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McBride, Jr. et al.

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(54) **OUTDOOR PAINT SPRAYER**
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USPC 239/302, 329, 333, 373, 375; 222/321.7, 222/321.8, 79, 401
See application file for complete search history.

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Related U.S. Application Data
(60) Provisional application No. 62/288,423, filed on Jan. 28, 2016.

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B05B 11/00 (2006.01)
B05B 9/04 (2006.01)
B05B 9/043 (2006.01)
B05B 9/08 (2006.01)
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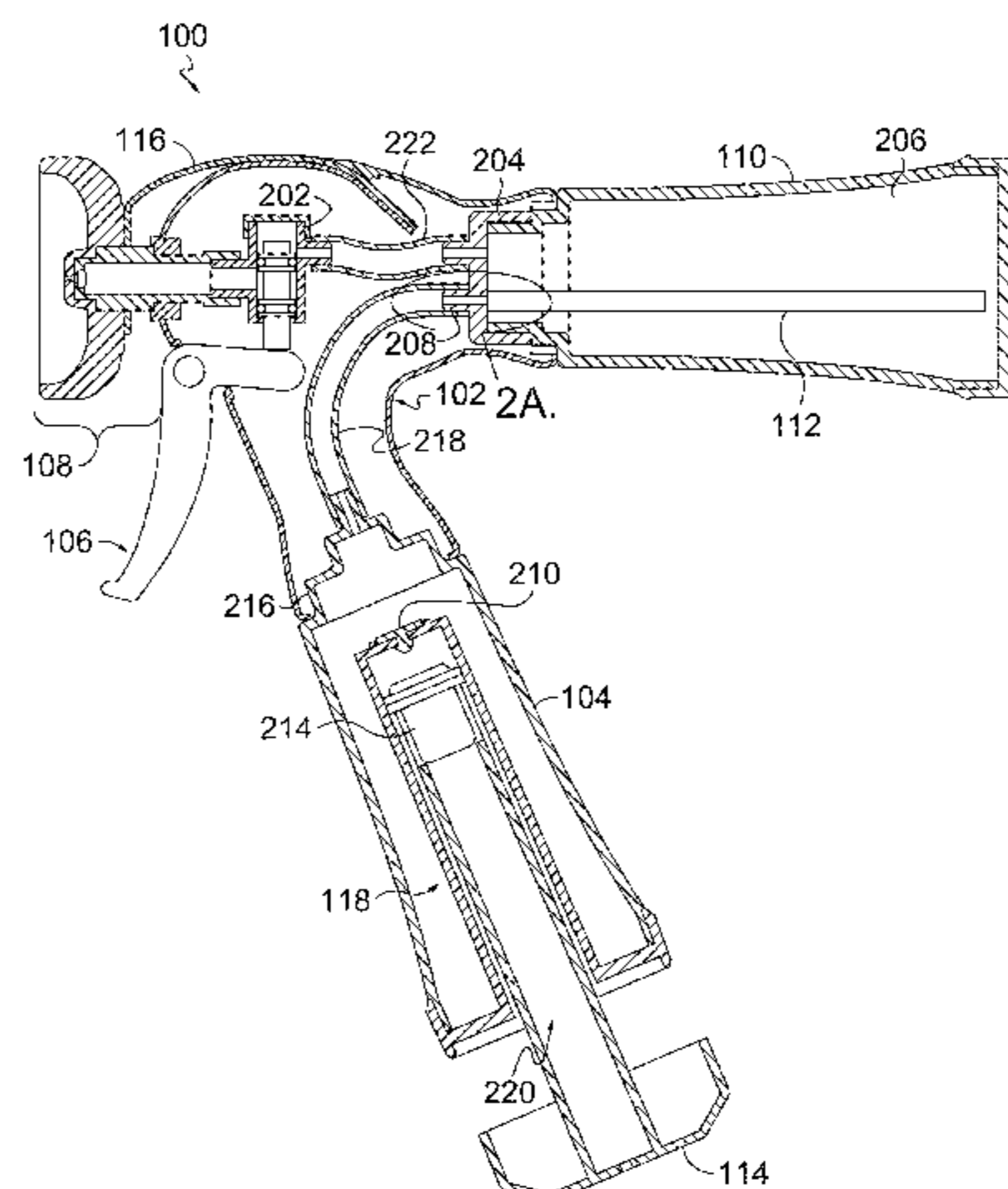
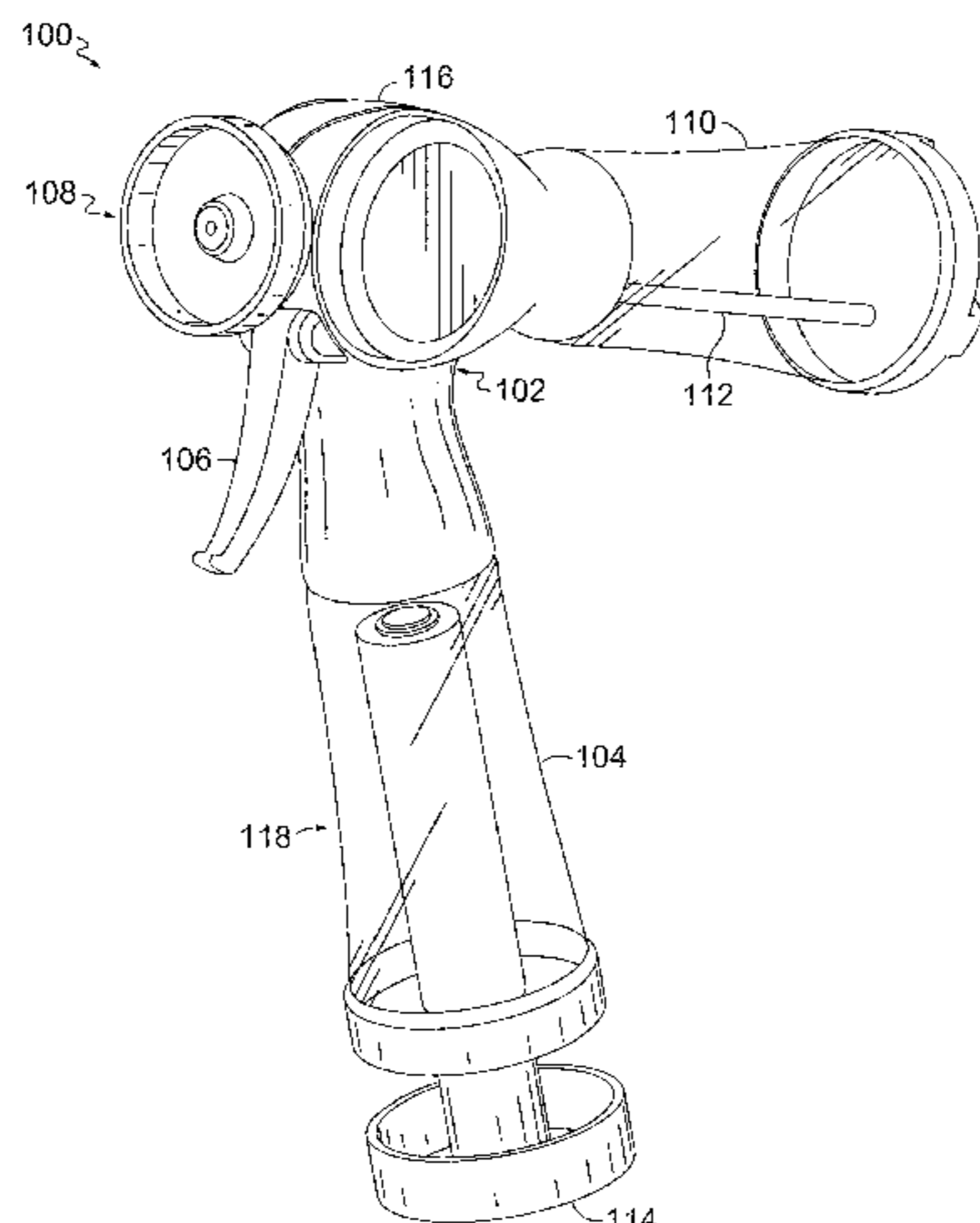
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(52) **U.S. Cl.**
CPC **B05B 7/04** (2013.01); **B05B 9/04** (2013.01); **B05B 9/0403** (2013.01); **B05B 9/043** (2013.01); **B05B 9/0827** (2013.01); **B05B 11/00** (2013.01); **B05B 11/0037** (2013.01); **B05B 11/3001** (2013.01); **B05B 11/3011** (2013.01);
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(57) **ABSTRACT**
Embodiments of the invention are directed to an outdoor paint sprayer having an air pump chamber separate from a refillable and/or replaceable paint chamber. In some aspects, the outdoor paint sprayer is configured to dispense a liquid paint with minimal dilution, such that a paint having an original concentration may be aspirated and dispersed by the outdoor paint sprayer without requiring additional manipulation of the paint outside of the sprayer. In some aspects, the outdoor paint sprayer includes one or more nozzle features and/or tips that produce a desired spraying application. In further aspects, additional features for emulating a particular marking effect may be incorporated with and/or coupled to the sprayer for application.

(58) **Field of Classification Search**
CPC ... B05B 7/04; B05B 11/0037; B05B 11/3001;

17 Claims, 10 Drawing Sheets



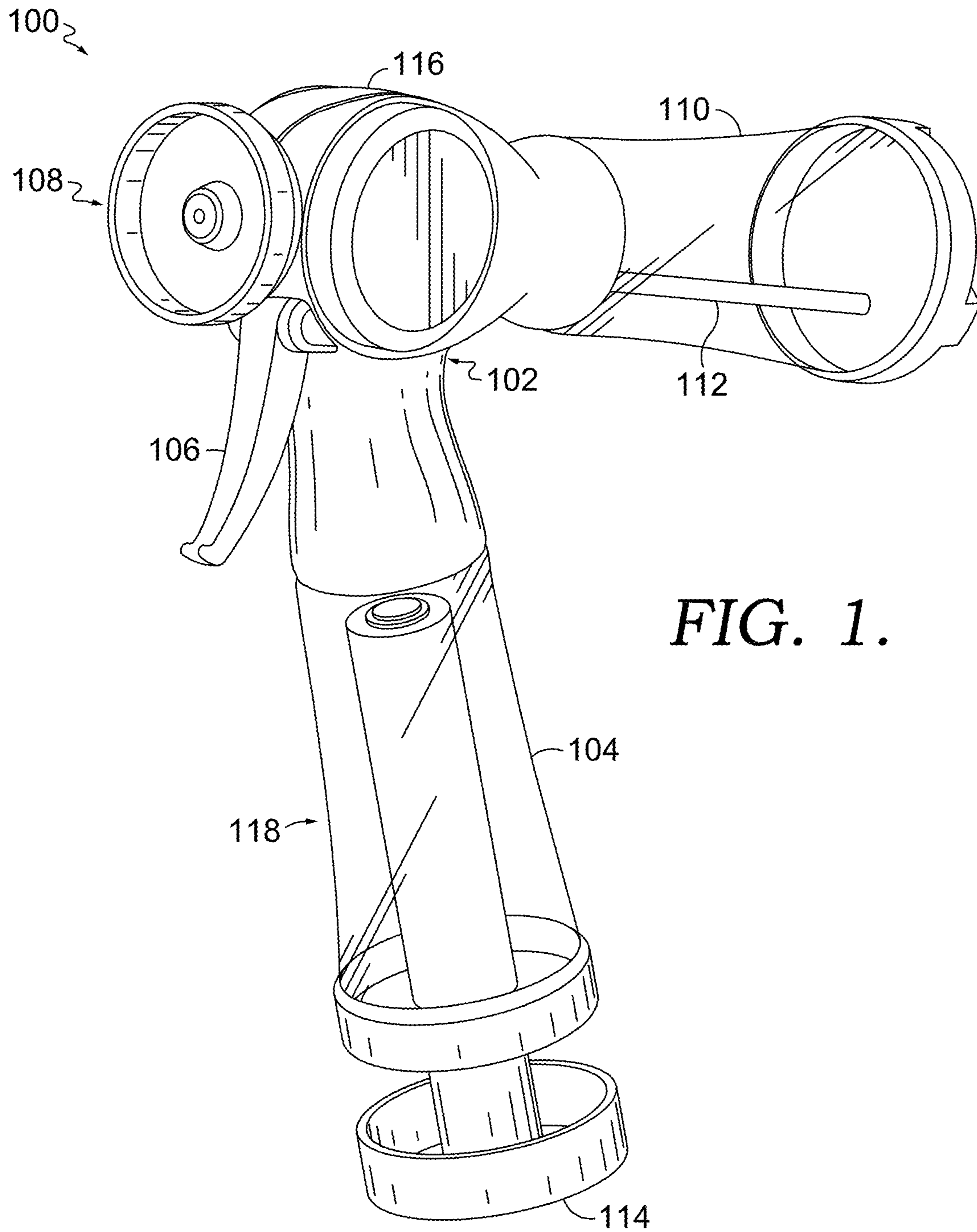


FIG. 1.

