of the present disclosure and useful with the reservoir systems of the present disclosure;
FIG. 25B is a top plan view of the plug of FIG. 25A;
FIG. 26 is a side view of the plug of FIG. 25A connected to the reservoir of FIG. 2 and supporting the reservoir on a surface;
FIG. 27A is a top perspective view of a shaker core in accordance with principles of the present disclosure and useful with the reservoir systems of the present disclosure;
FIG. 27B is a bottom perspective view of the shaker core of FIG. 27A;
FIG. 28 is a longitudinal cross-sectional view of the shaker core of FIG. 27A;
FIG. 29A is an exploded view illustrating connection of the shaker core of FIG. 27A with the reservoir of FIG. 2;
FIG. 29B is a perspective view of the shaker core and reservoir of FIG. 29A upon final assembly;
FIG. 29C is a perspective view of the connected shaker core and reservoir of FIG. 29B along with the plug of FIG. 25A connected to the reservoir;
FIG. 30A is an exploded view illustrating connection of the shaker core of FIG. 27A with another reservoir in accordance with principles of the present disclosure;
FIG. 30B is a perspective view of the shaker core and reservoir of FIG. 30A upon final assembly;
FIG. 31A is a perspective view of the adaptor of FIG. 15A connected to the reservoir of FIG. 30A; and
FIG. 31B is a perspective view of the adaptor of FIG. 20 connected to the reservoir of FIG. 30A.

Detailed Description

[0016] Some aspects of the present disclosure are directed toward reservoir systems or kits for supplying liquid to a spray gun. Additional aspects of the present disclosure are directed toward various components useful with reservoir systems or kits, such as a reservoir lid. By way of background, FIG. 1 depicts one embodiment of a spray gun assembly 20 including a reservoir system 30 in accordance with principles of the present disclosure assembled to a spray gun 32 of a gravity-feed type. The gun 32 can assume a wide variety of forms, and generally includes a body 34, a handle 36, and a spray nozzle 38 at a front end of the body 34. The gun 32 is manually operated by a trigger 40 that is pivotally mounted on the sides of the body 34. An inlet port 42 (referenced generally) is formed in or carried by the body 34, and is configured to establish a fluid connection between an interior spray conduit (hidden) of the spray gun 32 and a reservoir 44 (referenced generally) of the reservoir system 30. The reservoir 44 contains liquid (e.g., paint) to be sprayed, and is connected to the inlet port 42 (it being understood that the connection implicated by the drawing of FIG. 1 does not necessarily reflect the connections of the present disclosure). In use, the spray gun 32 is connected via a connector 46 at a lower end of the handle 36 to a source of compressed air (not shown). Compressed air is delivered through the gun 32 when the user pulls on the trigger 40 and paint is delivered under gravity from the reservoir 44 through the spray gun 32 to the nozzle 38. As a result, the paint (or other liquid) is atomized on leaving the nozzle 38 to form a spray with the compressed air leaving the nozzle 38.

[0017] With the above background in mind, FIG. 2 illustrates one non-limiting example of a reservoir system 50 in accordance with principles of the present disclosure. The reservoir system 50 includes a reservoir 52 and an optional adaptor 54. One or more additional, optional components can be included with reservoir systems of the present disclosure as described below. With the system 50 of FIG. 2, the reservoir 52 includes a cup receptacle 60 and a lid 62. In some embodiments, the reservoir 52 can further include a liner 64. In general terms, the liner 64 corresponds in shape to (and is a close fit in) an interior of the cup receptacle 60 and can have a narrow rim 66 at the open end which sits on the top edge of the cup receptacle 60. The lid 62 includes a flange or collar 68 and a lid body 70. The lid body 70 is configured to push-fit in the open end of the liner 64 to locate the peripheral edge of the lid body 70 over the rim 66 of the liner 64. The lid/liner assembly is secured in place by the collar 68 that releasably engages the cup receptacle 60 as described below.

[0018] The lid 62 forms a liquid outlet or spout 72 (referenced generally) through which liquid contained by the liner 64 can flow. In use, the liner 64 collapses in an axial direction toward the lid 62 as paint is withdrawn from the reservoir 52. Air may enter the cup receptacle 60 as the liner 64 collapses (e.g., via an optional vent hole (hidden) in a base of the cup receptacle 60, one or more openings in a side wall of the cup receptacle 60, etc.). On completion of spraying, the reservoir 52 can be detached from the spray gun 32 (FIG. 1), the collar 68 released and the lid/liner assembly removed from the cup receptacle 60.

The cup receptacle 60 is left clean and ready for re-use with a fresh lid 62 and liner 64. In this way, excessive cleaning of the reservoir 52 can be avoided.

[0019] The adaptor 54 facilitates connection of the reservoir 52 to the spray gun inlet port 42 (FIG. 1) as described in greater detail below. In general terms, the lid 62 provides a first connection format 74 (referenced generally) configured to releasably connect with a complementary second connection format 76 (referenced generally) provided with the adaptor 54, with the adaptor 54 further including a spray gun interface feature configured for connection to the spray gun inlet port 42. Upon final assembly, components of the reservoir system 50 are aligned along a central axis A.

[0020] The cup receptacle 60 is shown in greater detail in FIG. 3. The cup receptacle 60 includes an annular sidewall 80 defining an inner cavity 82. The sidewall 80 terminates at an open end 84 providing access to the inner cavity 82. Opposite the open end 84 is a base end 86. A floor 88 extends radially inwardly from the sidewall 80 proximate the base end 86, and has a ring-like shape defining an opening 90. The opening 90 can serve as a vent hole for the reservoir 52 (FIG. 2) during use. Regardless, the floor 88 serves as or provides a support for the liner 64 (FIG. 2). The floor 88 can be slightly off-set from the base end 86 as shown, with the base end 86 enabling the cup receptacle 60 to be stably rested directly on a flat working surface. In some embodiments, one or more notches 92 can be defined in the sidewall 80 and open at the base end 86, effectively forming the based end 86 as a plurality of circumferentially separated feet that promote stable placement on a flat working surface.

[0021] At least one aperture or window 100 is formed through a thickness of the sidewall 80 to permit the contents of the cavity 82 to be viewed therethrough. In some embodiments, the aperture 100 can have a non-uniform or varying circumferential width. For example, a perimeter of the aperture 100 can be described as defining a first side 102 opposite a second side 104. As more clearly shown in FIG. 4, the first side 102 is proximate, but longitudinally spaced from, the base end 86; the second side 104 is proximate, but longitudinally spaced from, the open end 84. Longitudinal extension of the aperture 100 can be viewed as defining a first section 106 extending from the first side 102, and a second section 108 extending from the first section 106 to the second side 104. A width (or circumferential width) aperture 100 along the first section 106 is greater than a width of the aperture 100 along the second section 108. With this construction, the relatively larger area of the aperture 100 at the first section 106 affords a user the ability to more easily discern a level of liquid within the cavity 82. The larger area first section 106 can also be appropriately sized for passage of a user's finger(s), such as to grasp the liner 64 (FIG. 2) when attempting to disassemble the lid 62 (FIG. 2) from the liner 64 (the liner 64 may also be grasped through the opening 90 (FIG. 3). The smaller area second section 108 also affords a user the ability to discern a level of liquid is in the cavity 82 when the cup receptacle 60 is inverted (e.g., such as when connected to a spray gun) but with minimal impact on a structural integrity of the cup receptacle 60. Stated otherwise, the second side 104 is spaced from the open end 84, such that the sidewall 80 is circumferentially continuous and uninterrupted between the open end 84 and the aperture 100. This continuous ring of material provides elevated hoop strength to the cup receptacle 60 at a region where a user is more likely to grasp or handle the cup receptacle 60. Similarly, by minimizing a width or size of the aperture 100 along the second section 108 that is otherwise more proximate the open end 84 (as compared to the first section 106), desired hoop strength of cup receptacle 60 at likely user handling regions is maintained while still affording an understanding of liquid level.

[0022] With cross-reference between FIGS. 3 and 4, tactile feedback members 110a, 110b (e.g., outwardly projecting ribs) can be formed or provided at opposite sides of the aperture 100. The tactile feedback members 110a, 110b allow a user to know, without looking at the cup receptacle 60, that they are gripping an area adjacent the aperture 100, such that they can properly locate their hand(s) and avoid inadvertently applying excess pressure (such as by squeezing) to the liner 64 (FIG. 2) through the aperture 100. It has been found that squeezing the liner 64 when it is filled with paint can cause spilling of paint (by forcing it upward and out of the open end of the liner 64 or accidental disconnection of the lid 62 (FIG. 2) from the liner 64 through excess deformation of the open end of the liner 64).

[0023] It can further be seen in the embodiment of FIGS. 3 and 4 that the cup receptacle 60 comprises receptacle rim 118 and a receptacle connection structure 120 proximate the open end 84. As described in greater detail below, the receptacle connection structure 120 enables the lid 62 (FIG. 2) to be secured to the cup receptacle 60 via the collar 68 (FIG. 2). The receptacle connection structure 120 can include a plurality of receptacle engagement members 122 that are akin to partial threads. Each of the receptacle engagement members 122 extends between opposing, leading and trailing ends 124, 126. The leading end 124 is more proximate the open end 84 as compared to the trailing end 126, such that the leading end 124 can be considered as being "above" the trailing end (relative to the upright orientation of FIGS. 3 and 4). A camming surface 128 is defined between the leading and trailing ends 124, 126, and can be linearly inclined as shown, or may be flat (not inclined), curved, or may comprise any combination of inclined, flat, and/or curved portions. In some embodiments, a shape of the receptacle engagement members 122 is uniform from the leading end 124 to the trailing end 126 (i.e., the receptacle engagement member 122, as a whole, is a continuous partial thread). Regardless of the particular configuration, the camming surface 128 is adapted to interact with complementary structure on the collar 68 to permit the collar 68 (and thus the lid 62) to

be securely attached to the cup receptacle 60 such that the liner 64 (FIG. 2) is retained in sealing relation between the lid 62 and the cup receptacle 60. In this regard, and for reasons made clear below, adjacent ones of the receptacle engagement members 122 are circumferentially spaced from one another, establishing a gap 130 (one of which is identified in FIG. 4).

[0024] In some embodiments, the cup receptacle 60 can be formed of a polymeric material or plastic material, and can be a molded component. In one non-limiting example, the cup receptacle 60 is or includes polypropylene, although any other polymer, co-polymer, combination of polymers, etc., is equally acceptable. In yet other embodiments, the cup receptacle 60 is metal. Further, the cup receptacle 60 can be formed to be transparent, semi-transparent or translucent to promote viewing of contents within the cup receptacle 60. In other embodiments, a material used to form (e.g., mold) the cup receptacle 60 can include a tint or pigment selected to provide a desired color.

[0025] Returning to FIG. 2, the collar 68 can initially be formed independently of the lid body 70 and subsequently attached to form the completed lid 62. With this in mind, the collar 68 is shown in greater detail in FIG. 5 and includes or defines a ring 140 and a lid connection structure 142 (referenced generally). In general terms, the ring 140 is configured to be rotatably received by the lid body 70 (FIG. 3). The lid connection structure 142 is configured to selectively interface with the receptacle connection structure 120 (FIG. 3) of the cup receptacle 60 (FIG. 3), and can be formed or carried by one or more tabs 144 projecting from the ring 140.

[0026] With additional reference to FIG. 6A the ring 140 defines a central opening 150 bounded by an inner edge 152. The inner edge 152 can define a circle or substantially circular shape (i.e., within 5% of a true circle). An outer edge 154 of the ring 140 is opposite the inner edge 152, with a radial width of the ring 140 being defined as a radial distance (relative to the central axis A) between the inner and outer edges 152, 154. In some embodiments, the ring 140 has a variable radial width. Stated otherwise, in a plane perpendicular to the central axis A (i.e., the plane of the view of the FIG. 6A), the ring 140 has a non-uniform radial width. For example, the ring 140 forms or defines tab portions 156. The tab portions 156 can be symmetrically disposed about a circumference of the ring 140, with each tab portion 156 corresponding with a respective one of the tabs 144. Circumferentially adjacent ones of the tab portions 156 are separated by a notch 158. In some embodiments each of the notches 158 is sized and shaped to receive a user's finger to facilitate handling and ease in manipulating the collar 68. In related embodiments, the notches 158 can be sized, shaped and located to interface with one or more other components of the corresponding reservoir system. Regardless, a radial width of the ring 140 is reduced in a region of the notches 158 (as compared to the radial width at the tab portions 156). A slot 160 (one of which is identified in each of FIGS. 5 and 6A) can be formed through a thickness of each of the tab portions 156. Where provided, the slots 160 can each be configured to interface with one or more other components of the corresponding reservoir system. In addition, a design of the slots 160 can facilitate injection molding of certain features of the collar 68 (e.g., by providing access by slides in injection-molding tooling to enable formation of details on the inside surface of the tabs 144).

[0027] As best shown in FIG. 5, flange rotation limiting features 162 can be provided with the collar 68, formed as nubs or projections from an upper face of the ring 140. The flange rotation limiting features 162 can located opposite one another relative to a circumference of the inner edge 152, and are configured to selectively interface with corresponding features of the lid body 70 (FIG. 2) as described in greater detail below.

[0028] The tabs 144 can have an identical construction in some embodiments, each projecting from an underside of the ring 140. In other embodiments, the tabs 144 need not be identical (e.g., two pairs of two differently-configured tab designs). Circumferentially adjacent ones of the tabs 144 are separated by a flange opening 166 (one of which is identified in FIG. 5) that is otherwise commensurate with a corresponding one of the notches 158. The flange openings 166 can provide for access for the fingers of an end user to assist in gripping the lid 62 (FIG. 2) for installation and removal. Such additional gripping functionality may be particularly desirable where end users may be likely to be wearing gloves, and where the end user's hands (gloved or otherwise) may be slippery with wet paint or other residue. In some embodiments, one or more ribs 168 can be formed as exterior projections on each of the tabs 144.

[0029] As mentioned above, the lid connection structure 142 can be associated with the tabs 144, and in some embodiments comprises a lid engagement member 170 carried by each of the tabs 144. The lid engagement members 170 are akin to partial threads. As shown in FIG. 6B, each of the lid engagement members 122 extends between opposing, leading and trailing ends 172, 174. The trailing end 174 is more proximate the ring 140 as compared to the leading end 172, such that the leading end 172 can be considered as being "below" the trailing end (relative to the upright orientation of FIG. 6B). A camming surface 176 is defined between the leading and trailing ends 172, 174, and can be linearly inclined as shown, or may be flat (not inclined), curved, or may comprise any combination of inclined, flat, and/or curved portions. Regardless of the particular configuration, the camming surface 176 is adapted to interact with complementary structure on the cup receptacle 60 (FIG. 3) as described below.

[0030] In some embodiments, the collar 68 can be formed of a polymeric material or plastic material, and can be a molded component. In one non-limiting example, the collar 68 is or includes 30% glass filled polypropylene, although any other polymer, co-polymer, combi-

nation of polymers, etc., is equally acceptable. In yet other embodiments, the collar 68 is metal. Further, the collar 68 can be formed to be transparent, semi-transparent or translucent to promote viewing of contents within the cup receptacle 60 (FIG. 3). In other embodiments, a material used to form (e.g., mold) the collar 68 can include a tint or pigment selected to provide a desired color.

[0031] Returning to FIG. 2, the lid body 70 generally includes features that promote assembly with the collar 68 to form the completed lid 62; features that, in concert with the collar 68, promote fluid tight mounting of the completed lid 62 to the cup receptacle 60 and the liner 64; and features that promote connection with the adaptor 54 (e.g., the first connection format 74). So as to provide a more complete understanding of a relationship between the completed lid 62 and the cup receptacle 60 in light of the collar 68 as described above, the corresponding features of the lid body 70 are described in detail below, followed by a detailed explanation of the first connection format 74 and the adaptor 54.

[0032] The lid body 70 is shown in greater detail in FIG. 7 and includes the spout 72 and the first connection format 74 (referenced generally). In addition, the lid body 70 includes a wall 200, a rim 202, a skirt 204, one or more liner sealing members 206, and flange retention features 208. The wall 200 defines an outer face 210 and an inner face (hidden in FIG. 7, but shown at 212 in FIG. 9D) opposite the outer face 210. The outer face 210 can a curved or dome-like shape as shown, although other shapes and geometries are also acceptable (e.g., conical). The outer face 210 extends from the rim 202 to the first connection format 74 and the spout 72. The rim 202 projects radially outwardly from a perimeter of the wall 200. The skirt 204 projects longitudinally from the rim 202. The liner sealing members 206 are one or more ribs projecting radially outwardly from the skirt 204 for reasons made clear below.

[0033] The flange retention features 208 can each be akin to a finger or latch projecting from and over the outer face 210, and collectively serve to retain the collar 68 (FIG. 2). For example, FIGS. 8A and 8B illustrate final assembly of the collar 68 to the lid body 70 in forming the completed lid 62. The ring 140 is slidably located over the wall 200 and the rim 202, with the flange retention features 208 collectively serving to capture the collar 68 relative to the lid body 70. In the embodiment shown, a rotational or sliding interface is established between the collar ring 140 and the flange retention features 208, allowing the collar 68 to rotate relative to the lid body 70 (and vice-versa). Rotation of the collar 68 relative to the lid body 70 is limited by selective abutment or interface between the flange rotation limiting features 162 provided with the collar 68 corresponding ones of the flange retention features 208. With this construction, the collar 68 can freely rotate relative to the lid body 70 (and vice-versa) in a first rotational direction until the flange rotation limiting features 162 are brought into abutting contact with a corresponding one of the flange retention features 208; with attempted further rotation of the collar 68 in the first direction, the lid body 70 will rotate with the collar 68.

[0034] The cross-sectional illustration of the lid 62 of FIG. 8B reveals that upon final assembly of the collar 68 to the lid body 70, the tabs 144 extend away from the rim 202, and are radially spaced from the hub 204. A clearance zone or gap 220 is established between each of the lid engagement members 170 and the skirt 204. Provision of the clearance zone 220 facilitates mounting of the lid 62 to the cup receptacle 60 (FIG. 2).

[0035] More particularly, FIG. 9A reflects arrangement of the lid 62 prior to mounting to the cup receptacle 60. As a point of reference, the liner 64 is disposed within the cup receptacle 60 and thus is primarily hidden in the view; the rim 66 of the liner 64 is partially visible and identified in FIG. 9A. The collar 68 is rotationally arranged relative to the cup receptacle 60 such that each of the tabs 144 are generally aligned with a corresponding one of the gaps 130 (two of which are generally identified in FIG. 9A) between the receptacle engagement members 122 of the cup receptacle 60. The lid 62 can then be lowered on to the cup receptacle 60 as in FIG. 9B. In this regard, because the tabs 144 are aligned with respective ones of the gaps 130 (FIG. 9A), the lid engagement member 170 (FIG. 5) carried by each of the tabs 144 freely passes between the receptacle engagement members 122. The lid 62 is essentially fully seated against the cup receptacle 60 (and/or the liner 64) - although not yet fully seated and tightened - prior to engagement of camming surfaces on either part. The "snapping" sensation and/or sound derives from a combination of (i) the liner sealing members 206 (FIG. 9A) being quickly advanced into an open end of the liner 64 such that a portion of the liner 64 rapidly stretches over the liner sealing members 206 and then relaxes; and (ii) the lid body rim 202 (FIG. 7) accordingly impacting the liner rim 66 / receptacle rim 118 as the lid 62 quickly drops into contact. The "snapping" sensation or sound is further facilitated by the segmented construction of the collar 68 (i.e., the notches 158 and corresponding flange openings 166). If the collar 68 were not segmented, the snapping sensation is unlikely to occur, allowing the user to undesirably "over tighten" or thread the lid 62 into the liner 64 and possibly folding the liner 64 in while doing so. This brief snapping sensation can provide tactile and/or audible reassurance to the end user that the lid 62 and the liner 64 are securely attached, although the lid 62 has yet to be secured to the cup receptacle 60.

[0036] The collar 68 can then be rotated relative to the cup receptacle 60 (and/or vice-versa) to effectuate engagement between the lid engagement members 170 and corresponding ones of the receptacle engagement members 122. For example, the partial cross-sectional view of FIG. 9C illustrates initial interface between one of the receptacle engagement members 122 and one of the lid engagement members 170 with rotation of the collar 68 relative to the cup receptacle 60. With initial rotation, the leading end 172 of the lid engagement mem-

ber 170 is directed toward the leading end 124 of the receptacle engagement member 122. In the seated arrangement in which the lid 62 is seated atop the cup receptacle 60 and installed to the liner 64 (FIG. 2) as described in the preceding paragraph, the leading end 172 of the lid engagement member 170 is located at a vertical position along the central axis A that is off-set or "below" the leading end 124 of the receptacle engagement member 122. Thus, with further rotation of the collar 68, the lid engagement member 170 readily passes "below" the receptacle engagement member 122. However, with even further rotation of the collar 68 relative to the cup receptacle 60, the camming surface 128 of the receptacle engagement member 122 directly interfaces with the camming surface 176 of the lid engagement member 170. In particular, with continued rotation of the collar 68, the cam-like interface between the receptacle engagement member 122 and the lid engagement member 170 effectuates a clamping force to be applied along the central axis A. Thus, a clamping motion of the lid 62 and the cup receptacle 60 along the central axis A is achieved with rotation of the collar 68 to better ensure a robust connection. Moreover, optional provision of the receptacle engagement members 122 and the lid engagement members 170 as easy-start partial threads as shown can not only make installation of the lid 62 faster, but can prevent possible cross-threading, reduce the number of areas where excess paint can collect and foul the assembly, and ease cleanup.

[0037] FIG. 9D reflects that upon final connection of the lid 62 to the cup receptacle 60 in forming the completed reservoir 52, the liner rim 66 is clamped between the receptacle rim 118 and the lid rim 202, providing a liquid seal. The liner 64 is further stretched or clamped between the liner sealing members 206 and the cup receptacle 60, further promoting a liquid-tight sealing relation between the lid 62 and the liner 64. With this sealed arrangement, liquid (e.g., paint) disposed in the liner 64 will flow (e.g., when the reservoir 52 is inverted from the orientation of FIG. 9D) from the liner 64 along the inner face 212 of the lid wall 200 to the spout 72. The separate collar 68 can be movably connected to the lid body 70 without worry of creating a leak path for paint.

[0038] In some embodiments, the lid body 70 can be formed of a polymeric material or plastic material, and can be a molded component. In one non-limiting example, the lid body 70 is or includes polypropylene, although any other polymer, co-polymer, combination of polymers, etc., is equally acceptable. In yet other embodiments, the lid body 70 is metal. Further, the lid body 70 can be formed to be transparent, semi-transparent or translucent to promote viewing of contents within the cup receptacle 60. In other embodiments, a material used to form (e.g., mold) the lid body 70 can include a tint or pigment selected to provide a desired color.

[0039] Returning to FIG. 7, the first connection format 74 (referenced generally in FIG. 7) includes a platform 250, a first retention structure 252a, and a second retention structure 252b. In general terms, the platform 250 and the retention structures 252a, 252b are formed at or project from the outer face 210 of the lid wall 200 at a location external the spout 72, and are collectively configured to facilitate selective connection or mounting with the complementary second connection format 76 (FIG. 2) of the adaptor 54 (FIG. 2).

[0040] The platform 250 terminates at or defines a guide surface 260 that revolves about the spout 72. As best shown in FIGS. 10A-10C, geometry of the guide surface 260 can be viewed as providing first and second guide segments 262a, 262b separated by first and second undercuts or trapping regions 264a, 264b. Relative to a rotational direction defined by revolution of the guide surface 260 about the spout 72 (clockwise or counterclockwise), the first guide segment 262a extends circumferentially in the clockwise direction from the first undercut 264a to the second undercut 264b and has a geometry generating a lead-in region 266 and a ramp region 268. Relative to the clockwise direction, then, the lead-in region 266 is "ahead" or "upstream" of the ramp region 268. Similarly, the second guide segment 262b can be viewed as extending circumferentially in the clockwise direction from the second undercut 264b to the first undercut 264a, and has a geometry generating a lead-in region 266 and a ramp region 268.

[0041] The guide segments 262a, 262b can be substantially identical in some embodiments such that the following description of the first guide segment 262a applies equally to the second guide segment 262b. The first guide segment 262a is located to correspond with the first retention structure 252a. A major plane of the lead-in region 266 can be substantially flat (i.e., within 5% of a truly flat shape) and substantially perpendicular (i.e., within 5% of a truly perpendicular relationship) to the central axis A. The ramp region 268 tapers longitudinally downward (relative to the upright orientation of FIGS. 10B and 10C) in extension from the lead-in region 266 to the second undercut 264b, creating a partial helical shape. Thus, the lead-in region 266 is longitudinally or vertically "above" the ramp region 268 (relative to the upright orientation of FIGS. 10A and 10B), and a major plane of the ramp region 268 is oblique to the major plane of the lead-in region 266 (and is not substantially perpendicular to the central axis A). A transition line or zone 270 is defined at an intersection of the lead-in and ramp regions 266, 268 and is generally aligned with the first retention structure 252a. The transition line 270 (as well as the transition line 270 associated with the second guide segment 262b) is more clearly evident in the cross-sectional view of FIG. 11.

[0042] With continued reference to FIG. 11, the guide surface 260 can have a varying or non-uniform radial width relative to the central axis A. The non-uniform radial width can be effectuated by an inner edge 280 of the guide surface 260 being circular (following the cylindrical shape of the spout 72), whereas an opposing, outer edge 282 of the guide surface 260 has a non-uniform shape.

For example, a shape of the outer edge 282 (relative to the top plan view of FIG. 11) along the lead-in region 266 of the first guide segment 262a can have an increasing radius in extension from the first undercut 264a toward the ramp region 268. Further, at least a segment of the shape of the outer edge 282 along the ramp region 268 can have an increasing radius in extension to the second undercut 264b. With this optional configuration, at the second undercut 264b, a radial width of the first guide segment ramp region 268 is greater than the radial width of the second guide segment lead-in region 266; similarly, at the first undercut 264a, a radial width of the second guide segment ramp region 268 is greater than the radial width of the first guide segment lead-in region 266.

[0043] The first and second undercuts 264a, 264b can be substantially identical, and can be equidistantly spaced about the spout 72. Geometry features generated by the first undercut 264a are provided by the enlarged view of FIG. 12. Commensurate with the descriptions above, the first undercut 264a is formed at, or defines, a transition between the ramp region 268 of the second guide segment 262b and the lead-in region 266 of the first guide segment 262a. A shoulder or retention feature 290 is defined by the undercut 264a, extending between a leading end 292 of the first guide segment 262a and a trailing end 294 of the second guide segment 262b. A major plane of the shoulder 290 is non-parallel relative to the major plane of the lead-in region 266 and relative to the major pane of the ramp region 268, with the shoulder 290 projecting outwardly above (relative to upright orientation of FIG. 12) the second segment ramp region 268.

[0044] FIGS. 7 and 12 generally illustrate that in some embodiments, portions of the guide surface 260 project into, or otherwise reflect a deviation in the continuous shape (e.g., dome-like shape) of the outer face 210 of the wall 200. A plane of the cross-sectional view of FIG. 13 is taken through the first undercut 264a and better reflects this optional feature. As shown, the outer face 210 has the continuous, declining shape (e.g., dome-like shape, conical shape, etc.) in extension from the platform 250 toward the rim 202. The ramp region 268 of the second guide segment 262b interrupts this continuous shape, with the trailing end 294 being interiorly located relative to a shape of the outer face 210. Stated otherwise, in some embodiments, the platform 250 can be considered as projecting from the outer face 210 of the wall 200, with the guide surface 260 being primarily defined by the platform 250 and partially by the outer face 210. Alternatively, and with reference between FIGS. 10B and 13, the lid body 70 can be viewed as including the platform 250 that at least partially surrounds the spout 72. The platform 250 includes or forms at least one region (e.g., the lead-in region(s) 266) that serves as an uppermost face of the platform 250 (relative to the upright orientation of FIGS. 10B and 13) and is substantially flat so as to define a major plane M of the platform 250. The platform 250 further includes or forms at least one region (e.g., the ramp region(s) 268) having a partial helical shape declining with respect to the major plane M and revolving about a central axis C of the spout 72. The outer face 210 of the wall 200 is adjoined to the platform 250 and includes a portion (identified generally at 296 in FIGS. 10B and 13) that is declining with respect to the major plane M of the platform 250. The partial helical shape of the platform 250 interrupts the declining portion 296 of the outer face 210 of the wall 200. The declining portion 296 can define or comprise a domed shape, a conical shape, etc. A first end of the partial helical shape is proximate a transition zone to the major plane M (e.g., the transition line 270 in FIG. 10A), and an opposing, second end of the partial helical shape (e.g., the trailing end 294) interrupts the declining portion 296 of the outer face 210 of the wall 200. In some embodiments, the second end (e.g., the trailing end 294) of the partial helical shape terminates at a retention feature, for example one of the undercuts 264a, 264b. With these constructions, an overall height of the lid body 70 (and thus of the lid 62 (FIG. 2) is reduced (as compared to conventional spray gun connector formats), thereby ergonomically locating the cup receptacle 60 (FIG. 2) closer to the spray gun 32 (FIG. 1) during use.

[0045] Returning to FIG. 7, the retention structures 252a, 252b can be identical such that the following description of the first retention structure 252a applies equally to the second retention structure 252b. The first retention structure 252a is associated with the first segment 262a of the guide surface 260, and includes an arm 300 and a tab 302. The arm 300 is radially spaced from the spout 72, and projects axially upwardly from the wall 200. A reinforcement rib 304 is optionally provided between the arm 300a and the wall 200, serving to control deflection of the arm 300 away from the spout 72 during use. The tab 302 projects radially inwardly from the arm 300 opposite the wall 200.

[0046] With reference to FIG. 14A, the first retention structure 252a can be viewed as defining opposing, entrance and exit ends 310, 312. Relative to the rotational directions described above, the entrance end 310 is "ahead" or "upstream" of the exit end 312. The cross-sectional views of FIGS. 14B and 14C further illustrate that a capture region 314 is defined by the first guide segment 262a, the arm 300 and the tab 302 for receiving a corresponding feature of the second connection format 76 (FIG. 2).

[0047] More particularly, projection of the arm 300 defines an enclosure surface 320. The enclosure surface 320 faces and is radially spaced from an exterior of the spout 72. The tab 302 projects radially inwardly relative to the enclosure surface 320, and defines an engagement surface 322 and an alignment surface 324. The engagement surface 322 faces and is longitudinally spaced from the first guide segment 262a. The alignment surface 324 faces, and is radially spaced from an exterior of, the spout 72. Dimensions of the radial spacing between the spout 72 and the engagement surface 322,

and between the spout 72 and the alignment surface, correspond with geometry features of the adaptor 54 (FIG. 2).

