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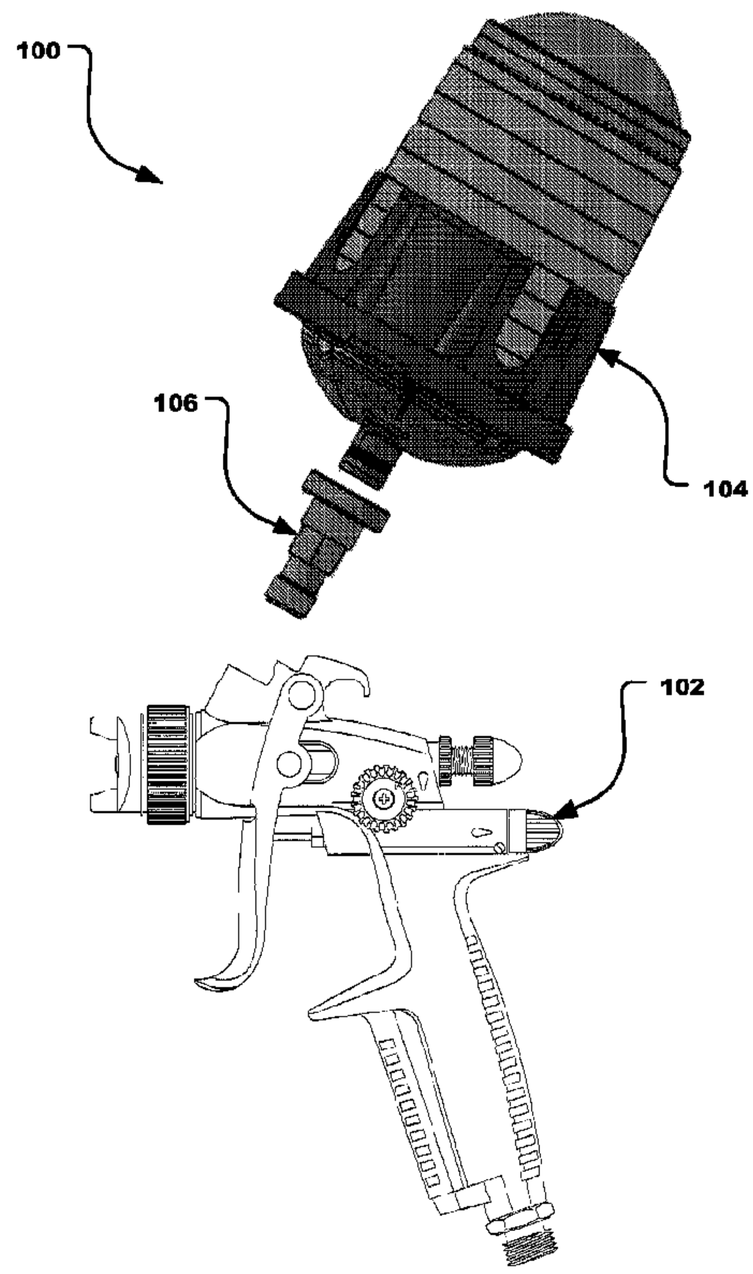

(57) Abrégé/Abstract:
A paint cup assembly for a paint sprayer is disclosed and can include a cap, a paint liner defining a closed proximal end and an open distal end, and a ring configured to fit around the paint liner. The ring can engage the cap and secure the paint liner to the cap. Further, the ring can include an axial extension that can extend toward the proximal end of the paint liner such that the ring can be configured to allow a user to grasp the paint cup assembly without collapsing the paint liner during attachment with a paint sprayer.

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[Continued on next page]

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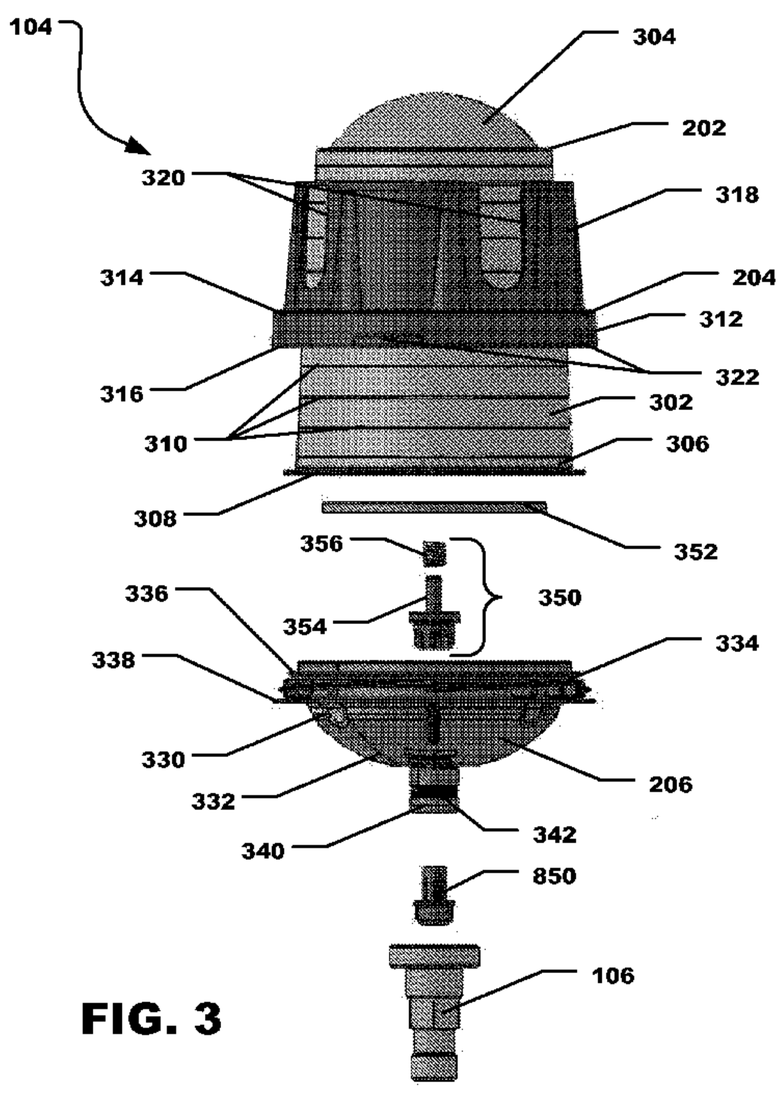

FIG. 3

(57) Abstract: A paint cup assembly for a paint sprayer is disclosed and can include a cap, a paint liner defining a closed proximal end and an open distal end, and a ring configured to fit around the paint liner. The ring can engage the cap and secure the paint liner to the cap. Further, the ring can include an axial extension that can extend toward the proximal end of the paint liner such that the ring can be configured to allow a user to grasp the paint cup assembly without collapsing the paint liner during attachment with a paint sprayer.

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PAINT CUP ASSEMBLY WITH AN EXTENDED RING

FIELD OF THE DISCLOSURE

The present disclosure is directed to a paint cup assembly and to a paint cup assembly having an extended ring to facilitate handling.

BACKGROUND

Spray guns can be used for rapidly coating surfaces with liquids, such as paint. Paint can be contained in a container that attaches to the spray gun. The outlet of the container can be a releasably connectable coupling that connects to the spray gun. Paint can flow from the container into the spray gun and then, fed to a spray nozzle. The spray nozzle can combine the paint with air, atomize the liquid, and form a spray. At the end of the spraying operation, the container and the mating connection to the spray gun should be thoroughly cleaned so that the paint from one operation does not contaminate the paint to be sprayed in the next spraying operation. Additionally, the coupling between container and spray gun should be free of any dried liquid that might interfere with the connection between container and spray gun. A container with a lid and a disposable cup or liner can be used to eliminate or reduce the labor required to clean the container and the coupling to the spray gun.

SUMMARY

In accordance with an aspect of the present disclosure there is a paint cup assembly for a paint sprayer, comprising: a cap; a paint liner defining a closed proximal end and an open distal end, the open distal end having an outwardly projecting rim and the entire closed proximal end having an outwardly rounded bottom, wherein the paint liner is adapted to collapse as a paint is withdrawn, and wherein the paint liner has a height; and a ring configured to fit around the paint liner, wherein: the ring engages the cap and secures the rim of the paint liner to the cap, the ring includes an axial extension extending toward the proximal end of the paint liner such that the ring is configured to allow a user to grasp the paint cup assembly without collapsing the paint liner during attachment with the paint sprayer, the axial extension has a height between about

20% of the height of the paint liner and 75% of the height of the paint liner; and the ring is adapted to support the paint liner while the paint liner is filled with the paint.

In accordance with another aspect of the present disclosure there is provided a paint cup assembly for a paint sprayer, comprising: a cap; a paint liner defining a closed proximal end and an open distal end, the proximal end having an outwardly projecting rim and the entire closed proximal end having an outwardly rounded bottom, wherein the paint liner is adapted to collapse as paint is withdrawn, and wherein the paint liner has a height; and a ring configured to fit around the paint liner, wherein: the ring engages the cap and secures the paint liner to the cap, the ring includes a hub and a skirt extending from the hub toward the proximal end of the paint liner such that the skirt is configured to allow a user to grasp the paint cup assembly without collapsing the paint liner during attachment with a paint sprayer, the skirt has a height between about 20% of the height of the paint liner and 75% of the height of the paint liner, and the ring is adapted to support the paint liner while the paint liner is filled with the paint.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments are illustrated by way of example and are not limited in the accompanying figures.

FIG. 1 includes a plan view of a paint sprayer assembly in accordance with a particular embodiment.

FIG. 2 includes a plan view of a paint cup assembly engaged with an adapter in accordance with a particular embodiment.

FIG. 3 includes an exploded plan view of a paint cup assembly and an adapter in accordance with a particular embodiment.

FIG. 3a includes a detailed cross-sectional view of a paint liner.

FIG. 4 includes a detailed plan view of a first embodiment of a paint cup assembly outlet tube in accordance with a particular embodiment.

FIG. 5 includes a detailed plan view of a second embodiment of a paint cup assembly outlet tube in accordance with a particular embodiment.

FIG. 6 includes a detailed plan view of a third embodiment of a paint cup assembly outlet tube in accordance with a particular embodiment.

FIG. 7 includes a plan view of a valve retainer in accordance with a particular embodiment.

FIG. 8 includes a cross-sectional view of a valve plunger in accordance with a particular embodiment.

FIG. 9 includes a cross-sectional view of a valve actuator in accordance with a particular embodiment.

FIG. 10 includes a cross-sectional view of a first embodiment of an adapter in accordance with a particular embodiment.

FIG. 11 includes a cross-sectional view of a second embodiment of an adapter in accordance with a particular embodiment.

FIG. 12 includes a cross-sectional view of a third embodiment of an adapter in accordance with a particular embodiment.

FIG. 13 includes a cross-sectional view of the paint cup assembly taken along line 13-13 in FIG. 2 in accordance with a particular embodiment.

FIG. 14 includes a detailed plan view of a third embodiment of a paint cup assembly valve assembly in accordance with a particular embodiment.

FIG. 15 includes a perspective view of a paint cup assembly filling station in accordance with a particular embodiment.

FIG. 16 includes a top plan view of a paint cup assembly filling station in accordance with a particular embodiment.

FIG. 17 includes a side plan view of a paint cup assembly filling station in accordance with a particular embodiment.

FIG. 18 includes a first cross-sectional view of a paint cup assembly filling station in accordance with a particular embodiment taken along line 18-18 in FIG. 16.

FIG. 19 includes a second cross-sectional view of a paint cup assembly filling station in accordance with a particular embodiment taken along line 19-19 in FIG. 16.

FIG. 20 includes a first perspective view of a paint cup assembly support stand in accordance with a particular embodiment.

FIG. 21 includes a second perspective view of a paint cup assembly support stand in accordance with a particular embodiment.

Skilled artisans appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures can be exaggerated relative to other elements to help to improve understanding of embodiments of the invention. The use of the same reference symbols in different drawings indicates similar or identical items.

DETAILED DESCRIPTION

The following description in combination with the figures is provided to assist in understanding the teachings disclosed herein. The following discussion will focus on specific implementations and embodiments of the teachings. This focus is provided to assist in describing the teachings and should not be interpreted as a limitation on the scope or applicability of the teachings.

As used herein, the terms “comprises,” “comprising,” “includes, “ “including, “ “has, “ “having,” or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of features is not necessarily limited only to those features but can include other features not expressly listed or other features that are inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, “or” refers to an inclusive-or and not to an exclusive-or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

The use of “a” or “an” is employed to describe elements and components described herein. This is done merely for convenience and to give a general sense of the scope of the embodiments of the disclosure. This description should be read to include one or at least one

and the singular also includes the plural, or vice versa, unless it is clear that it is meant otherwise.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. The materials, methods, and examples are illustrative only and not intended to be limiting.

Referring initially to FIG. 1, a paint sprayer assembly is illustrated and is generally designated 100. As illustrated, the paint sprayer assembly 100 includes a paint spray gun 102 and a paint cup assembly 104 that can be removably engaged with the paint spray gun 102 via an adapter 106. In a particular aspect, the adapter 106 can be threadably engaged with the paint spray gun 102 and the paint cup assembly 104 can be inserted into the adapter 104. Further, during operation of the paint spray gun 102, the paint cup assembly 104 can be in fluid communication with the paint spray gun 102. Specifically, the paint cup assembly 104 can deliver paint to the paint spray gun 102 and the paint spray gun 102 can be used to transmit the fluid, e.g., paint, to a substrate, e.g., a car body.

FIG. 2 through FIG. 9 illustrate details concerning the paint cup assembly 104 that is depicted in FIG. 1 in conjunction with the paint spray gun 102. Specifically, FIG. 2 and FIG. 3 include details concerning the paint cup assembly 104 in its entirety and FIG. 4 through FIG. 9 illustrate details concerning various component parts of the paint cup assembly 104.

As indicated in FIG. 2 and FIG. 3, the paint cup assembly 104 can include a paint reservoir, e.g., a paint liner 202. The paint cup assembly 104 can also include an extended ring 204 that can at least partially surround the paint liner 202. In a particular aspect, the extended ring 204 can include an axial extension, e.g., a skirt, that can extend toward a closed proximal end of the paint liner such that the ring can be configured to allow a user to grasp the paint cup assembly without collapsing the paint liner during attachment with a paint sprayer. As illustrated, the paint cup assembly 104 can include a cap 206 that can be threadably engaged with the extended ring 204. As described in detail below, the cap 206 can engage the adapter 106 in order for the paint cup assembly 104 to be attached to a spray gun (not illustrated).

FIG. 3 indicates that the paint liner 202 can include a hollow body 302 that defines a proximal end 304 and a distal end 306. The hollow body 302 can be generally frustoconical. The proximal end 304 of the hollow body 302 can be closed. Further, the proximal end 304 of the hollow body 302 can be rounded. The distal end 306 of the hollow body 302 can be open

and can facilitate filling the paint liner 202 with paint, as described in detail below. The hollow body 302 can also include a rim 308 that circumscribes the distal end 306 of the hollow body 302. When the extended ring 204 is engaged with the cap 206, the rim 308 of the paint liner 202 can be captured, or otherwise trapped, between the extended ring 204 and the cap 206.

In a particular aspect, the paint liner 202, including the hollow body 302, can be transparent. In another aspect, the paint liner 202, including the hollow body 302, can be translucent. In still another aspect, the paint liner 202, including the hollow body 302, can be opaque. In still another aspect, portions of the paint liner 202 can be opaque and other portions can be transparent, translucent, or a combination thereof. For example, the paint liner 202 can substantially opaque with one or more transparent strips to facilitate measuring while filling the paint liner 202 with paint.

In a particular aspect, the paint liner 202 can be disposable. Further, in a particular aspect, the paint liner 202 can be collapsible. Specifically, the paint liner 202 can be collapsible as paint is withdrawn from within the paint liner 202. Also, in a particular aspect, the paint liner 202 can be constructed from low density polyethylene (LDPE).

As illustrated in FIG. 3, the paint liner 202 can include a plurality of indicia 310 spaced along the length of the hollow body 302 of the paint liner 202. Each of the indicia can be space along the length of the hollow body 302. Each of the indicia 310 can represent an incremental change in an internal volume of the paint liner. In a particular aspect, the plurality of indicia 310 can be lines that are printed, or otherwise disposed, on an exterior surface of the body 302. In another aspect, the plurality of indicia 310 can be printed, or otherwise disposed, on an interior surface of the body 302. In still another aspect, the plurality of indicia 310 can be printed, or otherwise disposed, on an interior surface of the body 302 and on an exterior surface of the body 302. The indicia 310 can partially circumscribe the body 302. Alternatively, the indicia 310 can fully circumscribe the body 302.