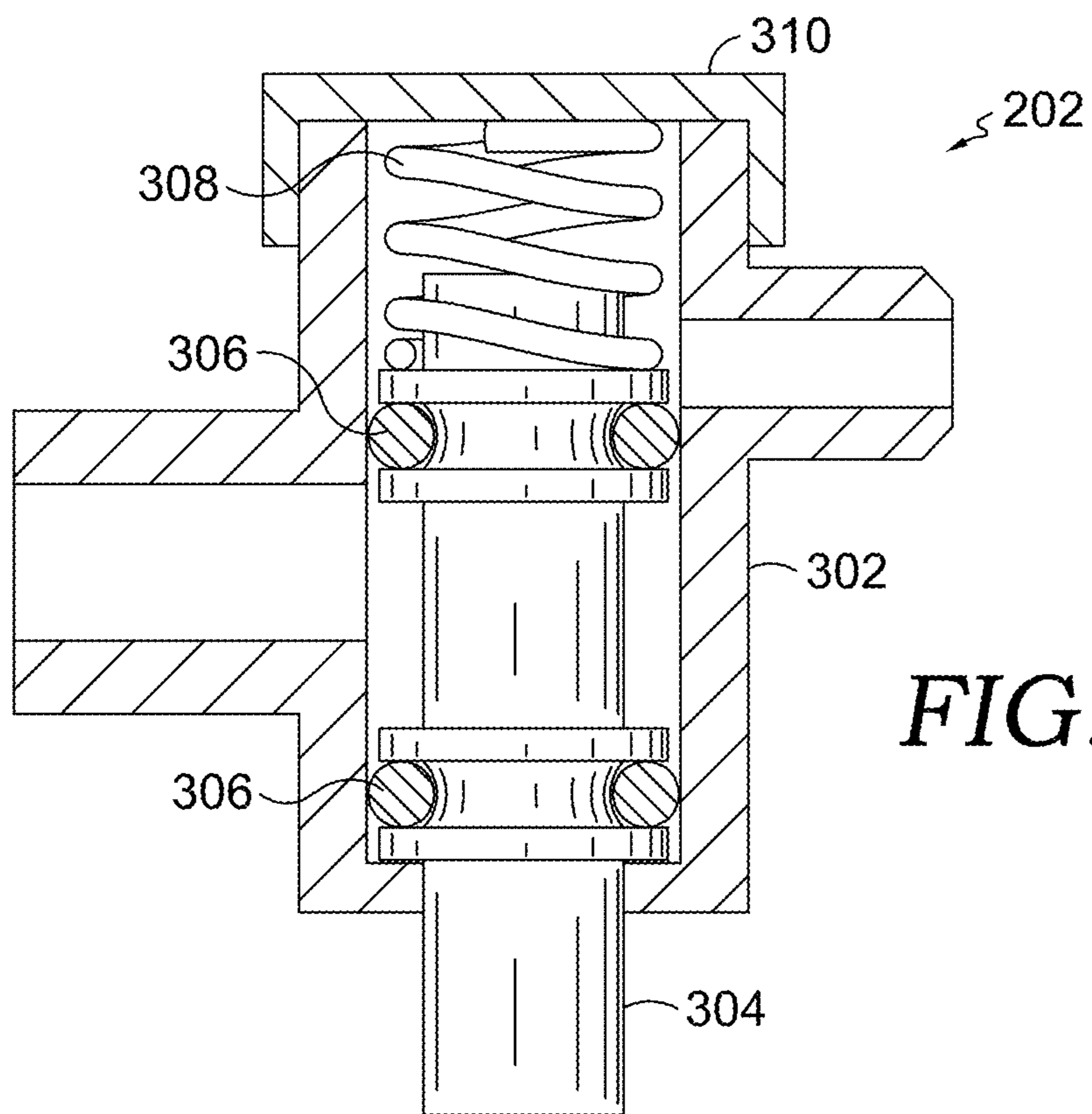


FIG. 3.

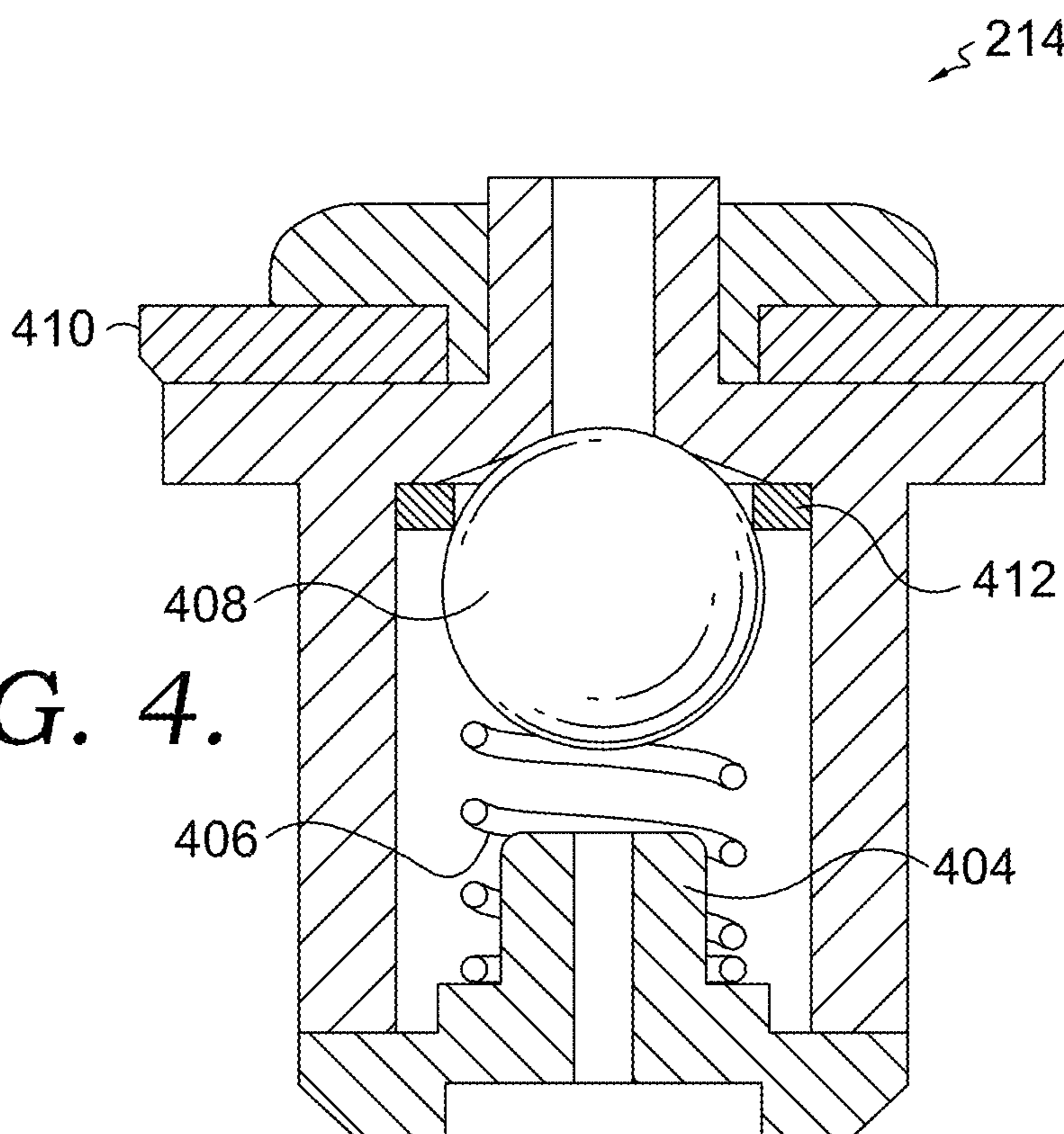


FIG. 4.

