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(54) **Title:** ADAPTOR ASSEMBLY AND SYSTEM FOR PRESSURIZED CONTAINERS

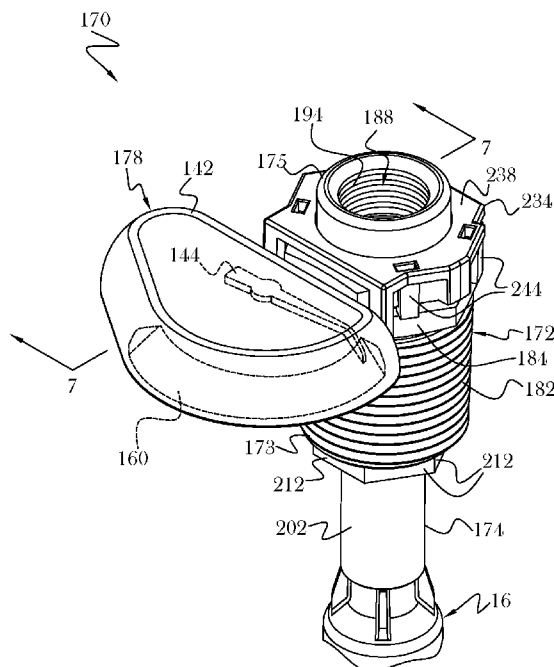


FIG. 6

(57) **Abstract:** An adaptor assembly (12) is provided for a pressurized gas container (14) having an internally threaded outlet port (38) for normally receiving a service valve. The adaptor assembly (12) includes a housing (70) having a lower externally threaded mounting portion (71) for mating with the internally threaded outlet port (38) and a check valve (74) operably associated with the housing (70). The check valve (74) has a valve shuttle (106) for movement between a normally closed position to prevent the transfer of liquid and/or gas between the container (14) and an exterior device and an open position to permit the transfer. The shuttle (106) is movable toward the open position only when a fitting (42) of the exterior device is operably connected to the check valve (74). A liquid level sending unit (16) with an overfill protective device (66) is connected to the adaptor assembly (12). A liquid level indicator (76) is connected to the housing (70). The indicator (76) is responsive to movement of the sending unit (16).

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TITLE OF THE INVENTION

Adaptor Assembly and System for Pressurized Containers

BACKGROUND OF THE INVENTION

This invention relates to fluid control and level indicating devices for tanks or other
5 containers, and more particularly to an adaptor assembly for permitting tanks to be
retrofitted with a liquid level transducer while controlling fluid ingress and egress.

Many areas of the world lack natural gas resources and/or centralized natural gas
distribution networks to meet basic living requirements such as cooking, heating,
bathing, and so on. Accordingly, homeowners in these areas often rely on various
10 sizes of bottles or cylinders of liquefied petroleum gas (LPG), such as propane, butane
or combinations thereof, that must be refilled or exchanged when empty. With many
of these containers, no provision is made for determining the amount of remaining
fuel. Consequently, the fuel usually runs out at a most inconvenient time, such as
during cooking or bathing.

15 In addition, many of these containers have a service valve with a hand wheel for
opening and closing the valve to selectively connect and disconnect pressurized gas
from the container to a gas appliance through a pressure regulator. In order to fill the
container, the service valve is first manually closed and the pressure regulator is then
detached. A supply of LPG is then connected to the service valve and the valve is
20 opened to allow the flow of LPG into the container. Once the container is filled to the
proper level, the service valve is again closed, the LPG supply is removed, the
pressure regulator is connected, and the service valve is opened to allow the flow of
fuel to the gas appliance. Such a construction, although safe when proper procedures
are followed, lacks safety features when operator error is introduced. For example,
25 failure to close the service valve prior to removing the pressure regulator can cause
remaining gas to escape from the container and gather in potentially unsafe areas.
Moreover, the bleeder tube in such systems, which must remain open to atmosphere

during filling, allows gas to escape from the container until the proper liquid level in the container is attained and the bleeder tube is manually closed.

It would therefore be desirable to provide an adaptor assembly that provides liquid level indication of the container with a stop-fill safety device while eliminating
5 potential operator error and inconvenience associated with connecting and/or disconnecting the container with the pressure regulator and/or gas lines and appliances.