It can be appreciated that the volume between adjacent indicia can be the same. Further, it can be appreciated that due to the tapered shape of the body 302 the spacing of the indicia along the body can vary.

In a particular aspect, each of the plurality of indicia 310 can be a raised rib extending from the body. Each of the ribs can extend internally into the body. Conversely, each of the ribs can extend externally, or outwardly, from the body.

In another aspect, each of the indicia 310 can serve as a crush zone to facilitate collapsing of the paint liner 202 as paint is expressed from the paint liner 202 during a spraying operation. As illustrated in FIG. 3a, the body 302 of the paint liner 202 can have a body wall thickness, t_{BW}, and each of the indicia 310 can have an indicia wall thickness, t_{IW}, and the indicia wall thickness can be less than the body wall thickness.

In a particular aspect, the indicia wall thickness can be less than or equal to ninety percent (90%) of the body wall thickness. In another aspect, the indicia wall thickness can be less than or equal to eighty-five percent (85%) of the body wall thickness. In yet another aspect, the indicia wall thickness can be less than or equal to eighty percent (80%) of the body wall thickness. In still another aspect, the indicia wall thickness can be less than or equal to seventy-five percent (75%) of the body wall thickness. In another aspect, the indicia wall thickness can be less than or equal to seventy percent (70%) of the body wall thickness. In still yet another aspect, the indicia wall thickness can be less than or equal to sixty-five percent (65%) of the body wall thickness. In yet another aspect, the indicia wall thickness can be less than or equal to sixty percent (60%) of the body wall thickness.

In another aspect, the indicia wall thickness can be less than or equal to fifty-five percent (55%) of the body wall thickness. In still another aspect, the indicia wall thickness can be less than or equal to fifty percent (50%) of the body wall thickness. In another aspect, the indicia wall thickness can be less than or equal to forty-five percent (45%) of the body wall thickness. In another aspect, the indicia wall thickness can be less than or equal to forty percent (40%) of the body wall thickness. In yet another aspect, the indicia wall thickness can be less than or equal to thirty-five percent (35%) of the body wall thickness. Further, in another aspect, the indicia wall thickness can be less than or equal to thirty percent (30%) of the body wall thickness. In still another aspect, the indicia wall thickness can be less than or equal to twenty-five percent (25%) of the body wall thickness. In another aspect, the indicia wall thickness may not be less than twenty percent (20%) of the body wall thickness. Further, the indicia wall thickness can be within a range between and including any of the percentage of body wall thickness values described herein.

Returning to FIG. 3, the extended ring 204 can include a hub 312 having a proximal end 314 and a distal end 316. As illustrated, a skirt 318 can extend longitudinally from the proximal end 314 of the hub 312. The skirt 318 can be formed with a plurality of slots 320. The slots 320 can allow a user to see the indicia 310 on the paint liner 202 while filling the paint liner 202 with paint.

FIG. 3 indicates that the distal end 316 of the hub 312 can be formed with a plurality of teeth 322 that extend radially outward from the hub 312. Accordingly, when viewed from the distal end 316, the hub 312 of the extended ring 204 can have a gear, or cog, shape. This gear, or cog, shape can be configured to key the paint cup assembly 104 to a filling station, described in detail below, during filling. Specifically, the gear shape can be configured to fit into a correspondingly shaped hole formed in a filling station in order to prevent the paint cup assembly 104 from rotating within the hole as the extended ring 204 is engaged with the cap 206.

The hub 312 can include an interior surface (not illustrated) that can be formed with a plurality of internal threads. As such, the hub 312, and the extended ring 204, can be configured to threadably engage the cap 206. When assembled, as illustrated in FIG. 2, the skirt 318 of the extended ring 204 can at least partially surround the paint liner 202. Further, the skirt 318 can extend at least partially along the length of the paint liner 202. In a particular aspect, the skirt 318 can be substantially rigid and the skirt 318 can be configured to be grasped without collapsing the skirt 318 and subsequently, collapsing the paint liner 202. Particularly, the extended ring 204 can be constructed from twenty percent (20%) talc filled polypropylene.

In a particular aspect, the paint liner 202 includes a height, H_{PL}, measured from the closed end of the paint liner 202 to the open end of the paint liner 202, and the skirt 318 has a height, H_S, measured from the hub 312 to the end of the skirt 318. In a particular aspect, H_S can be less than H_{PL}. For example, H_S can be less than or equal to 75% H_{PL}, such as less than or equal to 70% H_{PL}, less than or equal to 65% H_{PL}, less than or equal to 60% H_{PL}, less than or equal to 55% H_{PL}, or less than or equal to 50% H_{PL}. In another aspect, H_S can be greater than or equal to 10% H_{PL}, such as greater than or equal to 15% H_{PL}, greater than or equal to 20% H_{PL}, or greater than or equal to 25% H_{PL}. H_S can also be within a range between and including any of the percentage of H_{PL} values above.

In another aspect, the skirt 318 is generally frustoconical in shape and includes an interior space define by an inner wall of the skirt 318. The interior space of the skirt 318 is also generally frustoconical in shape and an inner diameter of the skirt 318 varies along the skirt 318 from the top of the skirt 318 (near to the hub) to the bottom of the skirt 318 (the free end of the skirt). In particular, the inner diameter of the skirt 318 decreases from the top of the skirt 318 to the bottom of the skirt 318. As such, an inner diameter of the skirt 318 at the top skirt 318, ID_T, is greater than an inner diameter of the skirt 318 at the bottom of the skirt 318, ID_B.

For example, ID_B can be less than or equal to 97% ID_T, such as less than or equal to 96% ID_T, less than or equal to 95% ID_T, less than or equal to 94% ID_T, less than or equal to 93% ID_T, or less than or equal to 92% ID_T. Further, ID_B can be greater than or equal to 75% ID_T, such as greater than or equal to 80% ID_T, or greater than or equal to 85% ID_T. ID_B can also be within a range between and including any of the percentage of ID_T values above.

In yet another aspect, the skirt 318 is sized and shaped to fit over the paint liner 202. As such, the interior of the skirt 318 can be larger than the exterior of the body 302 of the paint liner 202. In particular, at any point along the skirt 318 the inner diameter, ID_S, of the skirt 318 can be greater than the outer diameter, OD_B, of the body 302 of the paint liner 202 measured at the same point as the inner diameter of skirt 318 is measured, e.g., along the same line as the inner diameter. In particular, at any location, ID_S can be greater than or equal to OD_B. For example, ID_S can be greater than 101% OD_B, such as greater than 102% OD_B, greater than 103% OD_B, greater than 104% OD_B, or greater than 105% OD_B. In another aspect, ID_S can be less than or equal to 110% OD_B, less than or equal to 109% OD_B, less than or equal to 108% OD_B, or less than 107% OD_B. ID_S can also be within a range between and including any of the percentage of OD_B values described above.

In another aspect, each slot 320 can have a height, H_{SL}, and H_{SL} can be less than the height of the skirt, H_S. For example, H_{SL} can be less than 95% H_{SL}, such as less than 90% H_{SL}, or less than 85% H_{SL}. Additionally, H_{SL} can be greater than 50% H_{SL}, greater than 55% H_{SL}, greater than 60% H_{SL}, greater than 65% H_{SL}, greater than 70% H_{SL}, greater than 75% H_{SL}, or greater than 80% H_{SL}. H_{SL} can also be within a range between and including and of the percentage of H_{SL} values described herein.

As further illustrated in FIG. 3, the cap 206 of the paint cup assembly 104 can include generally hemispherical hollow body 329 having a proximal end 330 and a distal end 332. The proximal end 330 of the cap 206 can be formed with a plurality of external threads 334 that are configured to engage the internal threads (not illustrated) formed in the hub 312 of the extended ring 204. The cap 206 can also include a primary sealing structure 336 and a secondary sealing structure 338. The cap 206 can also include an external rim 339 having an external diameter. The primary sealing structure 336 can be located at a distance from the external rim 339 and the secondary sealing structure 338 can be located between the primary sealing structure 336 and the external rim 339.

During use, the extended ring 204 can be threaded onto the cap 206 and the rim 308 of the paint liner 202 can be sandwiched between the extended ring 204 and the cap 206. A primary seal can be established between the rim 308 of the paint liner 202 and the primary sealing structure 336 on the cap 206. The primary seal can substantially prevent fluid from leaking through the interface established by the paint liner 202 and the cap 206. A secondary seal can be established between secondary sealing structure 338 on the cap 206 and the hub 312 of the extended ring 204. The secondary seal can substantially prevent fluid from leaking through the interface established by the cap 206 and the extended ring 204.

Accordingly, when the paint cup assembly 104 is filled with fluid and assembled as illustrated in FIG. 1, the paint cup assembly 104 can be shaken to stir, or otherwise mix, the fluid within the paint cup assembly 104.

As illustrated in FIG. 3, the cap 206 can include an outlet tube 340 that can extend from the distal end 332 of the cap 206. Specifically, the outlet tube 340 can extend from the center of the distal end 332 of the cap 206. The outlet tube 340 can be configured to be removably engaged with the adapter 106. For example, as depicted in FIG.3, the outlet tube 340 can be formed with external threads 342.

Alternatively, as illustrated in FIG. 4, the outlet tube 340 can be formed within one or more locking pins 400 that can extend radially outward from the outlet tube 340. The locking pins 400 can be configured to engage one or more grooves, or slots, formed within the adapter 106. Examples of grooves or slots formed within the adapter 106 are described below in conjunction with FIG. 10 and FIG. 11.

In another aspect, the outlet tube 340 can be formed with one or more grooves configured to engage one or more locking pins within the adapter. FIG. 5 illustrates one such groove, generally designated 500. As such, the groove 500 can include a generally helical portion 502 that extends to a relatively straight portion 504. The relatively straight portion 504 can be substantially parallel to the end face of the outlet tube 340. To install the paint cup assembly 104 (FIG. 3) within the adapter 106 (FIG. 3), the outlet tube 340 can be inserted into the adapter 106 (FIG. 3) such that the groove 500, or grooves, fit over corresponding locking pins. Thereafter, the paint cup assembly 104 (FIG. 3) can be rotated in order to move the groove 500, or grooves, over the locking pins until the paint cup assembly 104 (FIG. 3) is essentially locked in placed within the adapter 106 (FIG. 3).

It can be appreciated that a spring in a valve assembly, described below, can provide a biasing force to facilitate locking the paint cup assembly 104 (FIG. 3) within the adapter 106 (FIG. 3). Further, it can be appreciated that the relatively straight portion 504 can be slightly angled with respect to the end face of the outlet tube 340 in order to provide a ramped structure to further facilitate locking the paint cup assembly 104 (FIG. 3) within the adapter 106 (FIG. 3). For example, the relatively straight portion 504 can be angled in a range of one degree to twenty degrees (1°-20°) relative to a line parallel to the end face of the outlet tube 340. Additionally, the relatively straight portion 504 can terminate in a notch 506, or divot. A locking pin can move into the notch 506 and can further secure attachment of the paint cup assembly 104 (FIG. 3) to the adapter (FIG. 3).

FIG. 6 illustrates another groove, generally designated 600. As illustrated, the groove 600 can include a vertical portion 602 that can be substantially perpendicular to the end face of the outlet tube 304. The vertical portion 602 leads to a first angled portion 604 that can be angled away from the end face of the outlet tube 304, e.g., in a range of one degree to twenty degrees (1°-20°). The first portion 604 can be angled with respect to a line parallel to the end face of the outlet tube 304. A second angled portion 606 extends from the first angled portion 604 in the opposite direction as the first angled portion 604, i.e., toward the end face of the outlet tube 304. The second angled portion 606 can be angled in a range of one degree to twenty degrees (1°-20°). The second angled portion 606 can be angled with respect to a line parallel to the end face of the outlet tube 304.

In a particular aspect, the cap 206 can be constructed from polypropylene (PP).

Returning to FIG. 3, the paint cup assembly 104 can also include a valve assembly 350. The valve assembly 350 can be installed within the cap 206. Specifically, the valve assembly 350 can be installed within the cap 206 between the outlet tube 340 and a valve retainer 352. The valve assembly 350 can include a plunger 354 and a spring 356. In another aspect, the valve assembly 350 can include a ball (not illustrated) in lieu of a plunger.

In a particular aspect, the plunger 354 can be constructed from a thermoplastic elastomer (TPE). Further, the spring 365 can be a conical compression spring made from stainless steel.

As illustrated in FIG. 7, the valve retainer 352 include a generally disk shaped frame 700. The frame 700 of the valve retainer 352 can be formed with a central opening 702 through which a portion of the plunger 354 can extend through after installation and during operation of

the valve assembly 350, as described below. FIG. 7 depicts that the frame 700 of valve retainer 352 can include one or more windows 704, or openings, formed therein. A filter material 706, e.g., a mesh type material, can be disposed within each window 704. In a particular aspect, the frame 700 can include an upper portion and a lower portion and the filter material 706 can be sandwiched there between. In another aspect, the frame 700 can be a single piece and formed with the windows 704 and the filter material 706 can be welded to an upper surface or lower surface of the frame 700.

In a particular aspect, the frame 700 of the valve retainer 352 can be constructed from polypropylene. Further, the filter material 706 can be a mesh type material suitable for filtering a fluid such as paint.

As illustrated in FIG. 8, the plunger 354 can include a shaft 800 that can include a proximal end 802 and a distal end 804. A head 806 can extend from the distal end 804 of the shaft 800. The head 806 of the plunger 354 can include a proximal end 808 and a distal end 810. A sealing collar 812 can extend radially from the proximal end 808 of the head 806. The sealing collar 812 can be formed with a sealing face 814. The sealing face 814 of the sealing collar 812 can be configured to engage a valve seat, described below, formed in the outlet tube 340 (FIG. 3) of the cap 206 (FIG. 3). When the sealing face 814 engages the valve seat, flow through the outlet tube 340 (FIG. 3) can be substantially blocked and the paint cup assembly 104 (FIG. 3) can be sealed.

FIG. 8 depicts that the head 806 of the plunger 354 can be formed with one or more flutes 816. The flutes 816 can facilitate fluid flow through the paint cup assembly 104 (FIG. 3) when the sealing face 814 is disengaged from the valve seat.

Returning to FIG. 3, the paint cup assembly 104 can further include the adapter 106. A valve actuator 850 can be installed within the adapter 106. FIG. 9 illustrates further details concerning the valve actuator 850 and FIG. 10 illustrates further details regarding the adapter 106.

As illustrated in FIG. 9, the valve actuator 850 can include a generally cylindrical, base 900. A generally cylindrical, hollow post 902 can extend from the base 900. As illustrated, the base 900 can be formed with a central bore 904. Further, the post 902 can be formed with one or more slots 906, or openings. The slots 906 are configured to allow fluid, e.g., paint, to flow through the post 902 and the base 900 when the valve assembly 350 (FIG. 3) is in the open

configuration. In a particular embodiment, the post 902 can be configured to engage the plunger 354 (FIG. 3, FIG. 8) and move the plunger 354 linearly in order to disengage the sealing face 814 (FIG. 8) of the plunger 354 (FIG. 8) from the valve seat, described in detail below in conjunction with FIG. 13.

In a particular aspect, the valve actuator 850 can be constructed from nylon.

FIG. 10 depicts details concerning the construction of the adapter 106. As illustrated, the adapter 106 can include an adapter body 1000 that can define a proximal end 1002 and a distal end 1004. Further, the adapter 106 can include an internal bore 1006 along the length of the adapter body 1000. The internal bore 1006 can include a first bore portion 1008 that can extend from the proximal end 1002 of the adapter body 1000 toward the distal end 1004 of the adapter body 1002. Further, the internal bore 1006 can include a second bore portion 1010 that can extend from the first bore portion 1008 toward the distal end 1004 of the adapter body 1002. A third bore portion 1012 can extend from the second bore portion 1010 and terminate at the distal end 1004 of the adapter body 1002.

In a particular aspect, the base 900 (FIG. 9) of the valve actuator 354 (FIG. 3) can be sized and shaped to fit into the second bore portion 1010 of the internal bore 1006 formed in the adapter body 1000. Moreover, the base 900 (FIG. 9) of the valve actuator 354 (FIG. 3) can be press fitted into the second bore portion 1010.