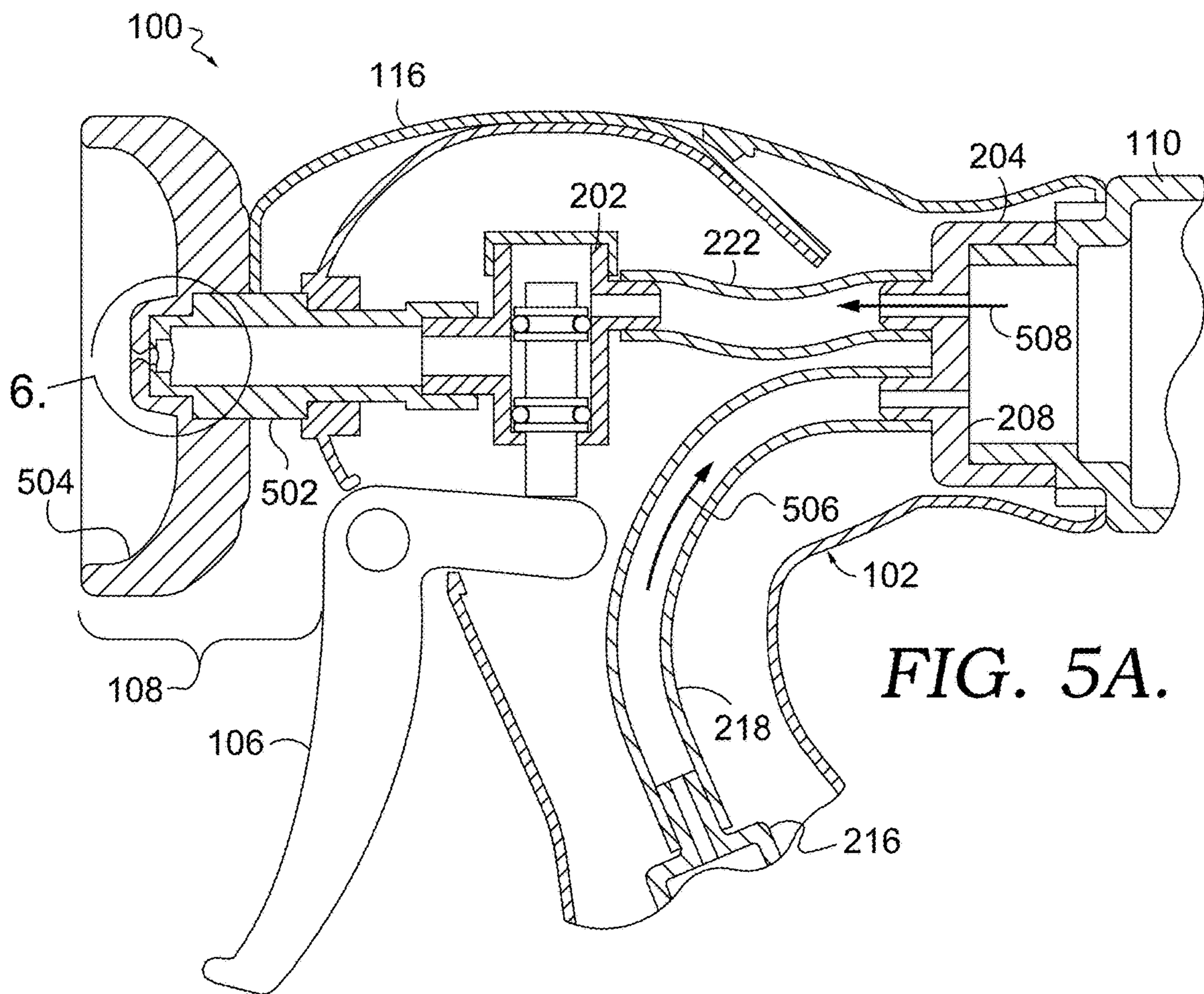
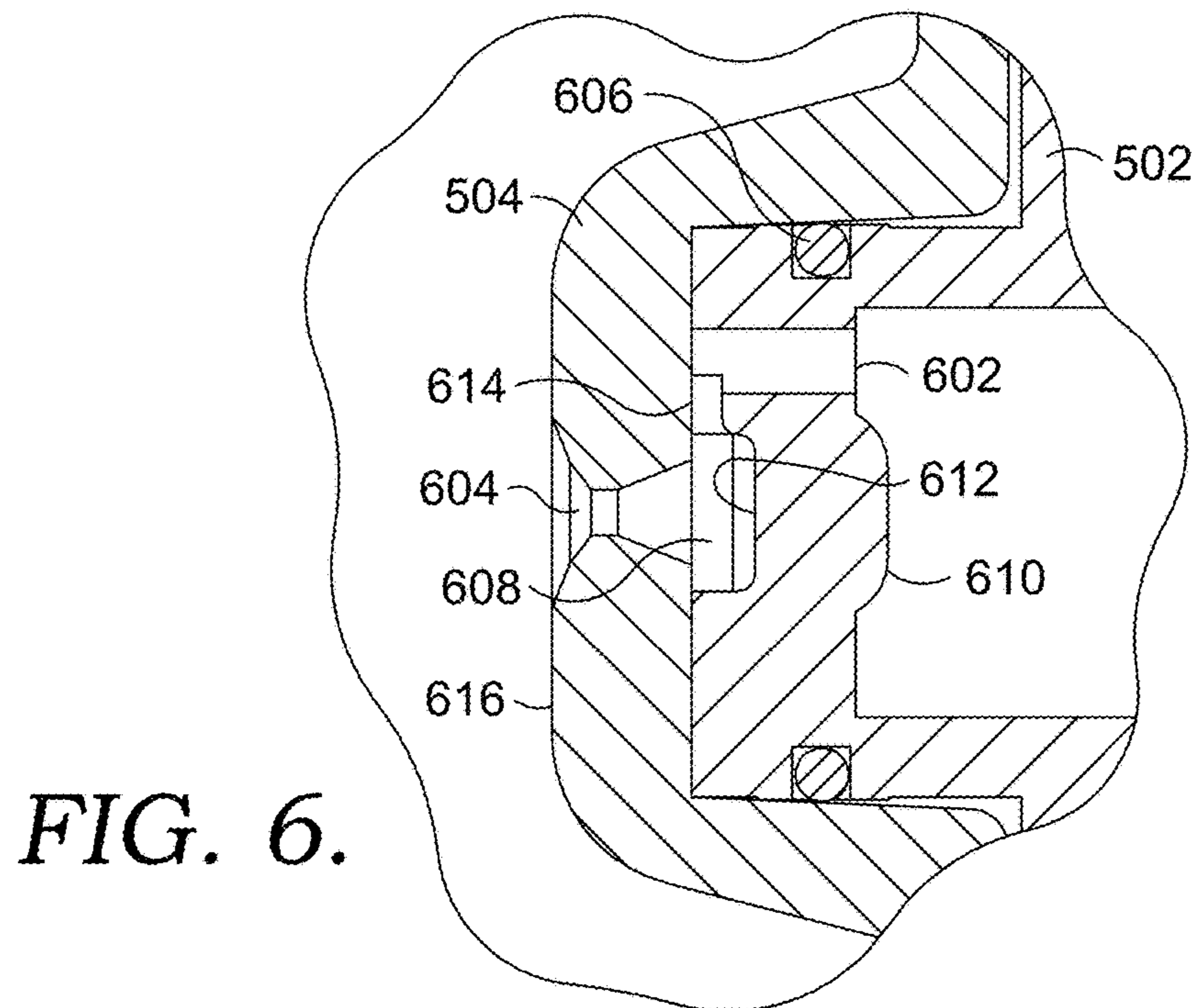
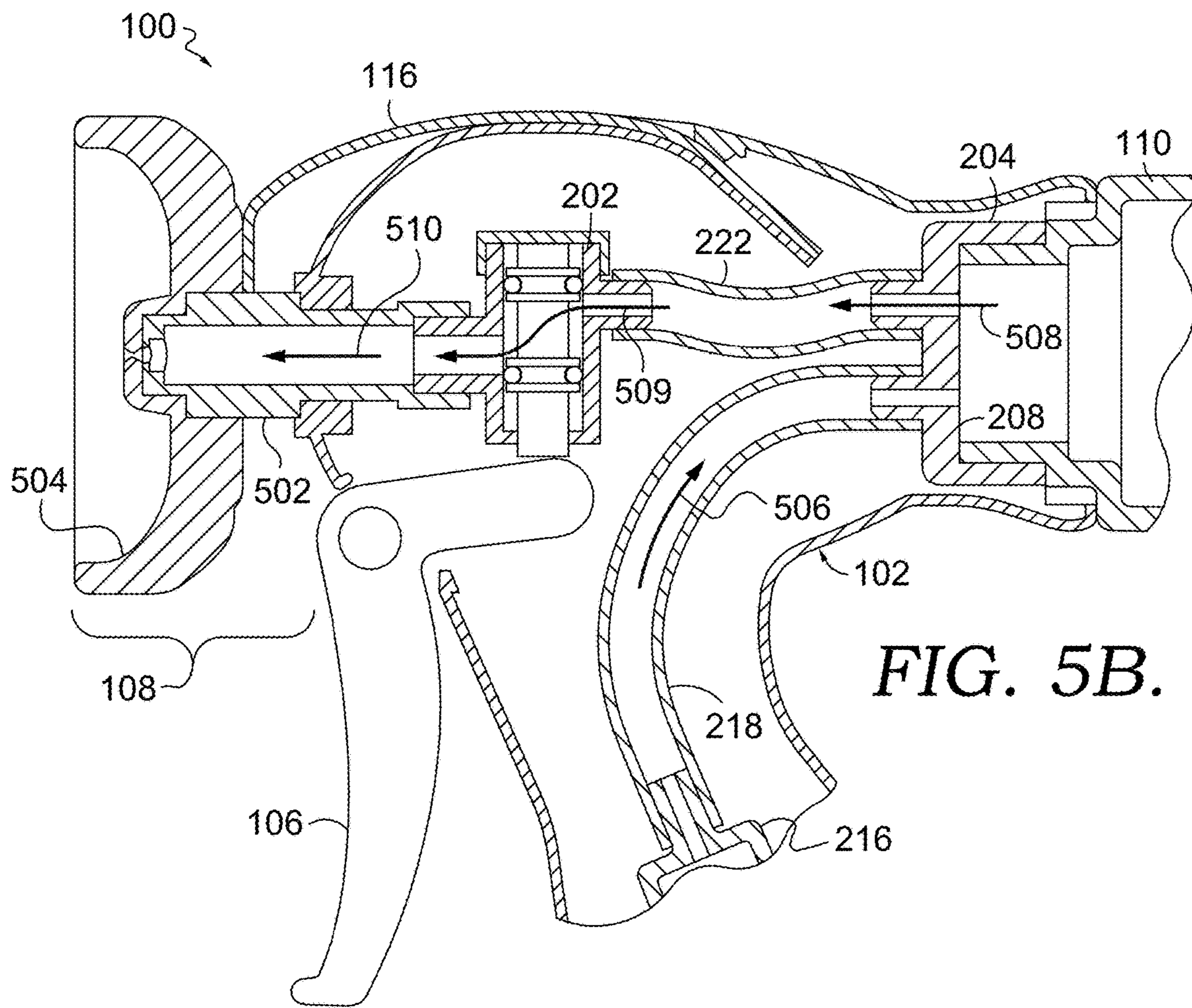


FIG. 5A.



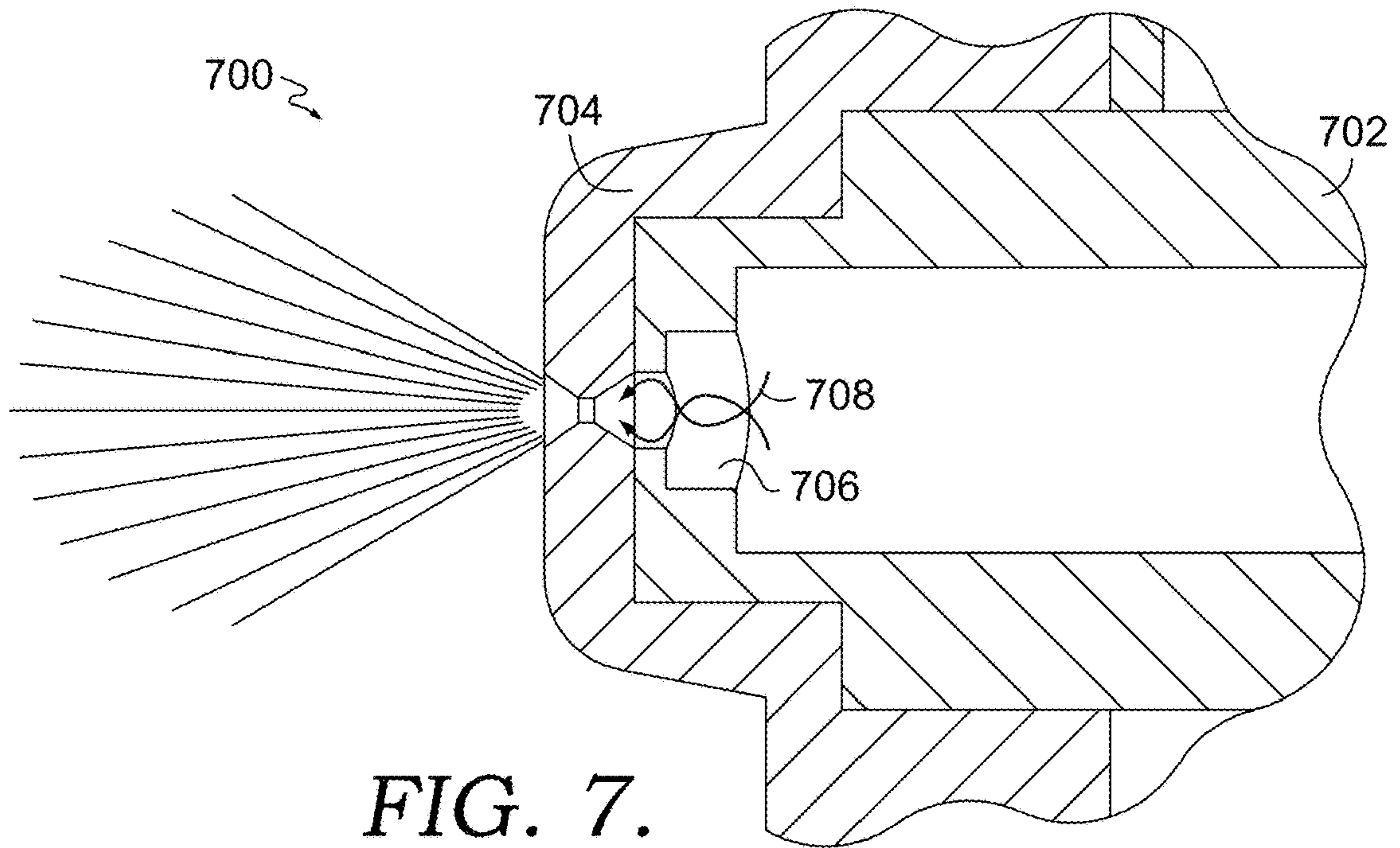


FIG. 7.

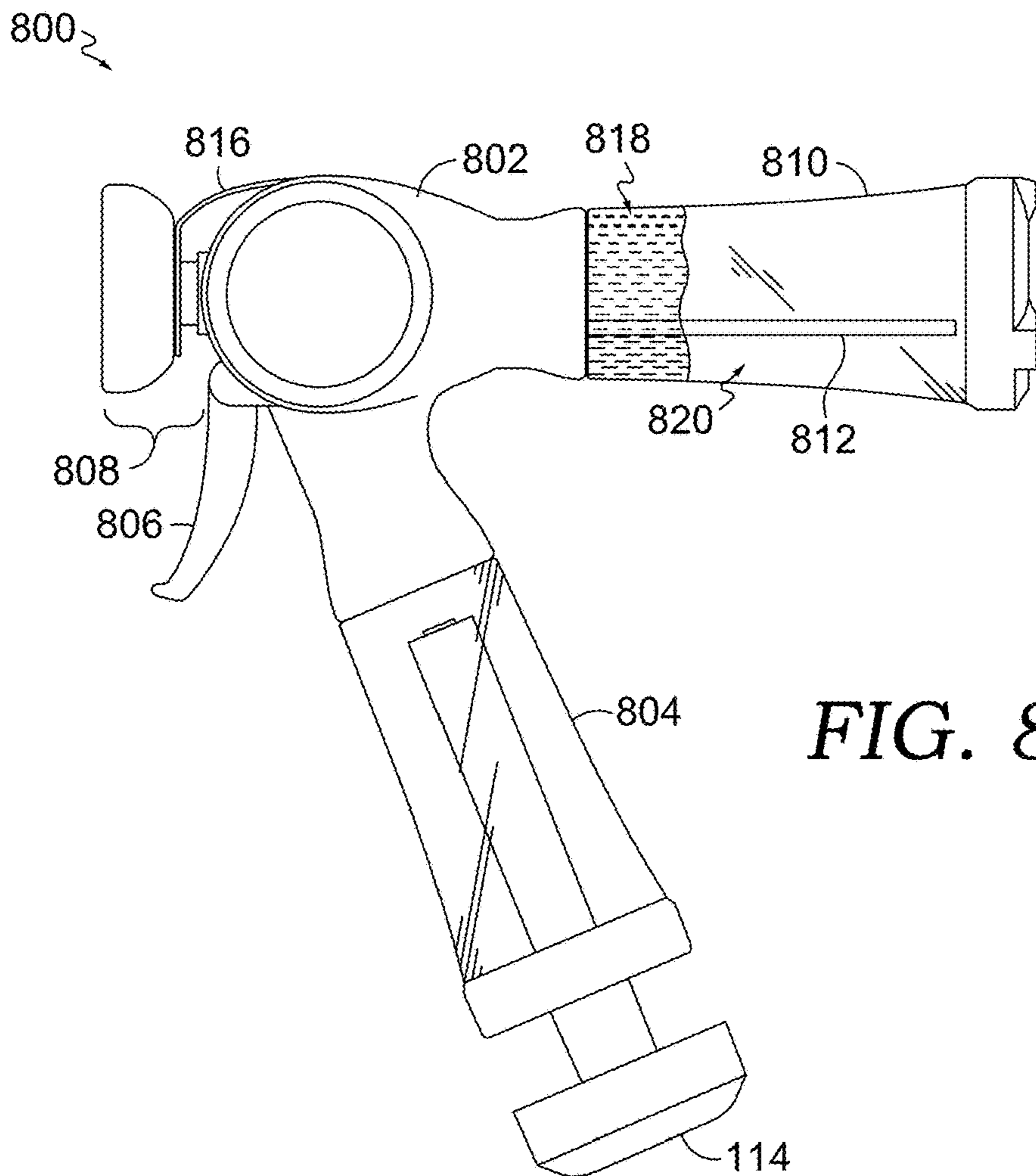


FIG. 8A.