[0048] Geometry of the first guide segment 262a and the engagement surface 322 is configured to facilitate a wedge-like, locked engagement with corresponding features of the second connection format 76 (FIG. 2). With specific reference to FIG. 14C, the tab 302a is in general alignment with the transition line 270 between the lead-in region 266 and the ramp region 268. A shape of the engagement surface 322 defines a wedging section 330 and an optional clearance section 332. The wedging section 330 extends from the entrance end 310, and is aligned with or disposed over the lead-in region 266. The clearance section 332 extends from the wedging section 330 to the exit end 312, and is aligned with or disposed over the ramp region 268. An intersection of the wedging and clearance sections 330, 332 is generally aligned with the transition line 270. A major plane of the engagement surface 322 along the wedging section 330 is non-coplanar with a major plane along the clearance section 332.

[0049] The wedging section 330 is substantially flat (i.e., within 5% of a truly flat shape), and a plane of the wedging section 330 is non-parallel with the plane of the lead-in region 266. For example, planes of the wedging section 330 and the lead-in region 266 combine to define an included angle on the order of 1 - 70 degrees, for example in the range of 1 - 30 degrees. With this construction, the longitudinal spacing or height of the capture region 314 tapers from the entrance end 310 toward the exit end 312, for example tapering to a smallest dimension at the transition line 270. Due to this tapering or wedge-like shape, a rigid body (provided with the adaptor 54 (FIG. 2)) initially inserted into the capture region 314 at the entrance end 310 and then directed toward the exit end 312 can become frictionally wedged or engaged within the capture region 314 as described below.

[0050] The clearance section 332, where provided, can also be substantially flat, and a plane of the clearance section 332 is non-parallel with a major plane of the ramp region 268. The planes of the clearance section 332 and the ramp region 268 are arranged such that the longitudinal spacing or height of the capture region 314 expands in a direction of the exit end 312, for example expanding or increasing from the transition line 270 to the exit end 312.

[0051] With additional reference to FIG. 14A, the retention structures 252a, 252b are arranged such that the tapering then expanding shapes of the capture region 314 of each retention structure 252a, 252b is in the same rotational direction relative to the central axis A. For example, relative to the orientation of FIG. 14A, the entrance end 310 of the first retention structure 252a is rotationally "ahead" of the corresponding exit end 312 in the clockwise direction; similarly, the entrance end 310 of the second retention structure 252b is rotationally "ahead" of the corresponding exit end 312 in the clockwise direction. Thus, the capture region 314 (hidden in FIG. 14A) associated with each of the retention structures 252a, 252b tapers in the clockwise direction. FIG. 14A further reflects that the entrance end 310 of each retention structure 252a, 252b can define a recess or chamfer to further promote initial directing of a body into the corresponding capture region 314. The alignment surface 324 of each retention structure 252a, 252b can be substantially planar as shown, generally tangent to a circumference of the spout 72; in other embodiments, the alignment surface 324 can have an arcuate or irregular shape.

[0052] With additional reference to FIG. 14B, the retention structures 252a, 252b establish robust engagement with the complementary second connection format 76 (FIG. 2), and are apart from the spout 72. With this construction, and unlike prior fluid connector designs utilized with paint spray guns, the connection formats of the present disclosure permit the spout 72 to present a relatively large inner diameter. In some embodiments, an inner diameter of the spout 72 is not less than 20 mm, alternatively not less than 22 mm, and optionally on the order of 30 mm. Further, by locating the capture regions 314 in close proximity to the wall 200, a height of the spout 72 can be reduced as compared to conventional spray gun reservoir connector designs. In some non-limiting embodiments, for example, a height of the spout 72 is on the order of 5 - 15 mm. Further, sealing features can be provided on or with the spout 72 for effectuating a liquid tight seal with a component (e.g., the adaptor 54 (FIG. 2)) inserted over the spout, such as an optional annular sealing rib 340 and/or an optional spout sealing surface 342 (e.g., a chamfered or sloped surface at a leading end 344 of the spout 72).

[0053] Returning to FIG. 2, the second connection format 76 is configured to selectively mate with features of the first connection format 74 as described above, and in some embodiments is provided as part of the adaptor 54. With reference to FIGS. 15A-15D, in addition to the second connection format 76 (referenced generally in FIG. 15A), the adaptor 54 generally includes a tubular member 350. The tubular member 350 can include or provide features akin to conventional spray gun reservoir adaptors, such as for establishing connection to an inlet port of a spray gun. With this in mind, the tubular member 350 can assume various forms, and defines a central passageway 352. The passageway 352 is open at a leading end 354 of the tubular member 350. Further, the tubular member 350 forms or provides mounting features that facilitate assembly to a conventional (e.g., threaded) spray gun inlet port. For example, exterior threads 356 can be provided along an exterior of the tubular member 350 adjacent the leading end 354, configured to threadably interface with threads provided with the spray gun inlet port. In this regard, a pitch, profile and spacing of the exterior threads 356 can be selected in accordance with the specific thread pattern associated with the make/model of the spray gun with which the adaptor 54 is intended for use. Other spray gun mounting features are equally acceptable that may or may not include or

require the exterior threads 356. The tubular member 350 can optionally further include or define a grasping section 358. The grasping section 358 is configured to facilitate user manipulation of the adaptor 54 with a conventional tool, and in some embodiments includes or defines a hexagonal surface pattern adapted to be readily engaged by a wrench. In other embodiments, the grasping section 358 can be omitted.

[0054] The second connection format 76 includes a base 360, a first lock structure 362a, a second lock structure 362b, and a tracking face 364. The base 360 projects from the tubular member 350 and carries or forms the lock structures 362a, 362b and the tracking face 264. The lock structures 362a, 362b, in turn, are configured to selectively interface with corresponding ones of the retention structures 252a, 252b (FIG. 7), and the tracking face 364 is configured to interface with the guide surface 260 (FIG. 7) as described below.

[0055] The base 360 includes a shoulder 370 and a ring 372. As best shown in FIG. 15E, the shoulder 370 and the ring 372 combine to define a chamber 374 that is open to the passageway 352 of the tubular member 350 and that is configured to receive the spout 72 (FIG. 2). The shoulder 370 extends radially outwardly and downwardly from the tubular member 350. The ring 372 projects longitudinally from an outer perimeter of the shoulder 370 in a direction opposite the tubular member 350 and terminates at the tracking face 364. Further, the ring 372 defines a cylindrical inner face 380 opposite an outer face 382. An inner diameter of the ring 372 (e.g., a diameter defined by the cylindrical inner face 380) corresponds with (e.g., approximates or is slightly greater than) an outer diameter of the spout 72. In some embodiments, the ring 372 can define or provide an adaptor sealing surface 284 along the inner face 380 that corresponds with the spout sealing surface 342 (FIG. 14B). An outer diameter of the ring 372 can vary in extension to the tracking face 364 as described below or can be uniform. Regardless, a maximum outer diameter of the ring 372 (e.g., a maximum diameter defined by the outer face 382) is selected to nest within a clearance diameter collectively established by the retention structures 252a, 252b (FIG. 7) as described below.

[0056] Geometries of a shape of the tracking face 364 are commensurate with those described above with respect to the lid guide surface 260 (FIG. 7). In particular, and with reference to FIG. 15F, the tracking face 364 can be viewed as providing or generating first and second track segments 390a, 390b separated by first and second undercuts or trapping regions 392a, 392b. The circumferential location and shape of the undercuts 392a, 392b correspond with the undercuts 264a, 264b (FIG. 7) in the lid body 70 (FIG. 7) as described above. The shape and geometry of the track segments 390a, 390b corresponds with the guide segments 262a, 262b (FIG. 7) as described above. Thus, for example, the track segments 390a, 390b can each be viewed as generating a lead-in region 394 and a ramp region 396 (identified for the first track segment 390a in FIG. 15F). A shape of the undercuts 392a, 392b establishes a finger or retention feature 400 at the transition between the track segments 390a, 390b. For example, as identified in FIG. 15F, the finger 400 defined at the second undercut 392b extends between a leading end 402 of the second track segment 390b and a trailing end 404 of the first track segment 390a.

[0057] In some embodiments, the lock structures 362a, 362b are identical, such that the following description of the first lock structure 362a applies equally to the second lock structure 362b. The lock structure 362a defines a first end 420 opposite a second end 422 in circumferential extension along the ring 372 as best seen in FIG. 15B. Further, projection of the lock structure 362a from the ring 372 defines or forms an abutment face 424 opposite an upper face 426, along with a guide face 428 as best identified in FIG. 15E. A shape of the abutment face 424 follows or is contiguous with the corresponding portions of the tracking face 364. For example, and as best seen in FIG. 15F, at the first end 420, the abutment face 424 intersects the first track segment 390a intermediate the ramp region 396. In extension from the first end 420, a shape of the abutment face 424 mimics or follows the angled or partial helix orientation of the ramp region 396; further, a shape of the abutment face 424 mimics or follows the substantially flat or planar shape of the lead-in region 394 to the second end 422.

[0058] With specific reference to FIG. 15C, the upper face 426 is formed longitudinally opposite the abutment face 424 to define a height of the lock structure 362a. In some embodiments, a plane or shape of the upper face 426 varies between the first and second ends 420, 422, forming the lock structure 362a to provide an insertion section 440, a locking section 442 and an optional tail section 444. The insertion section 440 includes the major plane of the upper face 426 being non-parallel with the major plane of the corresponding region of the abutment face 424 such that lock structure 362a has a reduced height at the first end 420. Stated otherwise, the height of the lock structure 362a increases along the insertion section 440 in extension from the first end 420. In some embodiments, a chamfer can be formed in the upper face 426 at the first end 420, and a remaining portion of the upper face 426 along the insertion section 440 is substantially flat or planar, arranged to be non-parallel with the abutment face 424. The upper face 426 is generally parallel with corresponding region of the abutment face 424 along the locking section 442, and generates a shape or geometry relative to the ring 372 akin to a partial helix (the locking section 442 associated with the second lock structure 362b is identified in FIG. 15A that further illustrates the partial helix shape). The tail section 444 can include the abutment and upper faces 424, 426 being substantially parallel in extension to the second end 422 (FIG. 15B). With this construction, a vertical location of the lock structure 362a relative to the central axis A changes as the lock structure 362a revolves about the

ring 372, with the first end 420 being vertically "below" the second end 422 relative to the upright orientation of the views.

[0059] As best seen in FIG. 15B, a radial width of the lock structure 362a is defined by a radial (relative to the central axis A) distance between the ring 372 and the guide face 428. With this in mind, the lock structure 362a can have a varying or non-uniform radial width relative to the central axis A. For example, a shape of the guide face 428 (relative to the top plan view of FIG. 15D) can define a uniform or slightly increasing radius in extension from the first end 420, and a tapering or decreasing radius to the second end 422 creating a streamlined appearance.

[0060] In some embodiments, a shape of the lock structure 362a is further demarcated from, and more precisely formed relative to, the ring 372 by an inset or depression 450 can be formed in a face of the ring 372 adjacent the lock structure 362a, as well as an optional groove 452 as identified in FIG. 15A. Regardless, the lock structures 362a, 362b are arranged about the ring 372 such that the spatial features are in the same rotational direction relative to the central axis A. For example, relative to the orientation of FIG. 15B, the vertically lower first end 420 of each lock structure 362a, 362b is rotationally "ahead" of the corresponding, vertically higher second end 422 in the clockwise direction.

[0061] In some embodiments, the adaptor 54 is formed of a rigid material, such as stainless steel (303 S31). Other materials, such as plastic, are also envisioned. Composites or other materials for use with particular coating materials and/or applications are also acceptable.

[0062] Coupling of the reservoir 52 and the adaptor 54 begins with alignment of the ring 372 with the spout 72 as shown in FIG. 16. In the arrangement of FIG. 16, the adaptor 54 is rotationally arranged such that the lock structures 362a, 362b are rotationally off-set from the retention structures 252a, 252b. The adaptor 54 is then directed on to the lid body 70 (and/or vice-versa), with the spout 72 nesting within the base 360.

[0063] In the initial assembly state of FIGS. 17A and 17B, the adaptor 54 has been placed on to the lid body 70 as described above, with the lock structures 362a, 362b being rotationally spaced from the retention structures 252a, 252b. FIG. 17C further clarifies the rotational arrangement of the adaptor 54 relative to the lid body 70 upon initial placement. Relative to a clockwise direction, the first end 420 of the first lock structure 362a is "ahead" of the entrance end 310 of the first retention structure 252a, and the first end 420 of the second lock structure 362b is "ahead" of the entrance end 310 of the second retention structure 252b. The enlarged radial width of the lock structures 362a, 362b encourages a user to initially place the adaptor 54 on to the lid body 70 in the rotational position shown. Returning to FIGS. 17A and 17B, sections of the tracking face 364 of the adaptor 54 bear against the guide surface 260 of the lid body 70. For example, the cross-section of FIG. 17D illustrates that a portion of the ramp region 396 of the first track segment 390a bears against the ramp region 268 of the first guide segment 262a. Due to the partial helix shape along the guide segments 262a, 262b of the lid body 70 and along the track segments 390a, 390b of the adaptor 54 as described above, in this initial state of contact between the adaptor 54 and the lid body 70, FIG. 17A reflects that the lock structures 362a, 362b are located vertically "above" the capture region 314 (hidden in FIG. 17A) of each of the retention structures 252a, 252b (relative to the orientation of FIG. 17A).

[0064] The adaptor 54 is then rotated relative to the lid body 70 (and/or vice-versa), directing each of the lock structures 362a, 362b into engagement with corresponding ones of the retention structures 252a, 252b. For example, and with reference to the first retention structure 252a and the first lock structure 362a identified in FIGS. 17A-17C, the adaptor 54 can be rotated (e.g., clockwise) such that the first end 420 of the first lock structure 362a approaches and then enters the capture region 314 at the entrance end 310 of the first retention structure 252a. Due to the sliding interface between the tracking face 364 of the adaptor 54 and the guide surface 260 of the lid body 70 (e.g., between the ramp region 396 of the first track segment 390a and the ramp region 268 of the first guide segment 262a as in FIG. 17D) and the corresponding helical-like shapes, as the adaptor 54 is rotated, the adaptor 54 vertically drops or lowers relative to the retention structures 252a, 252b such that as the first lock structure 362a nears the entrance end 310 of the first retention structure 252a, the first end 420 of the first lock structure 262a comes into alignment with the capture region 314 at the entrance end 310. For example, FIGS. 18A-18C illustrate a later stage of rotation of the adaptor 54 relative to the lid body 70. As shown in the cross-section of FIG. 18C, the first end 420 of the first lock structure 362a has entered the capture region 314 of the first retention structure 252a. In this regard, due to the reduced height of the first end 420 of the lock structure 362a and the increased height of the capture region 314 at the entrance end 310 as described above, the lock structure 362a readily directed into the capture region 314 with minimal interference between the upper face 426 of the lock structure 362a and the engagement surface 322 of the retention structure tab 302.

[0065] With continued rotation of the adaptor 54 relative to the lid body 70 (and/or vice-versa), each lock structure 362a, 362b will become frictionally and mechanically locked within the capture region 314 of a respective one of the retention structures 252a, 252b. FIGS. 19A-19C illustrate a locked state of the reservoir 52 and the adaptor 54. The tracking face 364 (referenced generally) of the adapter 54 has further rotated relative to and along the guide surface 260, achieving more complete engagement of the lock structures 362a, 362b within a corresponding one of the retention structures 252a, 252b. Further, the undercuts 392a, 392b of the adaptor 54 have been brought into meshes engagement with the under-

cuts 264a, 264b of the lid body 70. For example, in the view of FIG. 19C, an abutting interface is achieved between the finger 400 of the adaptor second undercut 392b against the shoulder 290 of the lid body first undercut 264a. This interface prevents over rotation of the adaptor 54 relative to the lid body 70 (and/or vice-versa) and serves to stabilize the connection assembly.

[0066] The cross-sectional view of FIG. 19D illustrates the first lock structure 362a lodged within the capture region 314 (reference generally) of the first retention structure 252a, and reflects that a shape and spatial orientation of the locking section 442 mimics that of the capture region 314 along the wedging section 330. In the locked state, the abutment face 424 of the lock structure 362a bears against the lead-in region 266 of the lid body guide surface 260, and the locking section 442 of the upper face 426 of the lock structure 362a bears against the wedging section 330 of the engagement surface 322 of the tab 302. The downward angular orientation of the guide and engagement surfaces 260, 322, and of the abutment and upper faces 424, 426 along the wedging section 330, relative to a plane perpendicular to the axis of rotation dictates that as the lock structure 362a progressively advances through the capture region 314 (i.e., the first end 420 of the lock structure 362a is progressively advanced from the entrance end 310 of the retention structure 252a), the adaptor 54 is pulled or drawn downwardly (relative to the orientation of FIG. 19D) on to the lid body 70, promoting a liquid-tight seal between the components. For example, in some non-limiting embodiments, a seal can be established between the annular sealing rib 340 (FIG. 14B) of the spout 72 with inner face 380 (FIG. 15E) of the adaptor 54, between the spout sealing surface 342 (FIG. 14B) and the adaptor sealing surface 384 (FIG. 15E), etc. The spout sealing surface 342 and the adaptor sealing surface 384 have a complementary configuration, designed to interfere and seal when the system is locked. The expanding height of the capture region 314 along the clearance section 332 to the exit end 312 readily allows passage of the first end 420 for ease of assembly.

[0067] Returning to FIG. 2, the complementary second connection format 76 can be incorporated into other adaptor configurations that can be optionally be provided with reservoir systems and kits of the present disclosure, such as the reservoir system 50, either in addition to, or in place of, the adaptor 54. For example, another embodiment of an adaptor 500 useful with the reservoir systems and kits of the present disclosure is shown in FIG. 20. The adaptor 500 includes a second connection format 76' (referenced generally), a tubular member 502, and opposing, first and second clips 504a, 504b.

[0068] The second connection format 76' can be highly akin to the second connection format 76 (FIG. 15A), and includes a base 360', the first lock structure 362a, the second lock structure (hidden in FIG. 20, but shown at 362b in FIG. 15A), and the tracking face 364 (referenced generally). The lock structures 362a, 362b and the tracking face 364 can be identical to the descriptions above. The base 360' can be highly similar to the descriptions above with respect to the base 360 (FIG. 15A). The base 360' has a differing exterior profile or shape as compared to the base 360, and need not necessarily form the insets or depressions 450 (FIG. 15A). Further, the base 360' defines a sealing surface 508 about the tubular member 502.

[0069] The tubular member 502 can include or provide features akin to conventional spray gun reservoir adaptors, such as for establishing connection to an inlet port of a spray gun. With this in mind, the tubular member 502 can assume various forms, and defines a central passageway 510. The passageway 510 is open at a leading end 512 of the tubular member 502. Further, the tubular member 502 optionally forms or provides features that facilitate sealed connection to a spray gun inlet port. For example, ribs 514 can be provided along an exterior of the tubular member 502 adjacent the leading end 512, configured to sealingly interface with an interior surface of the spray gun inlet port.

[0070] The clips 504a, 504b can be identical, each projecting from the base 360' at opposite sides of the tubular member 502. Each clip 504a, 504b terminates at a head 520 and defines an engagement surface 522 that is radially spaced from the tubular member 502. A latch surface 524 is defined at an intersection of the head 520 and the engagement surface 522. A longitudinal distance between the latch surface 524 and the sealing surface 508 corresponds with geometry features of the spray gun inlet port, as does a transverse distance between the opposing engagement surfaces 522. For example, FIG. 21A illustrates the adaptor 500 along with an inlet port 530 and a spray nozzle assembly 532 (referenced generally) of a spray gun. The inlet port 530 includes an inlet tube 534 and a connector assembly 536. The inlet tube 534 is fluidly connected to an outlet 538 of the spray nozzle assembly 532. An outer diameter of the tubular member 502 of the adaptor 500 corresponds with an inner diameter of the inlet tube 534. The connector assembly 536 can assume various forms, and in some embodiments includes first and second flanges 540, 542 radially projecting from the inlet tube 534. The flanges 540, 542 can have a varying perimeter shape or outer diameter as shown. The transverse distance between the engagement surfaces 522 of the clips 504a, 504b is selected to be greater than a minimum outer diameter of the flange varying perimeter shape, and less than a maximum outer diameter. Further, the longitudinal distance between the sealing surface 508 and the latch surface 524 of each of the clips 504a, 504b is selected to approximate a longitudinal spacing between opposing faces of the flanges 540, 542.

[0071] With the above construction, the adaptor 500 can be connected to the inlet port 530 by first spatially arranging the adaptor 500 such that the tubular member 502 is aligned with the inlet tube 534, and the clips 504a, 504b are aligned with a reduced diameter portion of the

perimeter shape of the flanges 540, 542. The tubular member 502 can then be inserted into the inlet tube 534, with the clips 504a, 504b passing "through" the flanges 540, 542. The adaptor 500 is then rotated relative to the inlet port 530 causing the clips 504a, 504b to engage the flanges 540, 542 as in FIG. 21B. In the mounted arrangement of FIG. 21B, the tubular member 502 (FIG. 21A) is fluidly sealed within the inlet tube 534, and the flanges 540, 542 are robustly captured by the clips 504a, 504b, including the first flange 540 abutting the sealing surface 508 (FIG. 20) and the second flange abutting the latch surface 524 (FIG. 20) of the each of the clips 504a, 504b. Further, the perimeter of the flanges 540, 542 bears against the engagement surface 522 (FIG. 21A) of the clips 504a, 504b, better ensuring as secured connection.

[0072] Other spray gun inlet port connection formats can be incorporated into the adaptor 500. Regardless, the reservoir connection features (e.g., the second connection format 76') of the adaptor 500 provides for secured assembly to the reservoir 52 in accordance with the descriptions above, and as generally reflected in FIG. 22.

[0073] One or more of the connection formats described above (e.g., the second connection format 76, 76') can be incorporated into other spray gun reservoir system components in accordance with principles of the present disclosure. For example, a nozzle unit 550 in accordance with principles of the present disclosure is shown in FIGS. 23A and 23B, and can be provided as part of a spray gun (e.g., the spray gun 32 (FIG. 1) described above). The nozzle unit 550 includes an inlet port 552 and a spray nozzle assembly 554 (referenced generally). The inlet port 552 includes an inlet tube 556 and the second connection format 76' (referenced generally). The inlet tube 556 is fluidly connected to an outlet 558 of the spray nozzle assembly 554. The second connection format 76' can have the constructions as described above, including the base 360', the first lock structure 362a, the second lock structure 362b, and the tracking face 364. The second connection format 76' as provided with the nozzle unit 550 is thus configured for direct connection to a reservoir (such as the reservoir 52 (FIG. 2)) of the present disclosure. With these embodiments, the spray gun inlet port 552 can be considered to be a component or part of the spray gun reservoir system.

[0074] Another embodiment of a spray gun nozzle unit 570 in accordance with principles of the present disclosure is shown in FIGS. 24A and 24B, and can be provided as part of a spray gun (e.g., the spray gun 32 (FIG. 1) described above). The nozzle unit 570 includes an inlet port 572 and a spray nozzle assembly 574 (referenced generally). The inlet port 572 includes an inlet tube 576 and the second connection format 76' (referenced generally). The inlet tube 576 is fluidly connected to an outlet 578 of the spray nozzle assembly 574. The second connection format 76' can have the constructions as described above, including the base 360', the first lock structure 362a, the second lock structure 362b, and the tracking face 364. The second connection format 76' as provided with the nozzle unit 570 is thus configured for direct connection to a reservoir (such as the reservoir 52 (FIG. 2)) of the present disclosure. With these embodiments, the spray gun inlet port 572 can be considered to be a component or part of the spray gun reservoir system.

[0075] The reservoir systems (e.g., the reservoir system 50 of FIG. 2) can include one or more additional auxiliary components, and can be provided as a reservoir system kit. For example, an optional plug 600 useful with the reservoir systems and kits of the present disclosure is shown in FIGS. 25A and 25B. The plug 600 includes or defines a plug body 602 and a lip 604. The plug body 602 has a closed end 606 and a side wall 608. A side wall 608 projects from the closed end 606 and defines a diameter of the plug body 602 that is selected in accordance with features of the corresponding reservoir, for example in accordance with an diameter of the reservoir spout (e.g., the lid body spout 72 (FIG. 7)) appropriate for effectuating a seal with the spout upon insertion. In some embodiments, the side wall 608 can have a stepped outer diameter, for example a first diameter along a first diameter along a first region 610 and a second diameter along a second region 612. The diameter along the second region 612 can be greater than that of the first region 610, for example selected to provide a sealed interface with the reservoir spout. With this construction, the plug 600 can be inserted into and sealed against the reservoir spout in a manner that permits temporary seal and protect for the reservoir (including paint or other liquid stored therein), including an upside down storage orientation. The diameter along the first region 610 or the second region 612 can be selected to interface with other components of the corresponding reservoir system or kit, for example to provide a sealed interface with a component of the adaptor provided with the system (e.g., with the adaptor tubular member 350 (FIG. 15A)). Other geometry features are also acceptable.

[0076] The lip 604 projects radially outwardly from the plug body 602 opposite the closed end 606, and provides a surface for grasping by a user. In some embodiments, the lip 604 is sized and shaped to define one or more tabs 614. In one embodiment, the lip 604 forms exactly three, identically shaped and equidistantly spaced tabs 614 as best shown in FIG. 25B. The tabs 614 facilitate user grasping of the plug 600 when inserted into a reservoir system component. Further, when the plug 600 is secured to the reservoir 52 and the reservoir 52 is stored in an upside down orientation as in FIG. 26, with embodiment which the three, equidistantly spaced tabs 614 are provided, the tabs 614 readily support the reservoir 52 relative to a storage surface 616 in the upside down position.

[0077] The plug 600 can be formed of various materials appropriate (in combination with geometry features of the plug 600) for achieving a tight seal with the reservoir 52, the adaptor 54 (FIG. 2), etc. For example, in some non-limiting embodiments, the plug 600 is or includes

low density polyethylene.

[0078] Another optional auxiliary component that can be included with the reservoir systems (e.g., the reservoir system 50 of FIG. 2) and kits of the present disclosure is a shaker core 700 shown in FIGS. 27A and 27B. As a point of reference, users may desire to mix paint stored within a reservoir (such as the reservoir 52 of FIG. 2) with an industrial-type "shaker" machine. Most shaker machines employ a clamping system or device to hold the reservoir in place during operation. In this regard, the shaker core 700 is temporarily assembled to the reservoir, serving to distribute the clamping forces applied by the shaker machine. With this in mind, the shaker core 700 is a generally cylindrical body, extending between a first end surface 702 (best seen in FIG. 27B) opposite a second end surface 704 (best seen in FIG. 27A) and including or defining a central ring 706. One or more ribs 708 are optionally provided to longitudinally support the ring 706. The end surfaces 702, 704 are each configured to provide a surface appropriate for engagement with a shaker machine clamping devices. The first end surface 702 is provided as part of a first end section 710 (referenced general) and the second end surface 704 is provided as part of a second end section 712 (referenced generally) In some embodiments, each of the end sections 710, 712 includes mating features configured for assembly to a reservoir, with the mating features of the first end section 710 differing (e.g., in terms of dimensions) from those of the second end section 712 such that the shaker core 700 is useful with differently-configured reservoirs. The shaker core 700 can be formed of a variety of materials appropriate for maintaining a structural integrity of the shaker core 700 when utilized with a shaker machine. In some non-limiting embodiments, for example, the shaker core 700 is or includes acrylonitrile butadiene styrene (ABS).

[0079] For example, and with additional reference to FIG. 28, the first end section 710 includes or defines an annular shoulder 720, a skirt 722, and one or more key bodies 724. The annular shoulder 720 projects radially outwardly from the central ring 706, with an interior surface of the central ring 706 and the annular shoulder 720 combining to define a ledge 726 (best seen in FIG. 27B). The skirt 722 projects longitudinally from the annular shoulder 720 opposite the central ring 706, and terminates in the first end surface 702. The key bodies 724 each project radially inwardly from the skirt 722 along the ledge 726. In some embodiments, four of the key bodies 724 are provided, and are equidistantly spaced about a circumference of the ledge 726. Any other number and spatial arrangement is also acceptable. Regardless, geometry features of the first end section 710 (e.g., size and/or shape of the skirt 722, ledge 726 and/or key bodies 724) can be configured to promote a robust interface with corresponding features of a reservoir, such as the reservoir 52 (FIG. 2).

[0080] For example, FIG. 29A illustrates the shaker core 700 relative to the reservoir 52. The first end section 710 of the shaker core 700 is configured to interface with the lid 62 of the reservoir 52. An inner diameter of the skirt 722 is selected to approximate (e.g., equal or be slightly greater than) a maximum outer diameter of the lid 62, and in particular of the collar 68. With embodiments in which the collar 68 includes the tabs 144, and the tabs 144 each include or provide one or more of the exterior ribs 168, the inner diameter of the skirt 722 approximates a diameter collectively defined by the tabs ribs 168. With this construction, the first end section 710 can be placed over the lid 62, with the inner surface of the skirt 722 fitting against or in close proximity to the ribs 168. The key bodies 724 can be sized, shaped and circumferentially located in accordance with the size, shape and location of the collar notches 158. Assembly of the first end section 710 onto the lid 62 thus includes each of the key bodies 724 nesting within a corresponding one of the notches 158. When so-arranged, the ledge 726 bears against the collar 68, and rotational movement of the shaker core 700 relative to the collar 68 (and vice-versa) is overtly limited by interface between the key bodies 724 and the collar 68. In some embodiments, a frictional fit is provided between the key bodies 724 and the collar 68 at the corresponding notches 158. Regardless, a height or longitudinal dimension of the shaker core 700 from the ledge 726 to the second end surface 704 is selected to be greater than a height or longitudinal dimension of the lid 62 from the collar 68 to the spout 72. With this construction, and as reflected by FIG. 29B, when the first end section 710 is connected or mounted to the lid 62 as described above, the second end surface 704 is longitudinally beyond the spout 72 for ready engagement with a shaker machine clamping device (not shown). Moreover, when "keyed" to the collar 68 (FIG. 29A) as in FIG. 29B, the shaker core 700 can be used as a tool helpful in loosening or unscrewing the collar 68 from the cup receptacle 60. For example, when paint or other residue is present between the cup receptacle 60/collar 68 interface, it may be difficult for a user to apply a sufficient force or torque on to the collar 68 when directly grasping the collar 68. Under these circumstances, the shaker core 700 can be connected to the collar 68 as shown, and provides a larger surface area for grasping and subsequent application of a sufficient manual loosening force or torque. FIG. 29C illustrates a related embodiment system of the present disclosure in which the shaker core 700 is connected to the reservoir 52 as described above, and the optional plug 600 is also provided and sealed to the reservoir 52 in accordance with previous descriptions.