As illustrated in FIG. 10, the first bore portion 1008 can be formed with one or more grooves 1016 that can be configured to engage one or more locking pins 400 (FIG. 4) that extend radially outward from the outlet tube 340 (FIG. 4) of the cap 206 (FIG. 3). The groove 1016 can include a generally helical portion 1018 that can extend to a relatively straight portion 1020. The relatively straight portion 1020 can be substantially parallel to the end face of the adapter 106. To install the paint cup assembly 104 (FIG. 3) within the adapter 106 (FIG. 3), the outlet tube 340 (FIG. 3) can be inserted into the adapter 106 (FIG. 3) such that the locking pins 400 (FIG. 4) fit into corresponding grooves 1016. Thereafter, the paint cup assembly 104 (FIG. 3) can be rotated in order to move the locking pins 400 (FIG. 4) within the grooves 1016 until the paint cup assembly 104 (FIG. 3) is essentially locked in placed within the adapter 106 (FIG. 3).

It can be appreciated that the relatively straight portion 1020 can be slightly angled toward to the end face of the adapter 106 in order to provide a ramped structure to further

facilitate locking the paint cup assembly 104 (FIG. 3) within the adapter 106 (FIG. 3). For example, the relatively straight portion 1020 can be angled in a range of one degree to twenty degrees (1°-20°) relative to a line parallel to the end face of the adapter 106. Additionally, the relatively straight portion 1020 can terminate in a notch 1022, or divot. A locking pin can move into the notch 1022 and can further secure attachment of the paint cup assembly 104 (FIG. 3) to the adapter 106 (FIG. 3).

FIG. 11 illustrates another groove, generally designated 1100, that can be formed in the adapter 106. As illustrated, the groove 1100 can include a vertical portion 1102 that can be substantially perpendicular to the end face of the adapter 106. The vertical portion 1102 leads to a first angled portion 1104 that can be angled away from the end face of the adapter 106, e.g., in a range of one degree to twenty degrees (1°-20°). The first portion 1104 can be angled with respect to a line parallel to the end face of the adapter 106. A second angled portion 1106 can extend from the first angled portion 1104 in the opposite direction as the first angled portion 1104, i.e., toward the end face of the adapter 106. The second angled portion 1106 can be angled in a range of one degree to twenty degrees (1°-20°). The second angled portion 1106 can be angled with respect to a line parallel to the end face of the adapter 106.

As illustrated in FIG. 12, in an alternative embodiment, the adapter 106 can be formed within one or more locking pins 1200 that can extend radially inward from the adapter body 1000. For example, the locking pins 1200 can extend radially inward from the wall of the first bore portion 1008 of the internal bore 1006 formed in the adapter body 1000. In a particular aspect, the locking pins 1200 can be configured to engage one or more grooves, or slots, formed within the outlet tube 340 of the cap 206.

In a particular aspect, the adapter 106 can be constructed from a metal, such as aluminum.

Referring now to FIG. 13, a detailed view of the paint cup assembly 104 is illustrated. FIG. 13 depicts the outlet tube 340 of the cap 206 inserted into the first bore portion 1008 of the internal bore 1006 formed in the adapter 106. As the outlet tube 340 is inserted into the adapter 106, the valve actuator 850 within the adapter 106 can engage the plunger 354 of the valve assembly 350. Specifically, the post 902 of the valve actuator 850 can contact and engage the head 806 of the plunger 354.

The post 902 of the valve actuator 850 can cause the plunger 354 to move linearly into the cap 206 and through the valve retainer 352, e.g., through the central opening 702 of the valve retainer 352. As the plunger 354 moves as described, the spring 356 can be compressed between the valve retainer 352 and the head 806 of the plunger 354. Further, as the plunger 354 moves into the cap 206, the sealing face 814 formed on the sealing collar 812 of the head 806 can be unseated, or otherwise disengaged, from a valve seat 1300 formed within the cap 206 at the base of the outlet tube 340.

As the sealing face 814 of the head 806 is unseated from the valve seat 1300 of the outlet tube 340, fluid, e.g., paint, can flow from the paint liner 202 through the cap 206 and out of the outlet tube 340. The fluid can then flow through the valve actuator 850 and through the adapter 106 into a paint sprayer. As the fluid flows through the cap 206, the filter material 706 (FIG. 7) disposed within the valve retainer 352 can filter the fluid, e.g., to remove any dirt, dust, or other particles.

Accordingly, as illustrated in FIG. 13, the valve assembly 350 can be configured to be operable from a closed configuration in which fluid flow through the outlet tube 340 can be prevented to an open configuration in which fluid flow through the outlet tube 340 can be permitted upon engagement with a paint sprayer. In particular, the open configuration can be achieved automatically during engagement of the paint cup assembly 104 with the adapter 106 or paint sprayer (not illustrated). Further, it can be appreciated that the engagement can be achieved by reducing a distance between the paint cup assembly and the adapter 106 or paint sprayer (not illustrated). Further, in a particular embodiment, engagement can include an interference fi. In another aspect, engagement can include a threaded engagement.

Referring to FIG. 14, a third embodiment of a valve assembly is illustrated and is designated 1400. As illustrated, the valve assembly 1400 can include a membrane 1402 disposed within an outlet tube 1404 of a cap (not illustrated). In particular aspect, the membrane 1402 can be self-sealing when a trocar is removed therefrom.

The valve assembly 1400 can further include a trocar 1406 or a similarly configured needle or piercing hollow shaft. The trocar 1406 can be disposed within an internal bore 1408 of an adapter 1410. The trocar 1406 can be supported by one or more support structures 1412 that extend radially from a base of the trocar 1406 to the wall of the internal bore 1408.

As a paint cup assembly (not illustrated) is engaged with the adapter 1410, the outlet tube 1404 of the cap (not illustrated) can be inserted into the internal bore 1408 of the adapter 1410. Further, as the outlet tube 1404 is pushed into the adapter, the trocar 1406 can pierce the membrane 1402 in order to permit fluid flow out of the paint cup assembly (not illustrated) and through the adapter 1410 into a paint sprayer (not illustrated).

When the paint cup assembly (not illustrated) is disengaged from the adapter 1410, the trocar 1406 can be retracted, or otherwise removed, from the membrane 1402. Once the trocar 1406 is removed from the membrane 1402, the membrane 1402 can seal the hole formed at the location within the membrane 1402 in which the trocar 1406 pierced the membrane 1402. As such, if the paint cup assembly (not illustrated) remains at least partially filled with fluid, leakage of the fluid can be substantially minimized.

FIG. 15 through FIG. 21 illustrate a paint cup filling station, generally designated 1500. As shown, the paint cup filling station 1500 can include a first paint cup tray 1502 and a second paint cup tray 1504 separated by a housing 1506. Depending on the orientation of the paint cup filling station 1500, the first paint cup tray 1502 can be considered an upper paint cup tray; the second paint cup tray 1504 can be considered a lower paint cup tray; and vice-versa.

The housing 1506 can have a first side wall 1510, a second side wall 1512, a third side wall 1514, and a fourth side wall 1516. Further, the housing 1506 can be constructed from a corrugated material and the housing 1506 can be foldable, or otherwise collapsible. When erected, the side walls 1510, 1512, 1514, 1516 can be connected to adjacent sidewalls 1510, 1512, 1514, 1516, the paint cup trays 1502, 1504, or a combination thereof via one or more fasteners 1520, e.g., removable push pin fasteners, thumb screws, etc.

As shown in FIG. 15 and FIG. 16, the first paint cup tray 1502 can be formed with one or more paint cup assembly holes 1530. Further, the second paint cup tray 1504 can also be formed with one or more paint cup assembly holes 1532. Each paint cup assembly hole 1530, 1532 can be configured to receive a correspondingly sized and shaped paint cup assembly 1540. Further, each paint cup assembly hole 1530, 1532 can be connected to one or more adjoining paint assembly holes 1530, 1532 via one or more fluid channels 1550. Accordingly, if a particular paint cup assembly 1540 is being filled and begins to overfill the fluid, e.g., paint, can flow from the particular paint cup assembly 1540 that is being overfilled and into one or more adjacent paint cup assemblies.

FIG. 17 indicates that at least one of the sidewalls 1510, 1512, 1514, 1516 can be formed with one or more elongated windows 1560. Each elongated window 1560 can be aligned with a respective paint cup assembly hole 1530, 1532. Specifically, a center axis of the window 1560 can be aligned with a center of a paint cup assembly hole 1530, 1532. Each elongated window 1560 can be configured to allow a user to view at least a portion of the paint cup assembly 1540 when the paint cup assembly 1540 is installed in the paint cup filling station 1500. For example, the elongated window 1560 can be configured to allow a user to view a paint liner of the paint cup assembly 1540. Accordingly, the user can easily determine the level of paint in the paint cup assembly 1540 while the paint cup assembly 1540 is being filled with paint.

In a particular aspect, at least a portion of a slot formed in an extended ring of the paint cup assembly 1540, e.g., the slot 320 illustrated in FIG. 2 and FIG. 3, can be substantially aligned with the elongated window 1560 when the paint cup assembly 1540 is installed in the paint cup filling station 1500.

As further illustrated in FIG. 17, the paint cup filling station 1500 can include a group of indicia 1562 adjacent to each elongated window 1560. The indicia 1562 can be used to indicate a volume amount of paint, or fluid, within the paint cup assembly 1540. The indicia 1562 on the paint cup filling station 1500 can be keyed to indicia on the paint liner of the paint cup assembly 1540.

In a particular aspect, the elongated window 1560 can have a window height, H_W, measured from a top of the window 1560 to a bottom of the window 1560 along the center axis of the window 1560. A paint liner, e.g., the paint liner 202 depicted in FIG. 2 and FIG. 3, can have paint liner height, H_{PL}, measured from the top, or open end, of a paint liner 202 to a bottom, or closed end, of the paint liner 202 along a center axis of the paint liner 202. Further, in a particular aspect, H_W can be at least 95% H_{PL}. For example, H_W can be at least 100% H_{PL}, such as at least 105% H_{PL}, or at least 110% H_{PL}. In another aspect, H_W can be less than or equal to 150% H_{PL}, such as less than or equal to 125% H_{PL}, or less than or equal to 115% H_{PL}. Moreover, H_W can be within a range between and including any of the percentage of H_{PL} values described herein.

In another aspect, the elongated window 1560 can have a window width, W_W, measured from a left side of the window 1560 to a right side of the window 1560. The slot in the extended ring of the paint cup assembly 1540 can include a slot width, W_S, measured from a left side of the slot to a right side of the slot. In this aspect, W_W can be at least 95% W_S. For example, W_W

can be at least 100% W_S, such as at least 105% W_S, or at least 110% W_S. In another aspect, W_W can be less than or equal to 150% W_S, such as less than or equal to 125% W_S, or less than or equal to 115% W_S. Moreover, W_W can be within a range between and including any of the percentage of W_S values described herein.

In another aspect, the paint liner of the paint cup assembly 1540 can have an outer diameter, OD, measured at the outer perimeter of the rim of the paint liner. In this aspect, W_W can be at least 5% OD. For example, W_W can be at least 6% OD, such as at least 7% OD, at least 8% OD, at least 9% OD, or at least 10% OD. In another aspect, W_W can be less than or equal to 25% OD, such as less than or equal to 20% OD, or less than or equal to 15% OD. Moreover, W_W can be within a range between and including any of the percentage of OD values described herein.

In a particular aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a three ounce (3 oz.) capacity. In another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a five ounce (5 oz.) capacity.

In still another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having an eight ounce (8 oz.) capacity. In yet another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a twenty-five ounce (25 oz.) capacity. In another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a thirty-two ounce (32 oz.) capacity.

In another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a ninety milliliter (90 ml) capacity. In yet still another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a one hundred fifty milliliter (150 ml) capacity.

In yet another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a two hundred fifty milliliter (250 ml) capacity. In another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a seven hundred fifty milliliter (750 ml) capacity. In yet another aspect, one or more of the paint cup assembly holes 1530, 1532 formed in the first paint cup tray 1502 and the second paint cup tray 1504 can be configured to receive a paint cup assembly having a nine hundred fifty milliliter (950 ml) capacity. The capacity of the paint cup assembly can be within a range between and including any of the capacity values described above.

It can be appreciated that the first paint cup tray 1502 can include an array of similarly sized paint cup assembly holes 1530 and the second paint cup tray 1502 can include an array of similarly sized paint cup assembly holes 1532. The paint cup assembly holes 1530 in the first paint cup tray 1502 can be different in size from the paint cup assembly holes 1532 in the second paint cup tray 1504. As such, the paint cup assembly filling station 1500 can be oriented as shown to receive paint cup assemblies having a particular size or the paint cup assembly filling station 1500 can be inverted to receive paint cup assemblies having a different size, e.g., capacity.

Also, it can be appreciated that the first paint cup tray 1502, the second paint cup tray 1504, or a combination thereof can include paint cup assembly holes 1532 of varying sizes.

In a particular aspect, the paint cup trays 1502, 1504 are constructed from acrylonitrile butadiene styrene (ABS) plastic. Moreover, the housing 1506 can be constructed from high density polyethylene (HDPE).

Referring now to FIG. 20 and FIG. 21, a paint cup assembly support stand is illustrated and is generally designated 2000. As shown, the paint cup assembly support stand 2000 can include a base 2002. Further, one or more support arms 2004 can extend from the base 2002. In a particular aspect, the support arms 2004 can extend in a direction that is substantially perpendicular to the base 2002. Further, at least one paint cup assembly support ring 2006 can extend from each support arm 2004. Specifically, each paint cup assembly support ring 2006 can be parallel to the base 2002.

As shown in FIG. 20 and FIG. 21, a support frame 2008 can extend from each support arm 2004 to the paint cup assembly support ring 2006 and the base of the paint cup assembly support stand 2000. The support frames 2008 can provide additional structural support for the weight of a paint cup assembly (not shown) inserted into the paint cup assembly support rings 2006.

In a particular aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a three ounce (3 oz.) capacity. In another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a five ounce (5 oz.) capacity.

In still another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having an eight ounce (8 oz.) capacity. In yet another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a twenty-five ounce (25 oz.) capacity. In another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a thirty-two ounce (32 oz.) capacity.

In another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a ninety milliliter (90 ml) capacity. In yet still another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a one hundred fifty milliliter (150 ml) capacity.

In yet another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a two hundred fifty milliliter (250 ml) capacity. In another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a seven hundred fifty milliliter (750 ml) capacity. In yet another aspect, each paint cup assembly support ring 2006 can be configured to receive a paint cup assembly having a nine hundred fifty milliliter (950 ml) capacity.

FIG. 20 and FIG. 21 indicate that in an exemplary embodiment, the paint cup assembly support stand 2000 can include three support arms 2004 extending from the base 2002 and each support arm 2004 can include a single paint cup assembly support ring 2006. It can be appreciated that the paint cup assembly support stand 2000 can include any number of support arms 2004 and any number of paint cup assembly support rings 2006. For example, in another aspect, the paint cup assembly support stand 2000 can include a single support arm 2004 having

multiple paint cup assembly support rings 2006 extending therefrom, e.g., radially. Further, each paint cup assembly support ring 2006 can be similarly sized to receive paint cup assemblies having similar capacities, as described herein. Alternatively, the paint cup assembly support stand 2000 can include multiple paint cup assembly support rings 2006 having various sizes and the paint cup assembly support stand 2000 can receive and support paint cup assemblies having varying capacities.

With the configuration described herein, the paint cup assembly provides a paint cup assembly that is substantially leak-proof regardless of the orientation of the paint cup assembly. Further, the paint cup assembly can be connected to a paint spray gun while the paint spray gun is in an upright position typically used while expelling paint from the paint spray gun. The valve maintains paint within the paint cup assembly until the paint cup assembly is engaged with the paint spray gun and the adapter opens the valve. Further, when the paint cup assembly is disengaged with the paint spray gun, the valve returns to a closed position and seals the outlet of the paint cup assembly. The paint cup assembly can be stored for later use and any remaining paint can stay fresh and usable for an extended period of time. In a particular aspect, the paint spray gun can incorporate one or more of the features of the adapter and in such an aspect, the paint cup assembly can be directly engaged with the paint spray gun without using the adapter. Accordingly, a post within the paint spray gun can be configured to open the valve when the paint cup assembly is directly engaged with the paint spray gun.

Note that not all of the activities described above in the general description or the examples are required, that a portion of a specific activity may not be required, and that one or more further activities can be performed in addition to those described. Still further, the order in which activities are listed is not necessarily the order in which they are performed.

Certain features that are, for clarity, described herein in the context of separate embodiments, can also be provided in combination in a single embodiment. Conversely, various features that are, for brevity, described in the context of a single embodiment, can also be provided separately or in any subcombination. Further, reference to values stated in ranges includes each and every value within that range.

Benefits, other advantages, and solutions to problems have been described above with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any feature(s) that can cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential feature of any or all the claims.