BRIEF SUMMARY OF THE INVENTION

According to one aspect of the invention, an adaptor assembly is provided for a
10 pressurized gas container having an internally threaded outlet port for normally receiving a service valve. The adaptor assembly includes a housing having a lower externally threaded mounting portion for mating with the internally threaded outlet port and a check valve operably associated with the housing. The check valve has a valve shuttle for movement between a normally closed position to prevent the transfer
15 of liquid and/or gas between the container and an exterior device and an open position to permit the transfer. The shuttle is movable toward the open position only when a fitting of the exterior device is operably connected to the check valve.

According to a further aspect of the invention, a system is provided for use with a
20 pressurized gas container having an internally threaded outlet port for normally receiving a service valve. The system includes a fitting associated with at least one of a pressure regulator, a supply hose and a gas-powered appliance, an adaptor assembly, a check valve, a liquid level sending unit, and a liquid level indicator. The fitting includes a hollow connection portion with outer threads. The adaptor assembly includes a housing having a lower externally threaded mounting portion for mating
25 with the internally threaded outlet port, an upper bore section with an upper internal threaded portion for mating with the outer threads of the fitting and a lower bore section with a reduced diameter portion separating the upper and lower bore sections. The adaptor assembly further includes a check valve with a valve shuttle positioned in the housing for movement between closed and open positions to close and open fluid

communication, respectively, between the upper and lower bore sections. The shuttle is movable toward the open position only when the fitting is threaded into the upper internal threaded portion of the upper bore section. The liquid level sending unit is connected to the housing and extends downwardly therefrom. The liquid level indicator is connected to the housing and is operably associated with the sending unit for displaying the amount of liquid within the container.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary as well as the following detailed description of the preferred embodiments of the present invention will be best understood when considered in conjunction with the accompanying drawings, wherein like designations denote like elements throughout the drawings, and wherein:

FIG. 1 is a front elevational view of a fuel delivery system showing a pressurized tank or container in cross section with an adaptor assembly and its associated components connected to the container;

15 FIG. 2 is an upper front exploded isometric view of the adaptor assembly in accordance with the present invention;

FIG. 3 is a lower rear exploded isometric view of the adaptor assembly;

FIG. 4 is a sectional view of the adaptor assembly taken along line 4-4 of FIG. 1 and showing a check valve in a closed position;

20 FIG. 5 is a sectional view similar to FIG. 4 with the check valve in an open position;

FIG. 6 is an upper front isometric view of an adaptor assembly in accordance with a further embodiment of the present invention;

FIG. 7 is a sectional view of the adaptor assembly taken along line 7-7 of FIG. 6;

FIG. 8 is an upper front exploded isometric view of the adaptor assembly of FIG. 6;

25 FIG. 9 is a lower front exploded isometric view thereof;

FIG. 10 is a top diagrammatic view of the adaptor assembly showing an indicator dial in a full indicating position when a magnet associated with the liquid level sending unit is in a first rotational position; and

5 FIG. 11 is a view similar to FIG. 10 with the indicator dial in an empty indicating position when the magnet is in a second rotational position.

It is noted that the drawings are intended to depict only typical embodiments of the invention and therefore should not be considered as limiting the scope thereof. It is further noted that the drawings are not necessarily to scale. The invention will now be described in greater detail with reference to the accompanying drawings.

10 DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, and to FIG. 1 in particular, a fuel delivery system 10 in accordance with an exemplary embodiment of the present invention is illustrated. The fuel delivery system 10 preferably includes an adaptor assembly 12 connected to a pressurized gas container 14, such as a liquefied petroleum gas (LPG) tank, a liquid level sending unit 16 positioned in the container and connected to a first or lower end 17 of the adaptor assembly 12, and a pressure regulator 18 of conventional construction connected to a second or upper end 19 of the adaptor assembly. A gas appliance 20, such as a stove, oven, water heater, clothes dryer, refrigerator, and so on, is connected to the pressure regulator 18, preferably through a manual shut-off valve 22 (shown schematically) positioned between the regulator and the appliance. The manual shut-off valve 22 provides an extra level of safety in addition to the adaptor assembly 12, as will be described in greater detail below. Accordingly, it will be understood that the valve 22 can be eliminated from the system where redundancy is not needed.