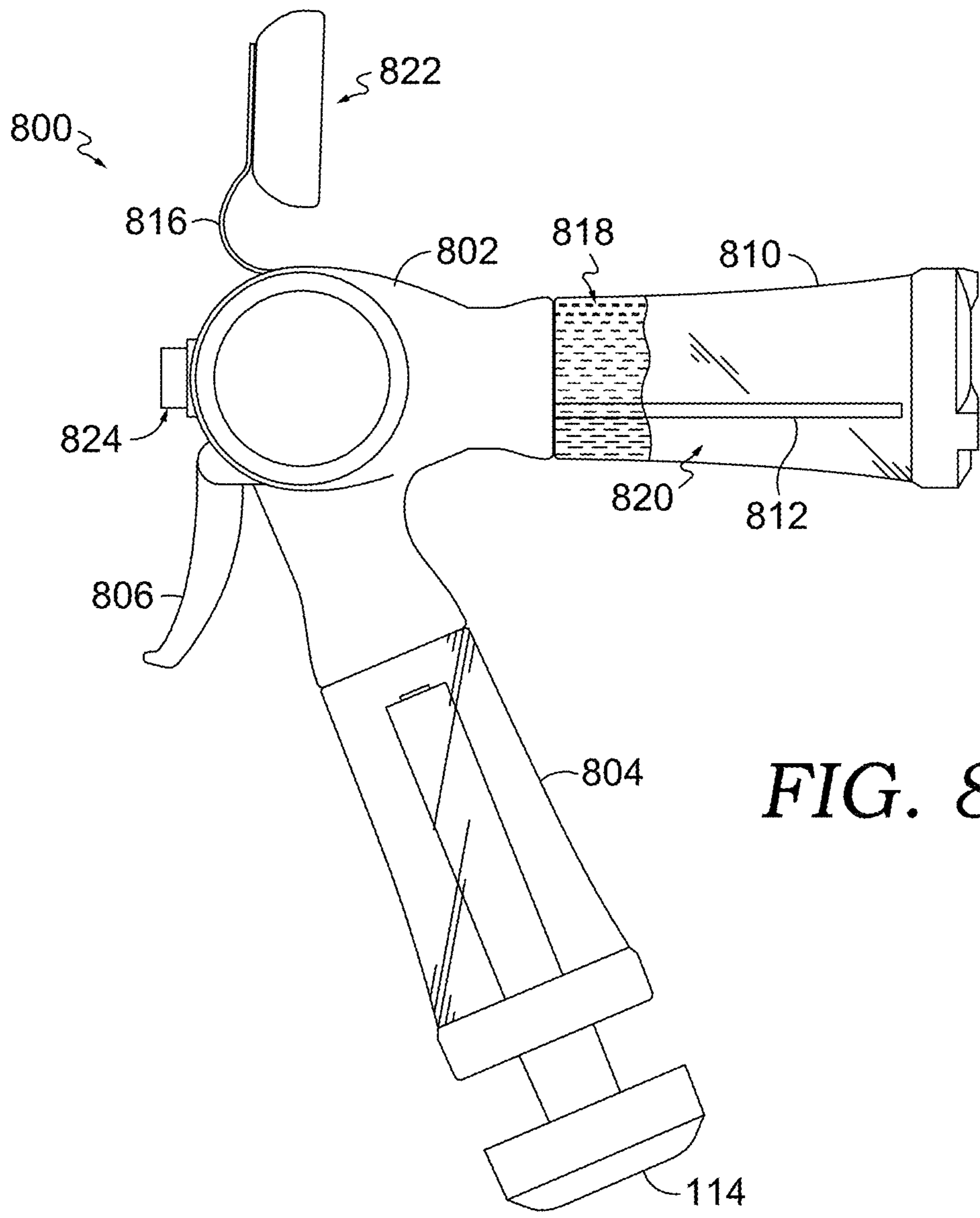


FIG. 8B.

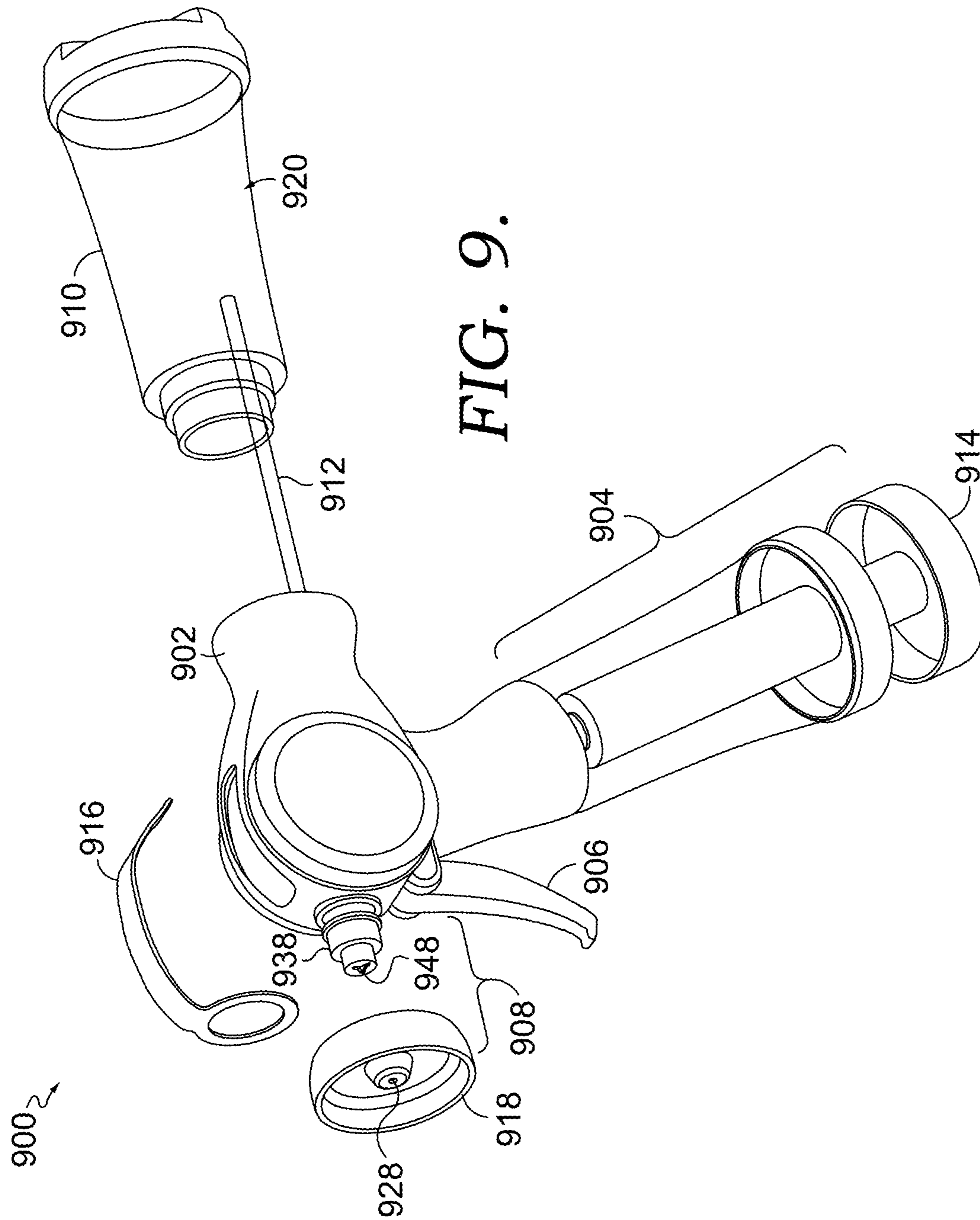


FIG. 9.

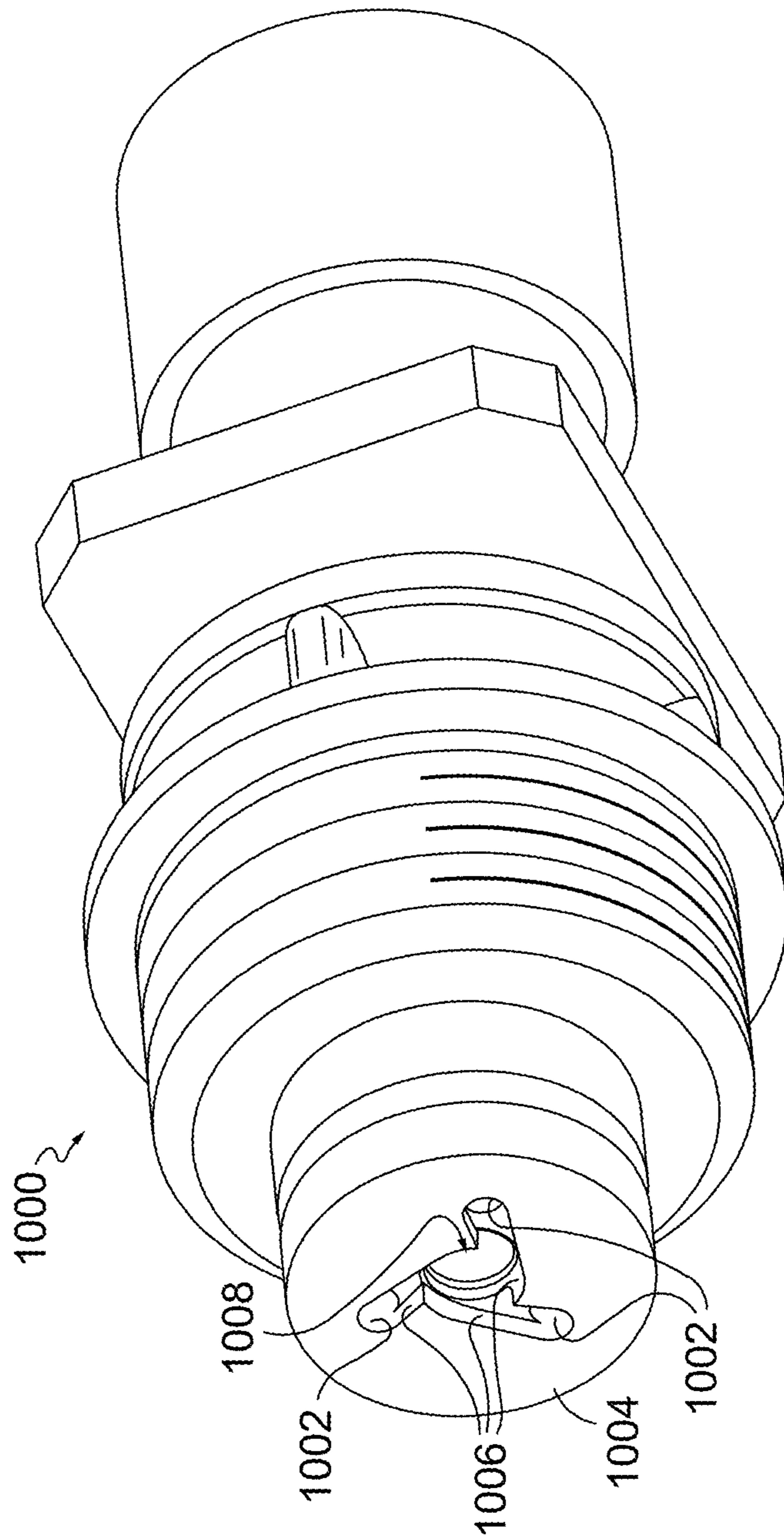


FIG. 10.