The specification and illustrations of the embodiments described herein are intended to provide a general understanding of the structure of the various embodiments. The specification and illustrations are not intended to serve as an exhaustive and comprehensive description of all of the elements and features of apparatus and systems that use the structures or methods described herein. Separate embodiments can also be provided in combination in a single embodiment, and conversely, various features that are, for brevity, described in the context of a single embodiment, can also be provided separately or in any subcombination. Further, reference to values stated in ranges includes each and every value within that range. Many other embodiments can be apparent to skilled artisans only after reading this specification. Other embodiments can be used and derived from the disclosure, such that a structural substitution, logical substitution, or another change can be made without departing from the scope of the disclosure. Accordingly, the disclosure is to be regarded as illustrative rather than restrictive.

What is claimed is:

1. A paint cup assembly for a paint sprayer, comprising:

a cap;

a paint liner defining a closed proximal end and an open distal end, the open distal end having an outwardly projecting rim and the entire closed proximal end having an outwardly rounded bottom, wherein the paint liner is adapted to collapse as a paint is withdrawn, and wherein the paint liner has a height; and

a ring configured to fit around the paint liner, wherein:

the ring engages the cap and secures the rim of the paint liner to the cap,

the ring includes an axial extension extending toward the proximal end of the paint liner such that the ring is configured to allow a user to grasp the paint cup assembly without collapsing the paint liner during attachment with the paint sprayer,

the axial extension has a height between about 20% of the height of the paint liner and 75% of the height of the paint liner; and

the ring is adapted to support the paint liner while the paint liner is filled with the paint.

2. A paint cup assembly for a paint sprayer, comprising:

a cap;

a paint liner defining a closed proximal end and an open distal end, the proximal end having an outwardly projecting rim and the entire closed proximal end having an outwardly rounded bottom, wherein the paint liner is adapted to collapse as paint is withdrawn, and wherein the paint liner has a height; and

a ring configured to fit around the paint liner, wherein:

the ring engages the cap and secures the paint liner to the cap,

the ring includes a hub and a skirt extending from the hub toward the proximal end of the paint liner such that the skirt is configured to allow a user to grasp

the paint cup assembly without collapsing the paint liner during attachment with the paint sprayer,

the skirt has a height between about 20% of the height of the paint liner and 75% of the height of the paint liner, and

the ring is adapted to support the paint liner while the paint liner is filled with the paint.

3. The paint cup assembly of claim 2, wherein the skirt includes at least one slot and at least a portion of the paint liner is visible through the at least one slot.

4. The paint cup assembly of any one of claims 1, 2, and 3, wherein the ring is threadably engaged with the cap.

5. The paint cup assembly of claim 1, wherein the ring comprises a hub and a skirt extending from the hub.

6. The paint cup assembly of any one of claims 2 and 5, wherein the skirt at least partially surrounds the paint liner.

7. The paint cup assembly of any one of claims 2 and 5, wherein the skirt fully circumscribes the paint liner.

8. The paint cup assembly of any one of claims 2 and 5, wherein the skirt has a height that is less than or equal to 70% of the height of the paint liner.

9. The paint cup assembly of any one of claims 2 and 5, wherein the skirt has a height that is greater than or equal to 25% H_{PL}, where H_{PL} is measured from a top, or open end, of the paint liner to a bottom, or closed end, of the paint liner along a center axis of the paint liner.

10. The paint cup assembly of any one of claims 2 and 5, wherein the skirt is frustoconical and includes an inner diameter that varies along the skirt from a top of the skirt to a bottom of the skirt.

11. The paint cup assembly of claim 10, wherein the inner diameter of the skirt decreases from the top of the skirt to the bottom of the skirt and an inner diameter of the skirt at the top of the skirt, ID_T, is greater than an inner diameter of the skirt at the bottom of the skirt, ID_B.

12. The paint cup assembly of claim 11, wherein ID_B is less than or equal to 97% ID_T.

13. The paint cup assembly of claim 12, wherein ID_B is greater than or equal to 75% ID_T.

14. The paint cup assembly of claim 10, wherein an inner diameter of the skirt, ID_S, is greater than an outer diameter of a body, OD_B, of the paint liner measured at a same point as the ID_S.

15. The paint cup assembly of claim 14, wherein ID_S is greater than 101% OD_B.

16. The paint cup assembly of claim 15, wherein ID_S is less than or equal to 110% OD_B.

17. The paint cup assembly of any one of claims 2 and 5, wherein the skirt is substantially rigid, and wherein the skirt is configured to be grasped without collapsing the paint liner.

18. The paint cup assembly of claim 5, wherein the skirt includes at least one slot and at least a portion of the paint liner is visible through the at least one slot.

19. The paint cup assembly of claim 18, wherein the skirt has a height, H_S, and each slot has a height, H_{SL}, and H_{SL} is less than the height of the skirt, H_S.

20. The paint cup assembly of claim 19, wherein H_{SL} is less than 95% H_S.

21. The paint cup assembly of claim 20, wherein H_{SL} is greater than 50% H_S.

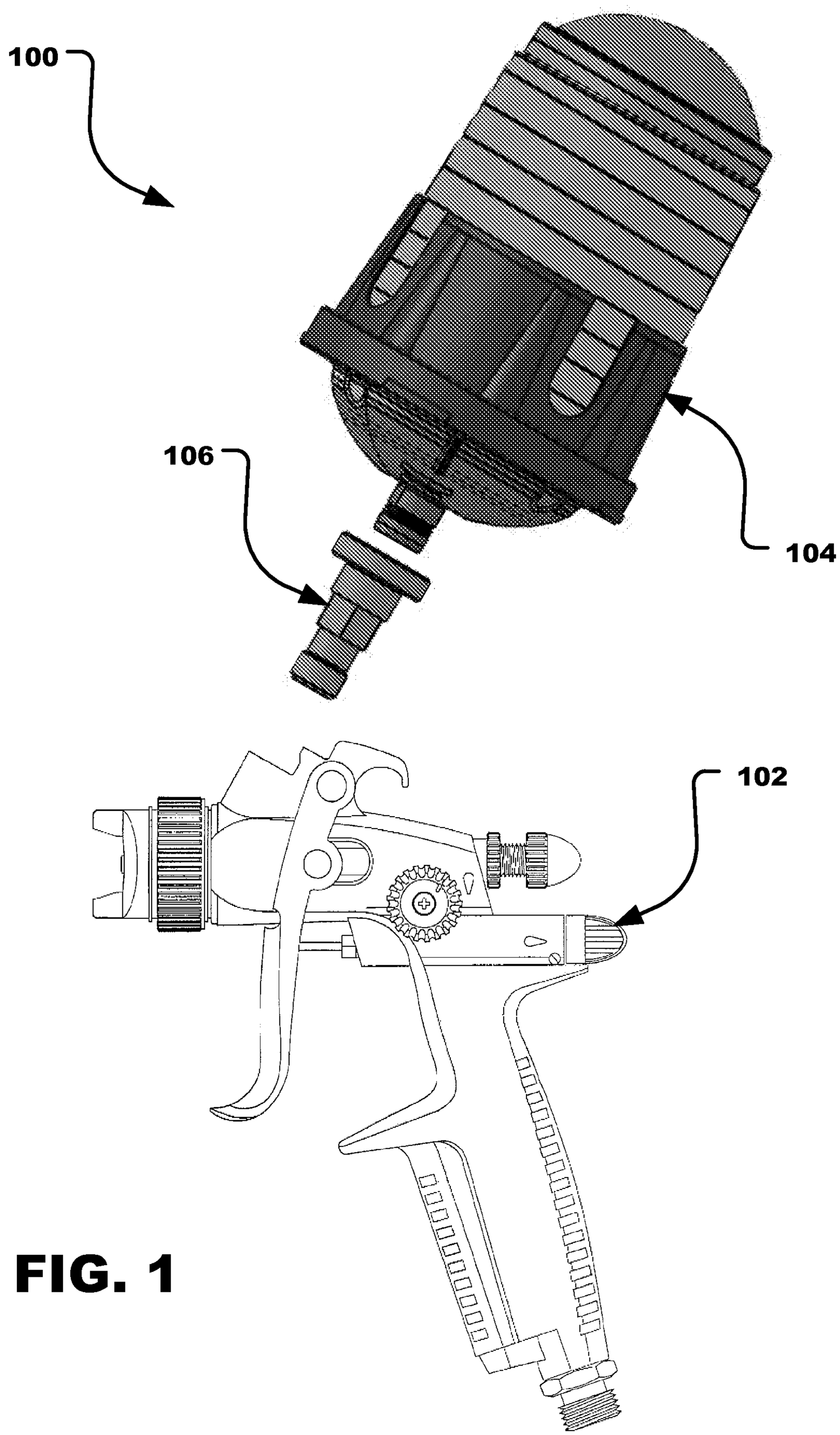


FIG. 1

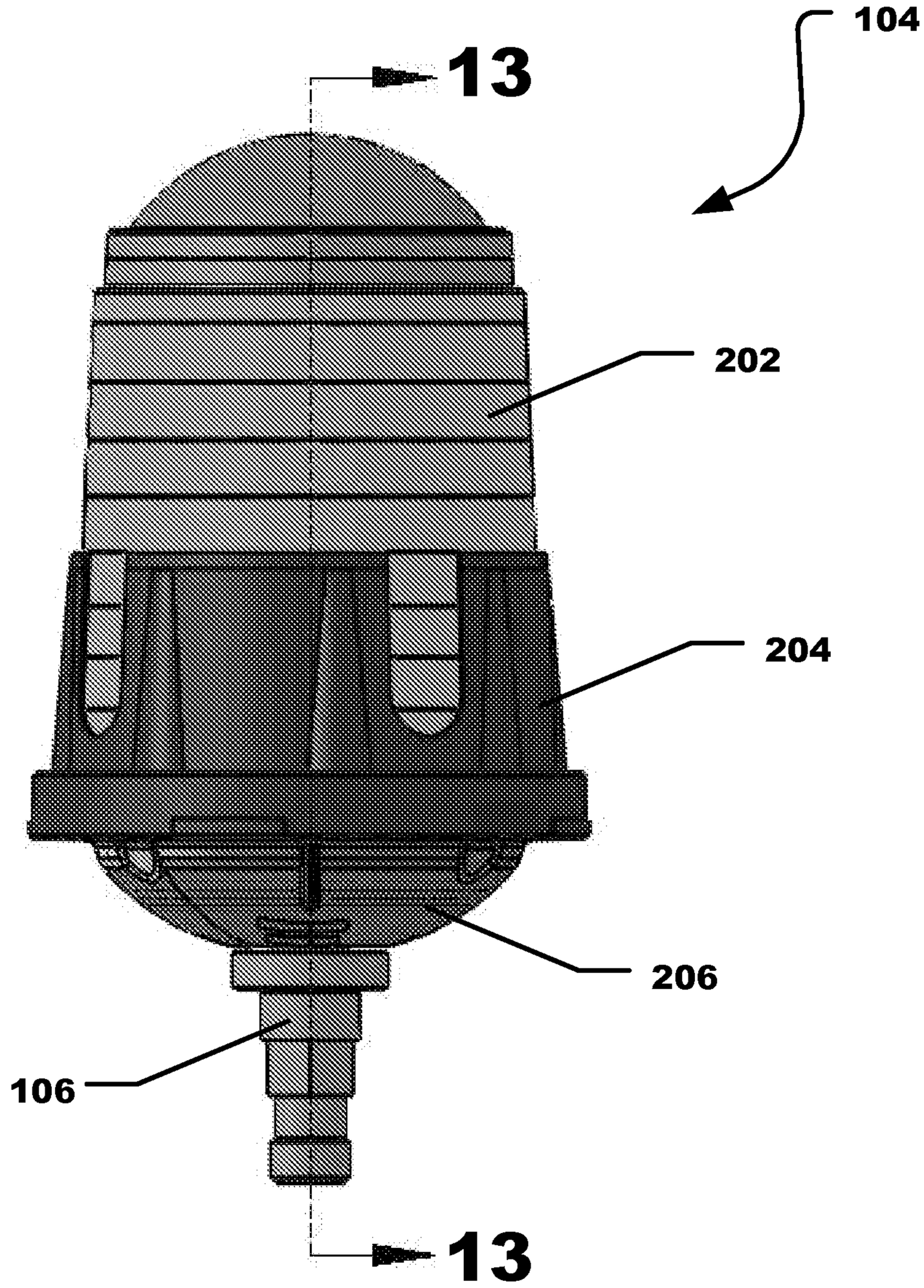
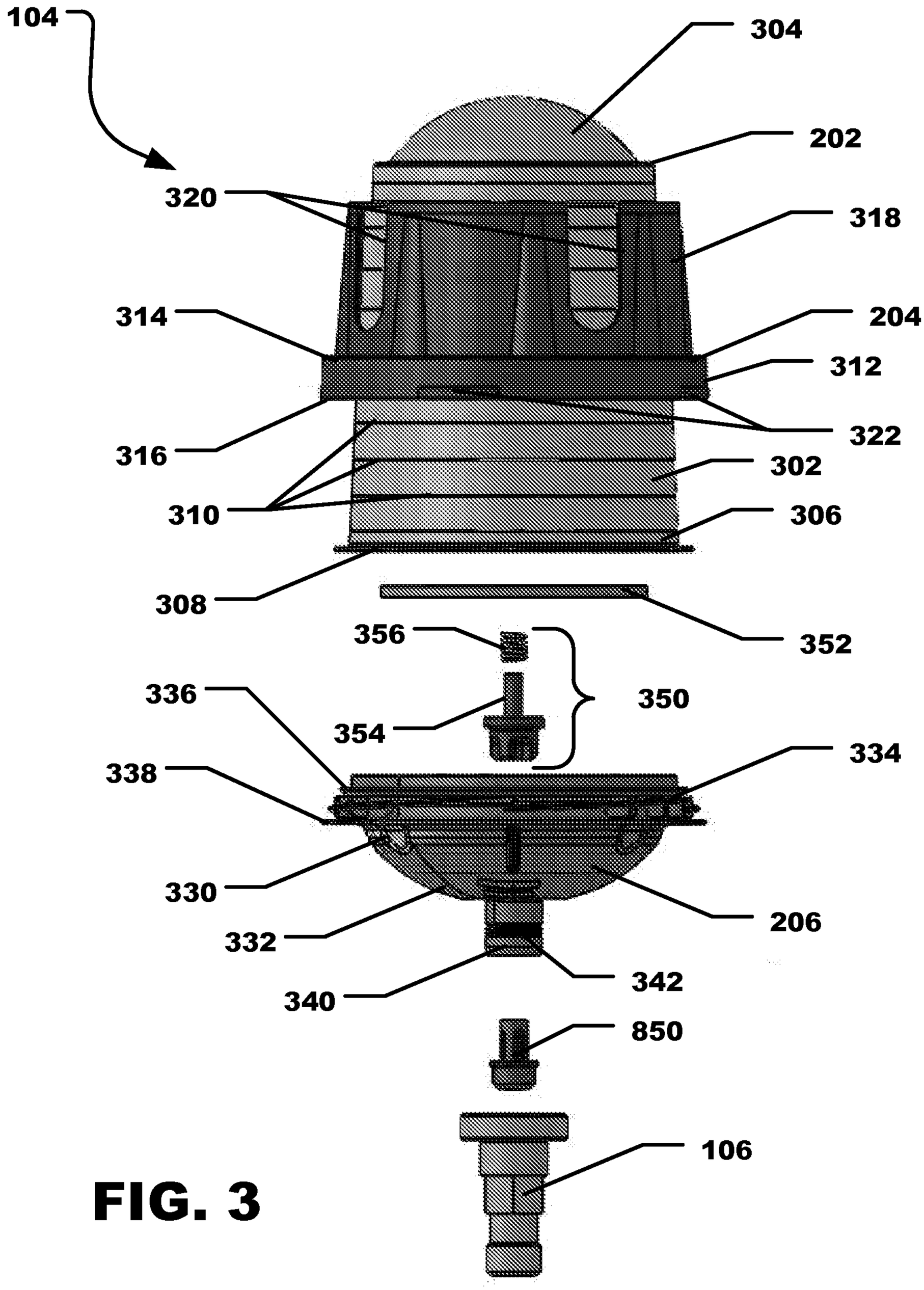


FIG. 2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304
202
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204
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322
316
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340
850
106