[0081] Returning to FIGS. 27A-28, the second end section 712 is optionally configured for assembly to a reservoir differing from the reservoir 52 (FIG. 2), for example in terms of dimensions. The second end section 712 can include a skirt 730, a ledge 732, and one or more key bodies 734. The skirt 730 projects longitudinally from the central ring 706, and terminates at the second end surface 704. The skirt 730 can have the intermittent con-

struction as shown, or can be a continuous, circumferentially un-interrupted body. Regardless, an inner diameter of the skirt 730 is less than an inner diameter of the central ring 706. The ledge 732 projects radially inwardly from the skirt 730 proximate the central ring 706. The ledge 732 can have the intermittent construction as shown, or can be a continuous, circumferentially un-interrupted body. The key bodies 734 each project radially inwardly from the skirt 730 along the ledge 732. In some embodiments, four of the key bodies 734 are provided, and are equidistantly spaced about a circumference of the ledge 732. Any other number and spatial arrangement is also acceptable. Regardless, geometry features of the second end section 710 (e.g., size and/or shape of the skirt 730, ledge 732 and/or key bodies 734) can be configured to promote a robust interface with corresponding features of a reservoir.

[0082] For example, FIG. 30A illustrates the shaker core 700 relative to a reservoir 52' in accordance with principles of the present disclosure. The reservoir 52' can be highly akin to the reservoir 52 (FIG. 2) described above, but with reduced dimensions. Thus, the reservoir 52' includes a lid 62' having a collar 68'. Commensurate with previous explanations, the collar 68' includes tabs 144' and forms notches 158'. Exterior ribs 168' are optionally provided on each of the tabs 144'. With these explanations in mind, the second end section 712 of the shaker core 700 is configured to interface with the lid 62' of the reservoir 52'. An inner diameter of the skirt 730 is selected to approximate (e.g., equal or be slightly greater than) a maximum outer diameter of the collar 68' (e.g., a diameter collectively defined by the tabs ribs 168'). With this construction, the second end section 712 can be placed over the lid 62', with the inner surface of the skirt 730 fitting against or in close proximity to the ribs 168'. The key bodies 734 can be sized, shaped and circumferentially located in accordance with the size, shape and location of the collar notches 158'. Assembly of the second end section 712 onto the lid 62' thus includes each of the key bodies 734 nesting within a corresponding one of the notches 158' in a manner akin to previous descriptions. When so-arranged, the ledge 732 bears against the collar 68', and rotational movement of the shaker core 700 relative to the collar 68' (and vice-versa) is overtly limited. A height or longitudinal dimension of the shaker core 700 from the ledge 732 to the first end surface 702 is selected to be greater than a height or longitudinal dimension of the lid 62' from the collar 68' to a spout 72'. With this construction, and as reflected by FIG. 30B, when the second end section 712 is connected or mounted to the lid 62' as described above, the first end surface 702 is longitudinally beyond the spout 72' for ready engagement with a shaker machine clamping device (not shown). Though not shown, the plug 600 (FIG. 25A) can optionally be provided and sealed to the spout 72'.

[0083] Apart from having smaller outer dimensions as compared to the reservoir 52 (FIG. 2), the reservoir 52' is compatible with other reservoir system components of the present disclosure in addition to the plug 600 and the shaker core 700. For example, the reservoir 52' can incorporate the first connection format 74 identical to the descriptions above, facilitating coupling with the adaptor 54 as shown in FIG. 31A and/or with the adaptor 500 as shown in FIG. 31B.

[0084] Any of the complementary connection formats described in the present disclosure may be formed integrally with a remainder of the corresponding lid. Alternatively, these components may be initially formed as a separate, modular part or assembly comprising connection geometry to permit connection to a remainder of the lid as described, for example, in WO 2017/123709, the entire teachings of which are incorporated herein by reference.

[0085] The spray gun reservoir systems of the present disclosure provide a marked improvement over previous designs. Robust, sealed connection between reservoir and adaptor components of the system is readily and easily accomplished by a user in a highly intuitive manner. Other optional system components are compatible with one another, and promote use and storage of the reservoir in desired manners.

[0086] Although the present disclosure has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes can be made in form and detail without departing from the spirit and scope of the present disclosure.

Claims

1. An adaptor (54), configured to selectively connect a spout (72) of a spray gun reservoir system (30, 50) with a spray gun inlet (530), wherein the adaptor includes a tubular member (350) and a base (360) projecting from the tubular member,

   the adaptor further comprising at least one lock structure (362a, 362b) projecting from an outer face of the base (360),
   wherein the at least one lock structure (362a, 362b) extends from a first end (420) to an opposing second end (422), and defines an abutment face (424), an upper face (426) opposite the abutment face (424), and a guide face (428) opposite the base (360),
   and further wherein a geometry of the abutment face (424) in extension from the first end (420) to the second end (422) differs from a geometry of the upper face (426) in extension from the first end (420) to the second end (422).

2. The adaptor (54) of claim 1, wherein the tubular member (350) terminates at an end (354), and the base (360) defines a tracking face (364) opposite the end (354), and wherein at least a portion of the tracking face (364) forms a partial helical shape.

3. The adaptor (54) of claim 1, wherein the upper face (426) defines an insertion section (440) extending from the first end (420) and a locking section (442) extending from the insertion section in a direction of the second end (422), and further wherein a major plane defined by the insertion section (440) segment is non-coplanar with a major planed defined by the locking section (442).

4. The adaptor (54) of claim 3, wherein the upper face (426) further defines a tail section (444) extending from the locking section (442) in a direction of the second end (422), and further wherein a major plane defined by the tail section (444) is non-coplanar with the major plane defined by the locking section (442).

5. The adaptor (54) of claim 4, wherein a shape of the tail section (444) is a partial helix.

6. The adaptor (54) of claim 2, wherein the guide face (428) defines a first region extending from the first end (420) and a second region extending from the first region in a direction of the second end (422), and further wherein the first region defines a uniform radius relative to a centerline of the tubular member (350), and even further wherein the second region defines a tapering radius relative to the centerline in extension from the first region toward the second end (422).

7. The adaptor (54) of claim 2, wherein the base (360) includes a shoulder (370) and a ring (372).

8. The adaptor (54) of claim 7, wherein the tubular member (350) defines a central passageway (352), and wherein the shoulder (370) and the ring (372) combine to define a chamber (374) that is open to the passageway (352) of the tubular member (350) and that is configured to receive a spout (72) of a spray gun reservoir system (30, 50).

9. The adaptor (54) of claim 8, wherein the shoulder (370) extends radially outwardly and downwardly from the tubular member (350).

10. The adaptor (54) of claim 2, wherein the tracking face (364) provides first and second track segments (390a, 390b) separated by first and second undercuts (392a, 392b).

11. The adaptor (54) of claim 10, wherein the track segments (390a, 390b) each generate a lead- in region (394) and a ramp region (396).

12. The adaptor (54) of claim 10, wherein a shape of the undercuts (392a, 392b) establishes a finger (400) at the transition between the track segments (390a, 390b).

13. The adaptor (54) of claim 12, where the finger (400) defined at an undercut (392a, 392b) extends between a leading end (402) of the second track segment (390b) and a trailing end (404) of the first track segment (390a).

14. A reservoir system (30, 50) for use with a spray gun (32), the reservoir system comprising:

a cup receptacle (60) and
a lid (62) including:

i) a lid body (70) providing a spout (72) and a platform (250) surrounding the spout, wherein at least a portion of the platform (250) forms a partial helical shape (268) revolving about a central axis (C) of the spout, and
ii) a collar (68) rotatably connected to the lid body (70), wherein the collar includes a lid connector structure (142) configured to connect the lid (62) to the cup receptacle (60),

wherein the reservoir system further comprises an adaptor (54) according to any one of the preceding claims.

15. A kit of parts comprising

a) a spray gun reservoir system (30, 50) comprising a spout (72), and
b) an adaptor (54) according to any one of claims 1 to 13, configured to selectively connect the spout (72) with a spray gun inlet (530).

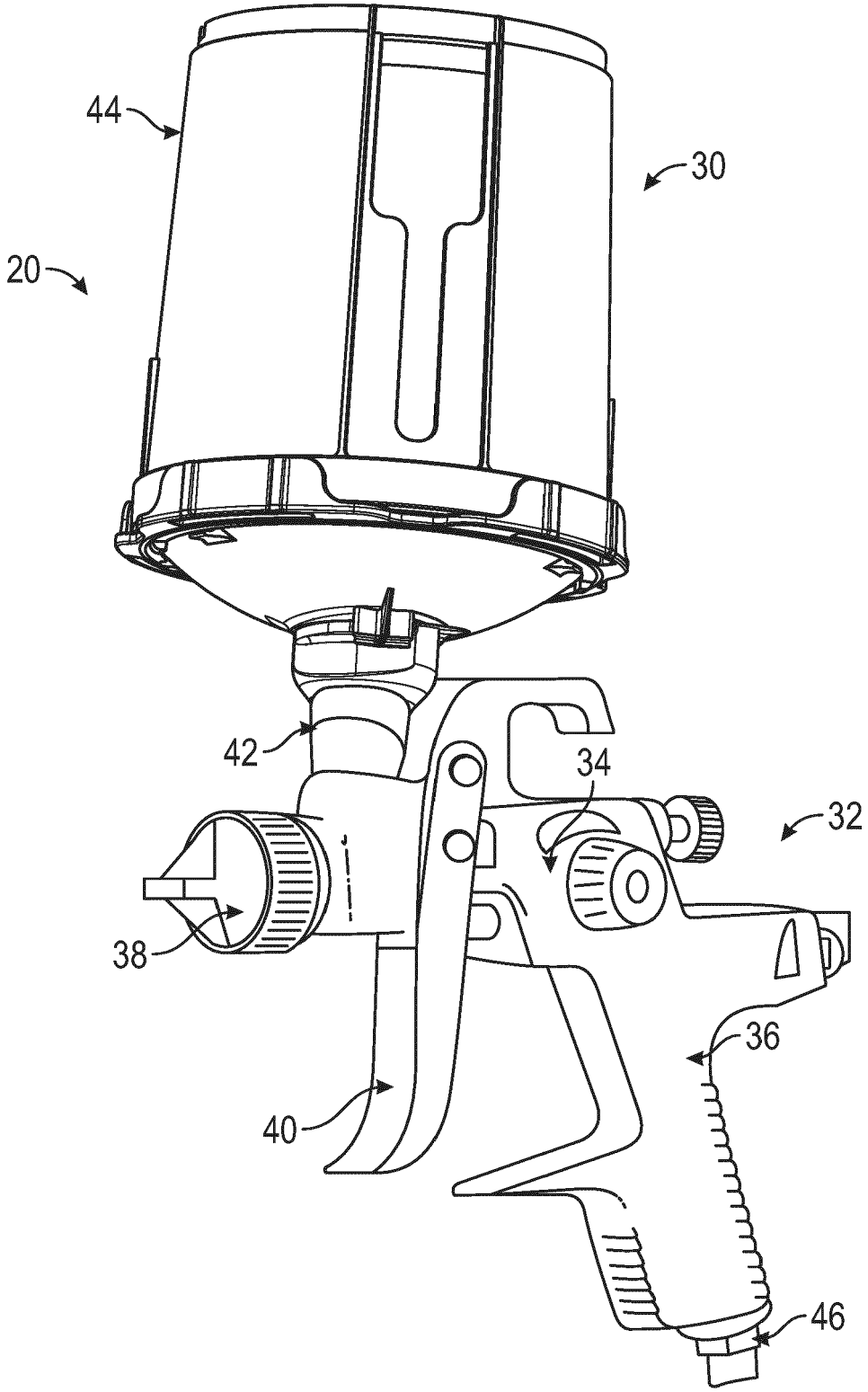


FIG. 1

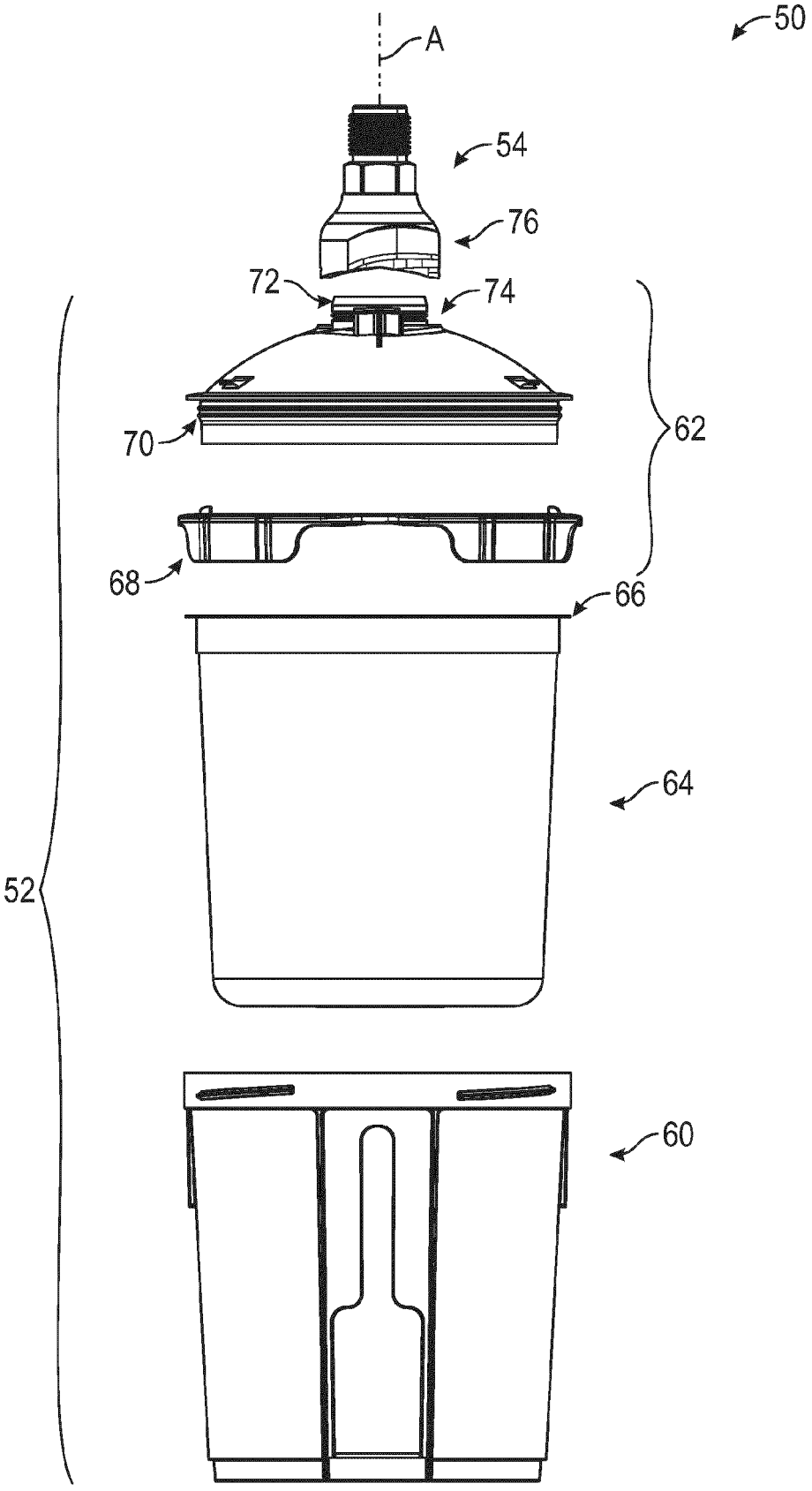


FIG. 2

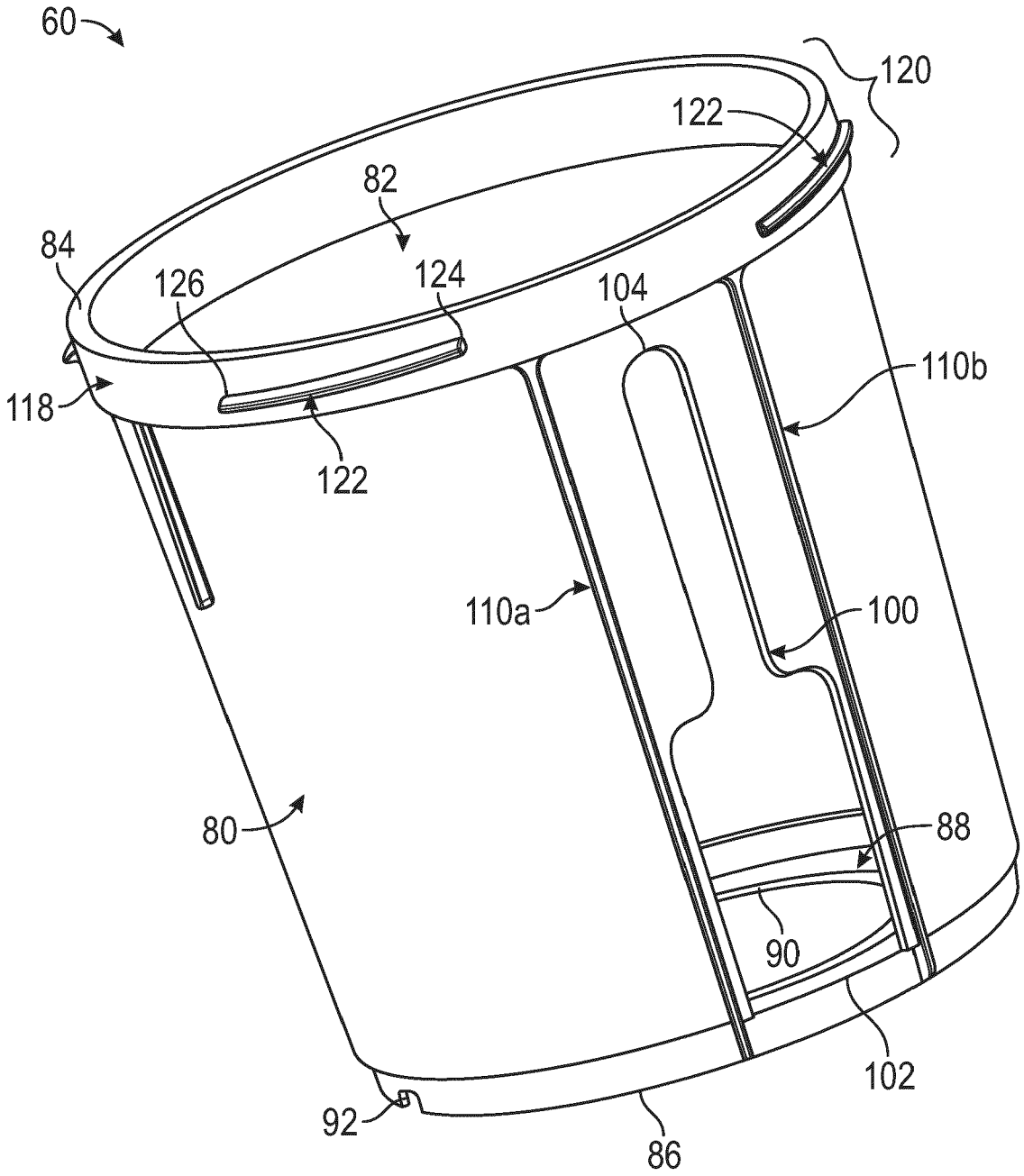

60
120
122
82
84
126
124
104
110b
118
122
110a
100
80
88
90
102
92
86

FIG. 3

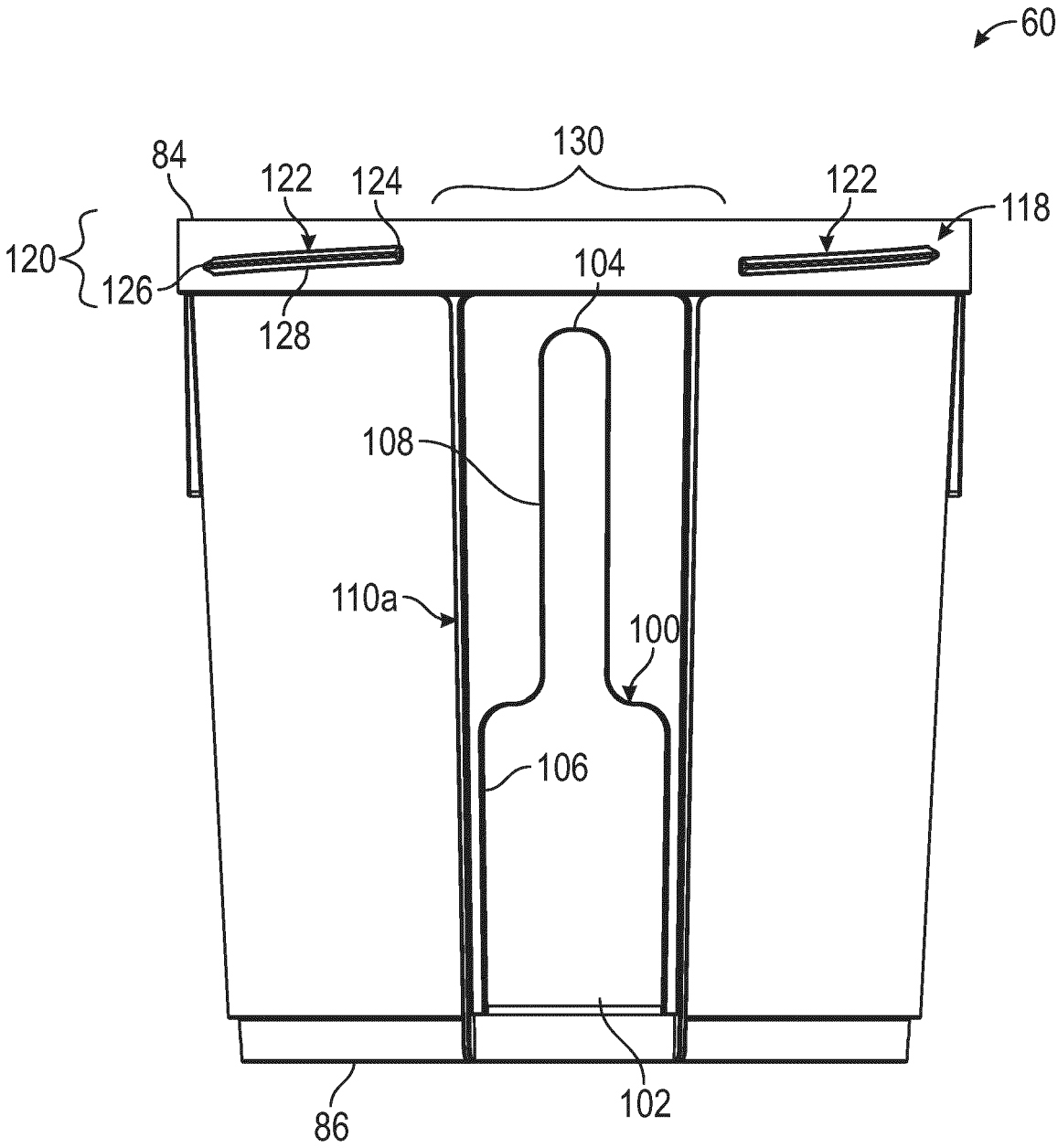


FIG. 4

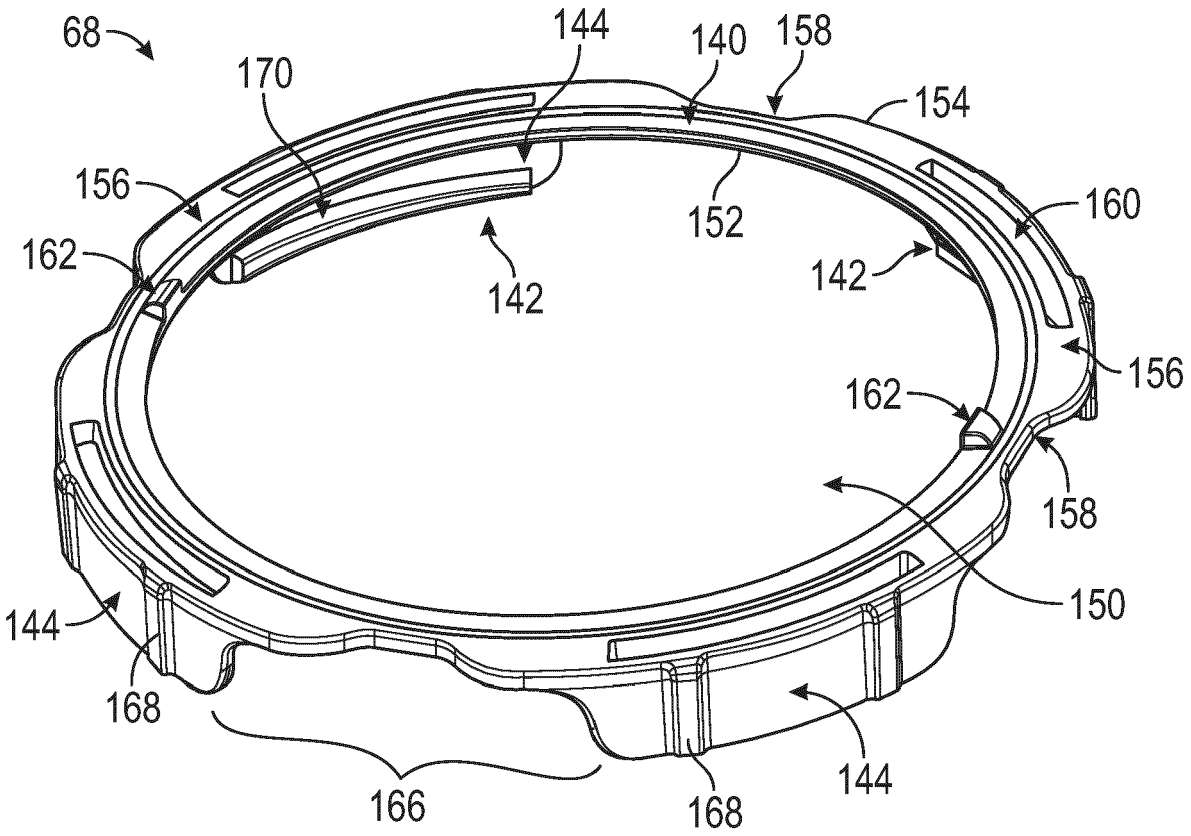

68
170
144
140
158
154
156
162
142
152
160
142
156
162
158
150
144
168
166
168
144