25 The container 14 is preferably of conventional construction for storing LPG or other gases and/or liquids under pressure and typically includes a continuous side wall 24 bounded by a lower wall 26 and an upper wall 28 to form a hollow interior 30 for holding a quantity of liquid fuel 32 and gas 34 in a pressurized state. A mounting

head 36 is located on the upper wall 28 for receiving the adaptor assembly 12. The mounting head 36 typically includes an internally threaded outlet port 38 that would normally receive a conventional manually operable service valve with a hand wheel, lever or the like (not shown) for opening and closing the valve for selectively release
5 pressurized gas and for filling the container. It will be appreciated that the adaptor assembly 12 of the present invention fits within the bore 38 and therefore eliminates the need for the manually operable service valve. A guard ring 40 extends outwardly from the upper surface 28 for protecting the adaptor assembly 12 from damage.

A fitting 42 is operably associated with the pressure regulator 18, gas line and/or gas-
10 powered appliance and includes a hollow connection portion 44 with outer threads 46 for connection to the second end 19 of the adaptor assembly 12, as will be described in greater detail below with respect to FIG. 5. A pair of arms or wings 48 preferably extend outwardly from the fitting 42 to facilitate installation and removal of the fitting with respect to the adaptor assembly 12 without the use of hand tools. It will be
15 understood that the fitting 42 can additionally or alternatively include one or more engagement surfaces for use with a wrench or other hand tool without departing from the spirit and scope of the invention.

The sending unit 16 preferably includes a pivot arm 50, a float 52 connected to an outer free end 54 of the pivot arm, and a rotating shaft 56 connected to an inner end 60
20 of the pivot arm via a gear assembly 58. A magnet 62 (FIG. 3) is located at an upper end 64 of the shaft 56 and is adapted to rotate therewith as the pivot arm 52 swings between a full tank position (as denoted by the float 52A in phantom line when the tank is in an upright orientation or by the float 52B when the tank is in a horizontal orientation) and the empty position (as shown by the float 52 in solid line). The
25 sending unit 16 also preferably includes an overfill protection device (OPD) 66 that functions to close a fuel inlet opening (not shown) in the sending unit when the liquid contents of the container 24 reach proper level 32 during filling to thereby prevent excess liquid from entering the container. Further details of suitable embodiments of the sending unit 16 can be found in U.S. Patent Nos. 7,654,281 and 7,293,578 and
30 International Publication No. W0 2008/022340, all assigned to Rochester Gauges, Inc.

of Dallas, Texas, the disclosures of which are hereby incorporated by reference. It will be understood that other known sending units with OPD's can be used without departing from the spirit and scope of the present invention. Moreover, it is contemplated that the OPD portion of the sending unit can be modified or eliminated
5 when other means are employed for stopping a filling operation and/or providing pressure relief or indication when a full container condition has been reached.

Referring now to FIGS. 2-4, the adaptor assembly 12 preferably includes a housing 70 with a sending unit connector 72 located at the lower end 17 thereof, a check valve assembly 74 located between the lower end 17 and upper end 19 thereof and a liquid
10 level indicator assembly 76 removably connected to the outside of the housing 70 between the opposite ends.

The housing 70 is preferably machined or otherwise formed from suitable material such as brass, aluminum, reinforced plastics, and so on, and is generally cylindrical in shape with a lower externally threaded mounting portion 71 sized to engage the
15 internally threaded outlet port 38. Flat wrench engagement surfaces 73 are formed around the outer periphery of the housing 70 above the mounting portion 71 to facilitate installation and removal of the adaptor assembly 12 with respect to the container 14 (FIG. 1) with a wrench or other hand tool. An upper bore section 77 and lower bore section 75 are formed in the housing 70. A first internal threaded portion
20 76 is located in the lower bore section 75 at the first end 17, a second internal threaded portion 78 is located in the upper bore section 77 at the second end 19, and a third internal threaded portion 80 is located between the first and second internal threaded portions. A reduced diameter portion 82 separates the upper and lower bore sections and is located between the second and third internal threaded portions. A valve seat
25 84 is integrally formed with the reduced diameter portion 82 and faces the third internal threaded portion 80. A step or groove 86 is also integrally formed with the reduced diameter portion for receiving and holding an O-ring 88.