FIG. 3

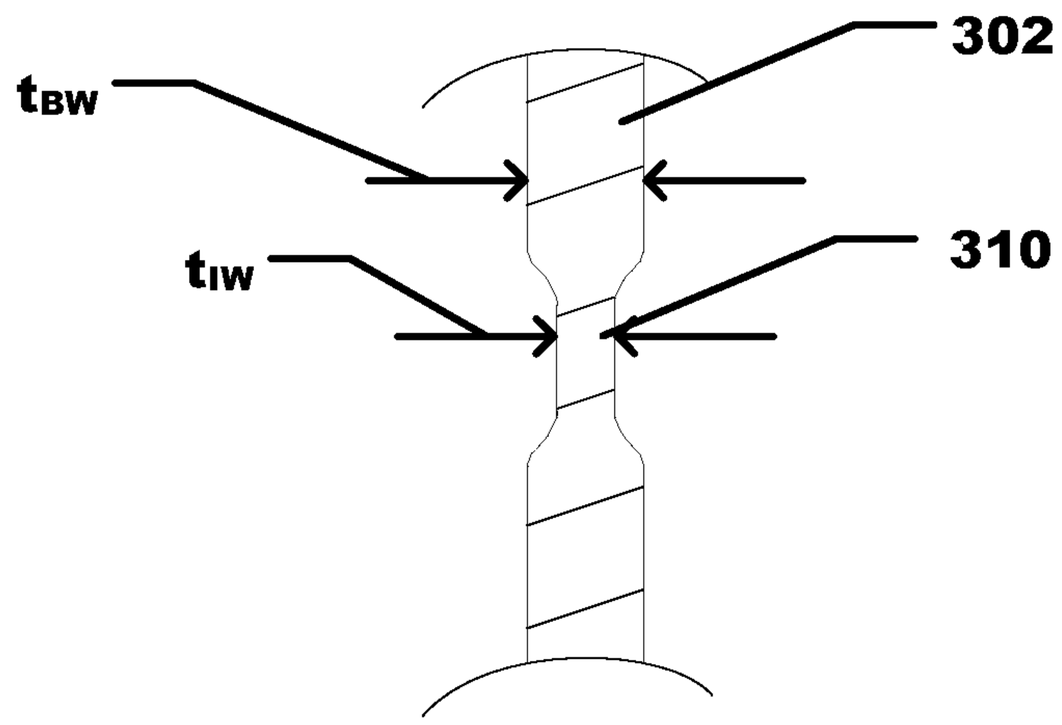


FIG. 3a

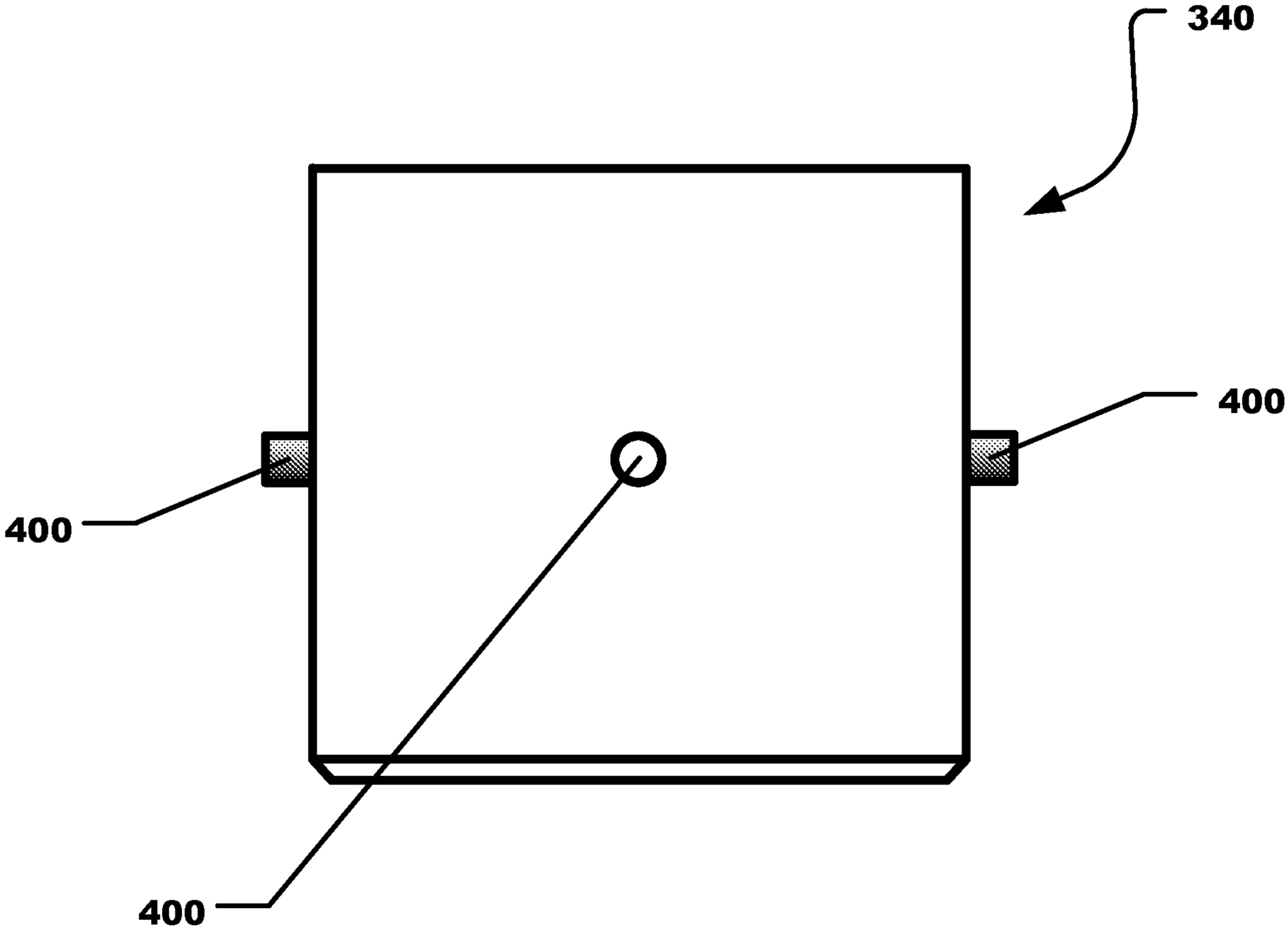


FIG. 4

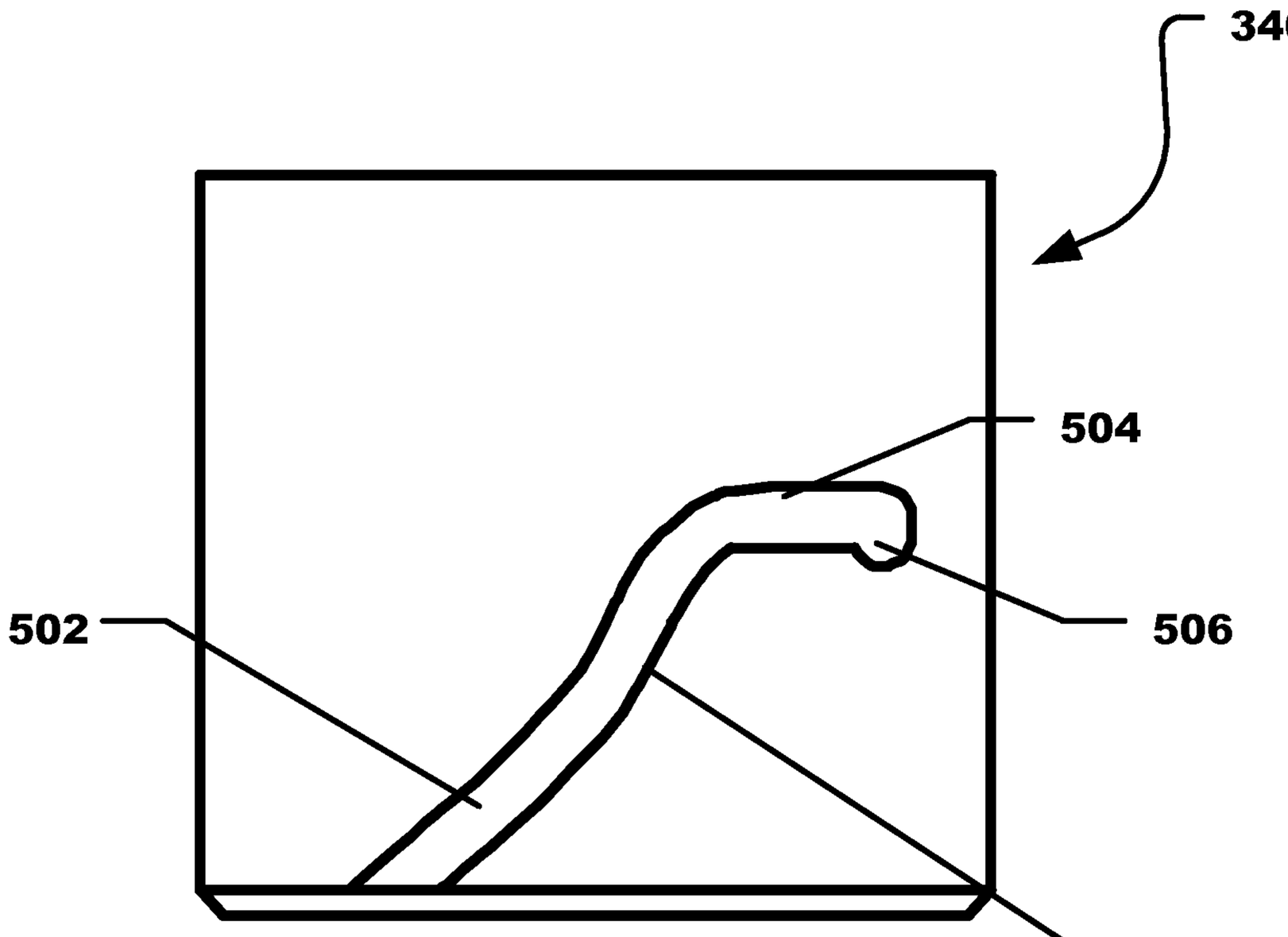


FIG. 5

FIG. 6

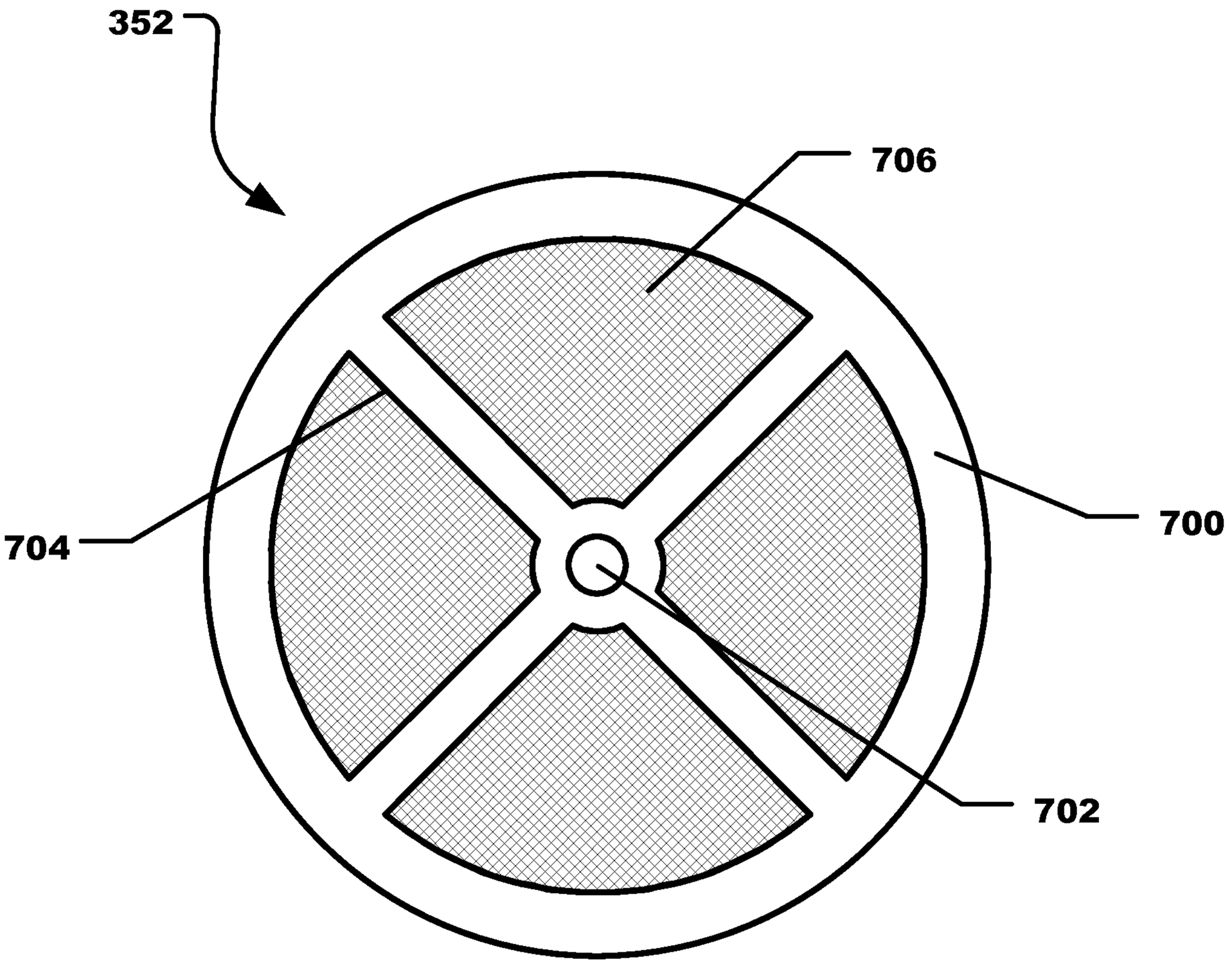


FIG. 7

FIG. 8

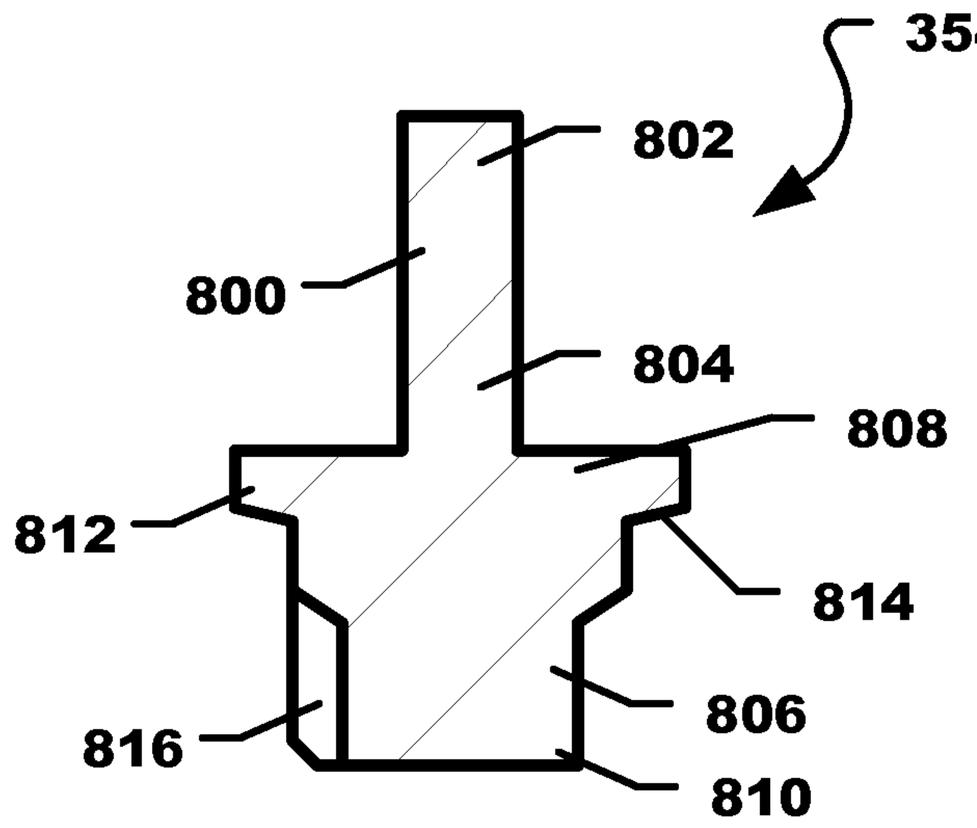


FIG. 9

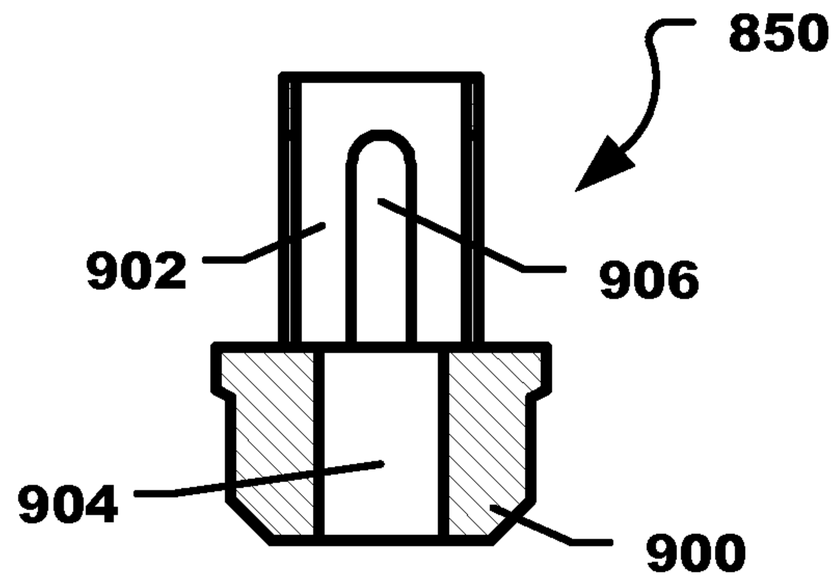
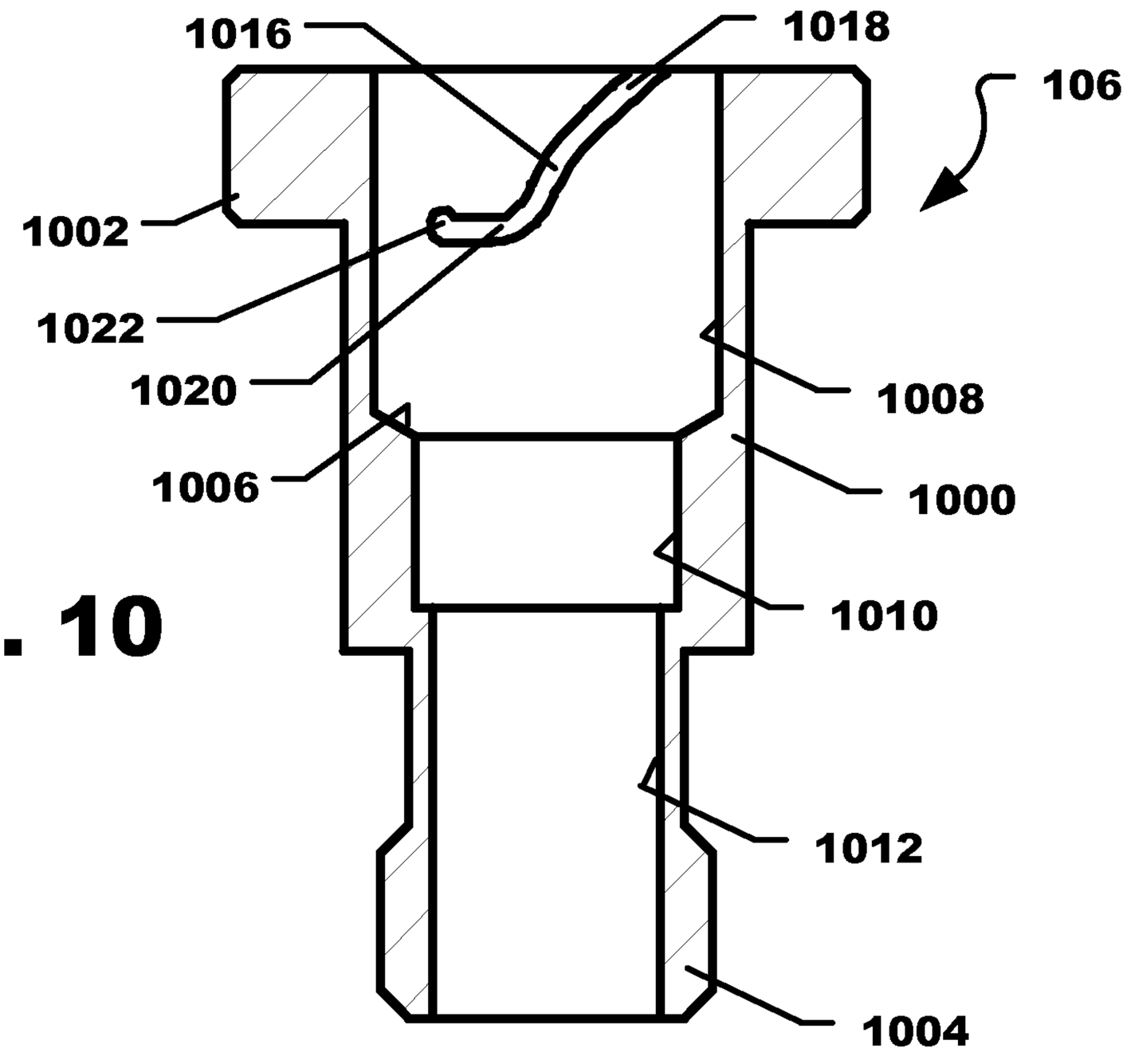