FIG. 5

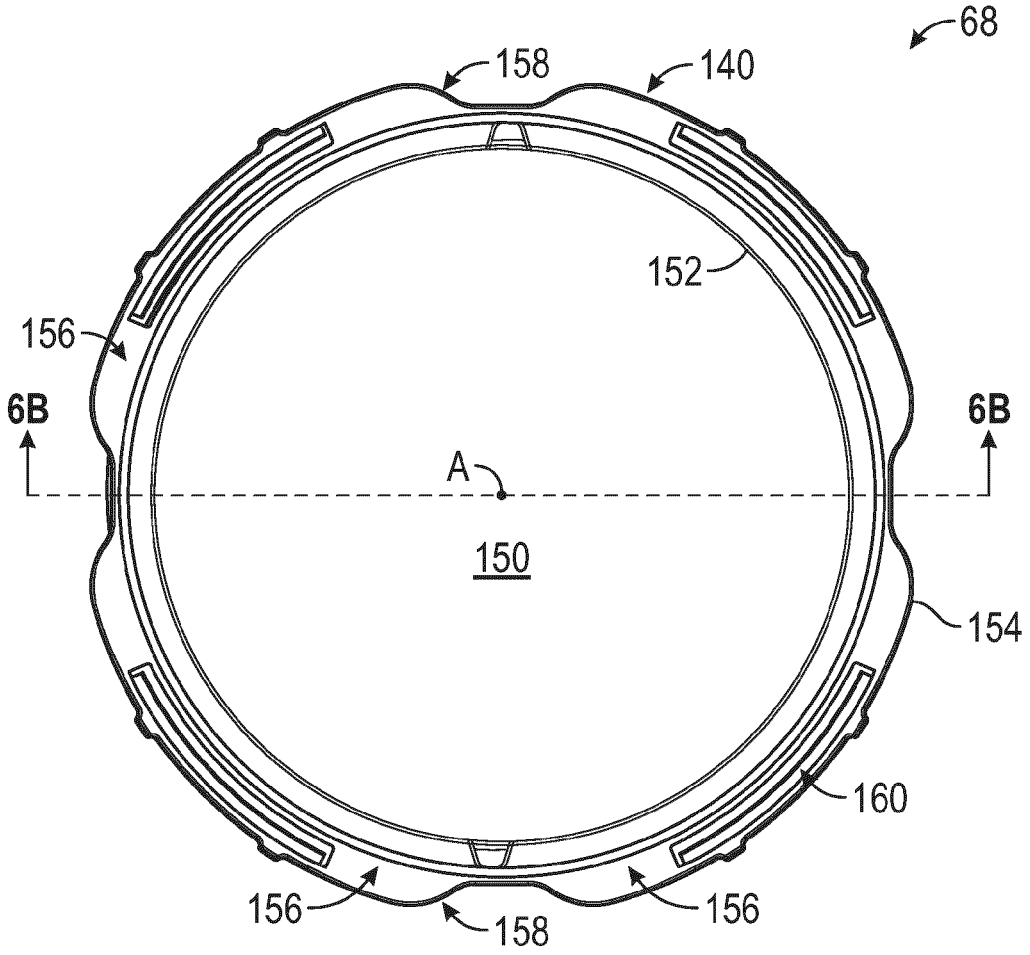

68
158
140
152
156
6B
6B
A
150
154
160
156
158
156

FIG. 6A

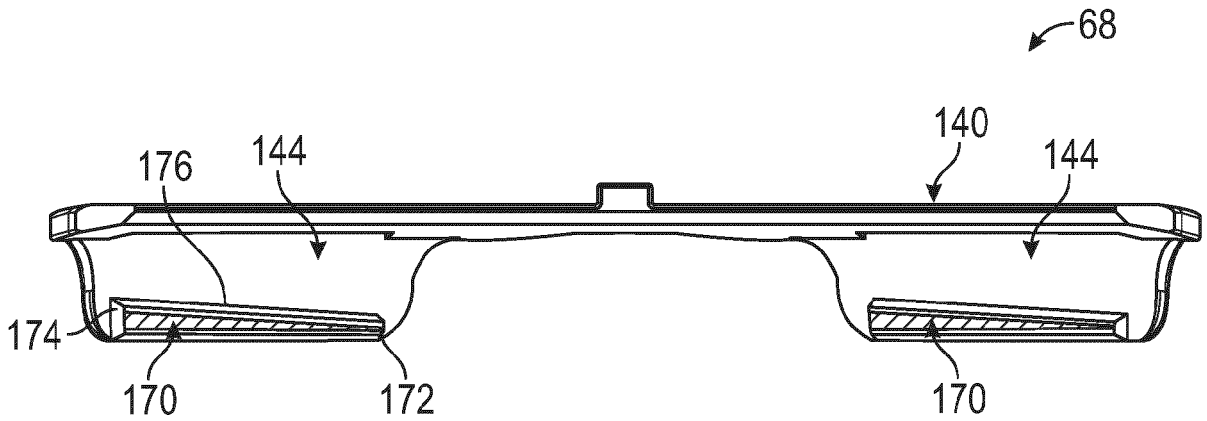

68
140
176
144
144
174
170
172
170

FIG. 6B

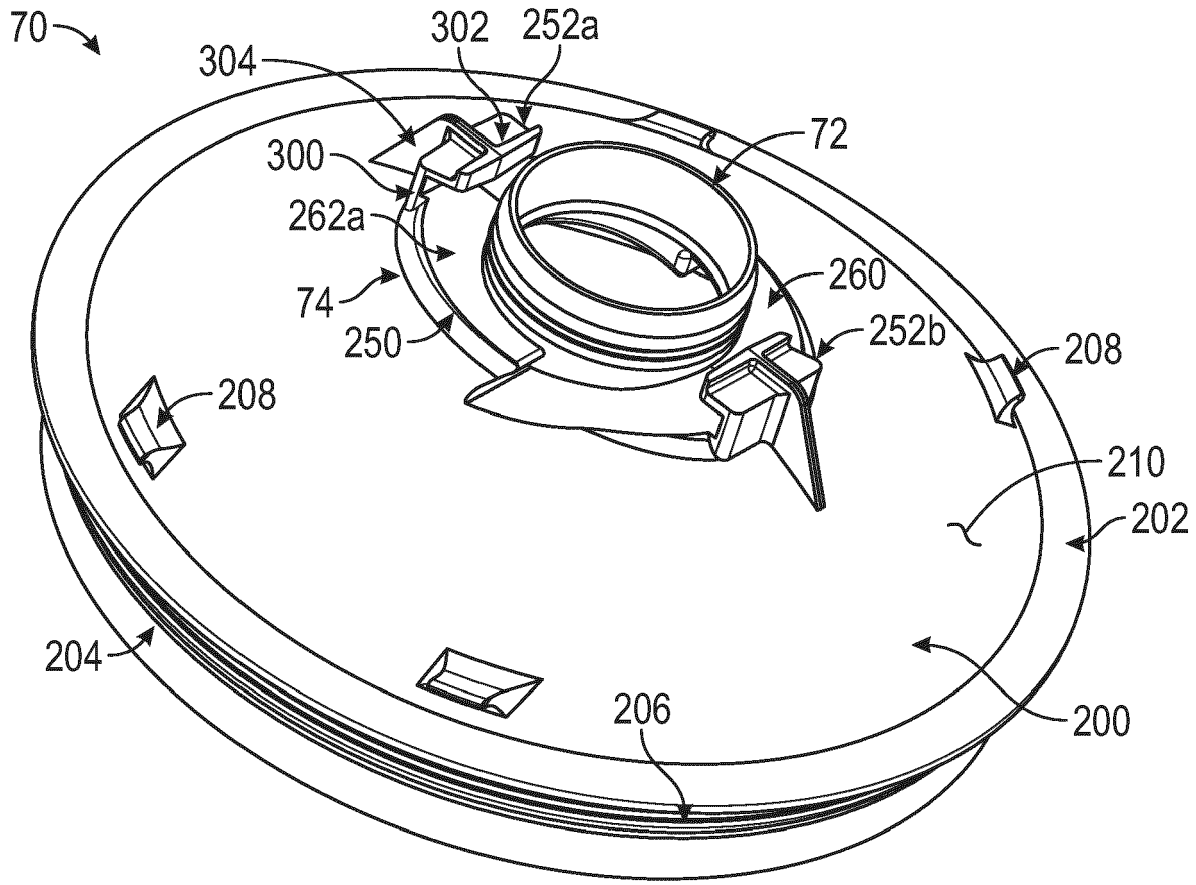

70
304
302
252a
72
300
262a
74
250
260
252b
208
208
210
202
204
206
200

FIG. 7

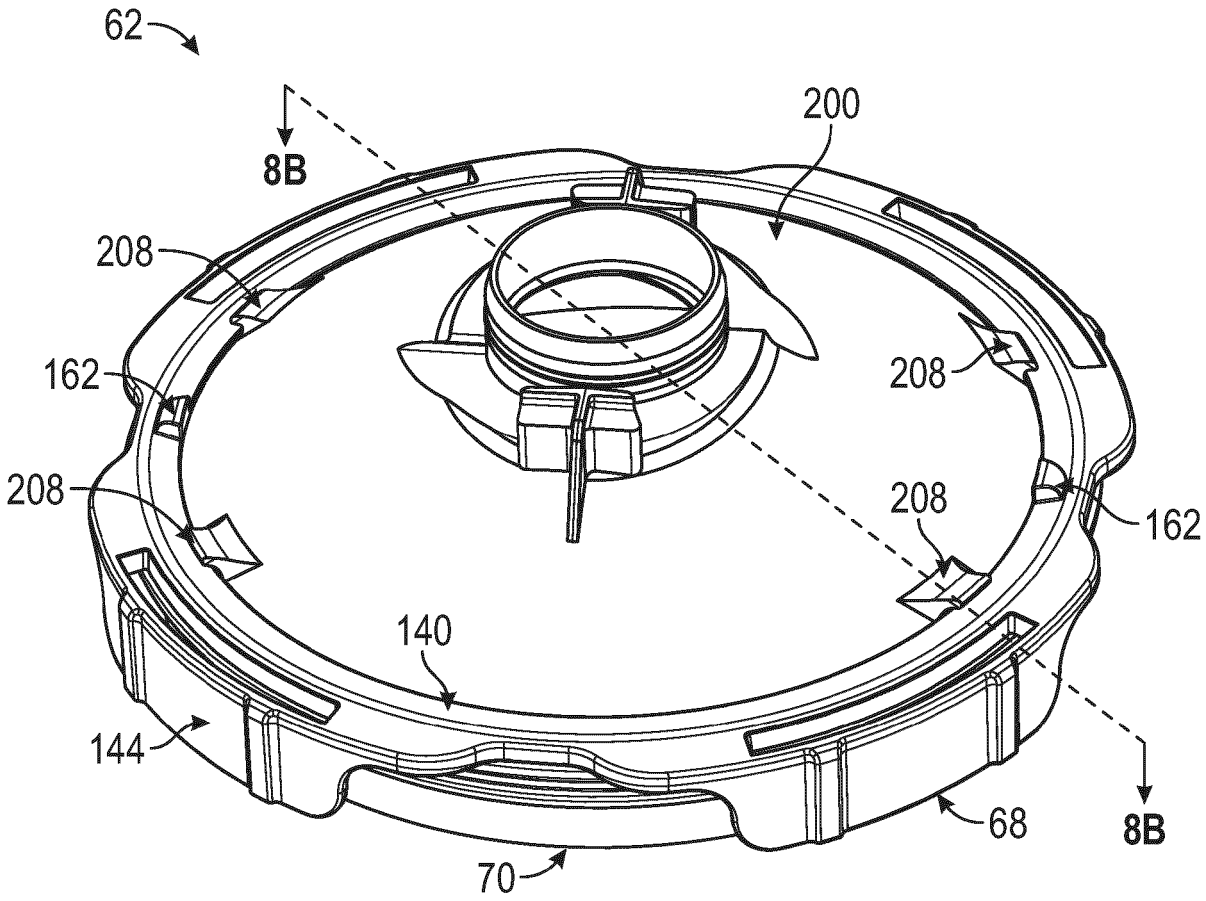

62
8B
200
208
162
208
208
208
162
140
144
68
8B
70

FIG. 8A

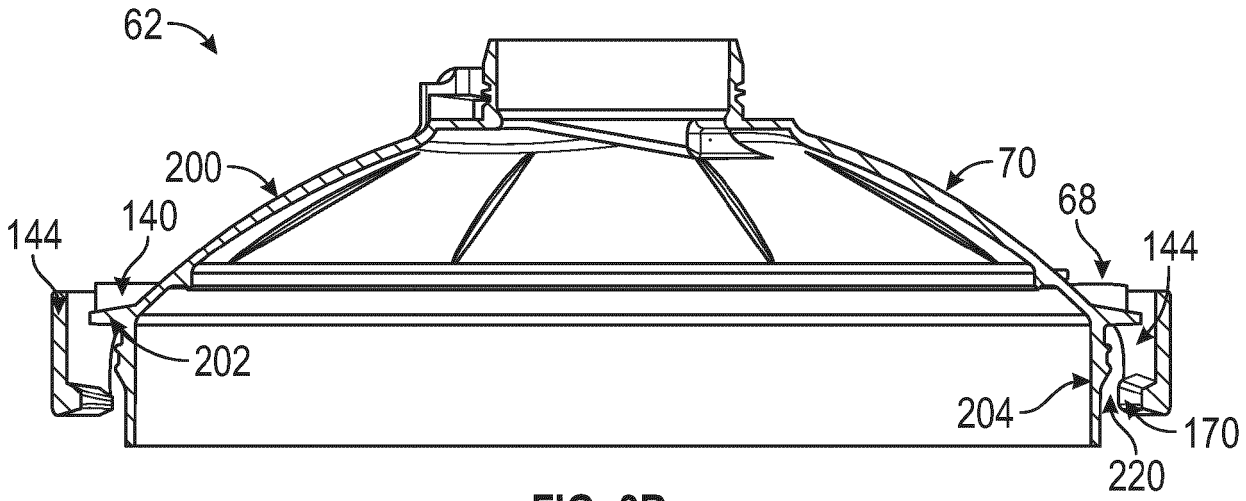

62
200
70
68
140
144
144
202
204
170
220

FIG. 8B

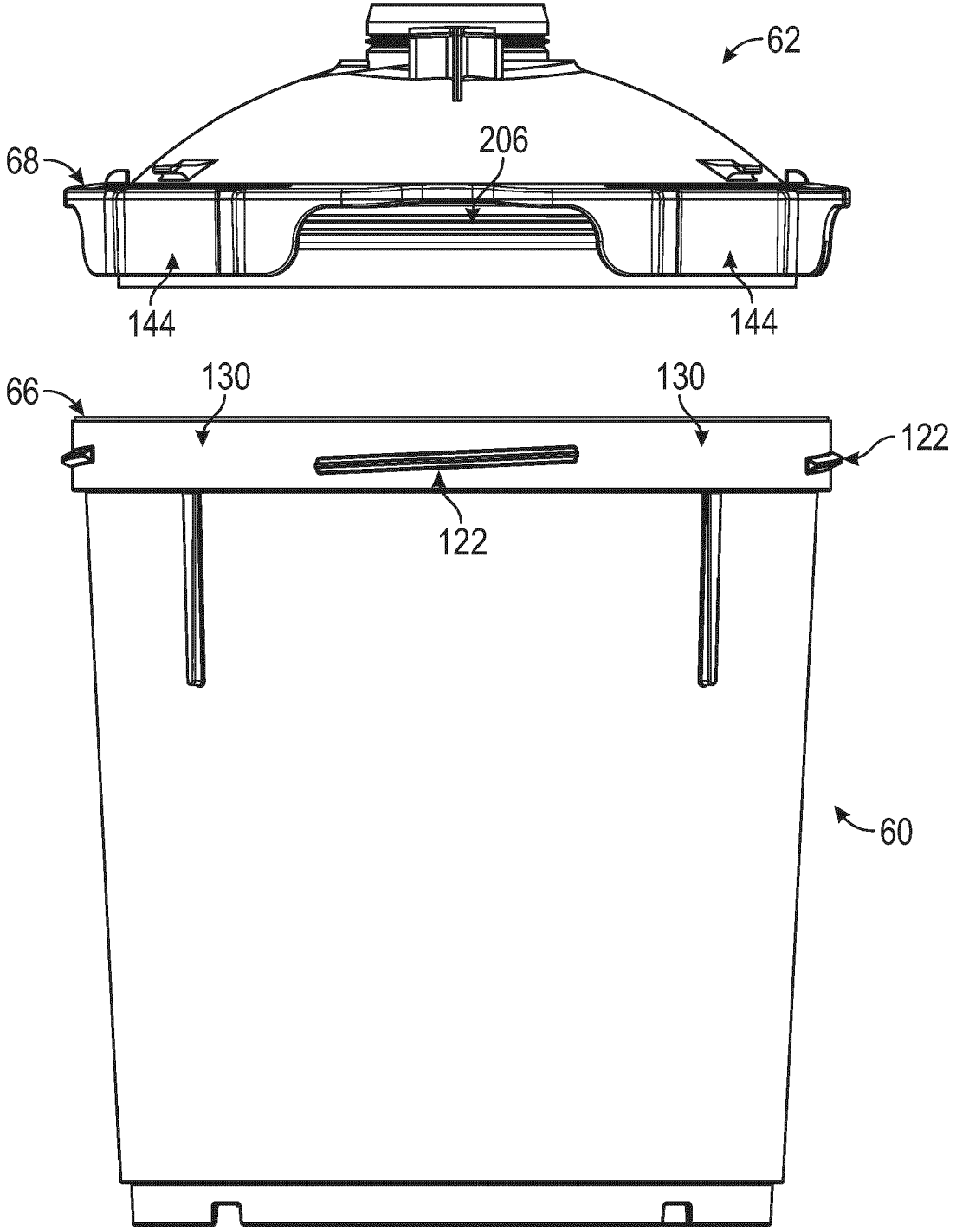


FIG. 9A

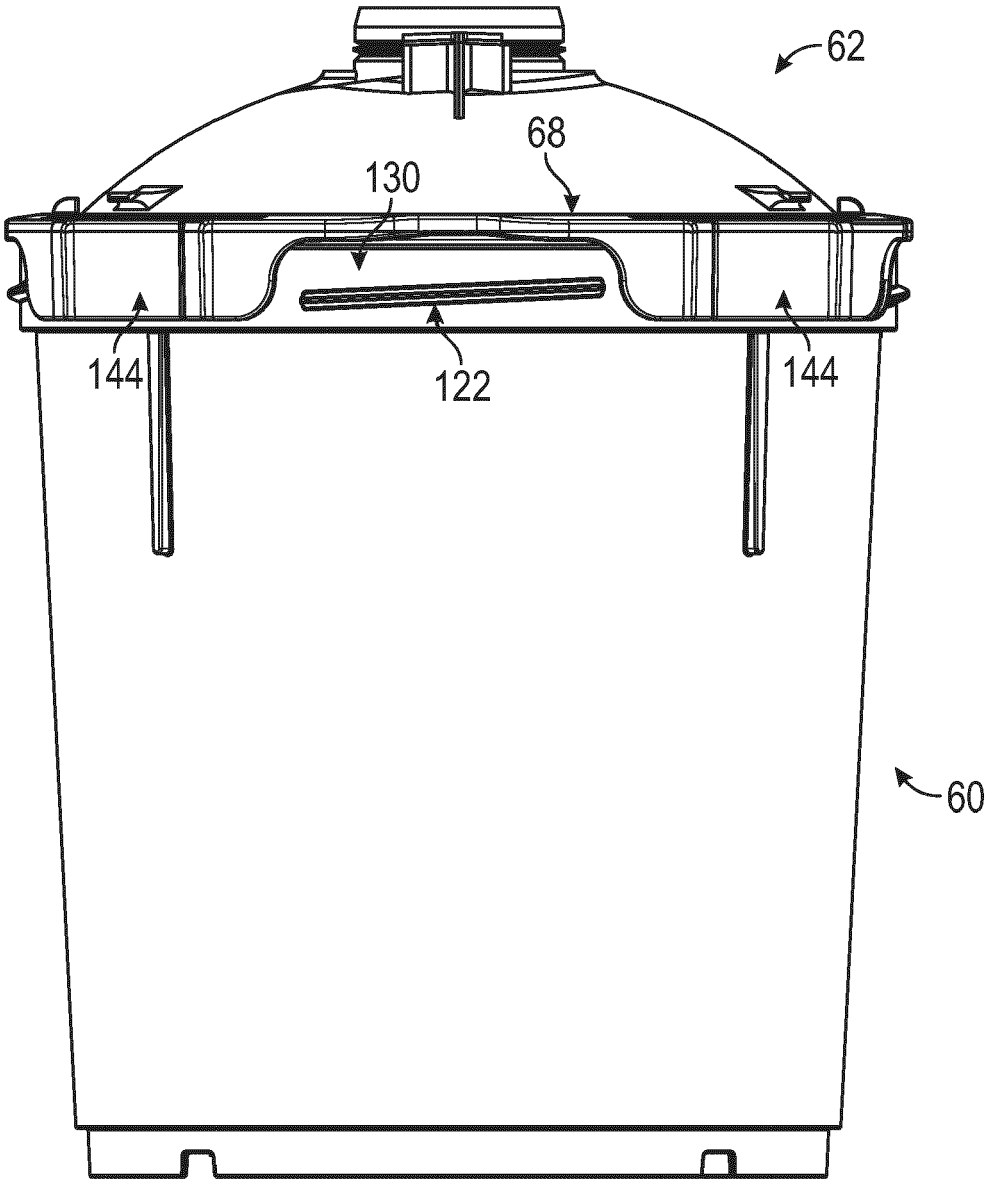


FIG. 9B

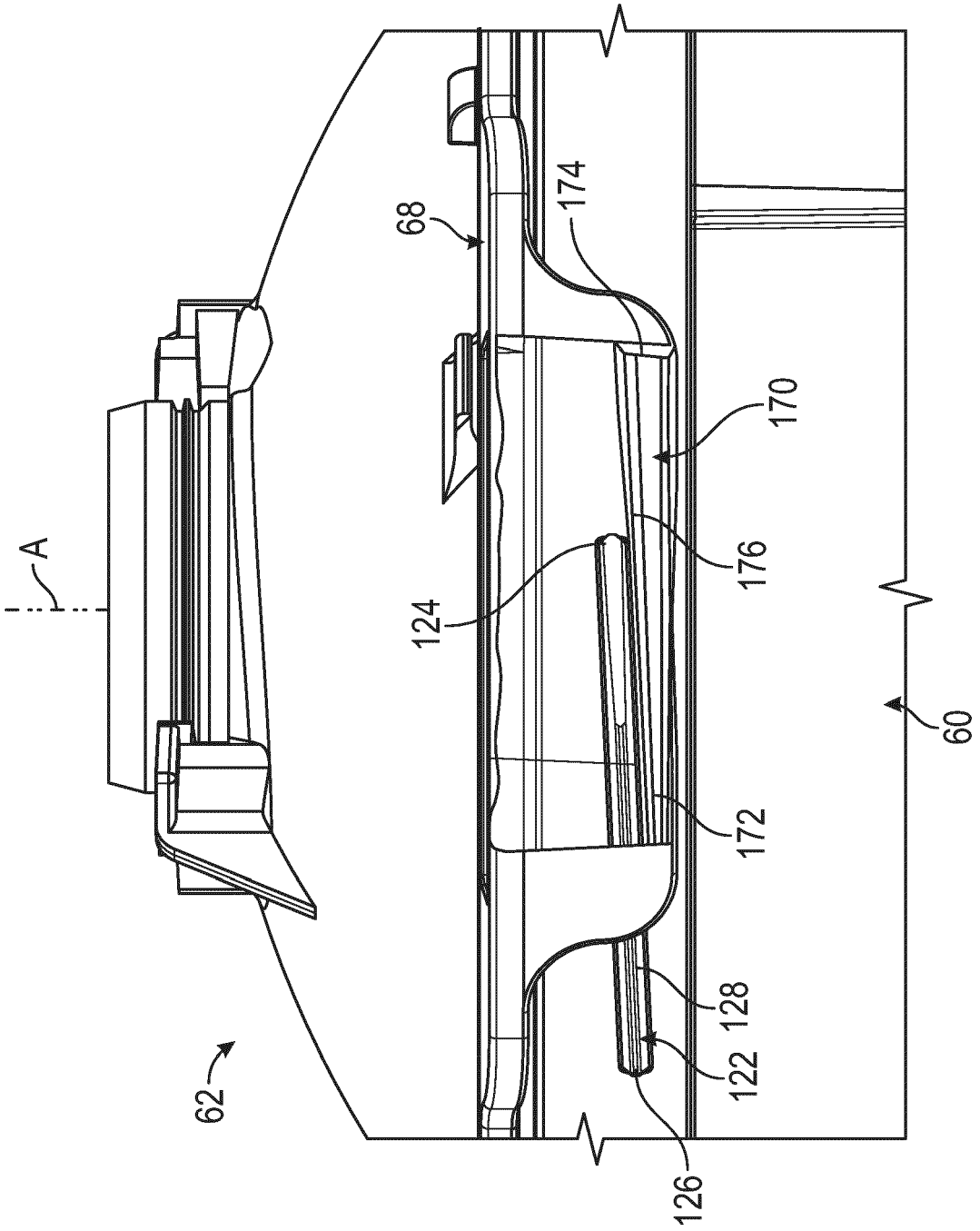


FIG. 9C

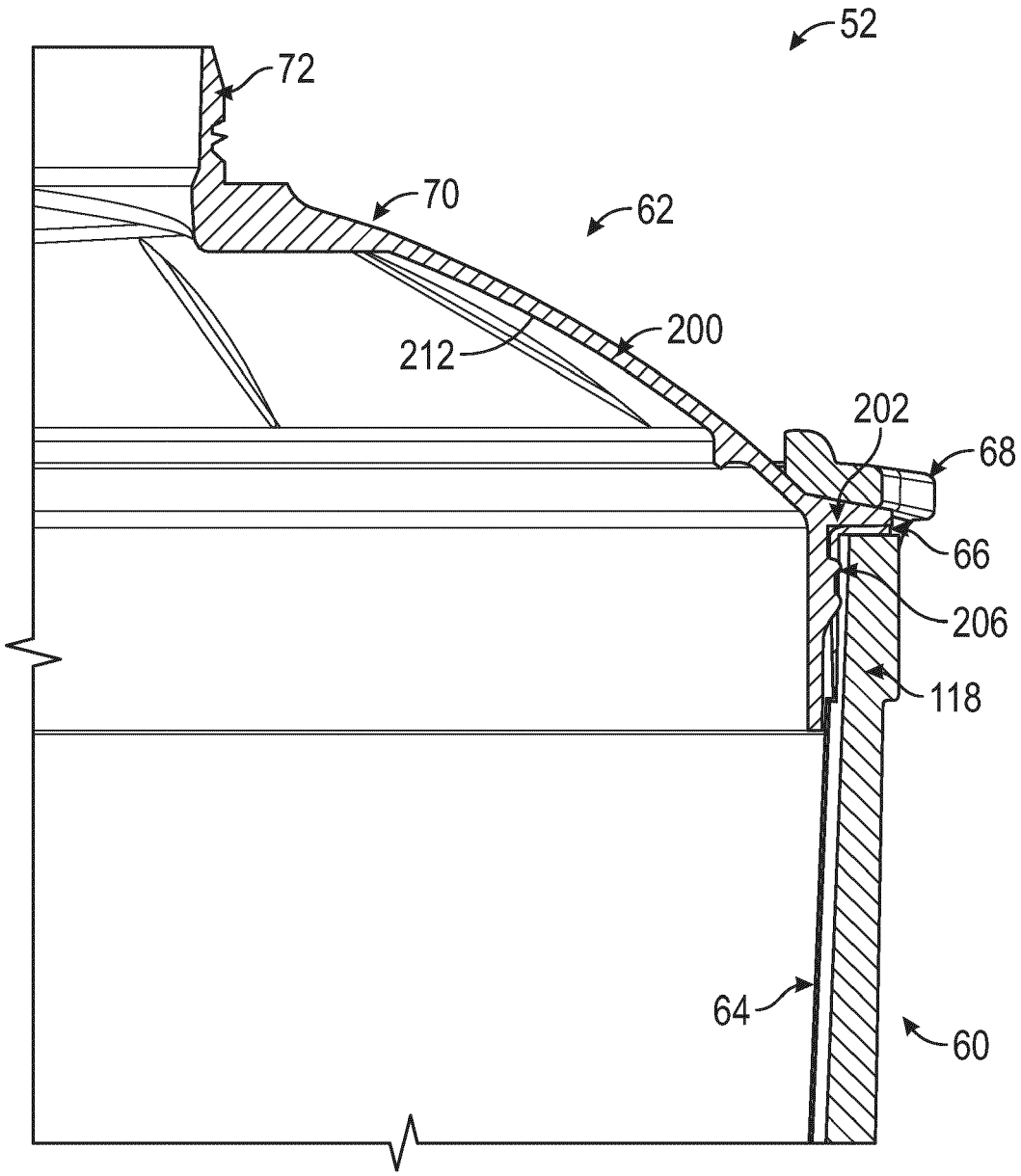


FIG. 9D

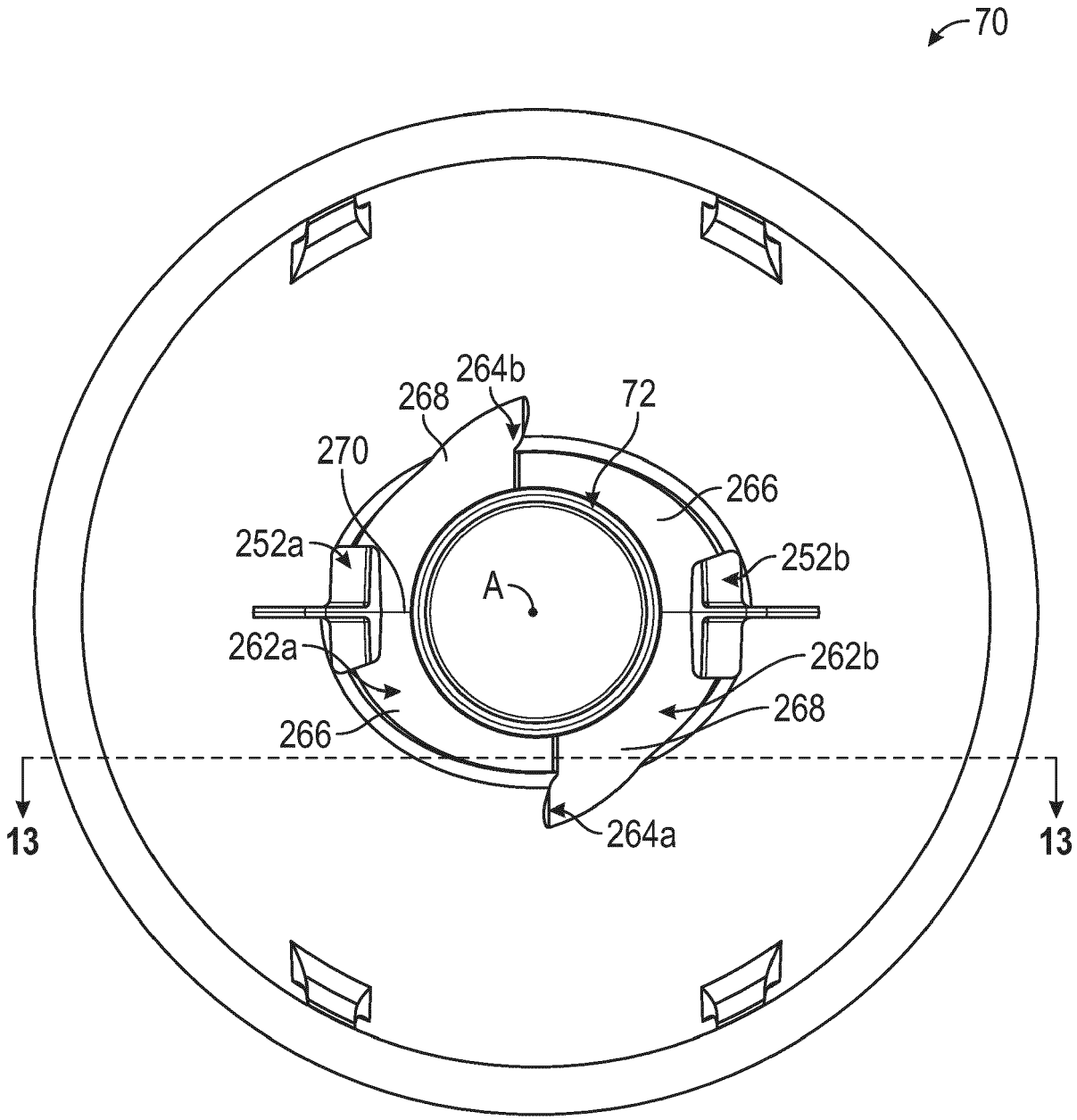


FIG. 10A