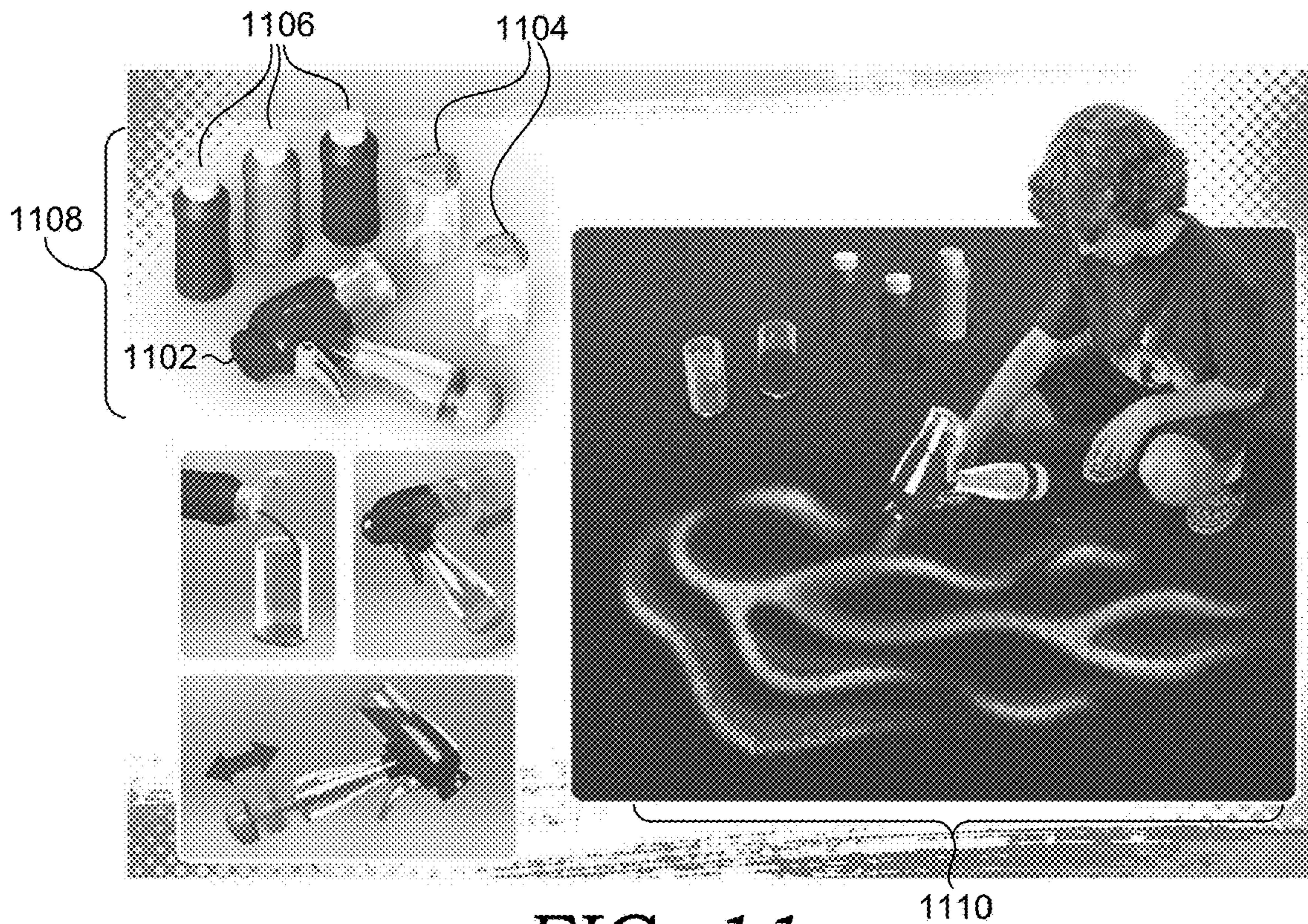


FIG. 11.

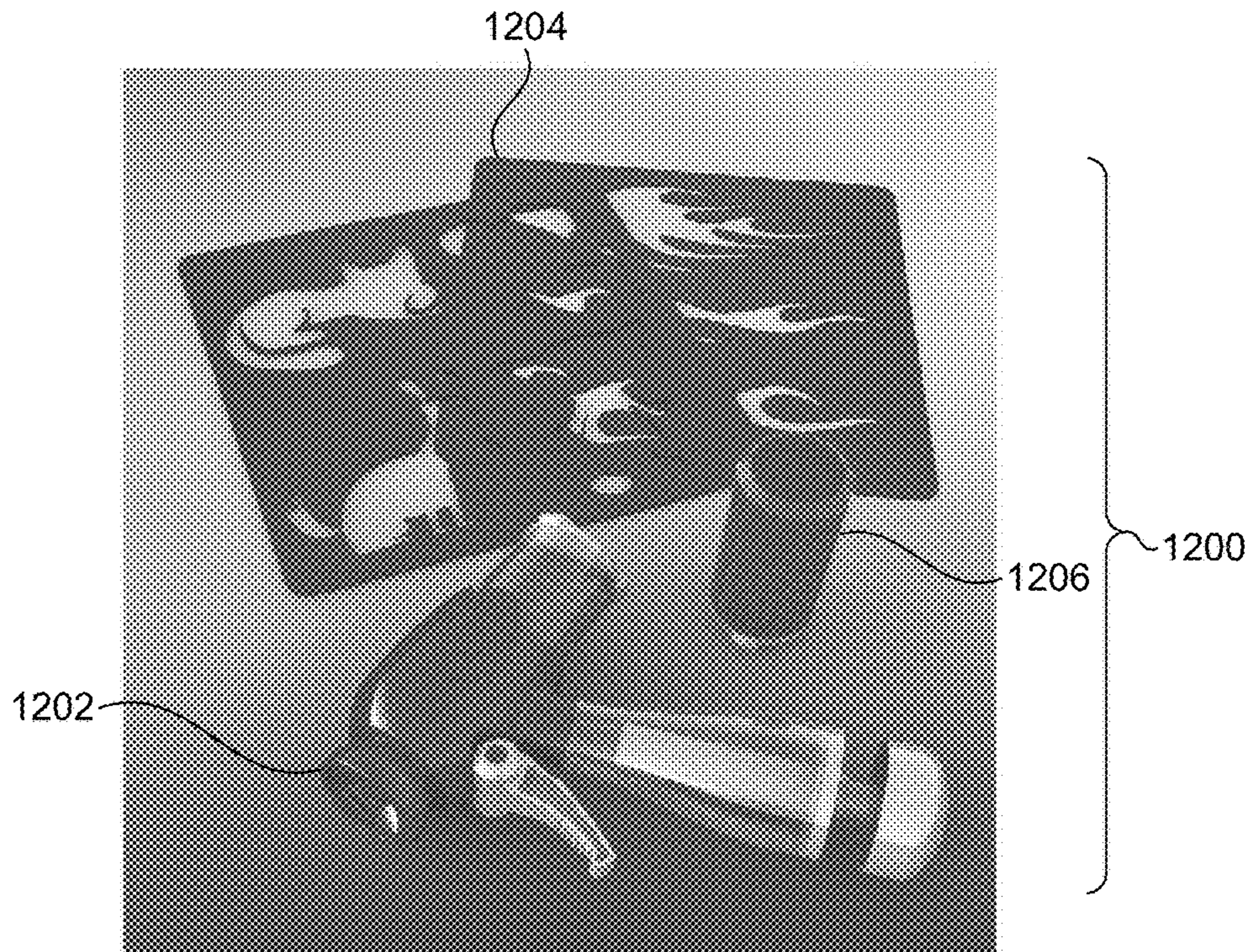


FIG. 12.

1**OUTDOOR PAINT SPRAYER****CROSS-REFERENCE TO RELATED APPLICATIONS**

This application claims priority to U.S. Provisional Patent Application No. 62/288,423, entitled "Outdoor Paint Sprayer," filed Jan. 28, 2016, the entire contents of which is hereby incorporated by reference.

SUMMARY

Embodiments of the invention are defined by the claims below, not this summary. A high-level overview of various aspects of the invention are provided here for that reason, to provide an overview of the disclosure, and to introduce a selection of concepts that are further described below in the detailed-description section below. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in isolation to determine the scope of the claimed subject matter.

In brief and at a high level, this disclosure describes, among other things, an outdoor paint sprayer having an air pump chamber separate from a paint chamber. In some aspects, the air pressure created by the air pump chamber is transferred to the paint chamber prior to dispensing the atomized paint product from a nozzle feature of the outdoor paint sprayer. Additionally, one or more of the air pump chamber, the paint chamber, and the nozzle of the outdoor paint sprayer may be configured to dispense a liquid paint product having a particular viscosity within a particular range. In some aspects, the nozzle feature of the outdoor paint sprayer may be configured to dispense separated, uniformly distributed, and/or atomized liquid paint in a particular dispersion pattern and/or with a particular desired application. For example, the particular pattern and/or desired application may include a particular spray pattern for contacting a surface within a threshold distance from the outdoor paint sprayer, a specific spray tip for marking on a surface to provide a particular visual effect, a desired spray range for covering a particular surface at a particular rate, an adjusted spray force for a particular paint viscosity, and/or a desired efficiency for paint transfer with minimal clogging of one or more dispensing mechanisms.

DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of the invention are described in detail below with reference to the attached drawing figures, and wherein:

FIG. 1 is a side, perspective view of an outdoor paint sprayer device having an air pump chamber separate from a paint compartment, in accordance with an embodiment of the invention;

FIG. 2 is a cross-sectional view of an exemplary outdoor paint sprayer device with a series of valves and hoses between the air pump chamber, the paint compartment, the sprayer body, and the nozzle, in accordance with an embodiment of the invention;

FIG. 2A is an enlarged cross-sectional view of an exemplary one-way valve assembly, in accordance with an embodiment of the invention;

FIG. 3 is a cross-sectional view of a portion of an exemplary outdoor paint sprayer valve assembly, in accordance with an embodiment of the invention;

2

FIG. 4 is a cross-sectional view of a portion of an exemplary outdoor paint sprayer pressure relief valve assembly, in accordance with an embodiment of the invention;

FIG. 5A is an enlarged, cross-sectional portion of an exemplary outdoor paint sprayer in an inactive state, in accordance with an embodiment of the invention;

FIG. 5B is an enlarged, cross-sectional portion of exemplary outdoor paint sprayer in a activated state, in accordance with an embodiment of the invention;

FIG. 6 is an enlarged, cross-sectional portion of an exemplary nozzle assembly, in accordance with an embodiment of the invention;

FIG. 7 is an enlarged, cross-sectional portion of an exemplary nozzle assembly and sample spray pattern, in accordance with an embodiment of the invention;

FIG. 8A is an exemplary outdoor paint sprayer depicted in a pressurized state ready for use, in accordance with an embodiment of the invention;

FIG. 8B is an exemplary outdoor paint sprayer depicted in a pressurized state ready for use with the nozzle assembly disassembled, in accordance with an embodiment of the invention;

FIG. 9 is a partially exploded view of an exemplary outdoor paint sprayer, in accordance with an embodiment of the invention;

FIG. 10 is an exemplary dispersion nozzle with a plurality of orifices for an outdoor paint sprayer, in accordance with an embodiment of the invention;

FIG. 11 is an exemplary operating environment and exemplary outdoor sprayer kit, in accordance with an embodiment of the invention; and

FIG. 12 is an exemplary outdoor sprayer kit, in accordance with an embodiment of the invention.

DETAILED DESCRIPTION

The subject matter of embodiments of the invention is described with specificity herein to meet statutory requirements. But the description itself is not intended to necessarily limit the scope of claims. Rather, the claimed subject matter might be embodied in other ways to include different steps or combinations of steps similar to the ones described in this document, in conjunction with other present or future technologies. Terms should not be interpreted as implying any particular order among or between various steps herein disclosed unless and except when the order of individual steps is explicitly described.

Embodiments of the invention include, among other things, an outdoor paint sprayer having an air pump chamber separate from a paint chamber. In some aspects, the air pressure created by the air pump chamber is transferred to the paint chamber prior to dispensing the atomized paint product from a nozzle feature of the outdoor paint sprayer. Additionally, one or more of the air pump chamber, the paint chamber, and the nozzle of the outdoor paint sprayer may be configured to dispense a liquid paint product having a particular viscosity within a particular range. In some aspects, the nozzle feature of the outdoor paint sprayer may be configured to dispense separated, uniformly distributed, and/or atomized, liquid paint in a particular dispersion pattern and/or with a particular desired application. For example, the particular pattern and/or desired application may include a particular spray pattern for contacting a particular surface within a threshold distance from the outdoor paint sprayer, a specific spray tip for marking on a surface to provide a particular visual effect, a desired spray

range for covering a particular surface at a particular rate, an adjusted spray force for a particular paint viscosity, and/or a desired efficiency for paint transfer with minimal clogging of one or more dispensing mechanisms. Accordingly, aspects of the invention provide a liquid paint dispensing device having a first chamber for generating an amount of hand-pumped air pressure, a second chamber for enclosing an amount of liquid paint (i.e., liquid paint having a variety of viscosities and/or fluid characteristics) and receiving the generated air pressure, and a common housing proximate the first and second chamber that variably facilitates release of the pressurized paint via a triggering mechanism and dispenses the liquid paint in an outward direction via an optimized nozzle.