FIG. 10



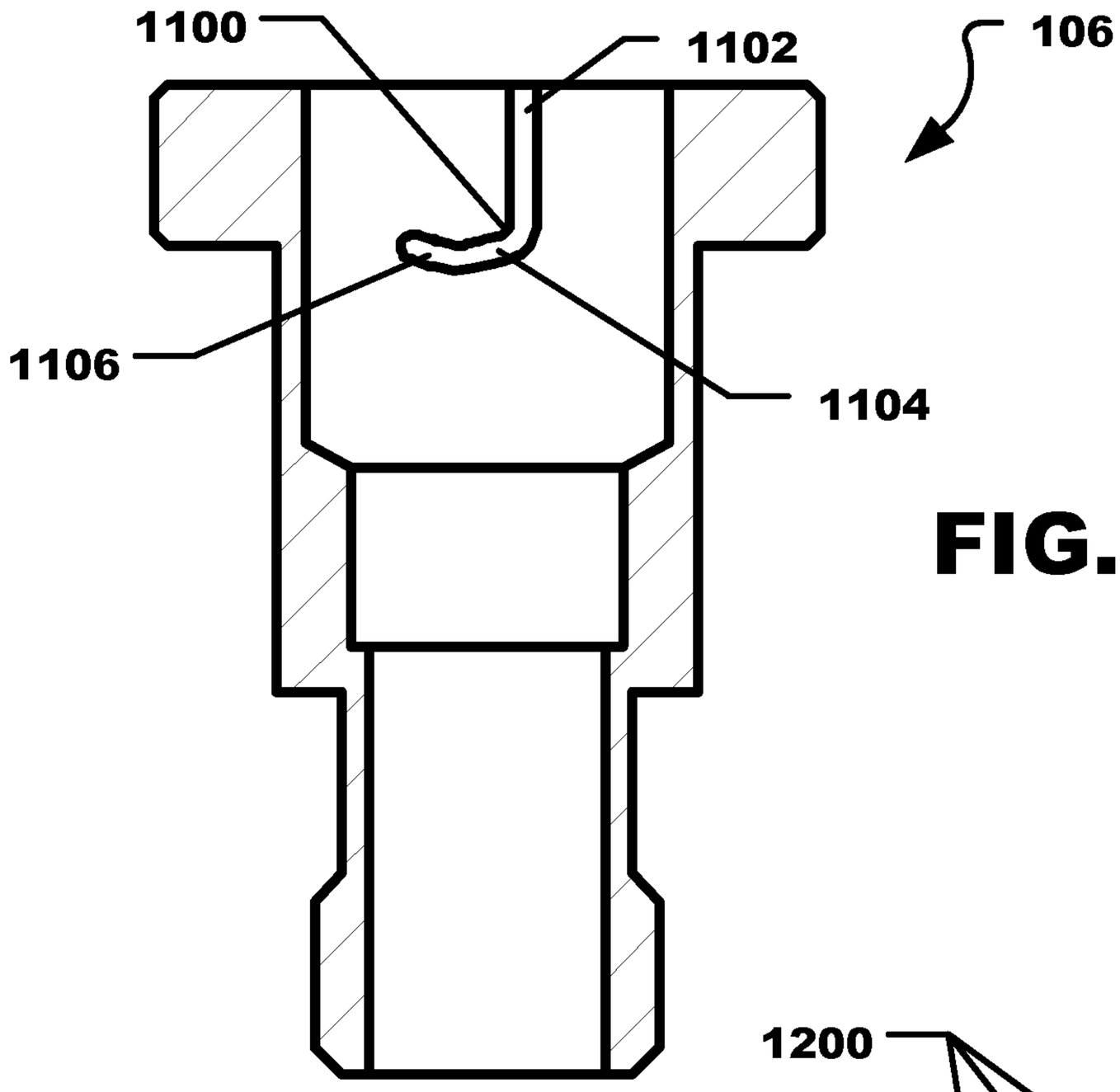


FIG. 11

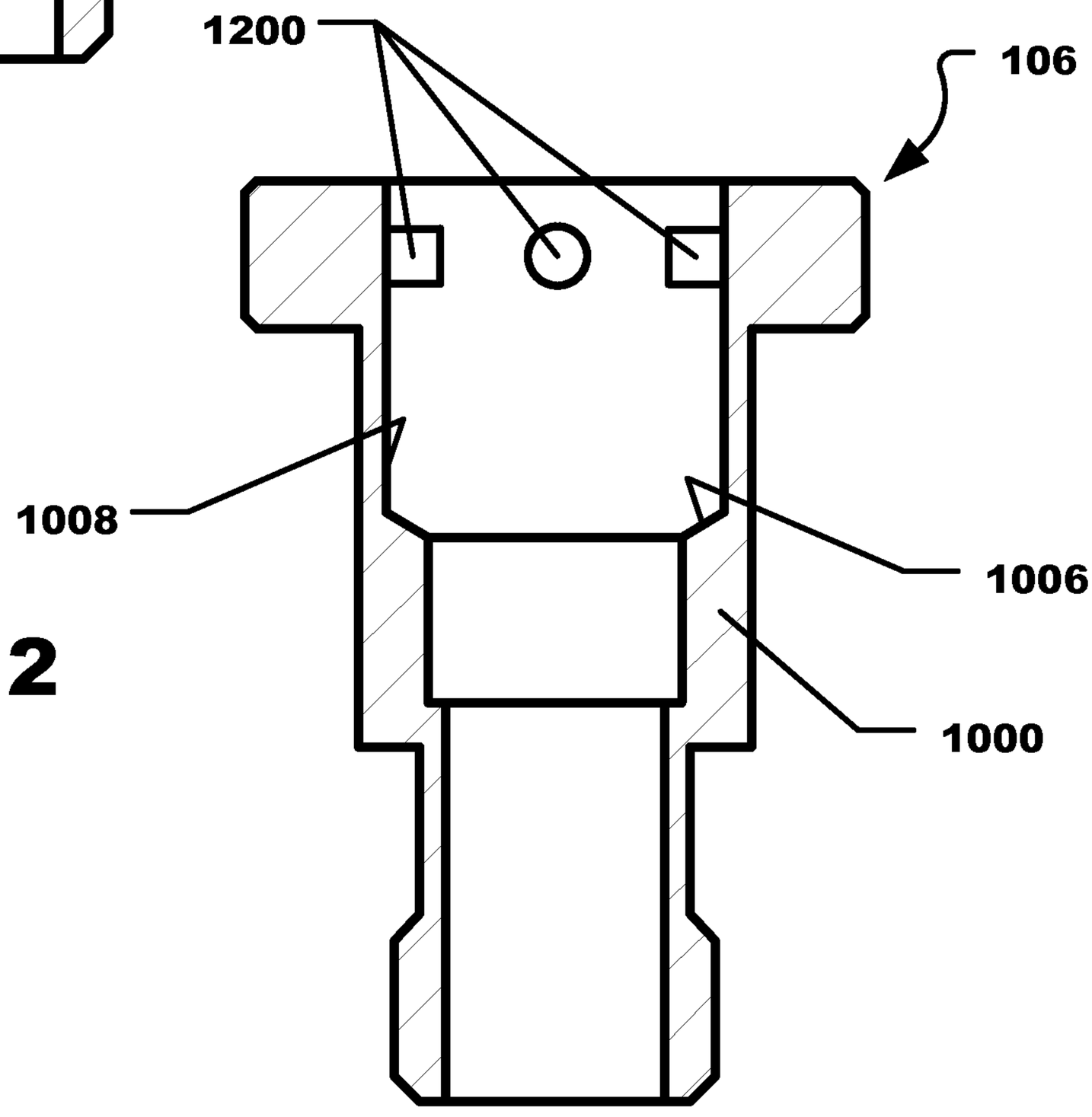


FIG. 12

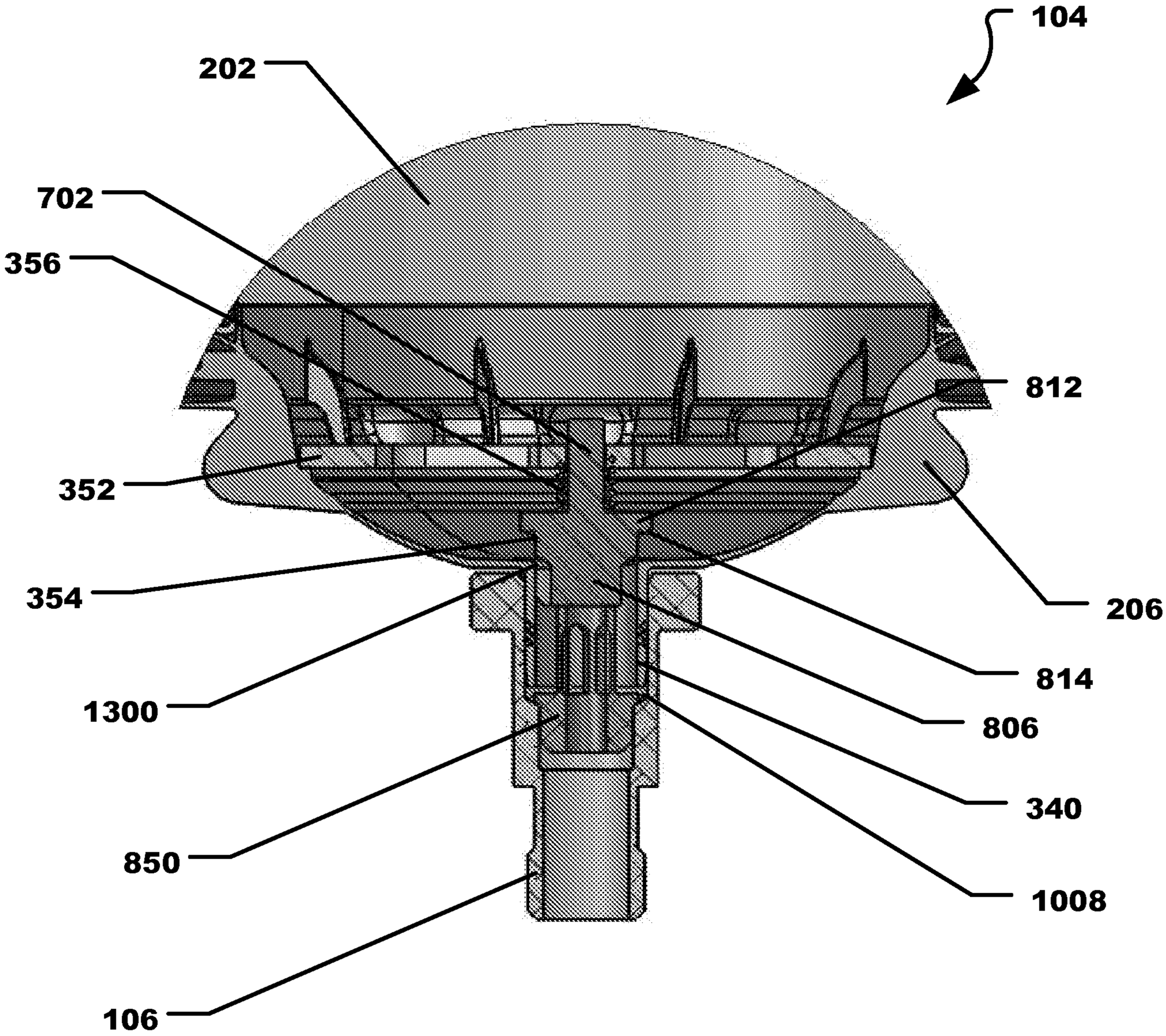


FIG. 13

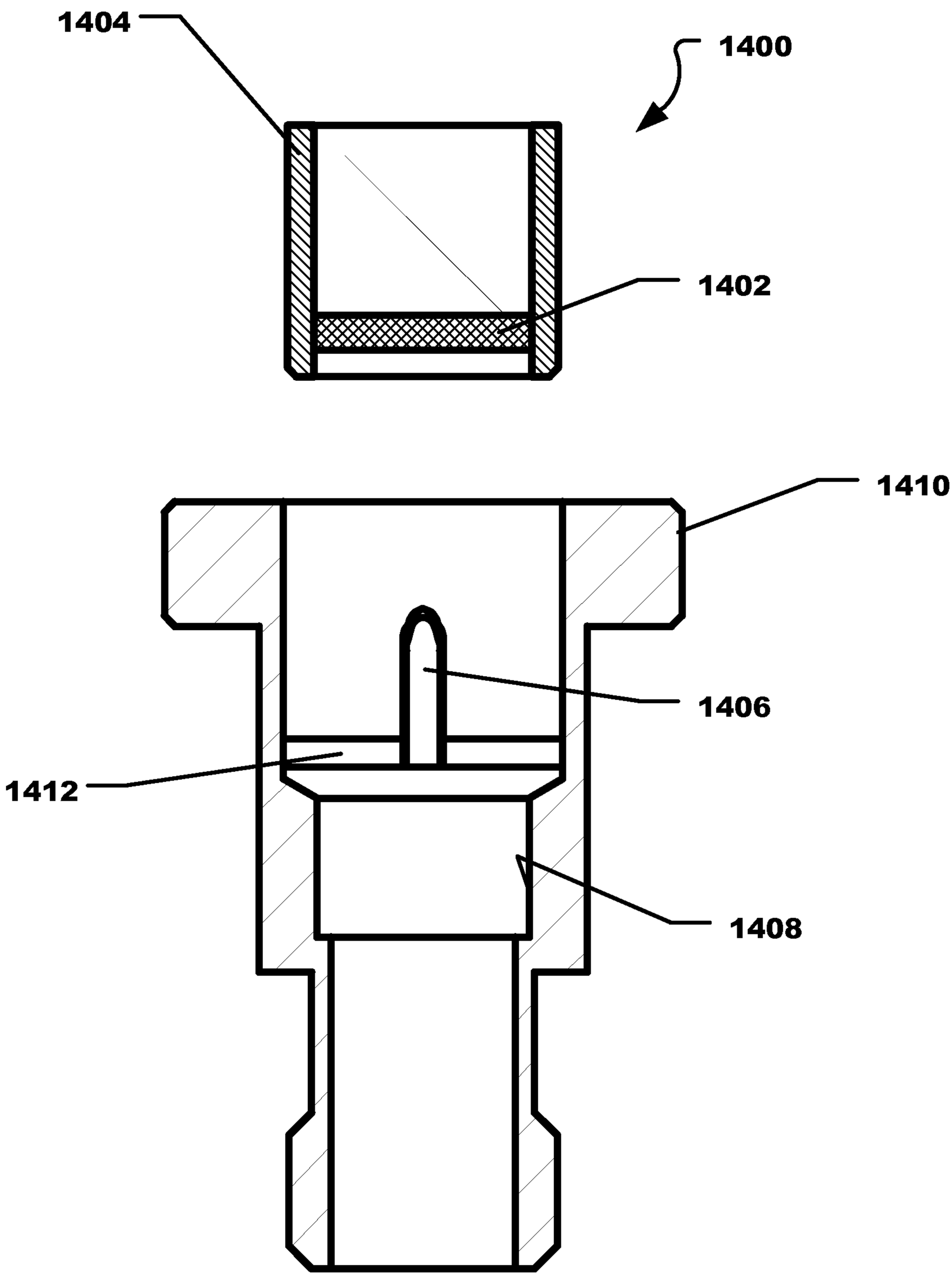


FIG. 14

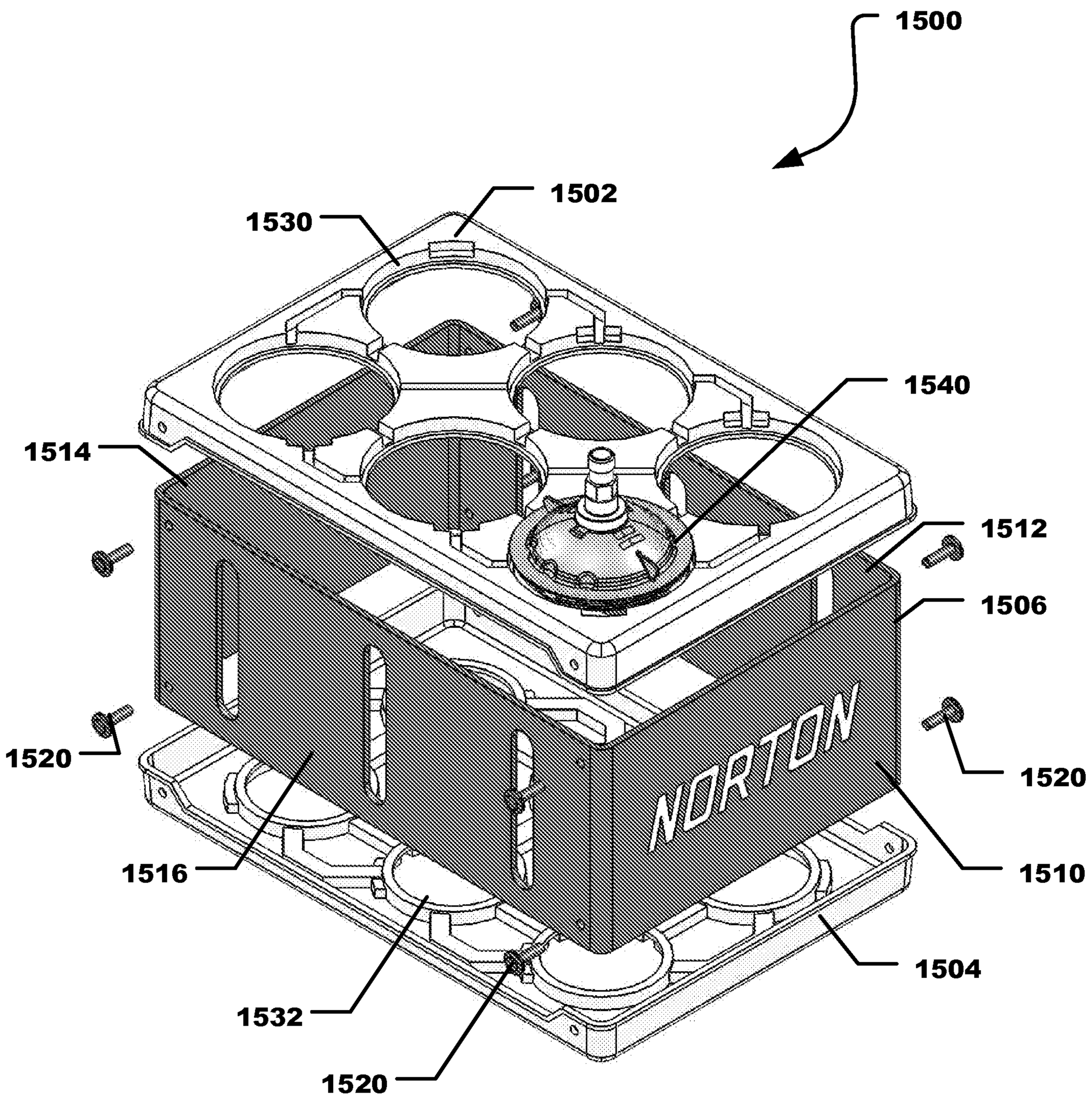