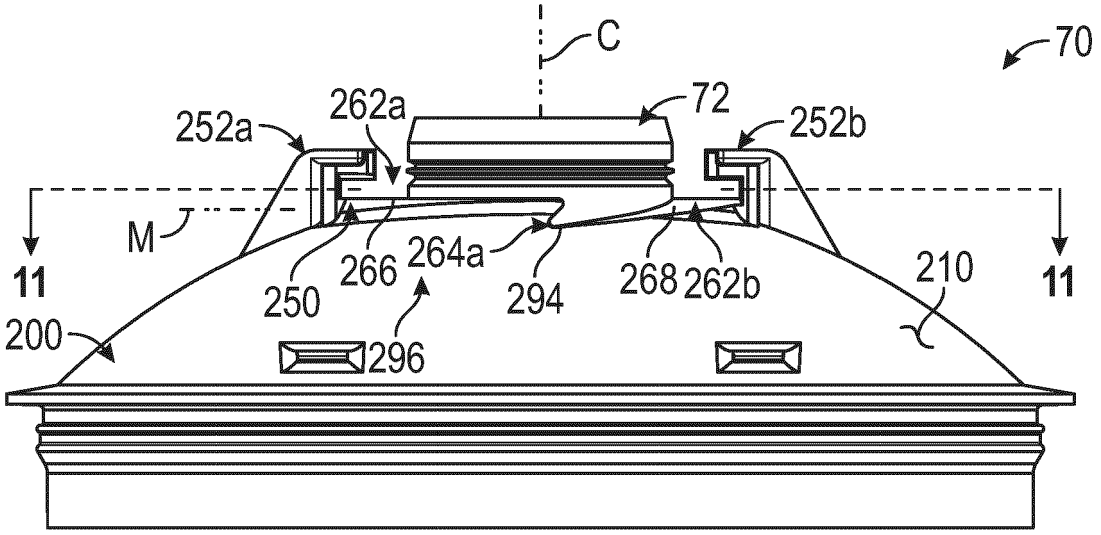


FIG. 10B

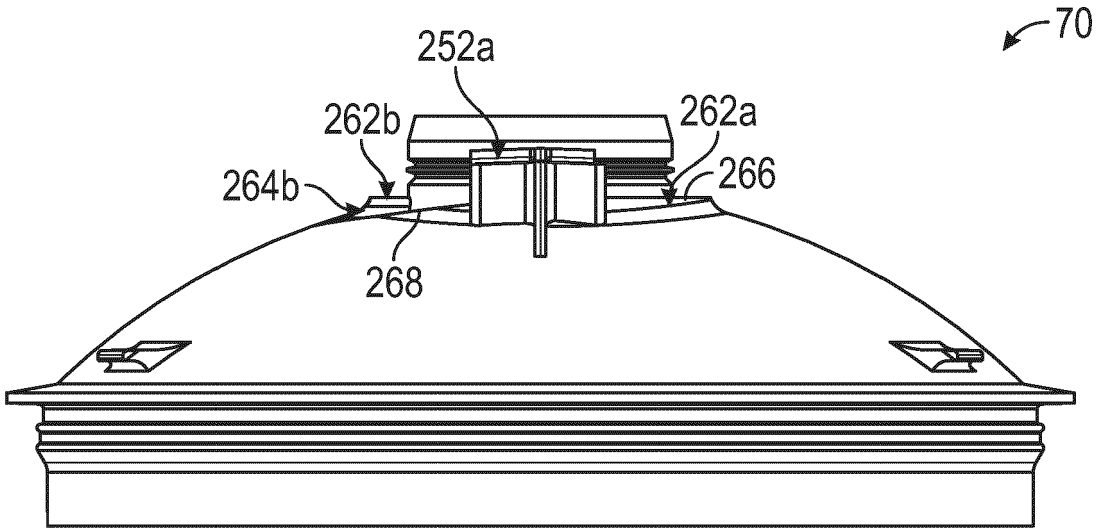


FIG. 10C

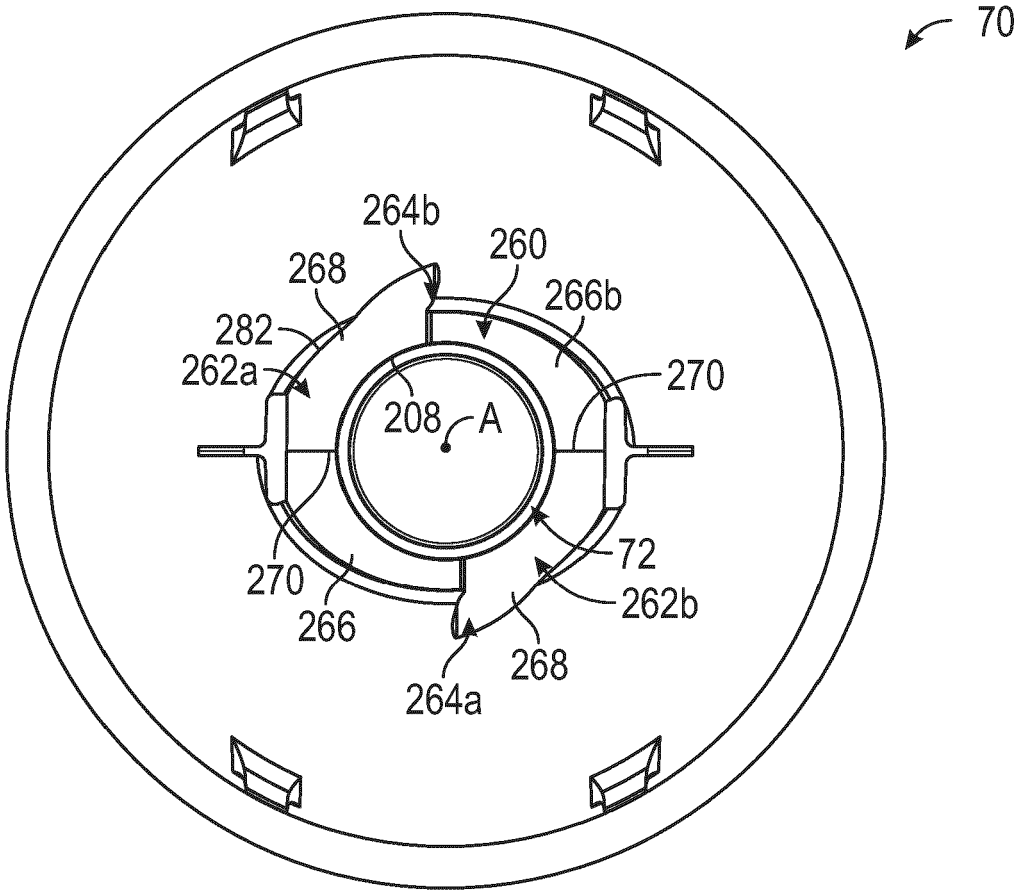

70
264b
260
268
266b
282
262a
270
208
A
270
72
262b
266
268
264a

FIG. 11

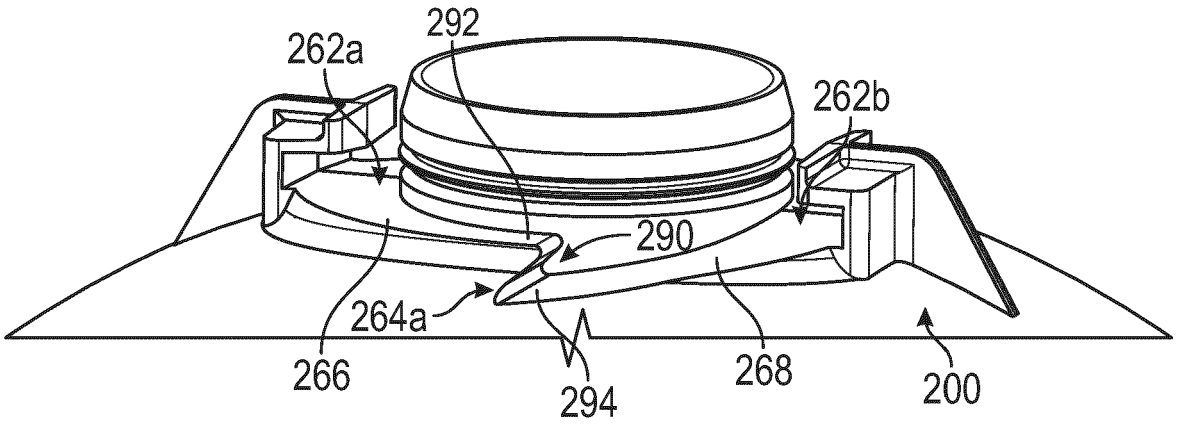

292
262a
262b
290
264a
266
294
268
200

FIG. 12

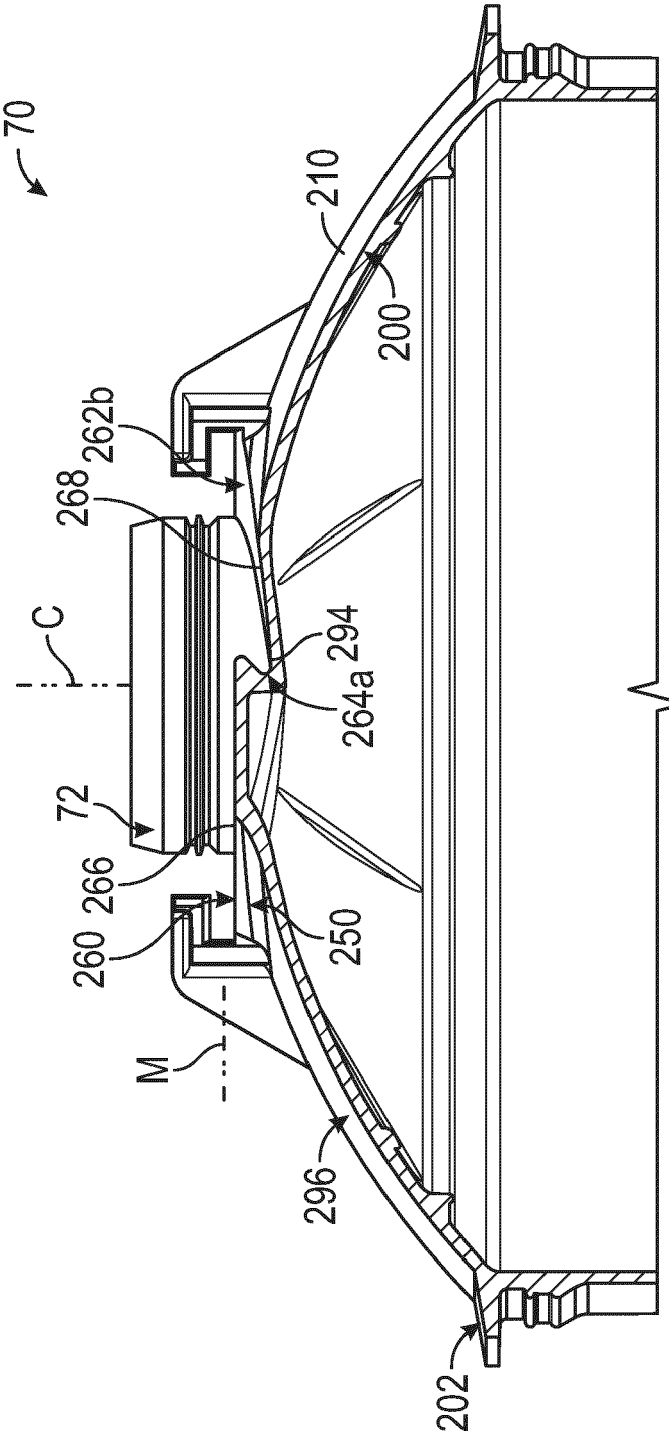


FIG. 13

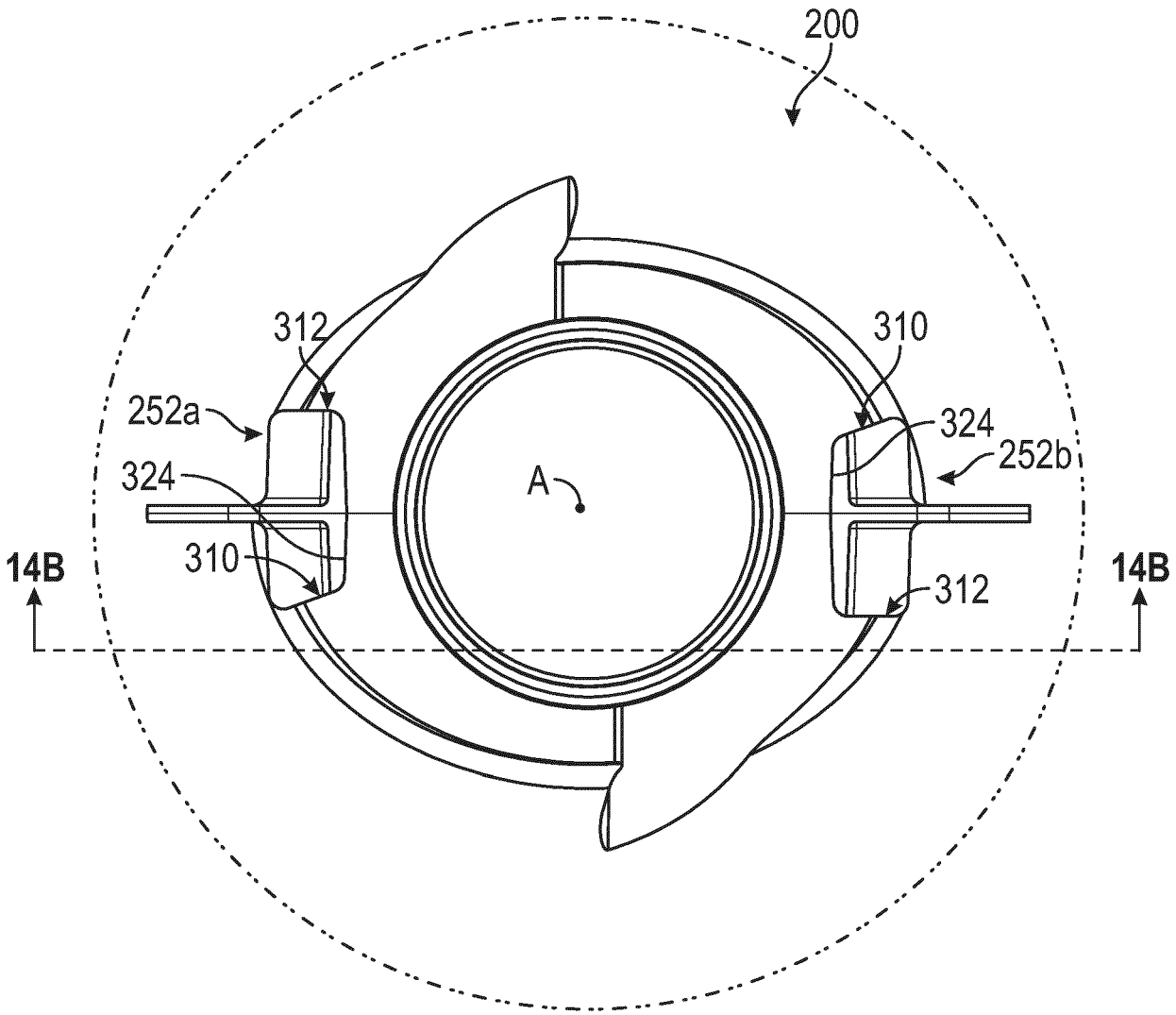


FIG. 14A

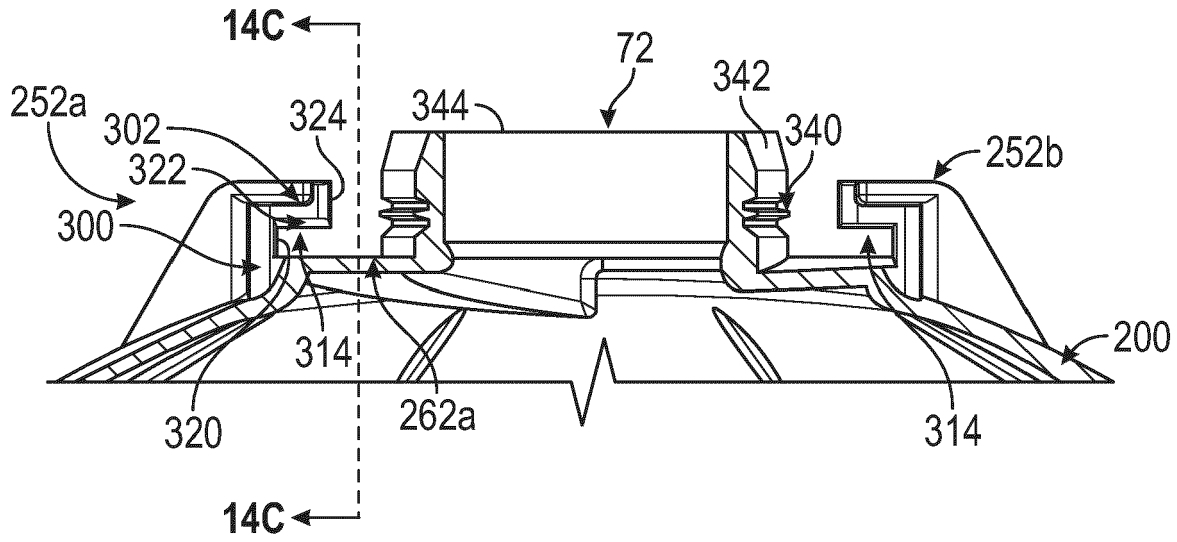


FIG. 14B

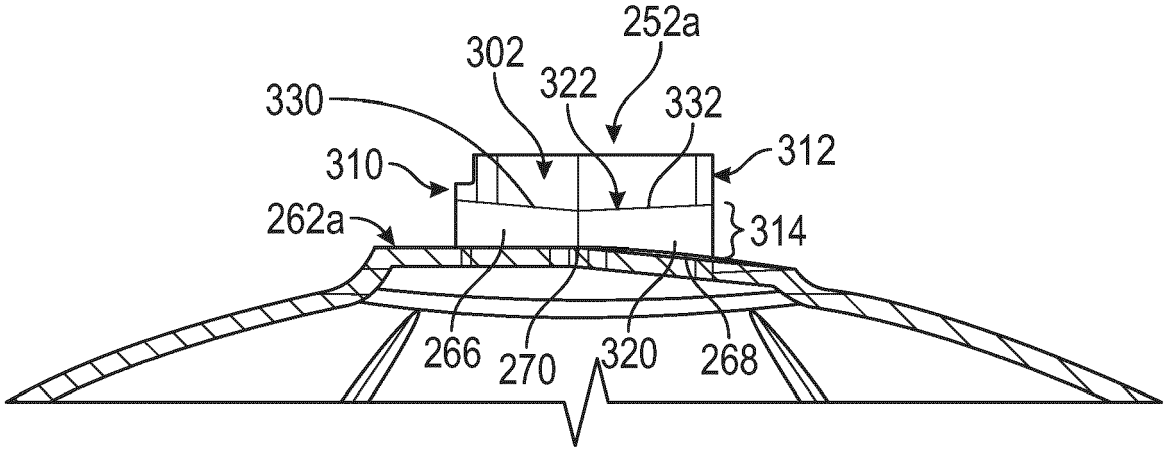


FIG. 14C

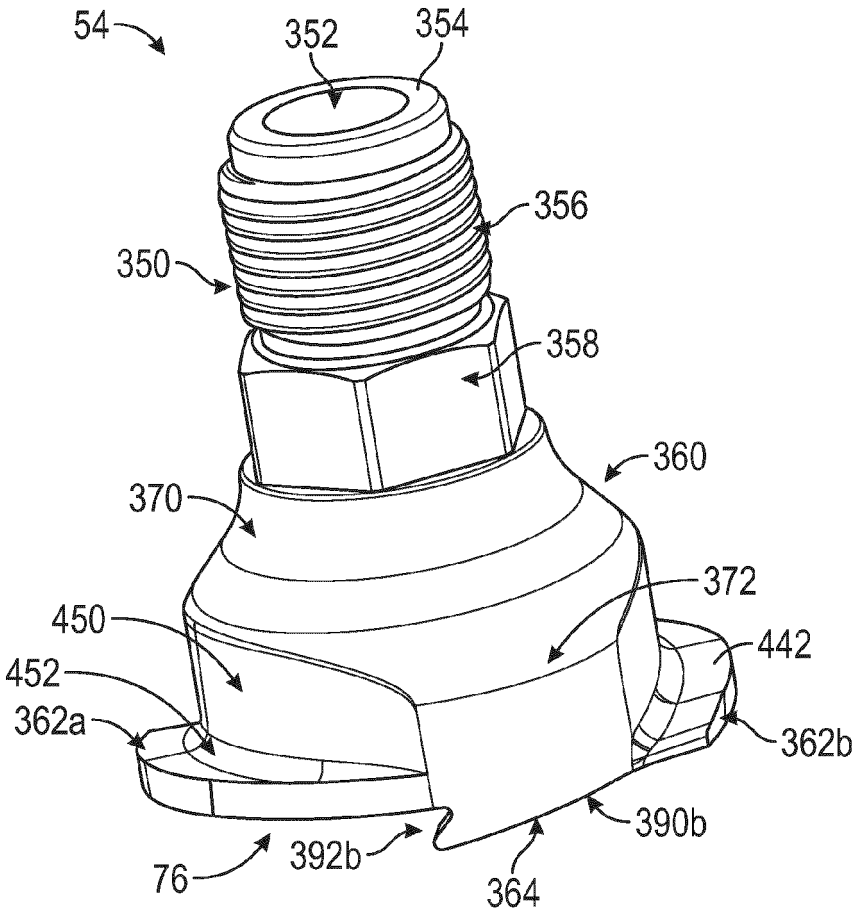


FIG. 15A

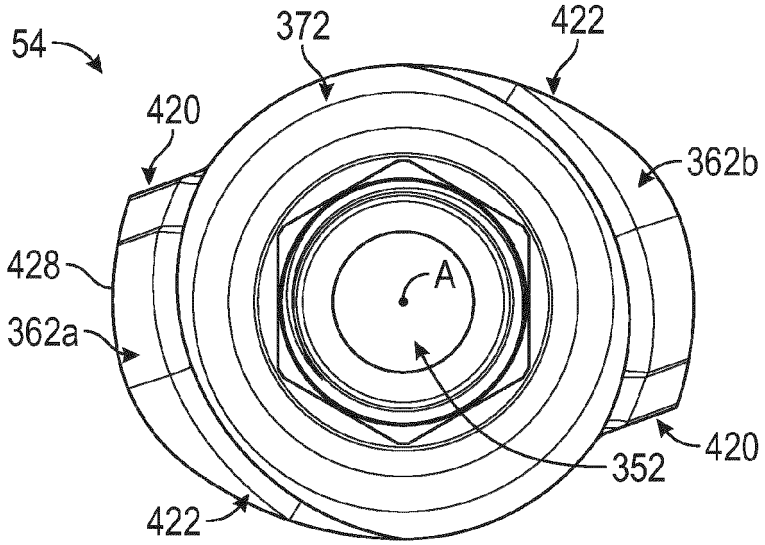


FIG. 15B

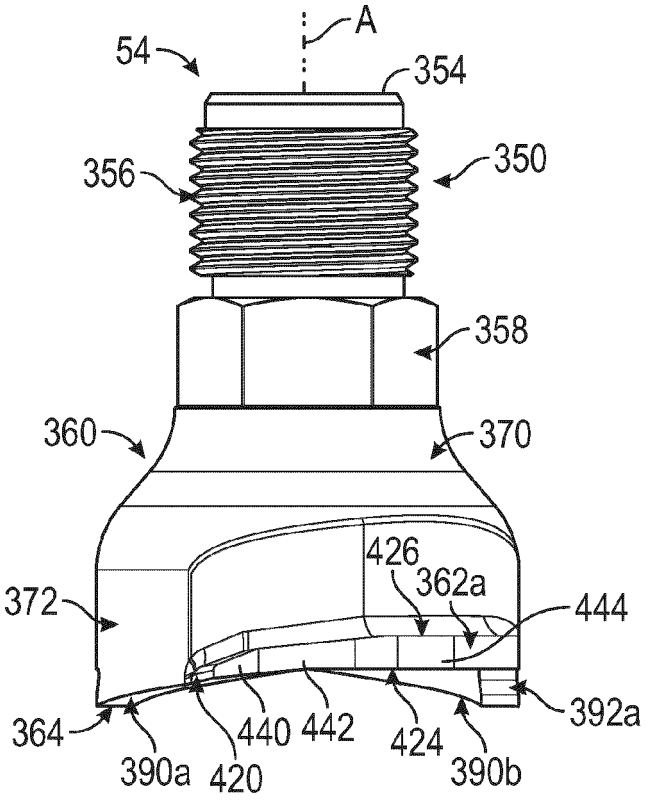


FIG. 15C

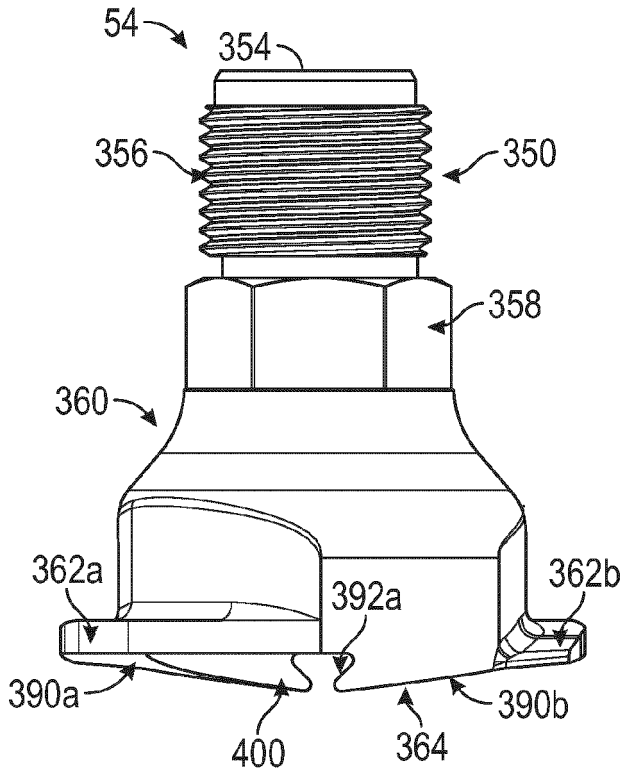


FIG. 15D

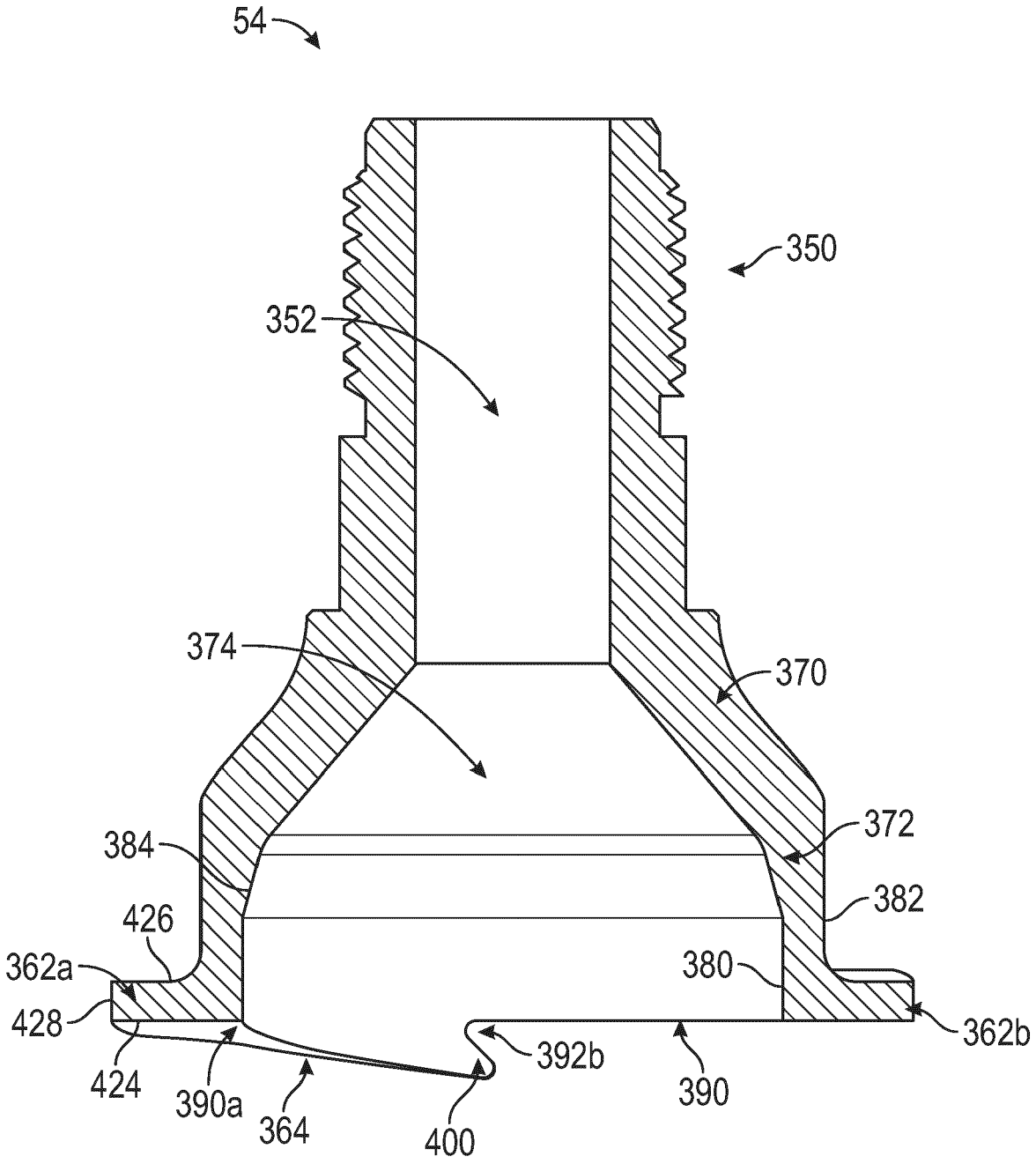
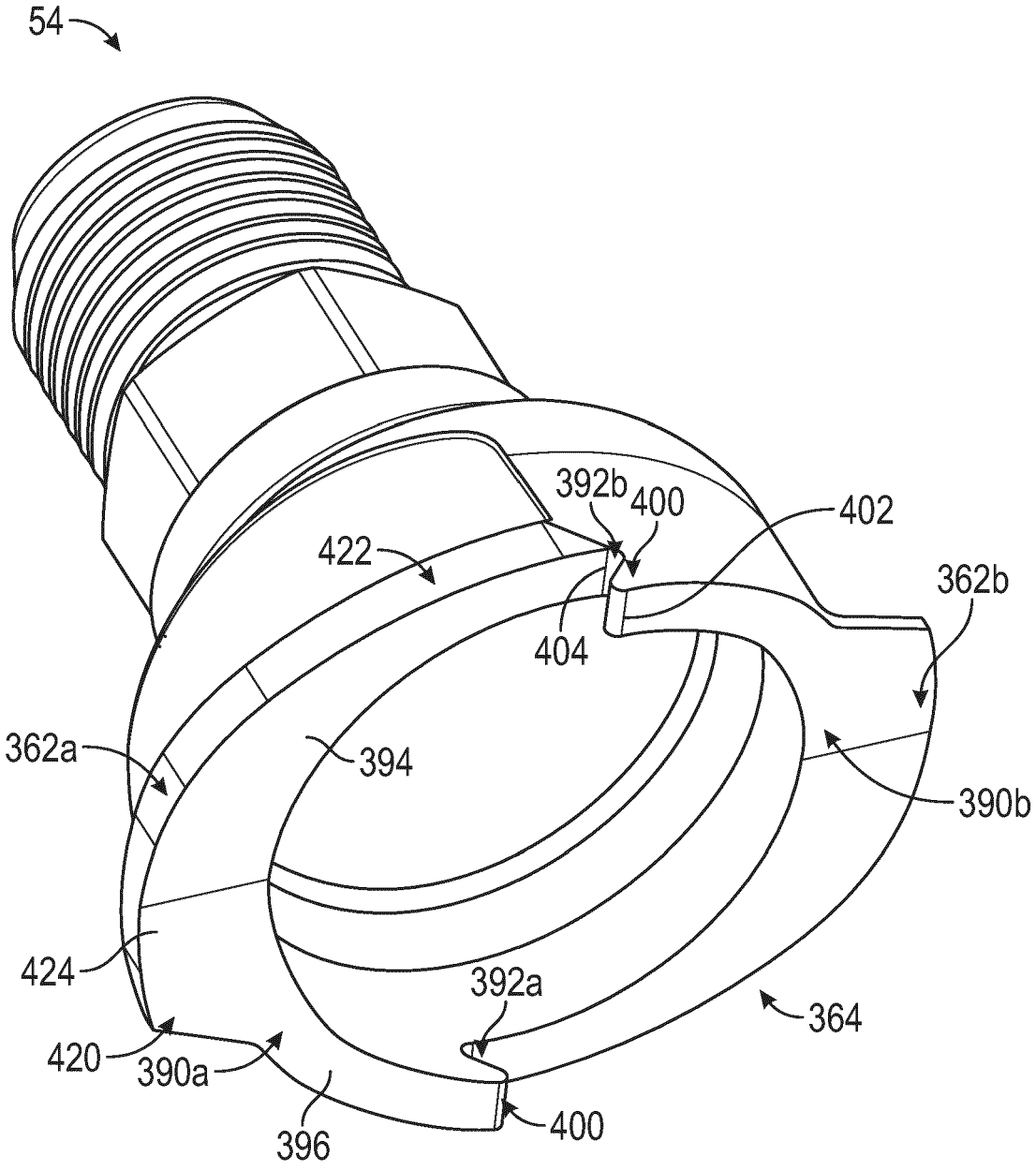