In one embodiment, an outdoor paint sprayer device comprises: a sprayer body; a paint chamber coupled to the sprayer body at a first position; an air pump chamber coupled to the sprayer body at a second position different than the first position; a nozzle feature coupled to the sprayer body; a trigger mechanism for providing an indication to dispense paint from the paint chamber; an air hose structure coupled between the air pump chamber and the paint chamber; and a paint hose structure coupled between the paint chamber and the nozzle, wherein the air pump chamber comprises at least a first valve assembly, and the paint chamber comprises at least a second valve assembly.

In another embodiment, a paint spraying device comprises: a sprayer body comprising at least one nozzle feature and at least one valve assembly; an air pump chamber coupled to the sprayer body, said air pump chamber comprising a pressure relief valve assembly, a pump mechanism, and a pump chamber port; and a paint chamber coupled to the sprayer body, said paint chamber comprising a one-way air valve, wherein the paint chamber is separate from the air pump chamber.

In a further embodiment, a device for dispensing an undiluted liquid paint comprises: an air pump chamber comprising a pressure relief valve assembly; a paint chamber separate from the air pump chamber and coupled to the air pump chamber via an air hose and a one-way air valve; and a nozzle comprising a valve assembly and a trigger mechanism, said nozzle coupled to said paint chamber via a paint hose.

One or more features of the outdoor paint sprayer may be optimized for dispersing a paint solution having a particular viscosity, with a particular spray characteristic and/or pattern, such as the exemplary spray pattern and nozzle feature in one example. In one aspect of the invention, the outdoor paint sprayer may include a separate air pump chamber and separate, refillable paint chamber that is configured to disperse a paint solution having between about 50 to 100% viscosity, in a range between a partially diluted or undiluted state from an original concentration. In further embodiments, the outdoor paint sprayer may be configured to disperse a paint solution having between about 70 to 100% viscosity, while in further aspects, a paint solution between 80 and 100% viscosity may be dispensed from the outdoor paint sprayer in a consistent spray pattern. In further aspects, an embodiment of the outdoor paint sprayer is configured to disperse a liquid paint having about 95% viscosity.

As such, a method for use of the outdoor paint sprayer may include loading paint into the paint chamber, hand-pumping air into the air pump chamber, and actuating a trigger to apply the liquid paint to an outdoor surface. In some aspects, the hand-pumped air supply pressurizes the paint chamber proximate a first end of the paint chamber, and upon actuating by a trigger, the liquid paint is released

proximate a second end opposite the first end, through a nozzle and onto an outdoor surface. In further aspects, the paint chamber may be refillable by a user, such that at least a portion of the paint chamber is removably coupled, providing access to an interior portion of the paint chamber. In other aspects, additional, pre-loaded paint chambers, such as one or more refill canisters of liquid paint, may be configured to couple to the sprayer base/body, providing a single spray gun for dispensing multiple, interchangeable colors. Further, one or more stencil and refill components may be provided for an outdoor paint sprayer, in accordance with an embodiment of the invention.

With reference now to the figures, FIG. 1 is a side, perspective view of an outdoor paint sprayer device 100 having an air pump chamber 104 separate from a paint chamber 110, in accordance with one embodiment of the invention. In this embodiment, the outdoor paint sprayer may include a sprayer body 102 coupled to a nozzle assembly 108, a refillable paint chamber 110, an air pump chamber 104 having an air pump mechanism 118, and a trigger 106. In embodiments, a tip harness 116 may be affixed to the sprayer body 102 at a first end of the tip harness 116 and affixed to a removable spray tip 504 of the nozzle assembly 108 at a second end of the tip harness. In such an embodiment, the tip harness 116 allows a user to remove the spray tip 504 from the nozzle assembly 108 for cleaning without the risk of misplacing the spray tip. Additionally, or alternatively, the tip harness 116 may allow a user to remove the spray tip 504 and dispense the liquid paint product directly from the dispersion nozzle without the risk of misplacing the spray tip 504.

In embodiments, the tip harness 116 may be removably affixed to the spray tip 504, such that the spray tip 504 may be replaced by a similar spray tip 504 or an alternative spray tip 504 having the same or different throughput features, such as a differently shaped opening. For example, if a first spray tip 504 is damaged, the user may remove the spray tip 504 from the nozzle assembly 108, remove the tip harness 116, replace the damaged spray tip 504 with a different spray tip 504, and attach the tip harness 116 to the undamaged spray tip 504. Additionally, or alternatively, aspects of the invention provide a removable first spray tip 504 that may be exchanged with a second spray tip 504 that produces a different liquid paint product spray profile. For example, the first spray tip 504 may be configured to spray liquid paint product in a circular pattern, a second spray tip 504 may be configured to spray liquid paint product in a half circle pattern, and a third spray tip 504 may be configured to spray liquid paint product in a crescent moon pattern. It will be understood by those skilled in the art that many different spray profiles and/or patterns may be created utilizing one or more spray tips 504, and remain within the scope of the present invention.

In some embodiments, the tip harness 116 may be at least partially flexible so as to facilitate easy cleaning and/or spray tip exchange while maintaining structural integrity. In some aspects, the tip harness 116 may be affixed to the sprayer body 102 and/or the spray tip 504 in many different configurations. In further aspects, the nozzle assembly 108 may include a spray tip 504 that is not removable, separate or continuous with surrounding nozzle features.

With continued reference to FIG. 1, the paint chamber 110 provides a liquid paint product reservoir, with an internal chamber configured to supply liquid paint product to be dispensed through the nozzle assembly 108. In embodiments, the paint chamber 110 may be coupled to the sprayer body 102 at a first position. In such an embodiment, the paint

chamber 110 may comprise a refill chamber port 204, a refill chamber gasket (not shown), and a refill reservoir 206. This configuration may allow the paint chamber 110 to be, at least temporarily, uncoupled from the sprayer body 102 so that the paint chamber 110 can be cleaned, refilled with similar, liquid paint product, or refilled with a different liquid paint product (e.g., a liquid paint product of a different color). The paint chamber 110 may then be re-coupled to the sprayer body 102 at the refill chamber port 204 without damaging the outdoor paint sprayer or the sprayer body 102. In other words, while the outdoor paint sprayer or sprayer body 102 remains intact, the removable paint chamber 110 may be accessed at one or more portions of the device, such as a rotatably coupled opening proximate an attachment point between the paint chamber 110 and the sprayer body 102. Additionally, or alternatively, the paint chamber 110 may further comprise a refill chamber end cap, such as a removably coupled end cap opposite the attachment end of the paint chamber that is directly coupled to the sprayer body 102. In an embodiment, the refill chamber end cap may be removably coupled to the paint chamber to achieve similar functionality as discussed above.

In embodiments, the trigger mechanism 106 provides an indication to the outdoor paint sprayer to dispense liquid paint product through the nozzle assembly 108. In embodiments, the trigger mechanism 106 is connected with a valve assembly such that activating the trigger mechanism 106 mechanically opens the valve assembly allowing liquid paint product to be dispensed through the nozzle assembly 108. In alternative embodiments, the trigger mechanism 106 may provide an electrical indication that actuates the valve assembly allowing liquid paint product to be dispensed through the nozzle assembly.

In the depicted embodiment of the outdoor paint sprayer device 100, the air pump chamber 104 is coupled to the sprayer body 102 at a second position. For example, the paint chamber 110 may be coupled to the sprayer body 102 at a first position generally parallel to the direction of paint flow exiting the sprayer device 100, while the air pump chamber 104 may be coupled to the sprayer body 102 at a second position that bisects the generally parallel axis of the paint chamber 110. Aspects of the air pump chamber 104 comprise a manual air pump mechanism 118 positioned in an internal cavity of the air pump chamber 104, wherein the pump mechanism 118 further comprises a pump handle 114. Further embodiments of the air pump mechanism 118 comprise a one-way air valve configured so that air is pumped into the air chamber 104 when the user operates the pump mechanism 118. In embodiments, the one-way air valve includes one or more features of an umbrella valve that seals the air pump mechanism 118 while the pump handle 114 is drawn back and opens the air pump mechanism 118 while the pump handle 114 is driven up such that air is delivered into the air chamber 104. In some embodiments, the pump mechanism 118 may further comprise a pressure release valve 214. In such an embodiment the pressure release valve 214 may insure that the air pressure created by the air pump mechanism 118 does not exceed a threshold pressure.

Turning next to FIG. 2, a cross-sectional view of the exemplary outdoor paint sprayer device 100 is shown in accordance with an embodiment of the invention. The outdoor sprayer device 100 may include the nozzle assembly 108 and the sprayer body 102 arranged along a central x-axis. As discussed later, in embodiments, components of the nozzle assembly 108 may be coupled to the sprayer body 102 at a first location on the sprayer body 102. In further embodiments, the sprayer body 102 may have a plurality of

coupling locations for the coupling of at least one other component. For example, the outdoor paint sprayer 100 may comprise the sprayer body 102, the nozzle assembly 108 coupled at the first position of the sprayer body 102, the air pump chamber 104 coupled at a second position (pump chamber port 216) of the sprayer body 102, the paint chamber 110 coupled at a third position (paint chamber port 204) of the sprayer body 102, the trigger mechanism 106 movably coupled to a fourth position of the sprayer body 102, and the tip harness 116 coupled to a fifth position of the sprayer body 102. As such, air pumped in the air pump chamber 104 by the pump mechanism 118 may be transferred to the paint chamber 110, and used to dispense paint from the paint chamber 110, through a valve assembly 202, and exit a nozzle assembly 108. Such nozzle assembly 108 may include one or more valves and/or tip structures configured to disperse the paint from the paint chamber, such as with a desired force and/or spray pattern.

In embodiments, the air pump chamber 104 further comprises an air hose 218, a one-way air valve 210, an air chamber 212, a pump mechanism 118, a pump handle 114, and a pressure relief valve 214. In an embodiment, the one-way air valve 210 is an umbrella valve configured such that air being pumped by the pump mechanism 118 can enter the air chamber 212 but not exit the air chamber 212 through the pump mechanism 118. Those skilled in the art will understand that many different valve assemblies, for example one-way air valves, may perform this function consistent with the present invention.

In an embodiment, the pressure release valve 214 may be configured such that the air pressure within the air pump chamber may not exceed a predetermined threshold pressure. In embodiments, the pressure release valve 214 is coupled with a pressure release vent 220, the pressure release vent comprising a hollow cavity within the pump mechanism 118 running longitudinally from the pressure release valve 214 to the surface of the pump handle 114. In such an embodiment, the addition of any air to the air chamber 212 that exceeds the threshold air pressure may activate the pressure relief valve 214, allowing the excess air pressure to be released through the pressure release vent 220 and back into the environment outside the pump handle 114. In embodiments, once the air pressure in the air chamber 212 falls below the threshold pressure, the pressure relief valve 214 automatically closes, preventing the further loss of air pressure. As such, application of pressure to the air chamber 212 via pumping action of the pump mechanism 118 may be automatically regulated to prevent over-pumping by a user, and in turn, maintain the stability of one or more components within the outdoor paint spray device 100. In further aspects, a consistent spray pattern of atomized liquid paint may be dispensed with a threshold amount of force transferred from the air-pressurized pump mechanism 118.

As depicted in FIG. 2, in one embodiment, the pump mechanism 118 may be a hand operated air pump. The pump mechanism 118 may be operated by pulling on the pump handle 114 that draws air into the pump mechanism 118. In further aspects, the pump mechanism 118 may be operated by pushing on the pump handle 114, which pushes air toward the one-way valve 210. The air may then open the one-way valve 210 and permit air to flow into the air chamber 212. In embodiments, this process may be repeated as many times as desired, incrementally increasing the air pressure until the desired air pressure is reached. In further embodiments, this process may be repeated as many times as desired until the air pressure in the air chamber 212 reaches a threshold pressure that activates the pressure release valve

214. In alternative embodiments, the pump mechanism **118** may be any air pump mechanism known or developed in the future, such as a pneumatic air pump, an electric air pump, a compressed air cartridge system, or the like.

Embodiments of the air pump chamber **104** may be coupled to the sprayer body at an air pump chamber port **216**. In one embodiment, the coupling between the sprayer body **102** and the air pump chamber port **216** may be any coupling known in the art or developed in the future that provides an airtight coupling between the sprayer body **102** and the air pump chamber port **216**. For example, coupling between the sprayer body **102** and the air pump chamber port **216** may be permanent, or semi-permanent, joining the sprayer body **102** and the air pump chamber port **216** in an airtight configuration. In alternative embodiments, the air pump chamber **104** may be removably coupled with the sprayer body **102** at the air pump chamber port **216**.