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FIG. 15

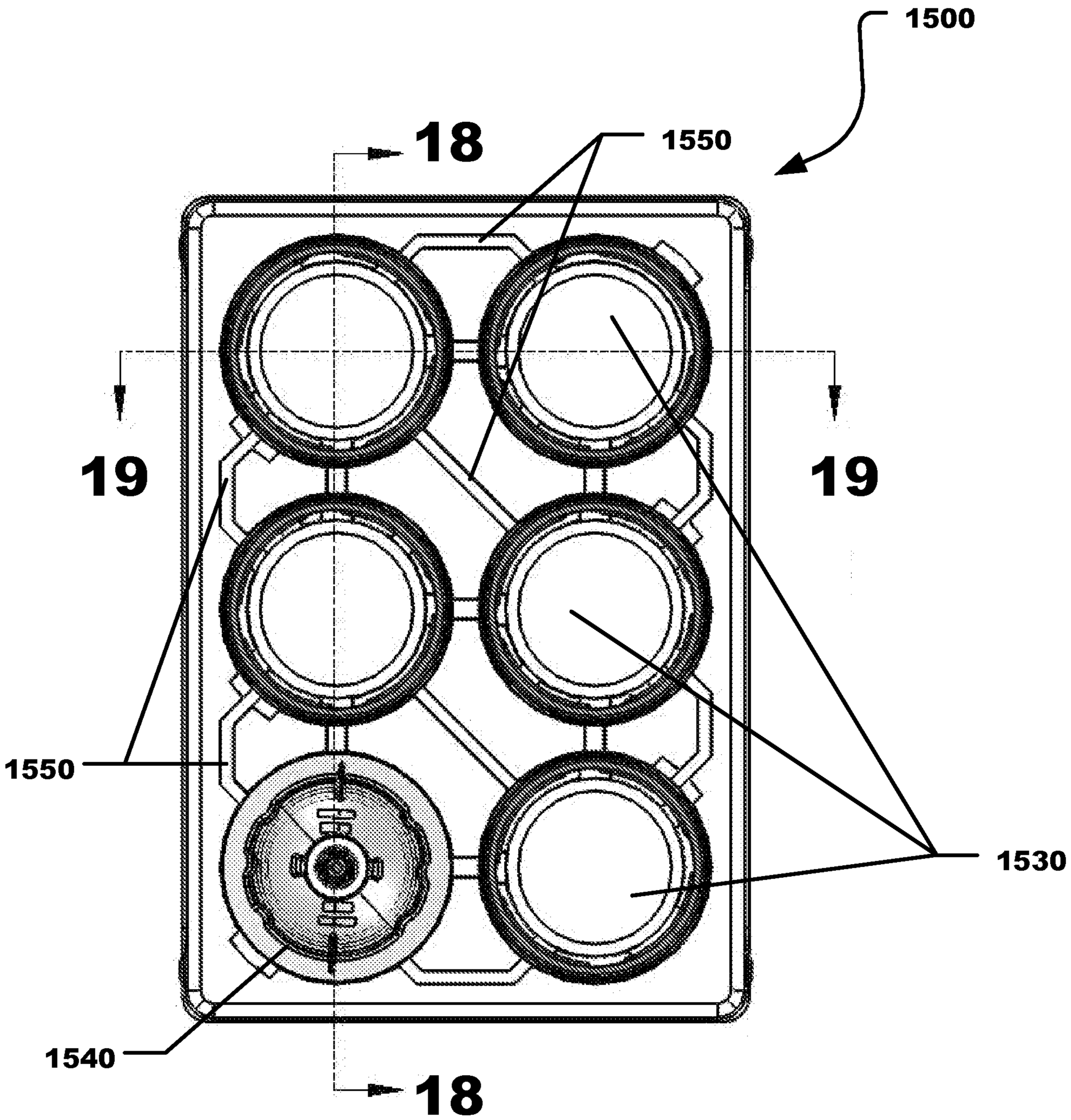


FIG. 16

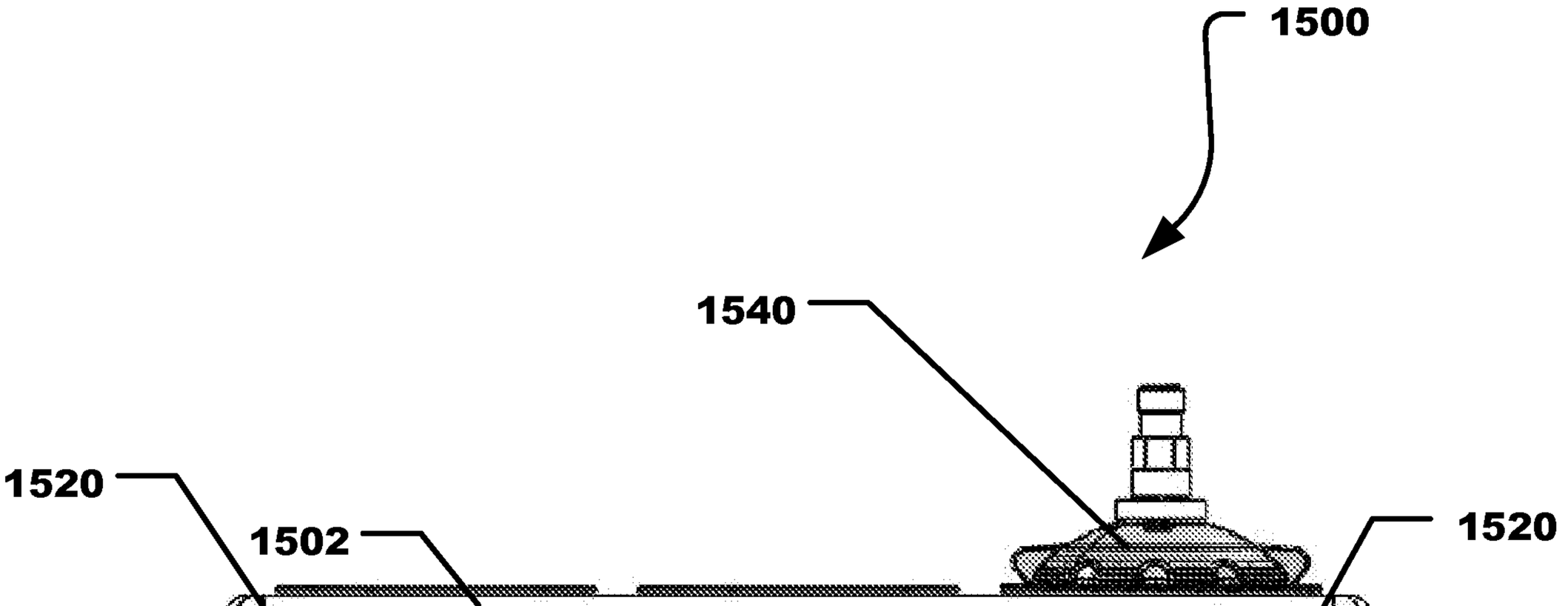


FIG. 17

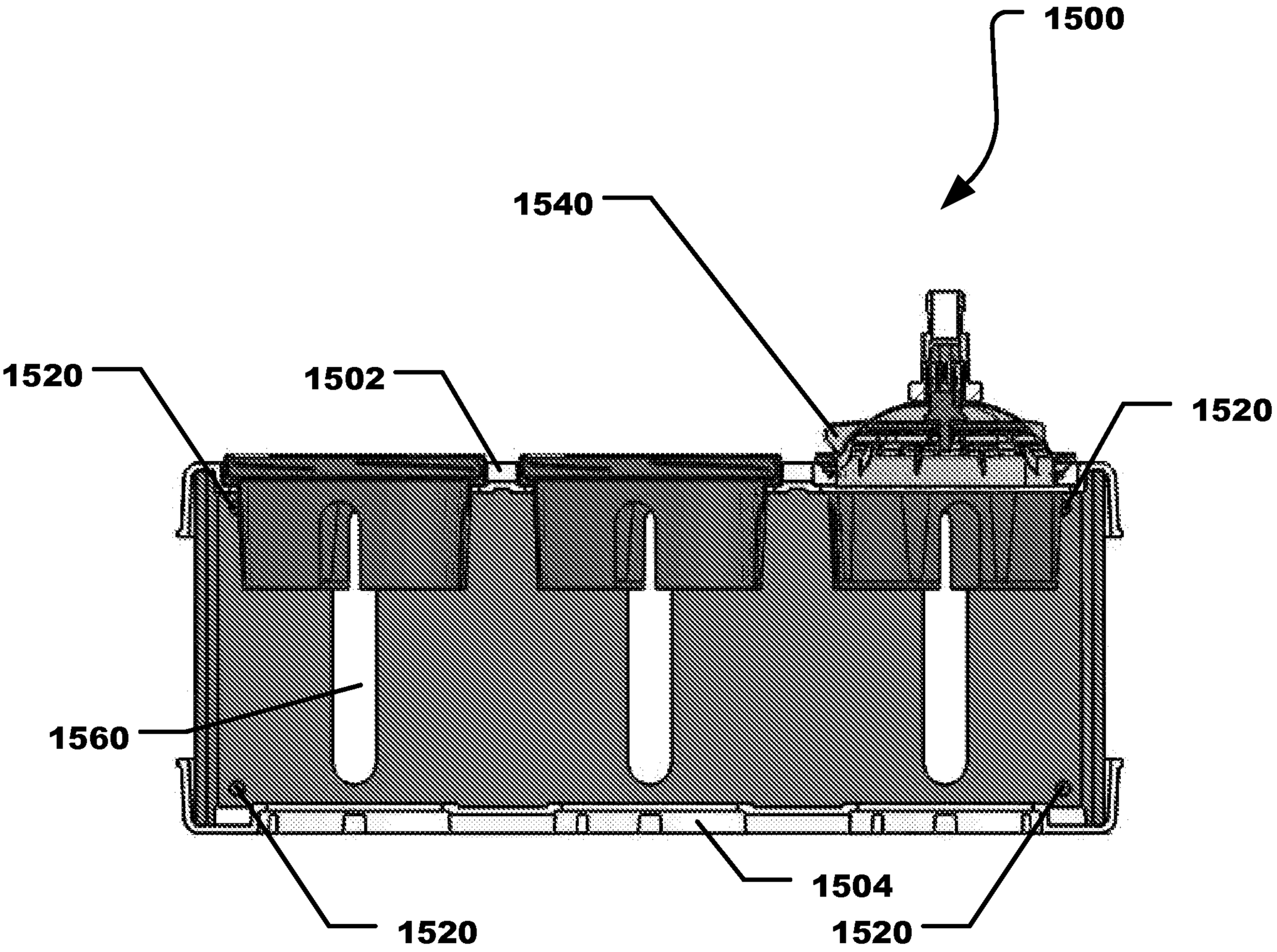


FIG. 18