54
350
352
374
370
372
384
382
426
362a
380
428
362b
392b
424
390a
364
400
390

FIG. 15E


54
392b
400
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362a
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390b
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392a
364
420
390a
396
400

FIG. 15F

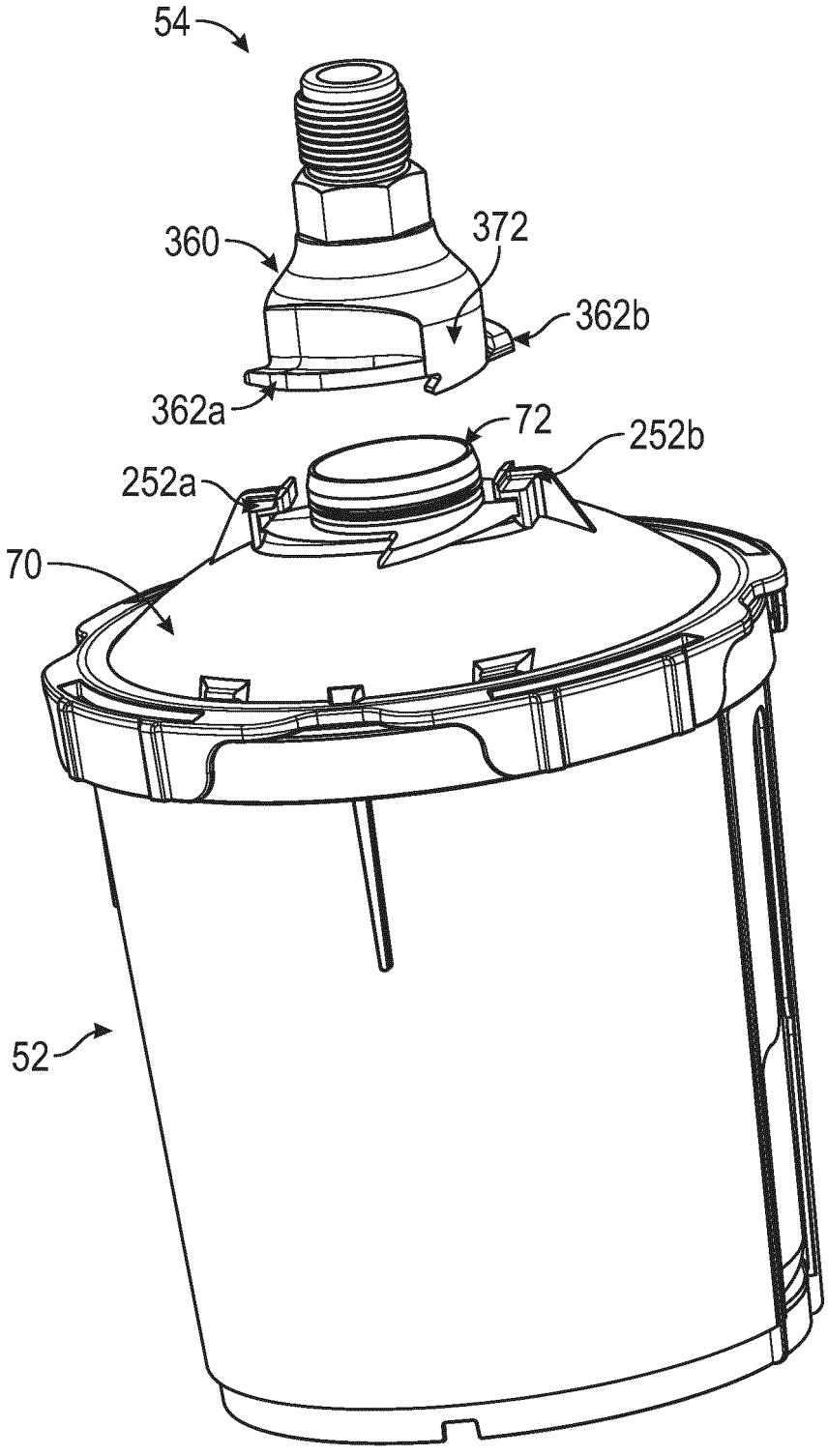


FIG. 16

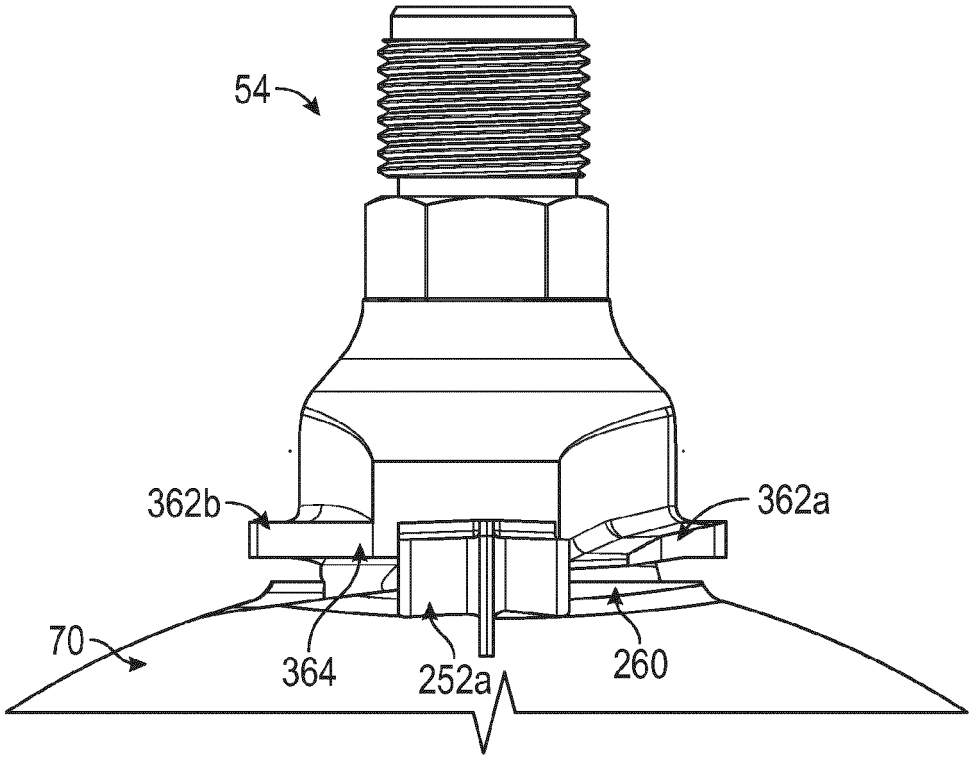


FIG. 17A

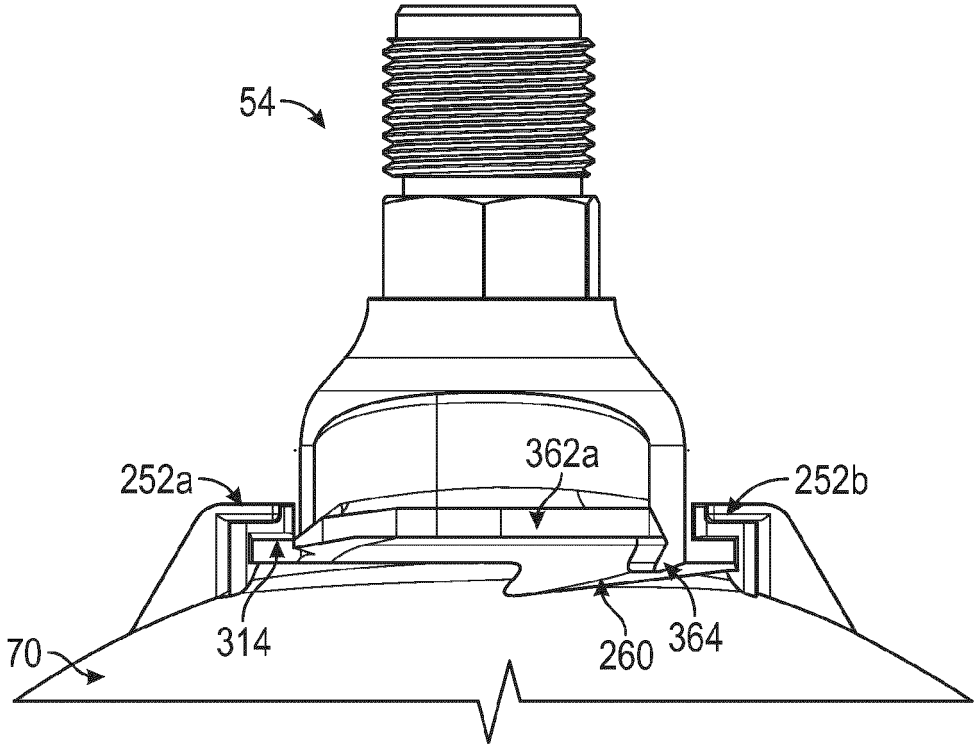


FIG. 17B

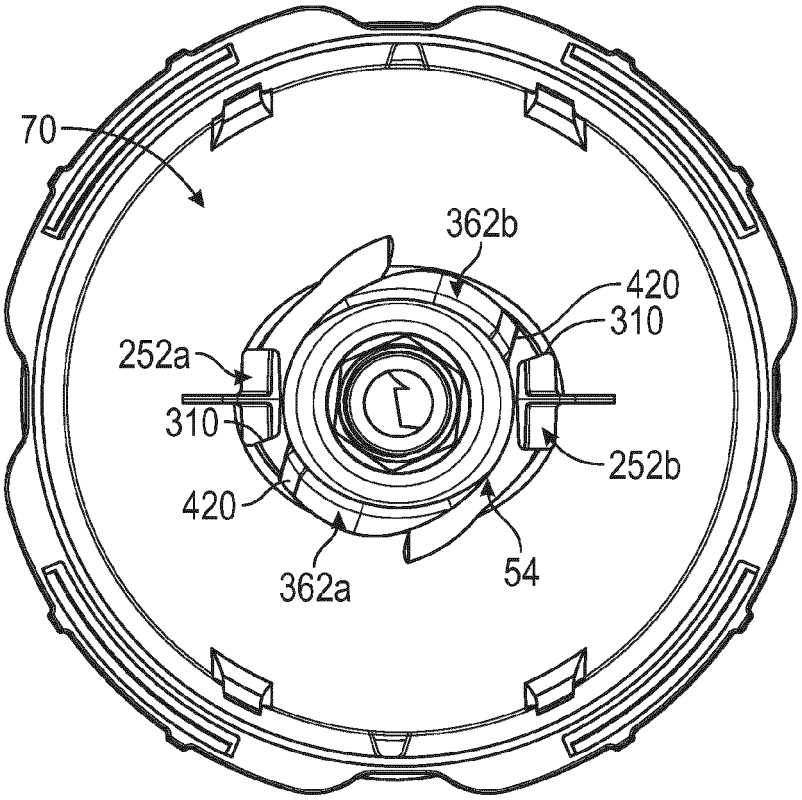


FIG. 17C

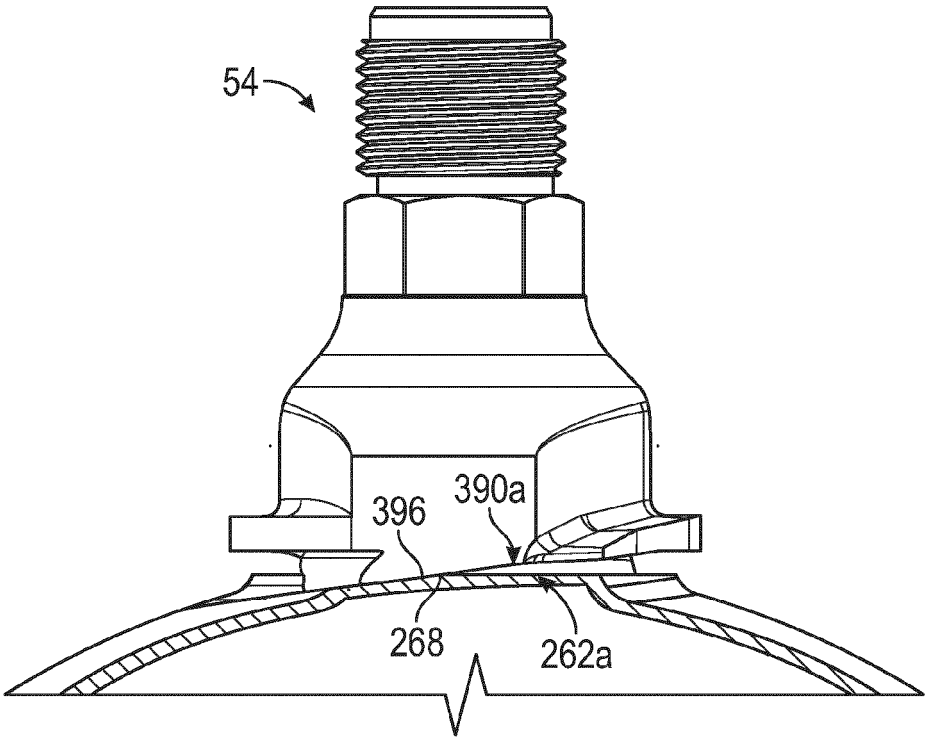


FIG. 17D

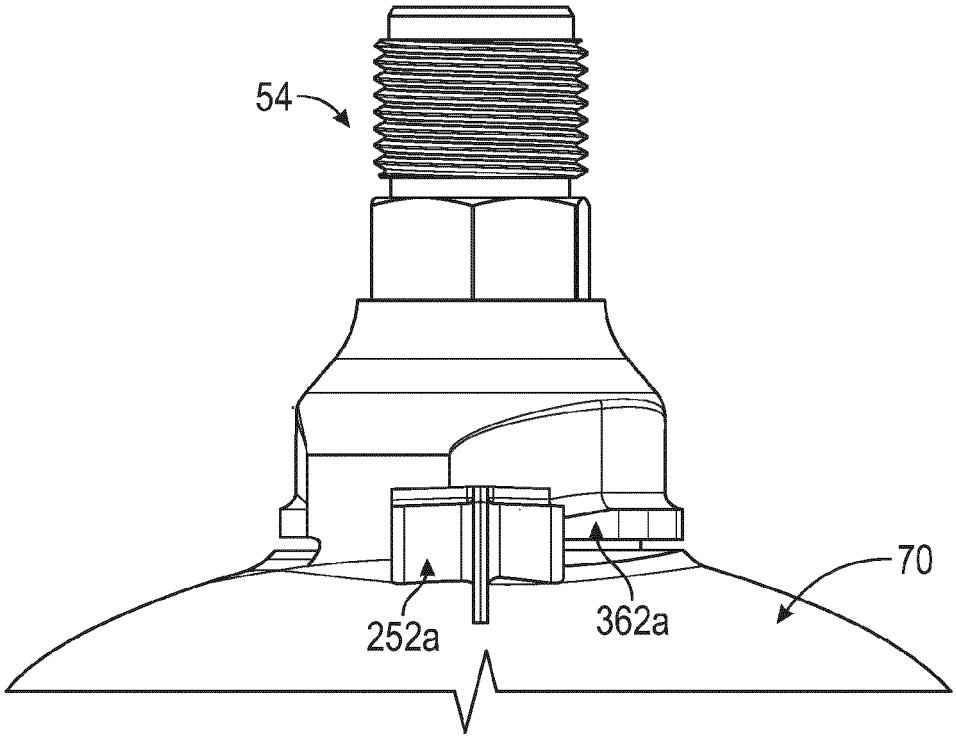


FIG. 18A

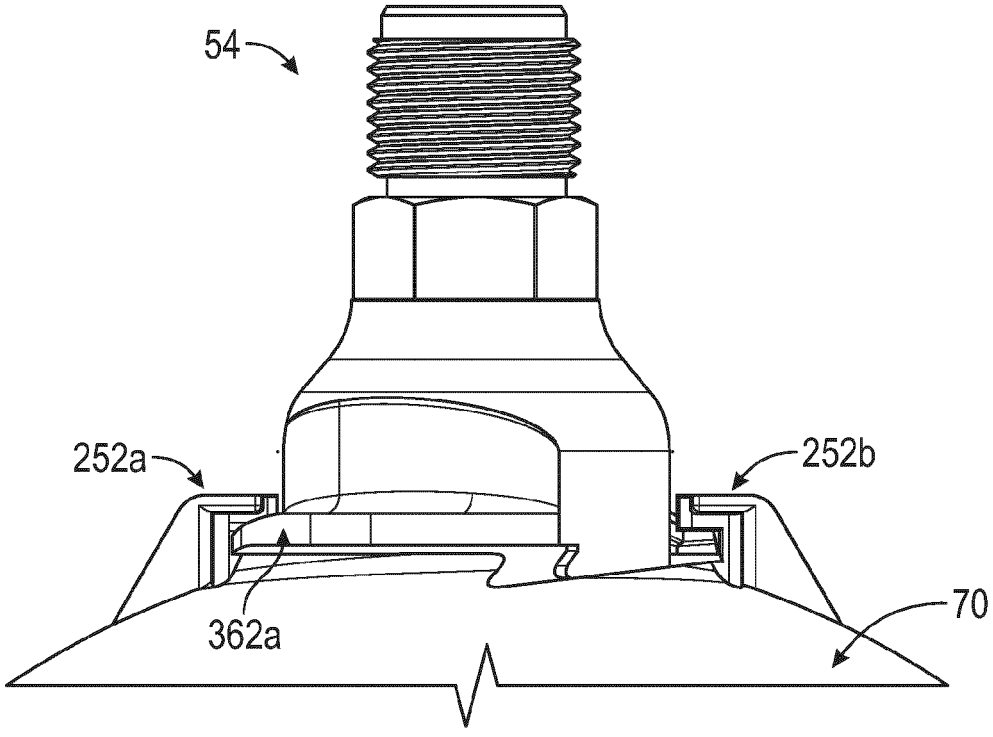


FIG. 18B

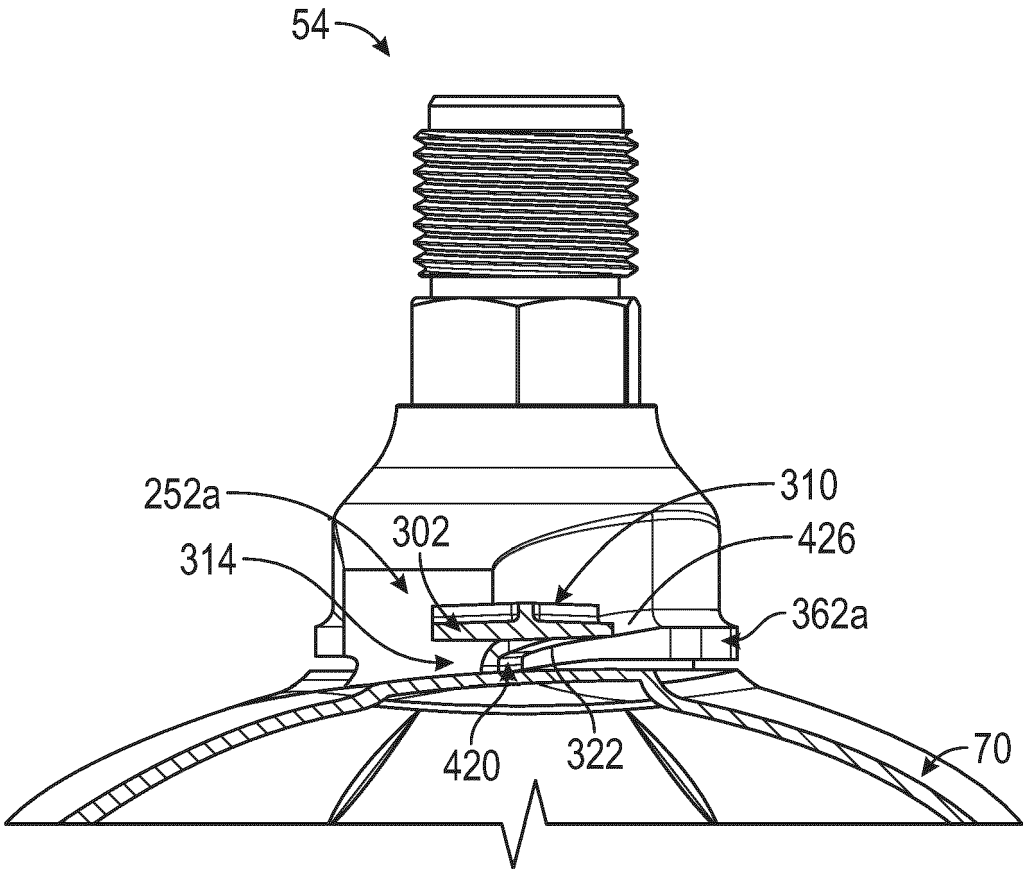


FIG. 18C

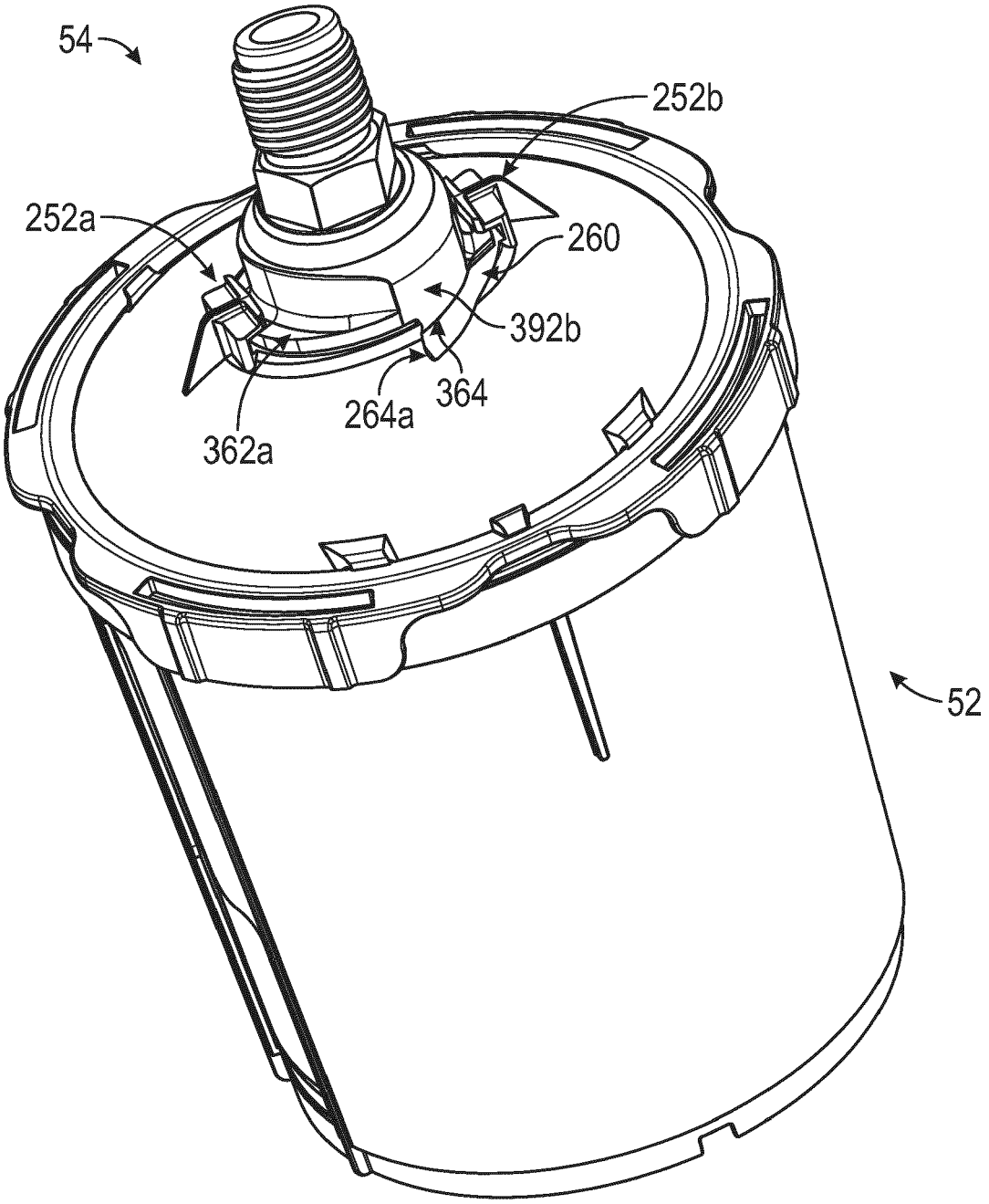


FIG. 19A

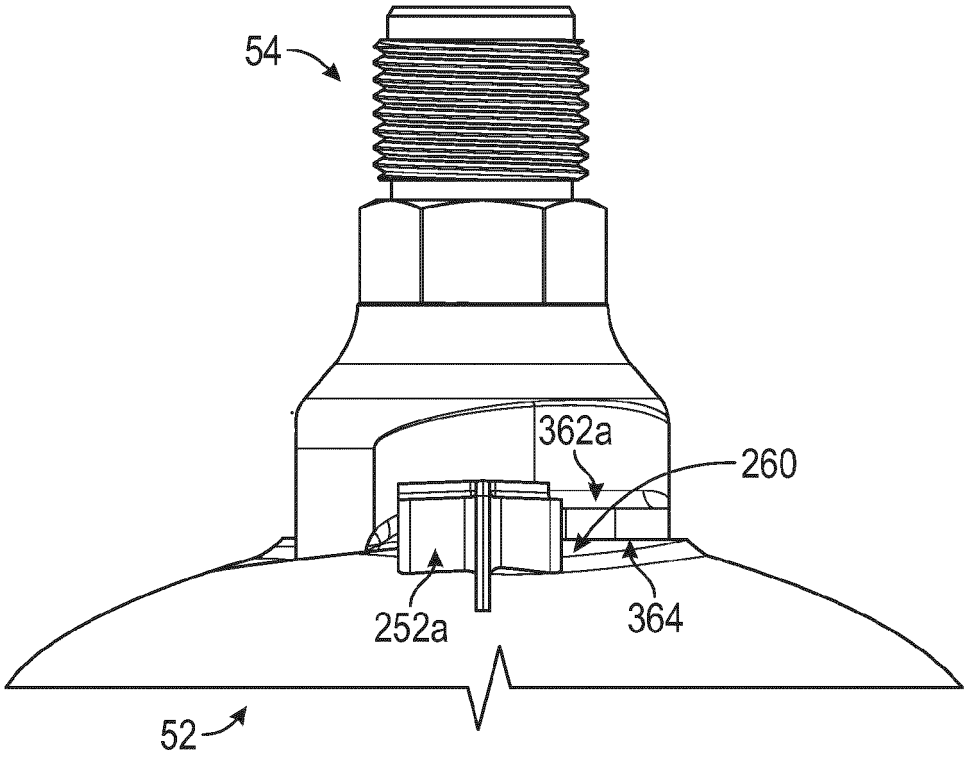


FIG. 19B

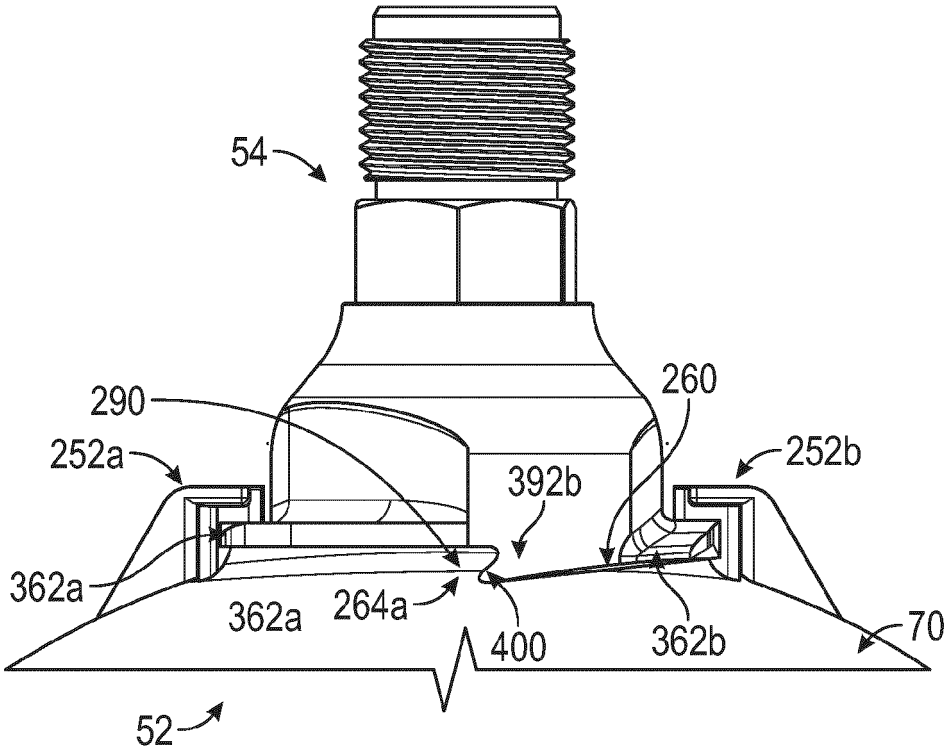
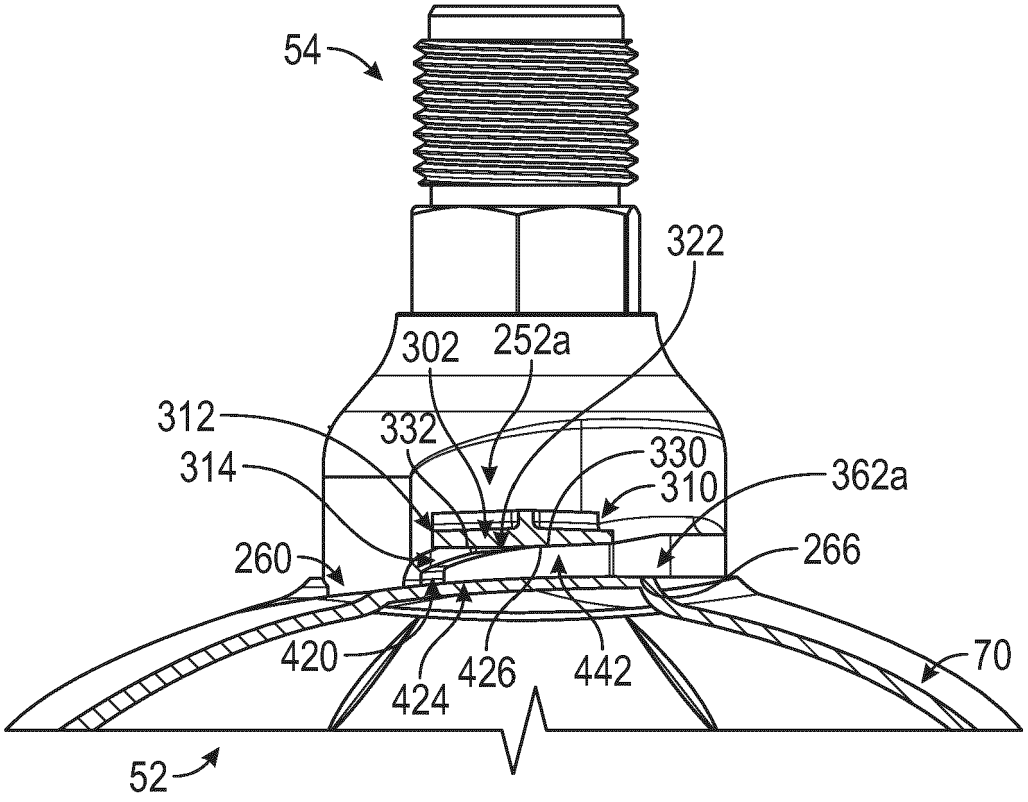