Aspects of the air pump chamber **104** may comprise an air hose **218**. The air hose **218** may be coupled to the air pump chamber **104** at a first end of the air hose **218** and the paint chamber **110** at a second end of the air hose **218** so that air pumped into the air pump chamber **104** flows through the air hose **218** into the paint chamber **110**. In an embodiment, the air hose **218** may be coupled to a one-way valve **208** that is incorporated into the paint chamber port **204**. In such an embodiment, the one-way valve **208** is configured to allow air to flow from the air pump chamber **104**, through the air hose **218**, and into the paint chamber **110** while the one-way valve **208** prevents any retrograde flow from the paint chamber **110** to the air pump chamber **104**. In embodiments, the one-way valve **208** comprises a duckbill valve. However, it will be understood by those skilled in the art that any valve structure, such as a one-way valve that provides unidirectional flow and an air-tight seal, may be incorporated in an embodiment without departing from the scope of the disclosed invention. In further embodiments, the air hose **218** passes through a hollow interior portion of the sprayer body **102** from the air pump chamber **104** to the paint chamber **110**, such that the air hose **218** may be enclosed by the sprayer body **102**.

Continuing with FIG. 2, embodiments of the paint chamber **110** further comprise a proximal first end configured for coupling to the sprayer body **102** at the paint chamber port **204**, a distal second end of the paint chamber **110**, and a hollow refill reservoir **206** for holding an amount of liquid paint product. In embodiments, the paint chamber further comprises a one-way valve **208**, as discussed above. In embodiments, the one-way valve **208** may allow the unidirectional flow of air from the air pump chamber **104** to the paint chamber **110**. In additional embodiments, the paint chamber further comprises a second air hose **112** that is coupled to the one-way valve **208** opposite the first air hose **218**. The second air hose **112** may be coupled to the one-way valve **208** at a first end of the second air hose **112** and configured such that the air exits the air hose **218** at the second end of the second air hose **112** proximate the distal second end of the paint chamber **110**. As such, air exiting the air hose **218** may form, at least partially, an air pocket proximate the distal second end of the paint chamber **110**. In such an embodiment, for example, the inadvertent combination of pressurized air and liquid paint is reduced, and creation of foam is minimized, such as foam formed between an amount of air and at least a portion of the liquid paint product. In one embodiment, the first air hose **218** and the second air hose **112** may comprise a unified air hose with the one-way valve integrated into the unified air hose. Accordingly, although depicted as separate hose features, it

will be understood that multiple hose components may be combined into a single or multiple units. In an alternative embodiment, the second air hose **112** may be integrated into an inner surface of the paint chamber **110** such that the second air hose **112** is formed from a hollow cavity structure integrated into the paint chamber running from the proximal first end to the distal second end of the paint chamber **110**. That is, a non-removable air hose may be integrated into the paint chamber **110** to provide air access to the distal second end of the paint chamber **110** (i.e., “behind” the paint being dispensed).

Embodiments of the paint chamber **110** further comprise a paint hose feature for providing paint to the nozzle assembly **108**. In an embodiment, the paint hose feature may include a first paint hose **222** having a first end coupled to the paint chamber **110** and a second end coupled to the sprayer valve assembly **202**. As such, paint flowing through the paint hose **222** may flow from the paint chamber **110** to the valve assembly **202** and flow from the valve assembly **202** to the nozzle assembly **108**. In embodiments, activating the trigger mechanism **106** may selectively open the valve assembly **202** and may allow the flow of liquid paint from the paint chamber **110**, through the valve assembly **202**, and on to the nozzle assembly **108**. In some embodiments, the paint hose feature includes a second paint hose (not depicted) coupled to the sprayer valve assembly **202** at a first end and coupled to the nozzle assembly **108** at a second end. In alternative embodiments, the nozzle assembly **108** may be coupled directly to the valve assembly **202**. It will be understood by those skilled in the art that the many configurations of the paint hose feature and the sprayer valve assembly **202** are possible within the scope of the disclosed invention.

Turning now to FIG. 2A, an enlarged cross-sectional view of an exemplary embodiment of the one-way valve **208** is provided. In embodiments, the one-way valve **208** may comprise an assembly of components. For example, in embodiments, the one-way valve **208** may comprise a valve collar **208a**, a valve sleeve **208b**, and a duckbill seal **208c**. As depicted in FIG. 2A, in embodiments, air hose **218** may be coupled to a first side of valve collar **208a**; a second side of valve collar **208a** may be coupled to a first side of valve sleeve **208b**, with duckbill seal **208c** nested between the coupling of valve collar **208a** and valve sleeve **208b**; a second side of valve sleeve **208b** may be coupled with refill chamber port **204**, such that, at least, a portion of the second side of valve sleeve **208b** extends through refill chamber port **204**; and, the portion of the second side of valve sleeve **208b** may be coupled to second air hose **112**. As such, air may flow through air hose **218**, valve collar **208a**, duckbill seal **208c**, valve sleeve **208b**, second air hose **112** and exit second air hose **112** proximate the distal second end of the paint chamber **110**. In embodiments, the duckbill seal **208c** is configured to allow air to flow from the valve collar **208a** into the valve sleeve **208b** while preventing any retrograde flow from valve sleeve **208b** to valve collar **208a**. It will be understood by those skilled in the art that the many configurations of the components discussed immediately above may be incorporated in an embodiment without departing from the scope of the disclosed invention.

Turning now to FIG. 3, a cross-sectional view of an exemplary outdoor paint sprayer valve assembly **202** is provided. As depicted, embodiments of the sprayer valve assembly **202** comprise a valve body **302**, a valve pin **304**, at least one valve O-ring **306** to prevent unwanted spraying and leakage of the liquid paint product, a valve spring **308**, and a valve body cap **310**. In further embodiments, activa-

tion of the trigger mechanism **106** applies a mechanical force on the valve pin **304**, such that the valve pin **304** may move, at least partially, vertically within the valve body **302**, wherein the movement of the valve pin **304** compresses, at least partially, the valve spring **308**. As the exemplary depiction suggests, translational and/or vertical movement of the valve pin **304** may result in the opening, at least partially, of the valve restricting paint flow, such that paint is then permitted to flow from the paint chamber **110** through the sprayer valve assembly **202** and to the nozzle assembly **108**. However, it will be understood by those skilled in the art that any valve structure may be incorporated in an embodiment without departing from the scope of the disclosed invention, while providing a mechanism to selectively control flow of paint from one portion of the sprayer valve assembly **202** to another.

With reference to FIG. **4**, a cross-sectional view of an exemplary outdoor paint sprayer pressure relief valve assembly **214** includes one or more features configured to facilitate valve function during pumping of the air chamber, such as one or more features for generating a desired amount of pressure to transfer into the paint chamber, and disperse the paint from the outdoor paint sprayer. In an embodiment, the pressure relief valve assembly **214** further comprises a pressure relief valve body **402**, a pressure relief valve cap **404**, a pressure relief valve spring **406**, a pressure relief valve ball **408**, a pump gasket **410**, and a pressure relief valve seal **412**. The force of the air pressure pushes against the pressure relief valve ball **408**, the pressure relief valve ball **408** may, at least partially, compress the pressure relief valve spring **406**, and air may be allowed to flow around the pressure relief valve ball **408** through an opening in the pressure relief valve cap **404** to the pressure relief vent and back into the environment. In such an embodiment, the attempted addition of air that results in an air pressure over the threshold pressure may activate the pressure release valve **214**, preventing the over-pressurization of the outdoor paint sprayer. However, it will be understood by those skilled in the art that any pressure release valve structure may be incorporated in an embodiment without departing from the scope of the disclosed invention. In some aspects, air released into the environment refers to air not retained within the outdoor paint sprayer, permitted to flow to the exterior of the sprayer body and/or pumping chamber.

Turning to FIG. **5A**, an enlarged cross-sectional portion of an exemplary nozzle assembly **108** comprises a dispersion nozzle **502** coupled to the sprayer body **102** and a spray tip **504**. In further embodiments, the spray tip **504** is removably coupled to the dispersion nozzle **502**.

Further, FIG. **5A** provides an exemplary illustration of a possible use case in an inactive state. As one example, air from the air pump chamber **104** flows through the air hose **218** into the paint chamber **110**, as illustrated by the air flow arrow **506**. As air flows in accordance to air flow arrow **506**, pressure builds within the paint chamber **110** and a portion of liquid paint product may be forced into the paint hose **222** toward the sprayer valve assembly **202**, as illustrated by the first paint flow arrow **508**. When the trigger mechanism **106** is not activated sprayer valve assembly **202** is in a closed position, such that liquid paint product may not pass through the sprayer valve assembly. It will be understood by those in the art that this is merely one example of many possible component configurations and flow configuration within the scope of the claimed invention.

FIG. **5B** provides an exemplary illustration of a possible use case in an active state. Activation of the trigger mechanism **106** may open the sprayer valve assembly **202**. In

embodiments, a portion of liquid paint product may then flow through the open sprayer valve assembly **202**, as indicated by the second paint flow arrow **509**. This may allow the release of a spray of liquid paint product out the nozzle assembly **108**, as indicated by the second paint flow arrow **510**. However, it will be understood by those in the art that this is merely one example of many possible component configurations and flow configuration within the scope of the claimed invention.

Turning to FIG. **6**, an enlarged cross-sectional portion of an exemplary nozzle assembly **108** depicts a dispersion nozzle **502** comprising a plurality of dispersion nozzle orifices **602**, a spray tip **504** comprising at least one spray tip orifice **604**, and a dispersion nozzle gasket **606**. In some aspects, the dispersion nozzle **502** includes an inner surface **610** and an outer surface **612**, the spray tip **504** having an inner surface **614** and an outer surface **616**. In an embodiment, the nozzle assembly **108** further comprises a vortex chamber **608** created from a hollow cavity between the outer surface of the dispersion nozzle **612** and the inner surface of the spray tip **614**. The vortex chamber **608** may be configured to cause, at least, a portion of a liquid paint product entering the vortex chamber **608** from the plurality of dispersion orifices **602** to create, at least partially, a vortex which may, at least partially, atomize a portion of the liquid paint product in the vortex chamber **608**. Further, in embodiments, the at least one spray tip orifice **604** may be at least partially be aligned with the vortex chamber along a central x-axis. It will be understood by those skilled in the art that while only one of the plurality of dispersion nozzle orifices **602** is show in FIG. **6**, further aspects of the nozzle orifices **602** in embodiments of a three-dimensional device are within the scope of the disclosed invention.

In embodiments, the dispersion nozzle gasket **606** is, at least, partially recessed in the dispersion nozzle **502** such that when the spray tip **504** is removably coupled, a seal is formed between the spray tip **504**, the dispersion nozzle gasket **606**, and the dispersion nozzle **502**. As such, the liquid paint product may be prevented from leaking through the coupling and may only exit the nozzle assembly **108** through the at least one spray tip orifice **604**. As discussed above, the at least one spray tip orifice **604** may result in the spray pattern in a desired shape specific to a particular spray tip **504**, according to some embodiments. For example the user may remove a first spray tip and exchange it with a second spray tip that produces a different liquid paint product spray profile. For example, the first spray tip may be configured to spray liquid paint product in a circular pattern, a second spray tip may be configured to spray liquid paint product in a half circle pattern, and a third spray tip may be configured to spray liquid paint product in a crescent moon pattern. It will be understood by those skilled in the art that many different spray patterns may be created and remain within the scope of the present invention.

Turning now to FIG. **7**, an enlarged cross-sectional portion of a simplified nozzle assembly **700** includes a dispersion nozzle **702**, a spray tip **704**, and a vortex chamber **706**. The dispersion nozzle **702**, the spray tip **704**, and the vortex chamber **706** of the exemplary nozzle assembly **700** of FIG. **7** are arranged along a central x-axis. Embodiments of the invention include a vortex chamber **706** being defined by a hollow cavity created between the dispersion nozzle **702** the spray tip **704**. Liquid paint product entering the vortex chamber **706** from the dispersion nozzle **702** may create, at least partially, a vortex **708** which may, at least partially, atomize a portion of the liquid paint product in the vortex chamber **706**. It will be understood by those skilled in the art

11

that FIG. 7 is a simplified representation of FIG. 6 to emphasize the vortex chamber 706 and the vortex 708 and not meant as a limitation on the disclosed invention.

Turning now to FIG. 8A, an exemplary embodiment of the outdoor paint sprayer device 800 includes: a nozzle assembly 810 coupled to a first position of the sprayer body 810; a tip harness 816 coupled to the nozzle assembly 810 and to a second position of the sprayer body 810; a paint chamber 810, with a proximal first end and a distal second end opposite the proximal first end, wherein the proximal first end of the paint chamber 810 is coupled at a third position of the sprayer body 810; an air hose 812 for delivery of air proximate the distal second end of the paint chamber 810, an air pump chamber 804 coupled to a fourth position of the sprayer body 810, and a trigger mechanism 806 for activating the sprayer device 800. In other words, the sprayer device 800 may comprise a sprayer body 802 with multiple coupling locations. As an example, a nozzle assembly 810 may be coupled to the sprayer body 802 at a first location of the sprayer body 802 coupling locations. As another example, a tip harness may be coupled to the sprayer body 802 at a second location of the sprayer body 802 coupling locations. As another example, a paint chamber 810 may be coupled to the sprayer body 802 at a third location of the sprayer body 802 coupling locations. As a further example, an air pump chamber 804 may be coupled to the sprayer body at a fourth location of the sprayer body 802 coupling locations. Those skilled in the art will recognize that the preceding examples represent merely a small subset of the possible configurations consistent with the scope of the claimed invention and many other configurations are possible within the scope of the claimed invention.