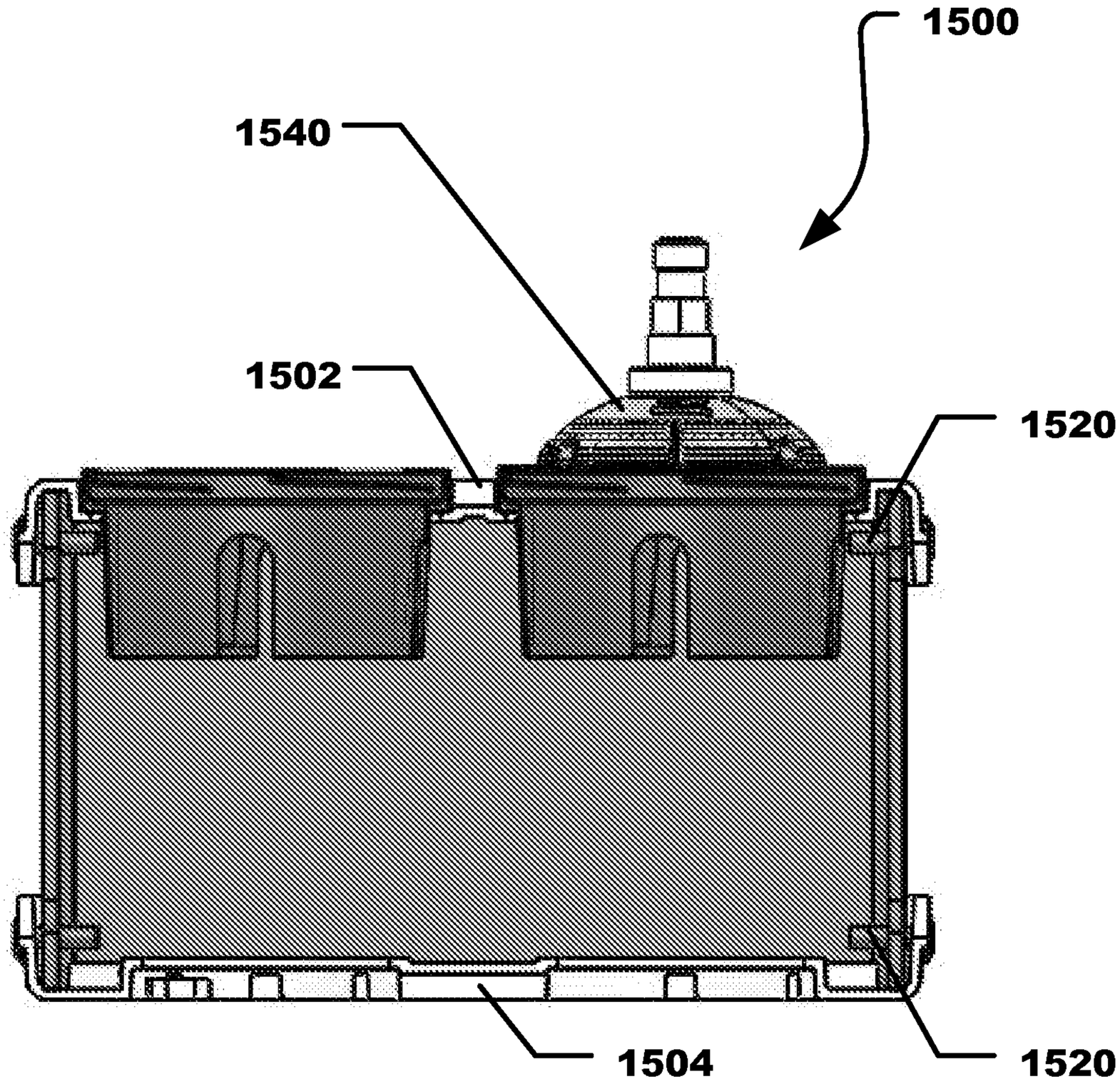


FIG. 19

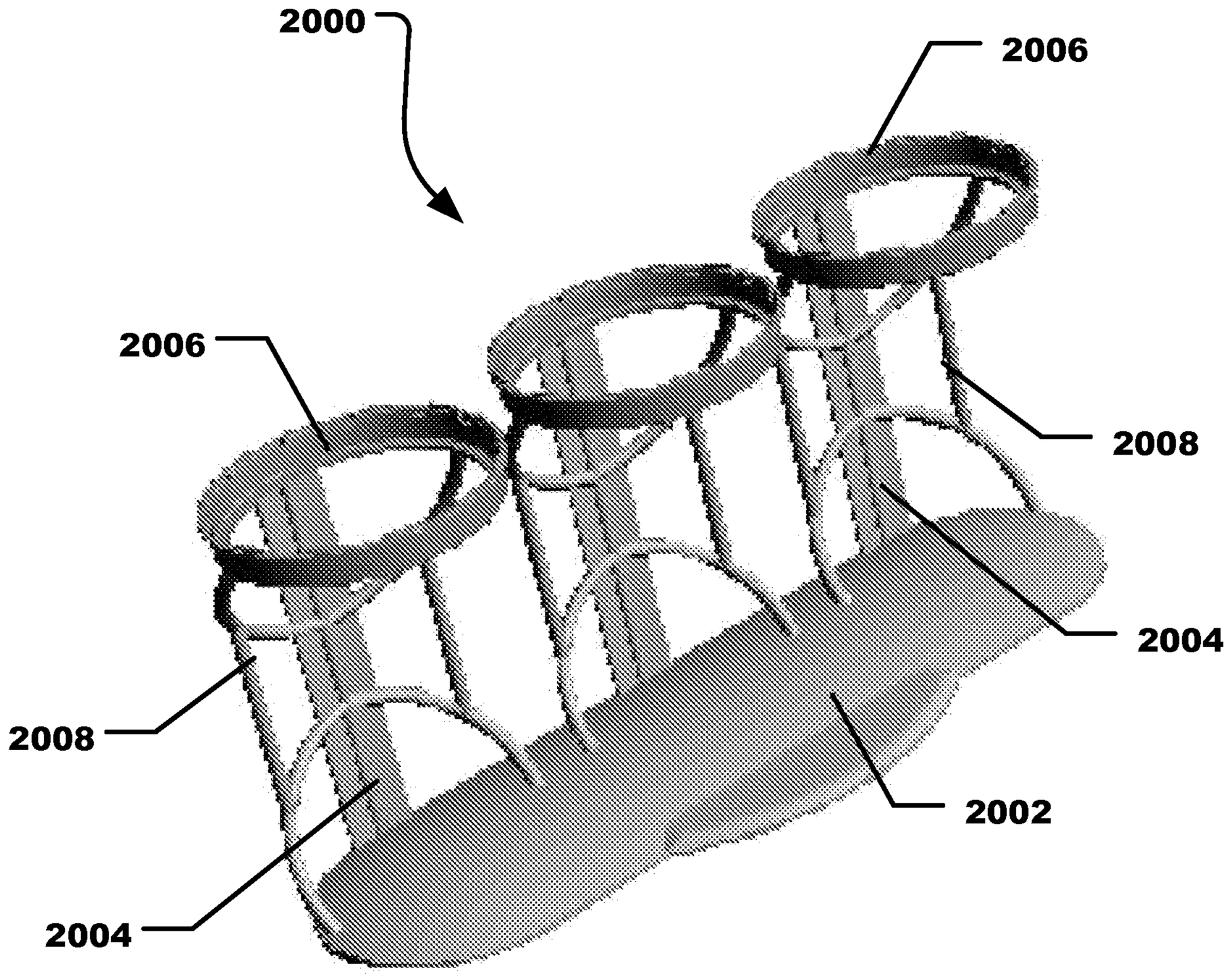


FIG. 20

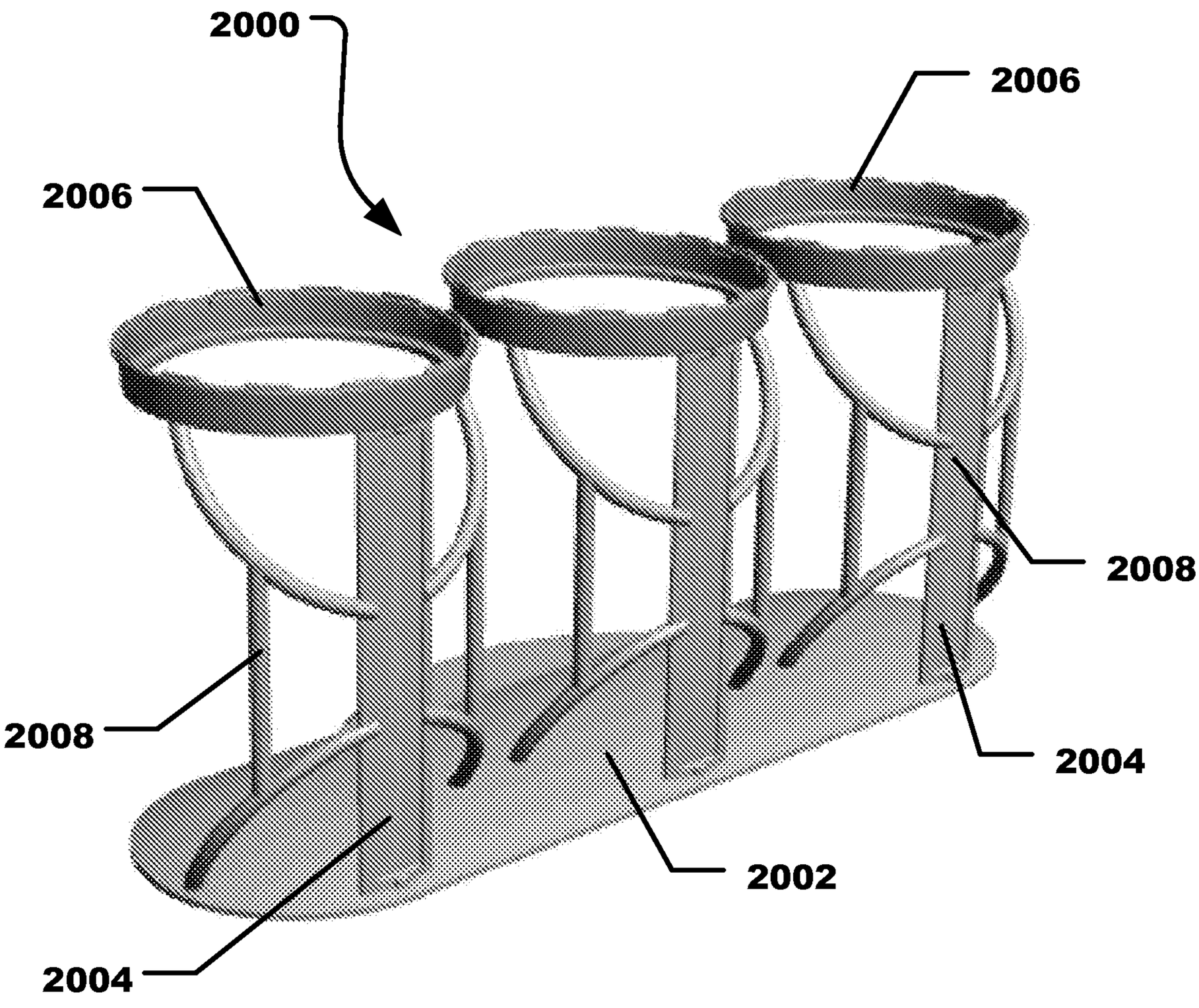
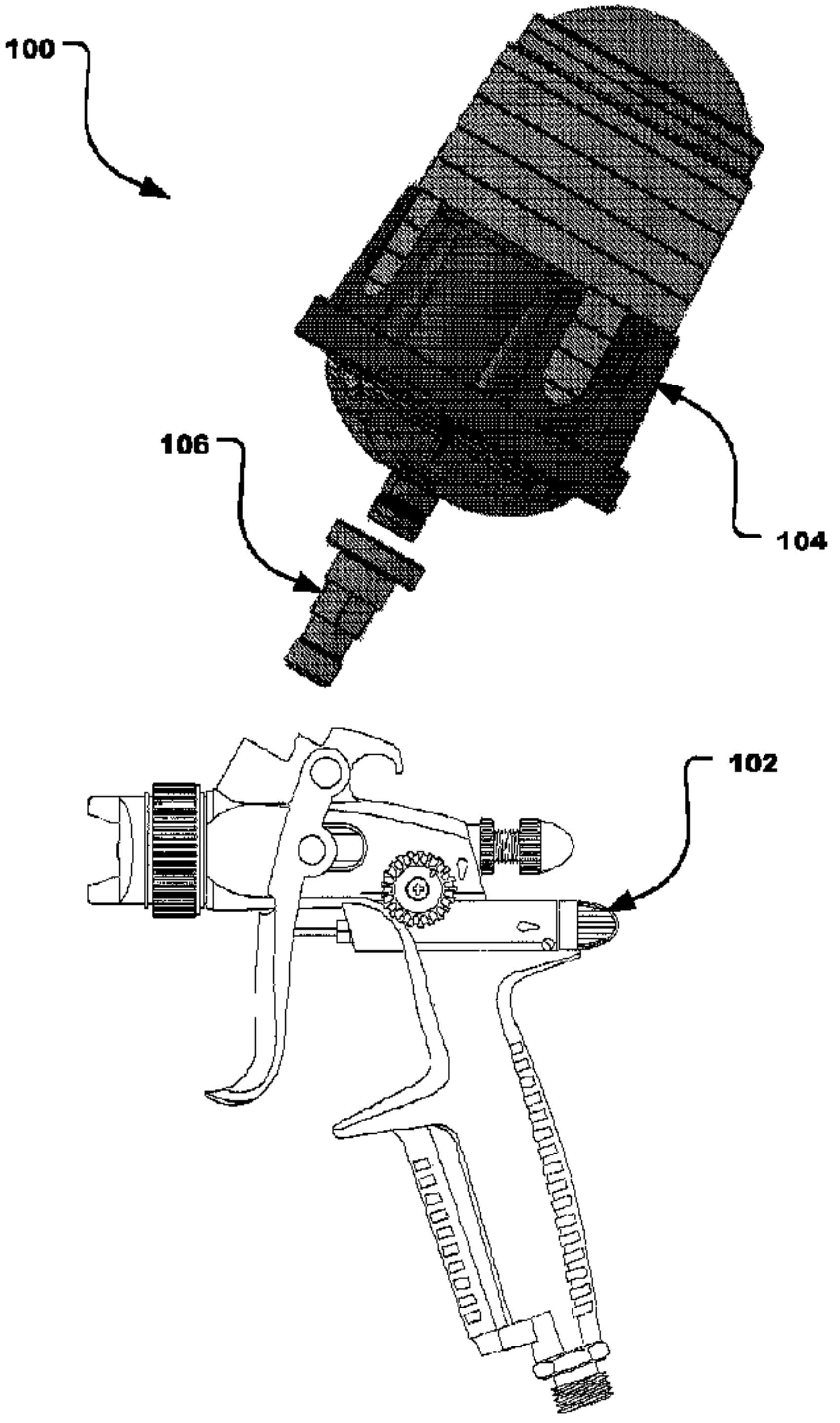


FIG. 21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