FIG. 19C


54
322
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252a
312
332
330
314
310
362a
260
266
420
424
426
442
70
52

FIG. 19D

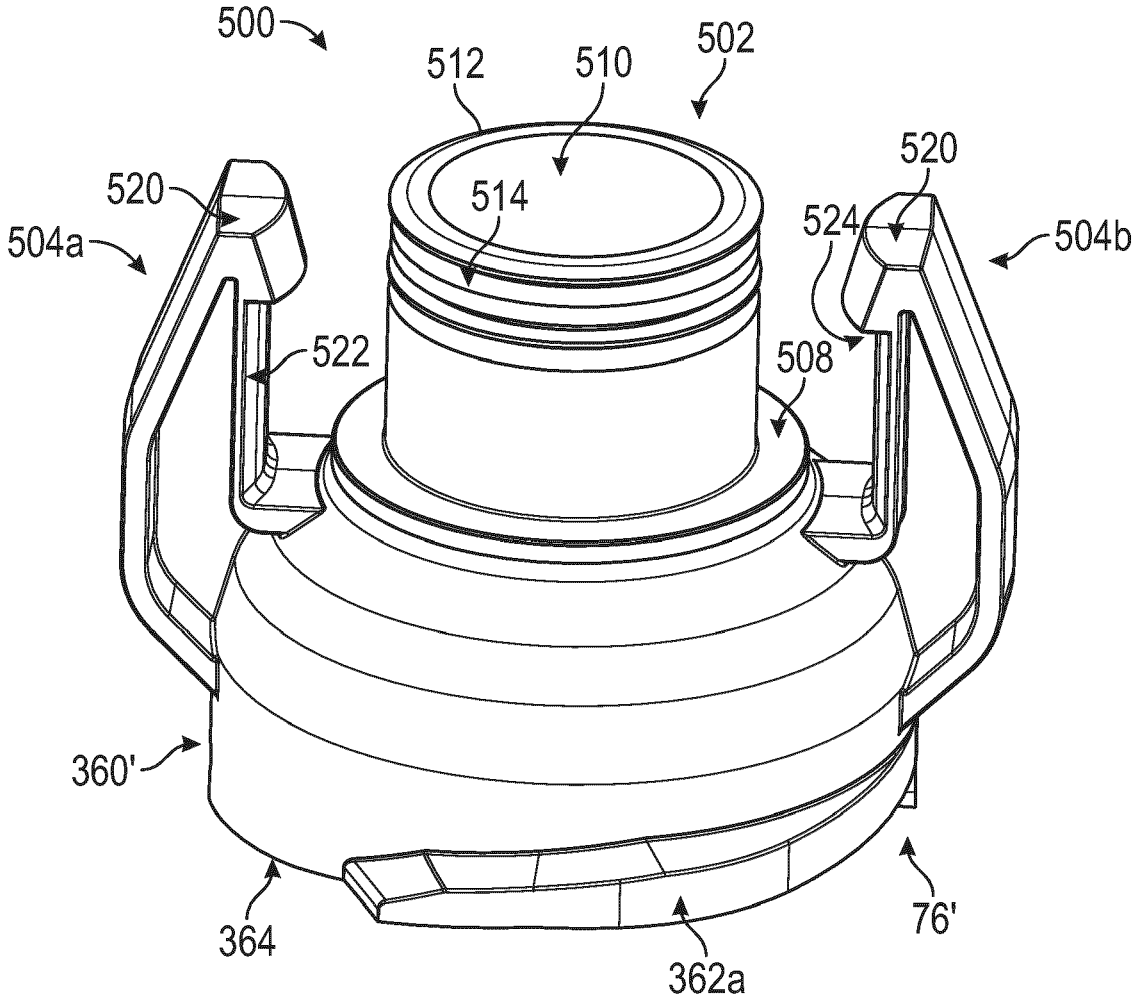
500
512
510
502
520
514
520
524
504a
504b
522
508
360'
364
362a
76'