Further, FIG. 8A includes a depiction of a liquid paint product 818 and a pressurized air pocket 820 within the paint chamber 810. As depicted, in an embodiment, air delivered through the air hose 812 proximate the distal second end of the paint chamber 810 may, at least partially, create a pressurized air pocket 820 which may force, at least, a portion of the liquid paint product 818 to the proximal first end of the paint chamber 810.

Turning now to FIG. 8B, an exemplary embodiment of the outdoor paint sprayer device 800 with the nozzle assembly is depicted in an at least partially disassembled view. As discussed above, in embodiments, the spray tip 822 may be removably coupled to the dispersion nozzle 824. In embodiments, the tip harness 816 is removably coupled at a first end to the spray tip 822 and coupled to the spray body 802 at a second end of the tip harness 816. As such, the nozzle assembly may be at least partially disassembled to facilitate cleaning of the spray tip 822 and the dispersion nozzle 824.

Turning now to FIG. 9, a partially exploded exemplary outdoor paint sprayer device 900 includes a sprayer body 902, an air pump chamber 904, a trigger mechanism 906, a nozzle assembly 908, a tip harness 916, a paint chamber 910, and an air hose 912 oriented around a central sprayer body 902. In embodiments, the nozzle assembly 908 further comprises a spray tip 918 with at least one spray orifice 928 and a dispersion nozzle 938 with a plurality of dispersion nozzle orifices 948. As depicted, in embodiments the spray tip 918 may be removably coupled to the dispersion nozzle 938. In a further embodiment, the tip harness 916 is removably coupled at a first end to the spray tip 918 and coupled to the spray body 902 at a second end.

In embodiments, the paint chamber 910 may be removably coupled to the sprayer body 902 at the proximal first end of the paint chamber 910. As such, the paint chamber 910 may comprise refill reservoir 920 for holding liquid

12

paint product, wherein the refill reservoir 920 is a hollow cavity defined by the paint chamber 910. As depicted the paint chamber may be removed to allow a user to clean the paint chamber 910, the refill reservoir 920, or the air hose 912, refill the refill reservoir 920 with similar liquid paint product, or fill the refill reservoir 920 with a different liquid paint product, for example a liquid paint product of the different color. In an embodiment the outdoor paint sprayer further comprises a paint chamber cap (not depicted) that may be removably coupled to the proximal first end of the paint chamber 910 when the paint chamber 910 is removed from the sprayer body 902. As such, the paint chamber 910 may be sealed by the paint chamber cap to prevent spilling of the liquid paint product, temporary or long term storage of the liquid paint product, and/or prevent unwanted evaporation, drying, or curing of the liquid paint product.

For example, a user may fill the refill reservoir 920 of the paint chamber 910 with a desired liquid paint product, for example a green liquid paint; the user may then couple the paint chamber 910 to the sprayer body 902; the user may then, as discussed above in reference to other figures, repeatedly pump the air pump mechanism by alternating pulls and pushes on the pump handle 914, such that air is forced into the air pump chamber 904; air may then flow from the air pump chamber 904 through, at least, the air hose 912, such that the paint chamber may become pressurized; the user may stop pumping air into the air pump chamber 904 when the desired pressure is reached and may activate the trigger mechanism 906; the trigger mechanism 906 may open a valve assembly and the air pressure may force, at least, a portion of liquid paint product through at least one paint hose and valve assembly to the dispersion nozzle 938. The dispersion nozzle 938 may channel, at least, a portion of the liquid paint product into the plurality of dispersion orifices 948. A portion of liquid paint product may then form a vortex which may result is at least a portion of the liquid paint product to atomize, upon exiting the plurality of dispersion orifices 948. The atomized liquid paint product may then pass through the spray tip 918 and a spray of atomized liquid paint product may exit the outdoor paint sprayer 900 through the at least one spray tip orifice 928. At some point, the user may stop activating the trigger mechanism 906 and wish to change liquid paint products, for example to change colors. The user may uncouple the paint chamber 910. Then the user may cap the paint chamber 910 with the paint chamber cap for later use. The user may then fill the refill reservoir of a second paint chamber, similar to the paint chamber 910, with a second liquid paint product, for example a red liquid paint. The user may then couple the second paint chamber to the spray body 902 and repeat the process as many times as desired. It will be understood by those skilled in the art that the preceding example uses are not intended to be limiting and merely one, of many, possible examples of how one embodiment, of many possible embodiments, of the disclosed invention can be used.

Turning to FIG. 10, a perspective view of an exemplary dispersion nozzle 1000 is depicted. In embodiments, the plurality of dispersion orifices 1002 may be configured in a specific orientation around a central x-axis and a central y-axis. For example, in an embodiment, the plurality of dispersion orifices 1002 may be three dispersion orifices configured in a triangular orientation around a central x-axis and a central y-axis. As another example, in an alternative embodiment, the plurality of dispersion orifices 1002 may be six dispersion orifices configured in a triangular orientation around a central x-axis and a central y-axis. In other alternative embodiments, the plurality of dispersion orifices

13

1002 may comprise any number of dispersion orifices, greater than one, configured in any orientation around a central x-axis and a central y-axis.

In embodiments, the dispersion nozzle **1000** may comprise a first surface **1004** and the plurality of dispersion orifices **1002** may be at least partially recessed from the forward surface **1004**. In further embodiments, a recessed guide channel **1006** may connect the plurality of dispersion orifices **1002** to a predetermined location, for example a location centered about the central x-axis and y-axis. In 5
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embodiments, the guide channel **1006** may be configured such that, when a spray tip is coupled to the dispersion nozzle, liquid paint product is directed through the guide channel **1006** into the vortex chamber **1008**. In such an embodiment the guide channel **1006** may, at least partially, aid in the atomization of at least a portion of the liquid paint product. For example, the guide channel **1006** may be configured such that at least a portion of liquid paint product flows in, at least, a partially circular path as the liquid paint product enters the vortex chamber **1008**. This may aid in the formation of a vortex motion as described above. As another example, the guide channel **1006** may be configured such that at least a portion of liquid paint product flowing from a first of the plurality of dispersion orifices **1002** forcibly collides with, at least, a portion of liquid paint product flowing from, at least, a second of the plurality of dispersion orifices **1002**. This forcible collision may aid in the atomization of at least a portion of the liquid paint product.

Turning now to FIG. **11**, an exemplary outdoor paint sprayer kit **1108** is depicted in an exemplary use case. In 30
35
embodiments, the outdoor paint sprayer kit **1108** may comprise an outdoor paint sprayer **1102**, a plurality of liquid paint products **1106**, and a plurality of paint chambers with paint chamber caps **1104**. As depicted, the outdoor paint sprayer **1102** may be used to spray paint onto a suitable surface **1110**.

Turning now to FIG. **12**, a second exemplary outdoor paint sprayer kit **1200** is depicted. In embodiments the second outdoor paint sprayer kit may comprise an outdoor paint sprayer **1202**, one or more stencils **1204**, and at least one paint chamber with paint chamber cap **1206**. In embodiments, the one or more stencils **1204** may be in any design suitable to allow liquid paint product to be sprayed by the outdoor paint sprayer **1202** such that liquid paint product is applied to a suitable surface in the design of the particular stencil. 45

Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the scope of the claims below. Embodiments of the technology have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to readers of this disclosure after and because of reading it. Alternative means of implementing the aforementioned can be completed without departing from the scope of the claims below. Certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. 50
55

The invention claimed is:

1. An outdoor paint sprayer device comprising:
 - a nozzle assembly comprising a spray tip and a dispersion nozzle for dispersing an atomized paint from a liquid paint product, wherein the dispersion nozzle comprises a plurality of orifices;
 - a sprayer body coupled to the dispersion nozzle, at a first position of the sprayer body;

14

- a paint chamber coupled to the sprayer body, at a second position of the sprayer body; and
 - an air pump chamber coupled to the sprayer body at a third position of the sprayer body;
- wherein the sprayer body comprises a paint hose structure for providing the liquid paint product to the sprayer body, wherein the paint chamber provides the liquid paint product to the paint hose structure, wherein the dispersion nozzle receives the liquid paint product from the paint hose structure.
 2. The device of claim **1** wherein the paint chamber is removably coupled to the sprayer body.
 3. The device of claim **1**, wherein the paint chamber comprises:
 - a proximal first end of the paint chamber, wherein the proximal first end of the paint chamber is coupled to the sprayer body;
 - a distal second end of the paint chamber opposite the proximal first end; and
 - a one-way air valve wherein the one-way air valve is configured to transfer air flowing into the paint chamber.
 4. The device of claim **3**, wherein the paint chamber further comprises:
 - a first air hose structure coupled to the one-way air valve, wherein the air transferred by the one-way valve flows through the first air hose structure, and
 - wherein the air exits the first air hose structure proximate the distal second end of the paint chamber.
 5. The device of claim **1**, further comprising:
 - a second air hose structure coupled between the air pump chamber and the one-way valve, said second air hose structure configured to provide air flowing from the air pump chamber to the one-way air valve;
 - wherein the air pump chamber comprises an air pump device, a pressure relief valve, and an air chamber.
 6. The device of claim **1**, wherein the spray tip is removably coupled to the dispersion nozzle.
 7. The device of claim **6**, further comprising a tip harness coupled to the sprayer body at a fourth position, wherein the spray tip is further coupled to the tip harness.
 8. The device of claim **1**, wherein the atomized paint comprises an undiluted liquid paint product.
 9. The outdoor paint sprayer of claim **8**, wherein the nozzle assembly is configured to dispense an atomized liquid paint product in a particular dispersion pattern.
 10. The device of claim **1**, wherein the nozzle feature further comprises a vortex chamber between the spray tip and the dispersion nozzle, and
 - wherein the vortex chamber receives the liquid paint product from the plurality of orifices of the dispersion nozzle.
 11. The device of claim **10**, wherein the swirl chamber is configured such that at least a portion of the liquid paint product is set into a vortex motion.
 12. An outdoor paint sprayer device comprising:
 - a sprayer body;
 - a paint chamber coupled to the sprayer body at a first position;
 - an air pump chamber coupled to the sprayer body at a second position different than the first position;
 - a nozzle assembly coupled to the sprayer body at a third position different than the first position and the second position, wherein the nozzle assembly comprises a spray tip removably coupled to a dispersion nozzle;
 - a trigger mechanism for providing an indication to dispense paint from the paint chamber;

15

an air hose structure coupled between the air pump chamber and the paint chamber; and
 a paint hose structure coupled between the paint chamber and the nozzle,
 wherein the air pump chamber comprises at least a first valve assembly, and the paint chamber comprises at least a second valve assembly. 5

13. The device of claim **12** wherein the dispersion nozzle comprises a plurality of orifices.

14. The device of claim **12** wherein the coupling of the spray tip and the dispersion nozzle comprises a vortex chamber, 10

wherein the vortex chamber is configured such that at least a portion of the liquid paint product is set into a vortex motion.

15. The device of claim **12**, wherein the paint chamber comprises a proximal first end and a distal second end, 15

wherein the proximal first end of the paint chamber is removably coupled to the sprayer body,

wherein the air hose structure extends through the proximal first end of the paint chamber and terminates at the distal second end of the paint chamber such that air travelling through the air hose structure exits the air hose structure proximate the distal second end of the paint chamber. 20

16. A device for dispensing an undiluted liquid paint, said device comprising: 25

16

a sprayer body comprising at least one nozzle assembly and at least one valve assembly;

an air pump chamber coupled to the sprayer body, said air pump chamber comprising a pressure relief valve assembly, a pump mechanism, and a pump chamber port, the pump chamber port comprising a first air hose structure coupled with a one-way air valve of a paint chamber, wherein air traveling through the air hose structure exits the air hose structure into the paint chamber; and

the paint chamber comprising a proximal first end coupled to the sprayer body and a distal second end, the one-way air valve, and a second air hose structure coupled with the one way air valve opposite the first air hose structure,

wherein air traveling through second air hose structure exits the second air hose structure proximate the distal second end of the paint chamber, and wherein the paint chamber is separate from the air pump chamber.

17. The paint spraying device of claim **16**, wherein the at least one nozzle assembly comprises:

a spray tip and a dispersion nozzle, said spray tip removably coupled to said dispersion nozzle, said dispersion nozzle coupled to said sprayer body.

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