FIG. 20

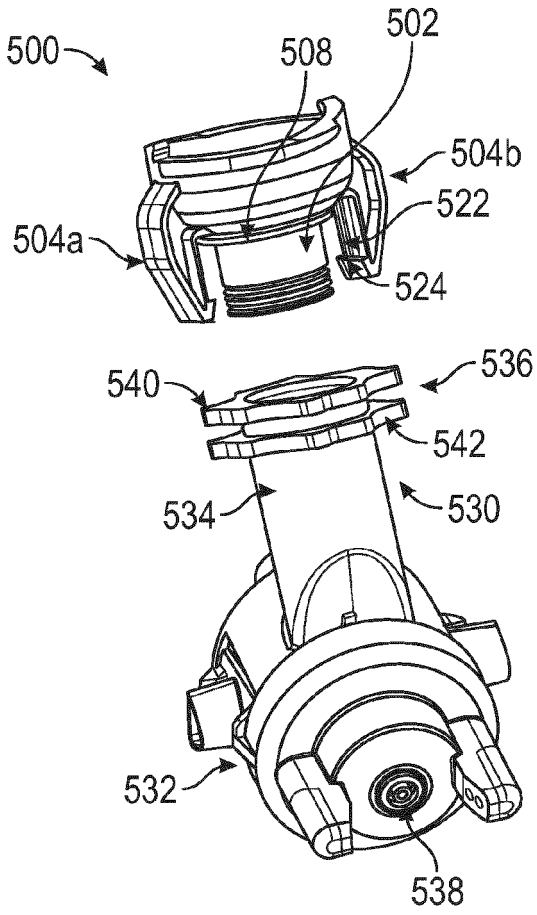

FIG. 21A

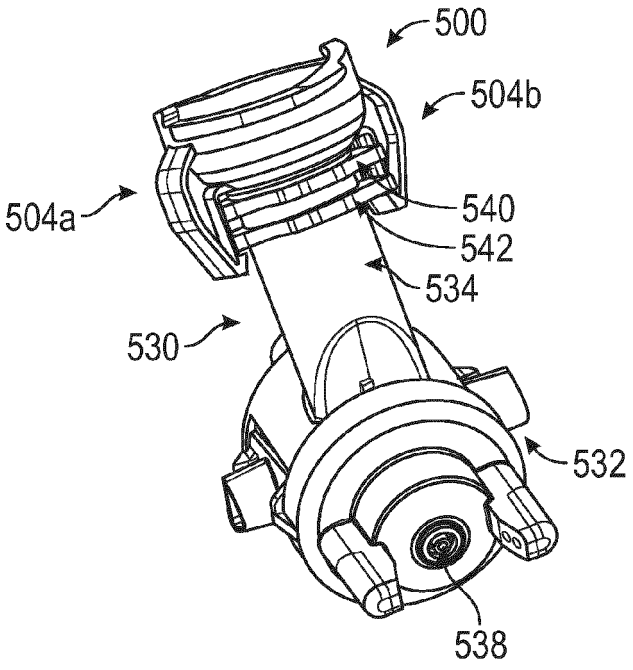

FIG. 21B

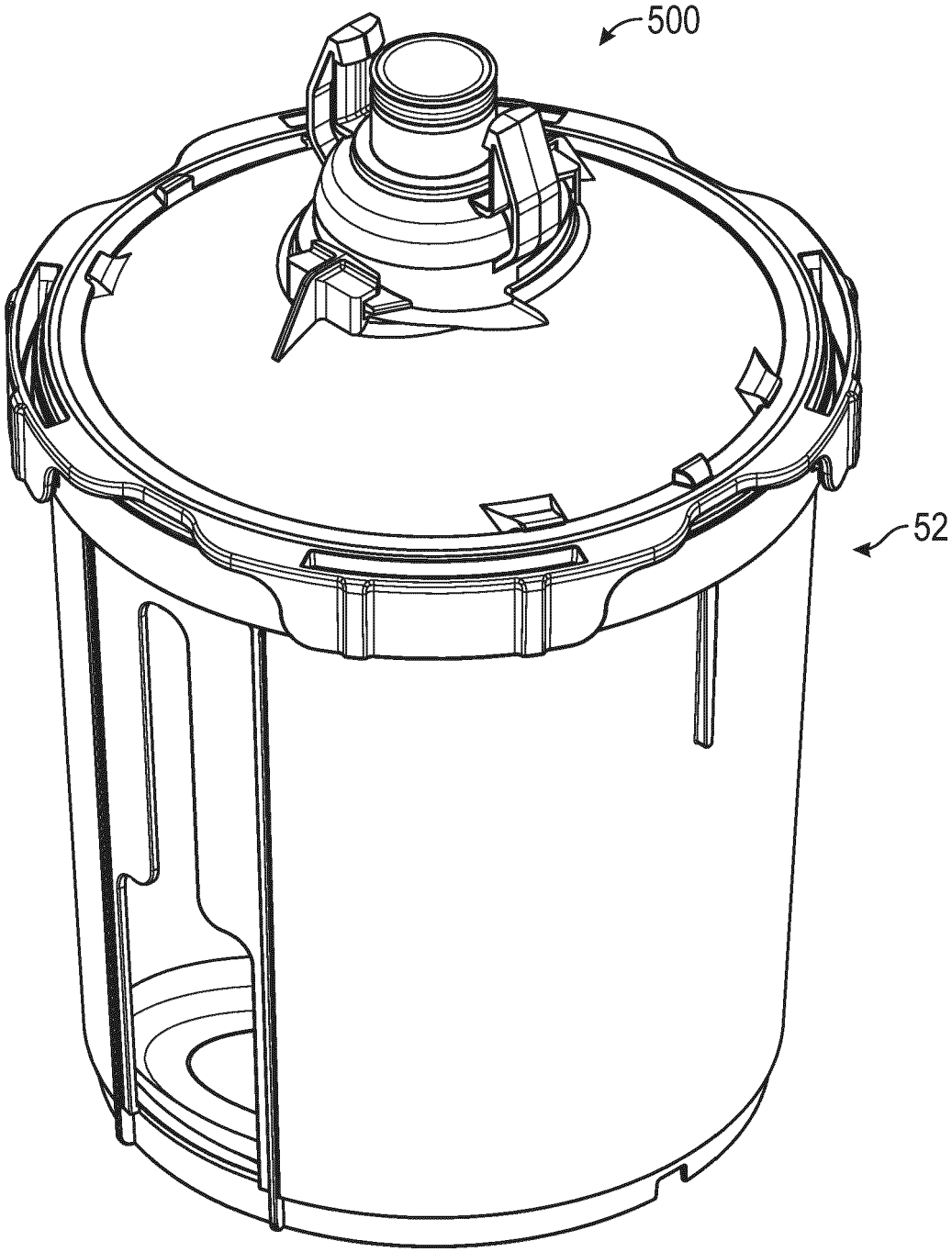

FIG. 22

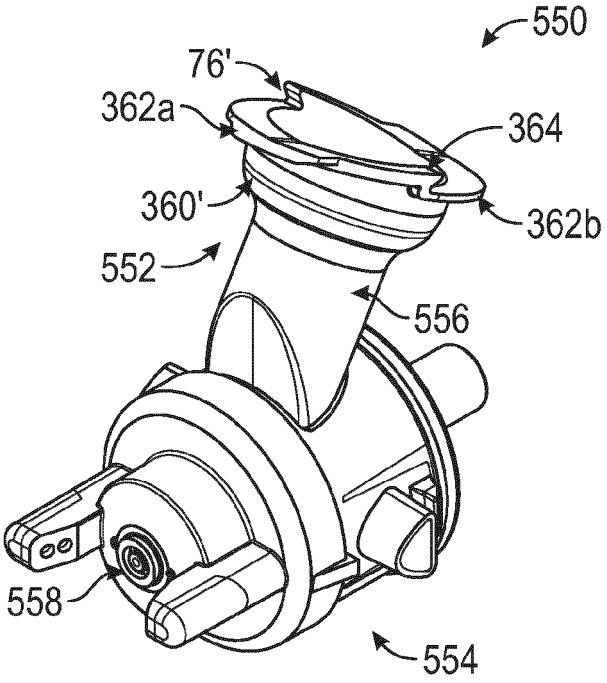

FIG. 23A

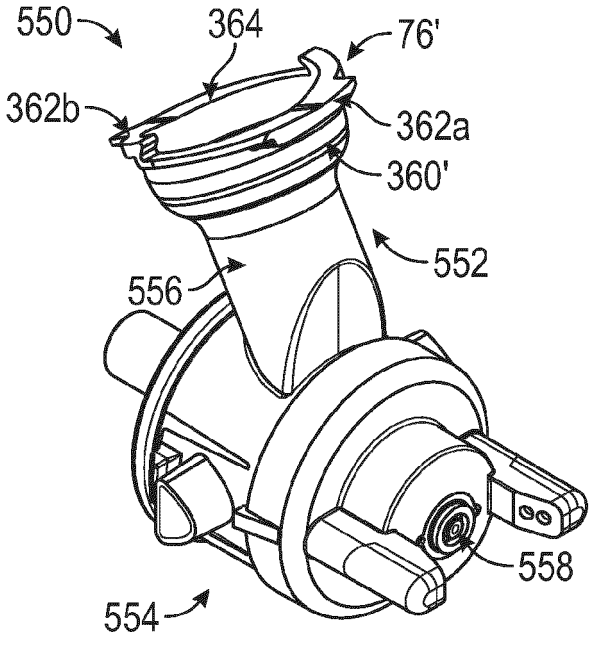

FIG. 23B

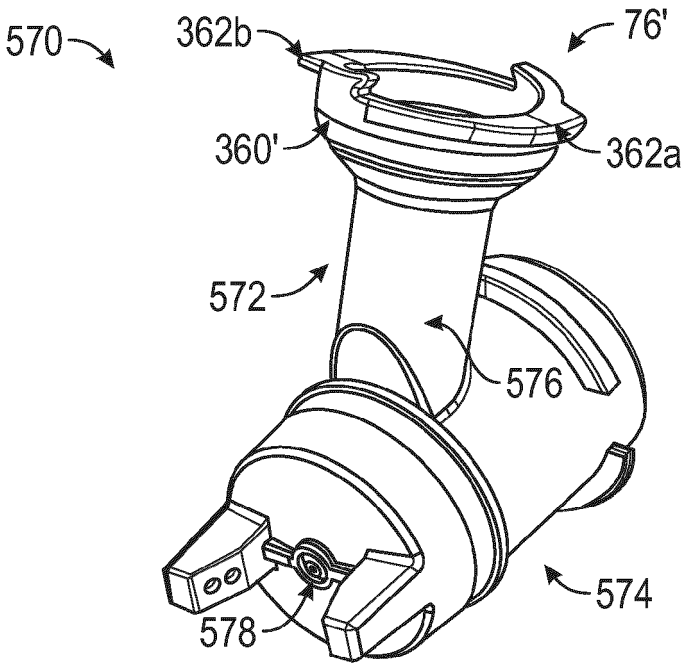

FIG. 24A

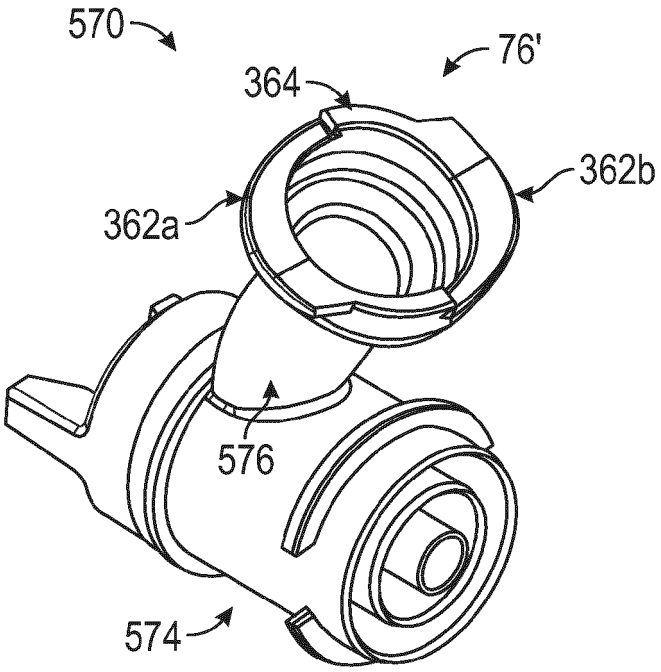

FIG. 24B

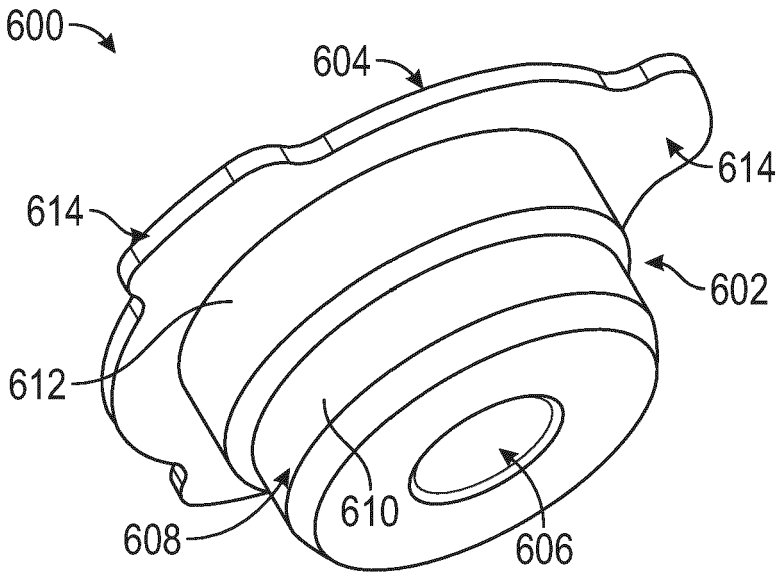

FIG. 25A

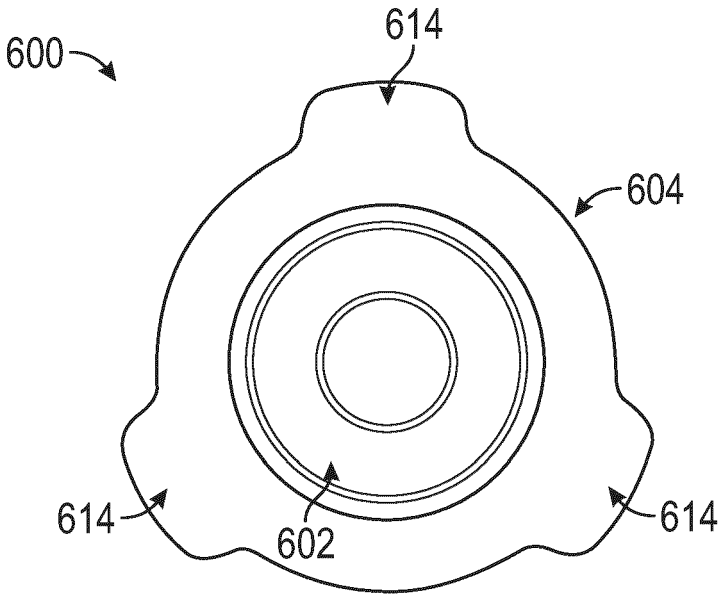

FIG. 25B

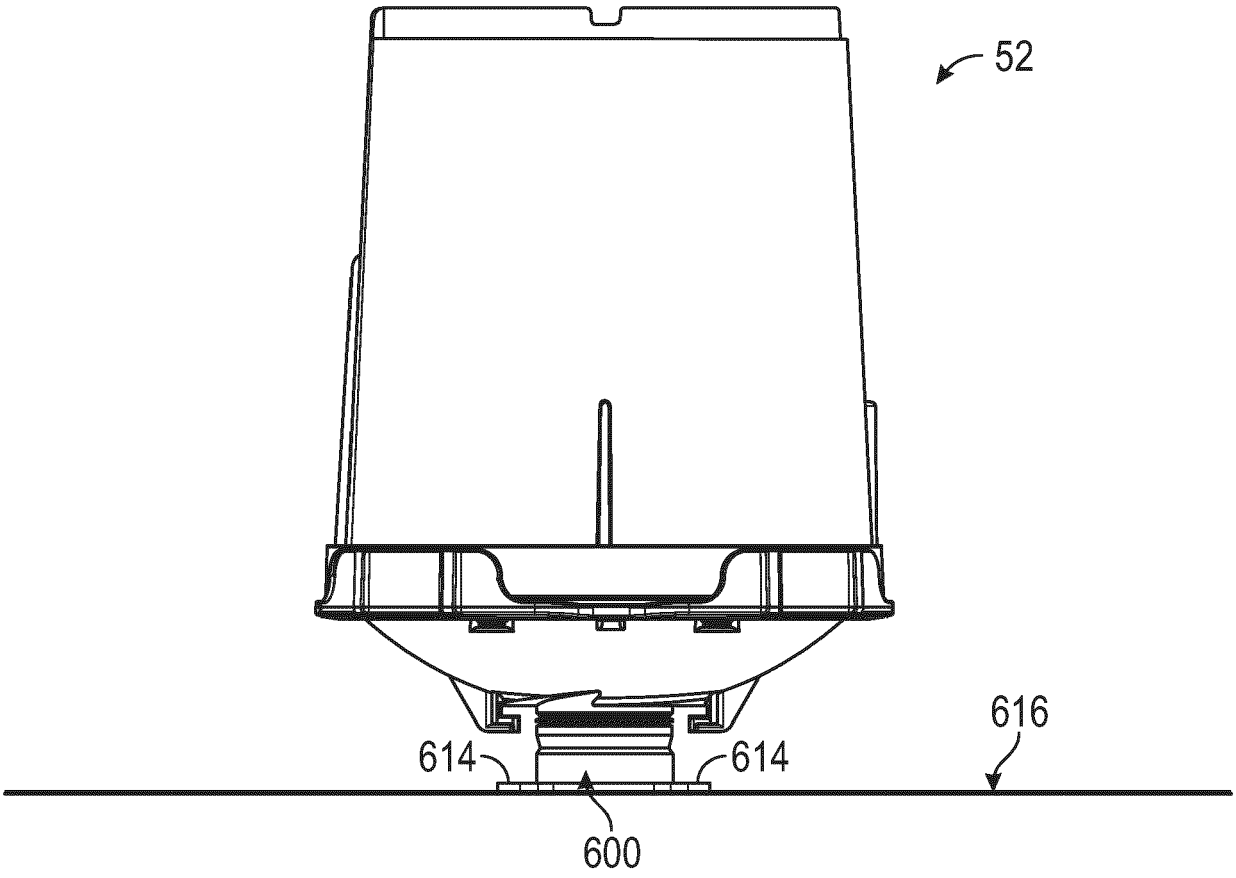

FIG. 26

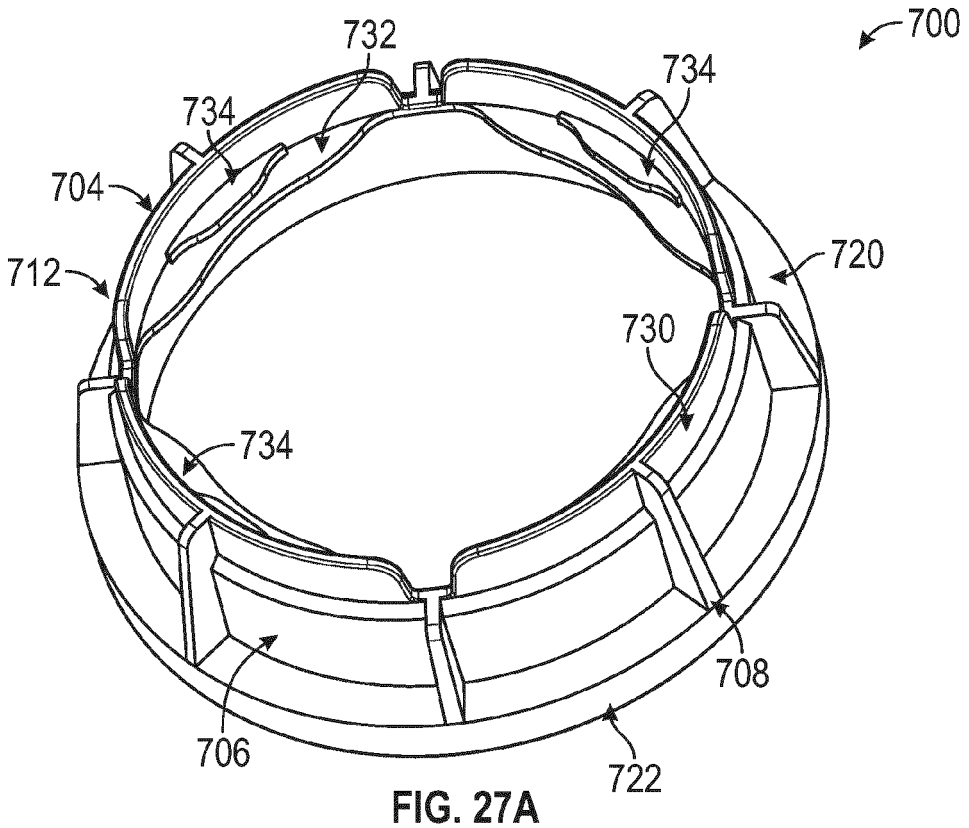

FIG. 27A

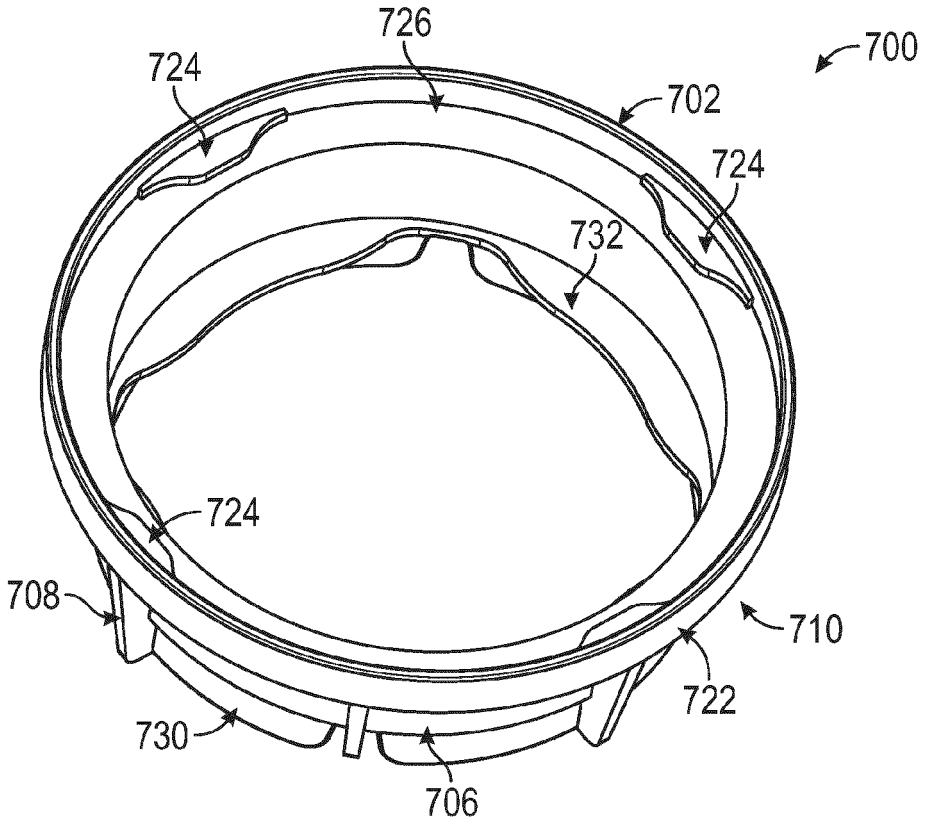

FIG. 27B

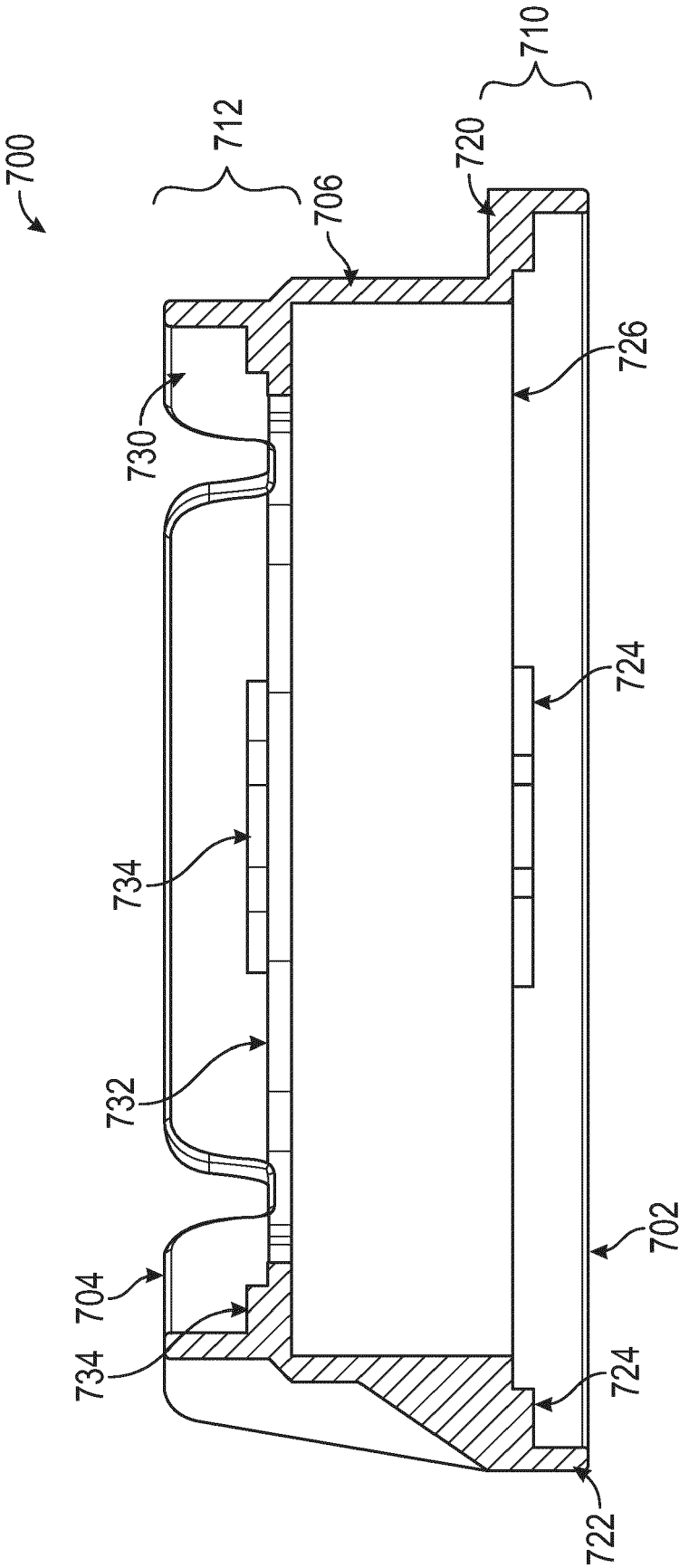

FIG. 28

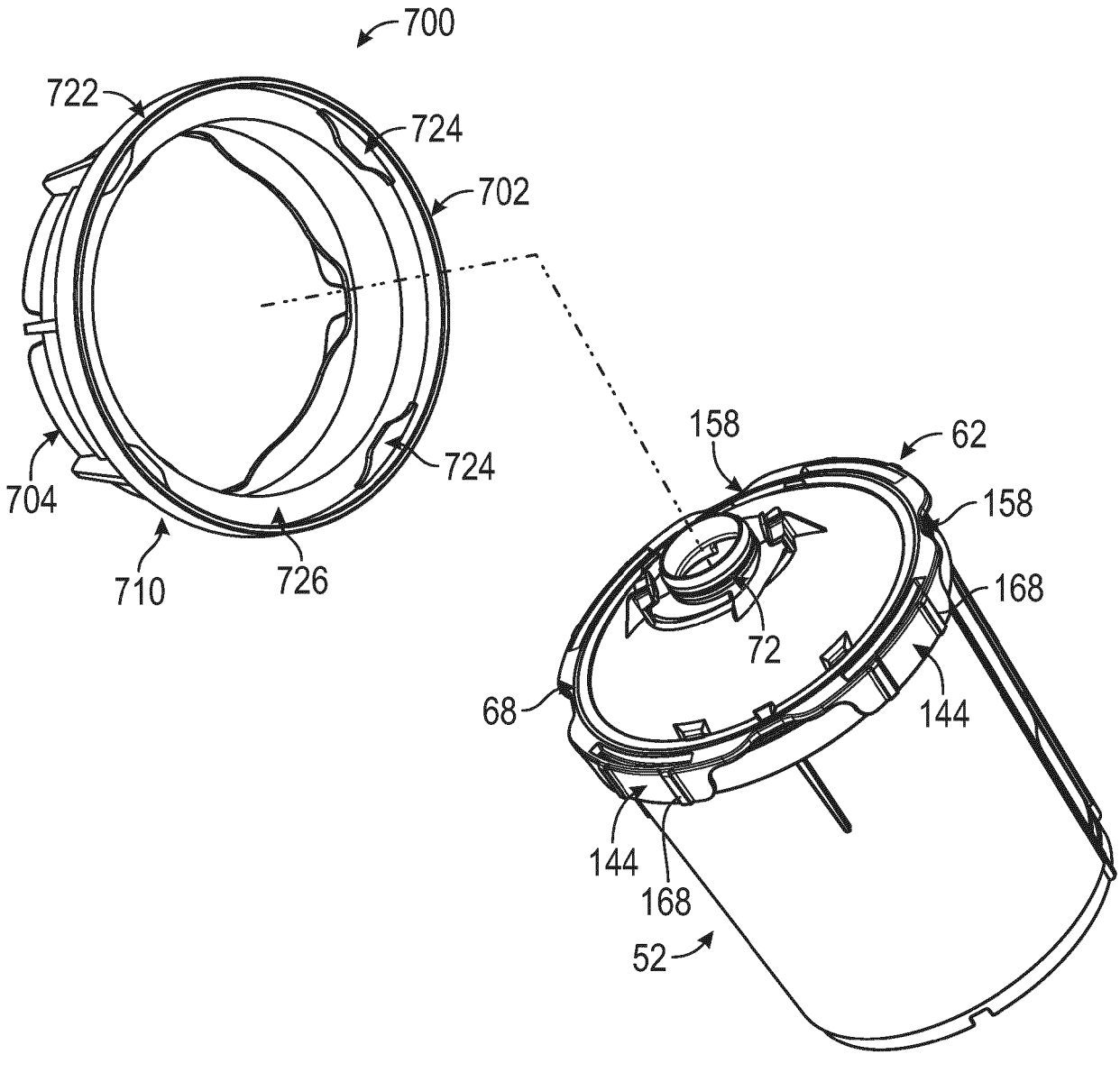
700
722
724
702
704
724
710
726
158
62
158
168
72
68
144
144
168
52

FIG. 29A

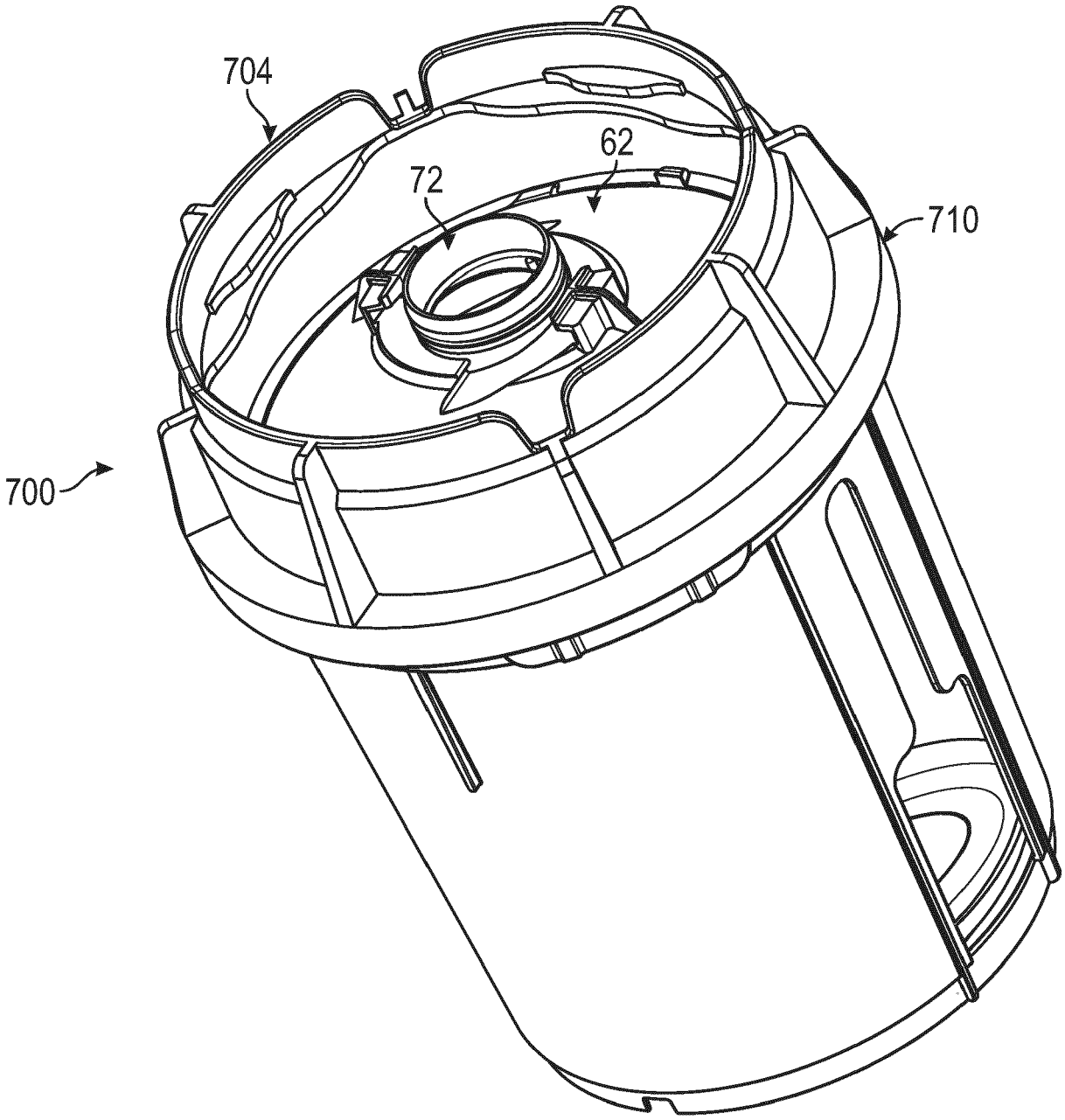

FIG. 29B

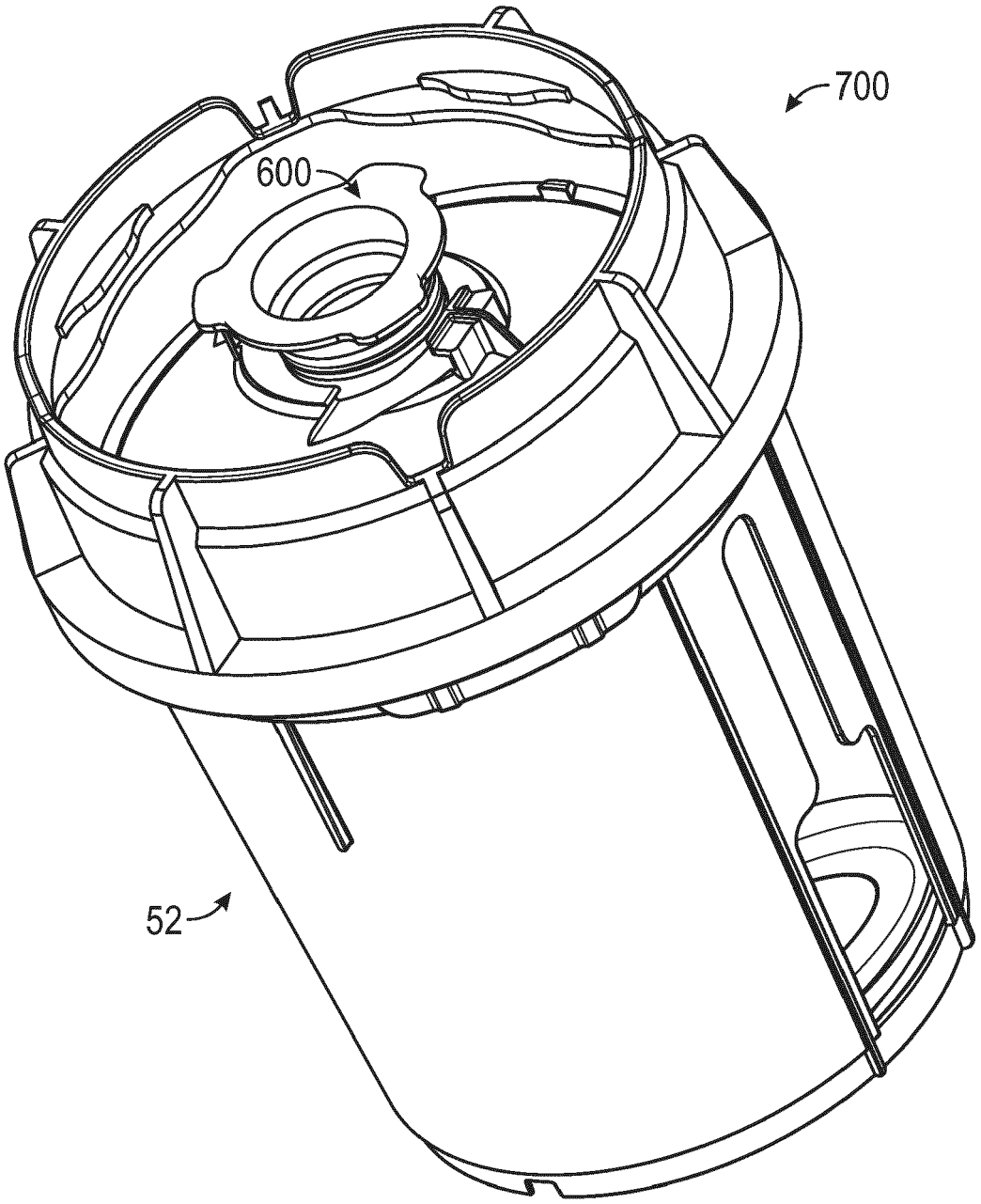

FIG. 29C

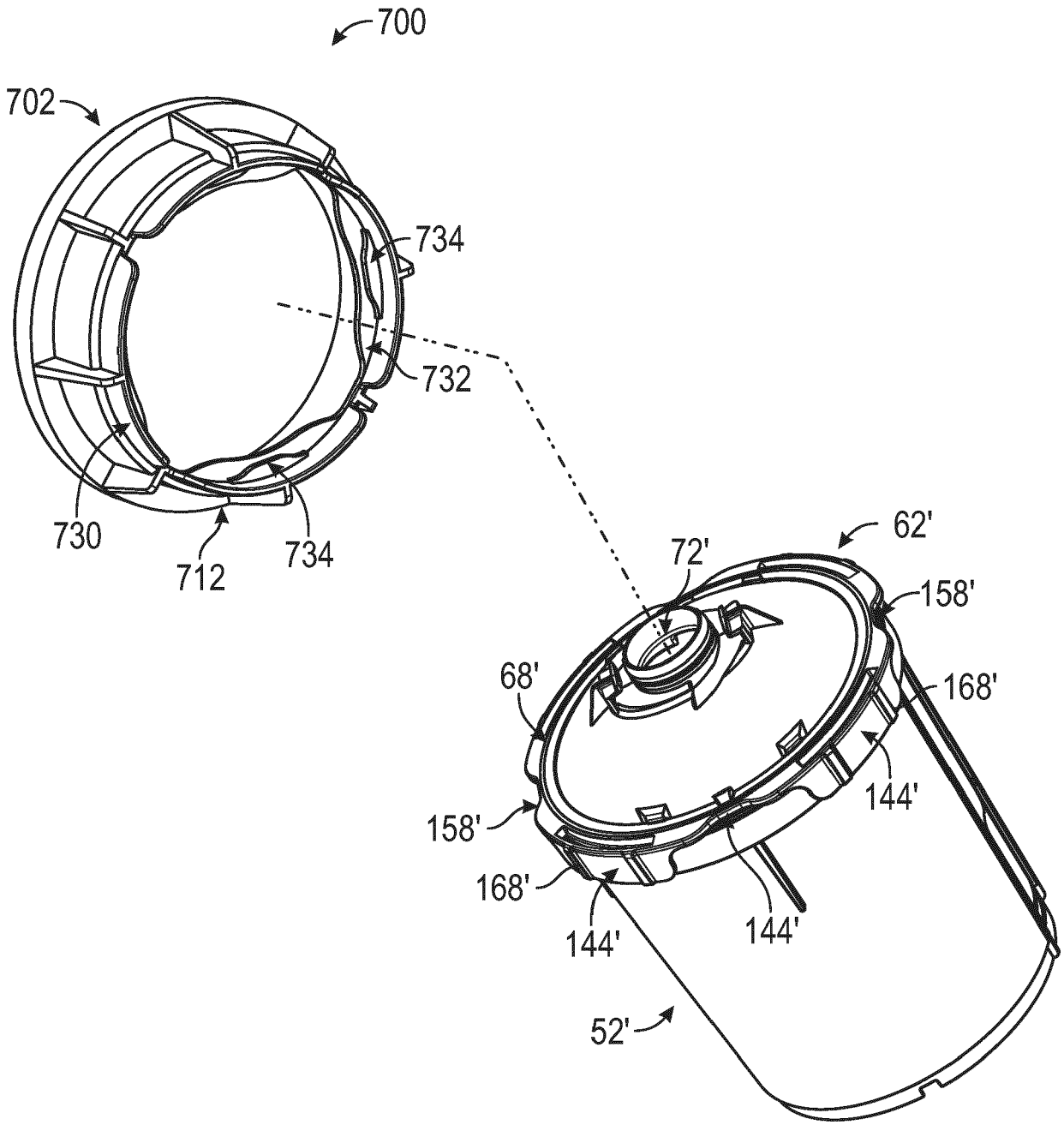
700
702
734
732
730
712
734
62'
72'
158'
68'
168'
144'
158'
168'
144'
144'
52'

FIG. 30A

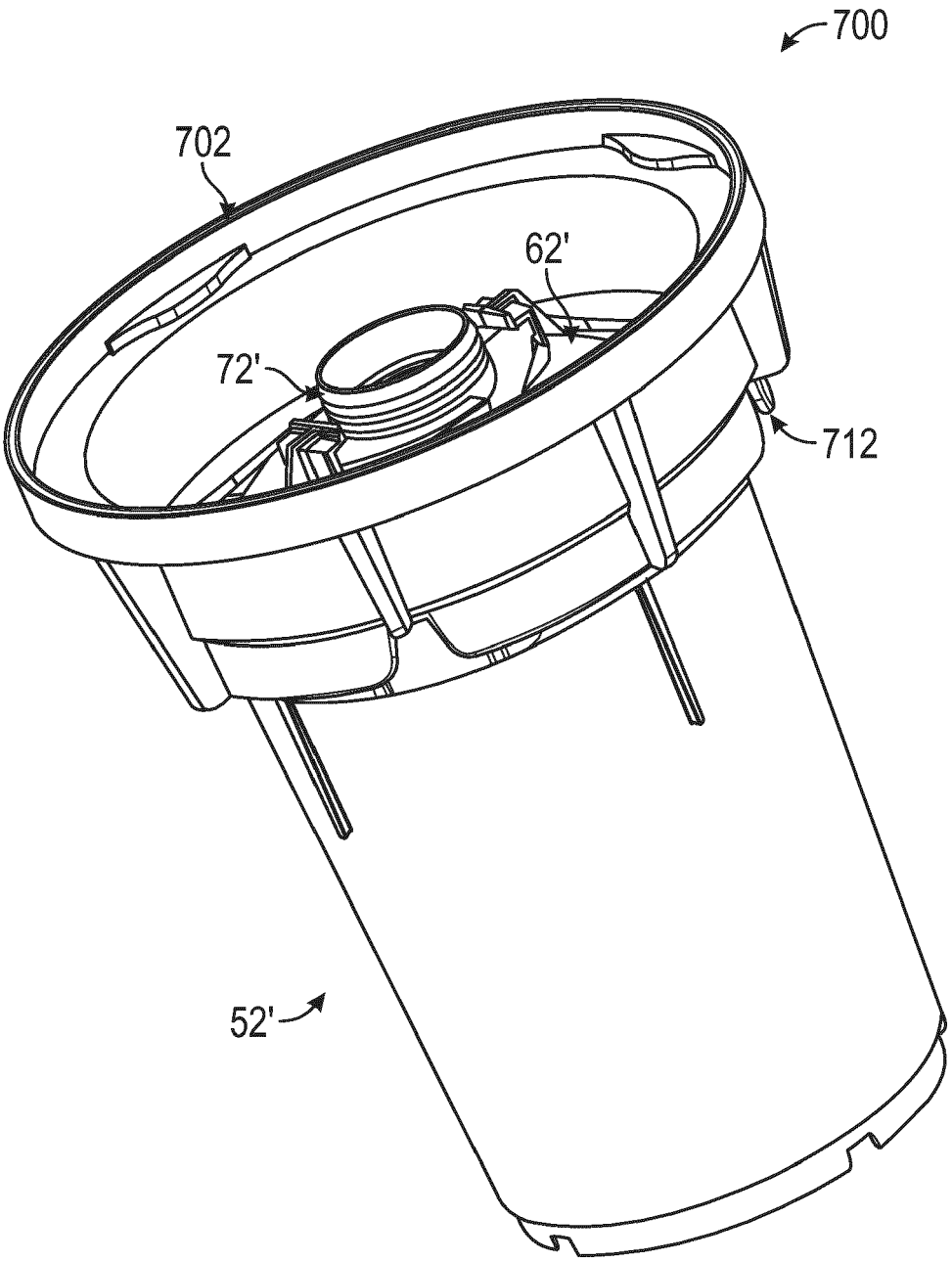

FIG. 30B

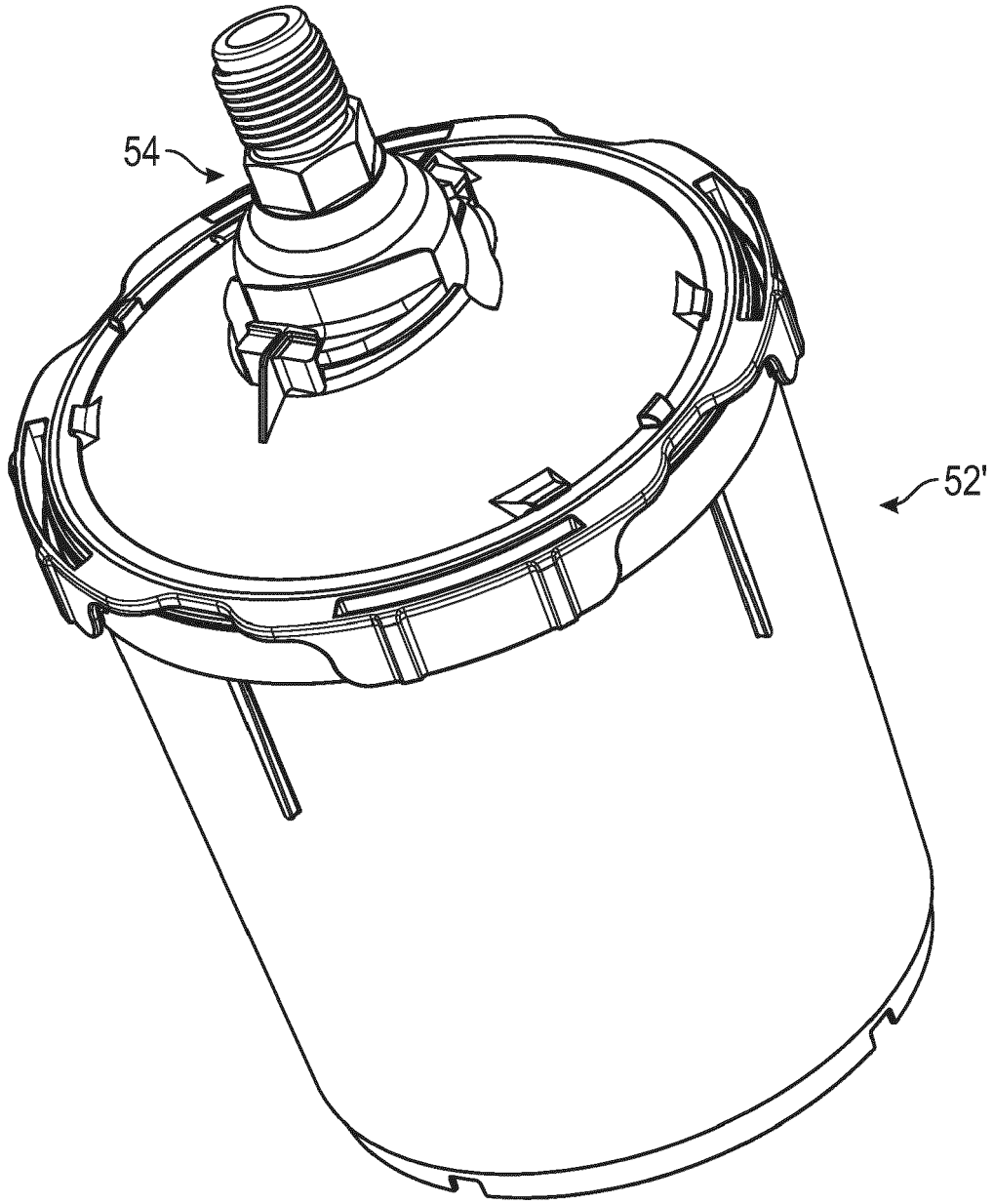

FIG. 31A

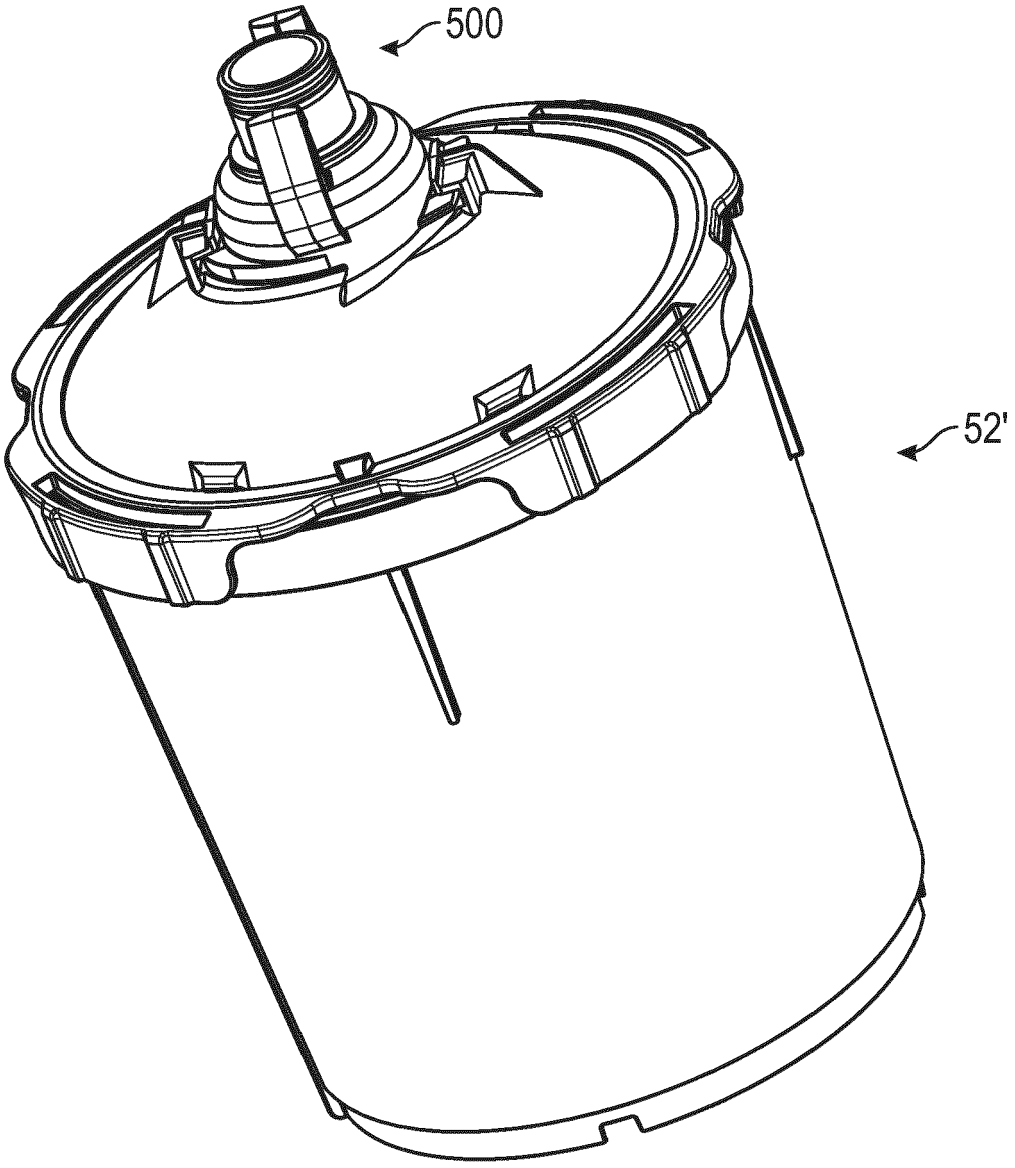

FIG. 31B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2017123709 A **[0084]**