The sending unit connector 72 preferably includes a connector body 90 with a bore 92 extending therethrough. A circumferential flange 94 is formed on the connector body

90 and is located between a lower internal threaded portion 96 and an upper external threaded portion 98. Opposing wrench flats 100 are formed on the flange 94 for engagement by a wrench or other hand tool during assembly and disassembly of the connector 72 with respect to the housing 70. As best shown in FIG. 4, the upper external threaded portion 90 is located in the lower bore section 75 and engages the first internal threaded portion 76 of the housing 70 so that the bore 92 is in fluid communication with the lower bore section 75. The lower internal threaded portion 96 also engages an upper external threaded portion 102 of the sending unit 16 when the components are assembled together. The connector 72 can be shaped and/or dimensioned to accommodate a wide variety of different sending units.

The check valve assembly 74 preferably includes a spring seat 104, a valve shuttle 106, a compression spring 108 positioned between the spring seat and valve shuttle, a seal 110 connected to the shuttle 106, a retainer 112 connected to the valve shuttle 106, and a retaining washer 114 located between the seal 110 and the retainer 112.

The spring seat 104 preferably includes a lower installation portion 115 with a pair of opposing wrench flats 116 for engagement by a spanner wrench or other tool (not shown) during assembly/disassembly, and an upper external threaded portion 118 that engages the third internal threaded portion 80 of the housing 70 to fixedly retain the spring seat 104 in the lower bore section 105. A circular depression 120 is formed in the spring seat 104 for receiving the compression spring 108 and a central bore 122 extends through the lower installation portion 114 and is in fluid communication with the depression 120.

The valve shuttle 106 preferably includes a rod 124 with a reduced diameter guide section 126 at a lower end thereof and an enlarged receptacle 128 at an upper end thereof. The guide section 126 is located within the central bore 122 of the spring seat 104 and has an outer diameter that is preferably less than the inner diameter of the central bore 122 to enable fluid flow therebetween. The receptacle 128 is sized to receive the seal 110, which is preferably in the form of an elastomeric washer or the like. It will be understood that other seal shapes, sizes and types can be used without

departing from the spirit and scope of the invention. The retainer 112 has a lower threaded portion 130 that extends through the retaining washer 114 and seal 110 and into a threaded aperture 132 formed in the upper end of the rod 124. An enlarged head 134 of the retainer 112 presses against the retaining washer 114 to sandwich the washer and seal 110 between the head and receptacle 128. A slot 136 can be formed in the head 134 for receiving a screw driver or the like (not shown) during assembly/disassembly. The slot 136 also functions as a passage for liquid and gas flow when the fitting 42 is installed as shown in FIG. 5.

Although the check valve 74 is shown built into the housing 70, it will be understood that a separate check valve can be provided and installed on the housing 70 in accordance with a further embodiment of the invention.

As shown in FIGS. 2-4, the liquid level indicator assembly 76 preferably includes a base 140 with a dial face 141, a transparent cover or lens 142, and a magnetically driven dial 144 connected between the base and cover members via needle bearings for rotation with respect thereto. A clip 146 is preferably connected to the rear of the base 140 for attachment to the housing 70. The clip 146 is preferably constructed of resilient material and includes a pair of legs that fit into a circumferential groove formed in the housing 70. A circular depression 152 is formed in one of the wrench flats 73 of the housing 70 for accommodating a similarly shaped rear protrusion 154 of the base 140. The rear protrusion 154 is in turn shaped to receive the magnetic portion 156 of the dial 144.

As shown, the liquid level indicator assembly 76 is preferably oriented in a direction generally parallel to a central axis 157 of the housing 70 of the adaptor assembly 12 so that the dial face 141 can be viewed from the side of the container 14 (FIG. 1). However, it will be understood that the liquid level indicator assembly 76 can be oriented in any direction convenient for viewing by an operator. In accordance with a further embodiment of the invention, as will be described in further detail below with respect to FIGS. 6-11, the indicator assembly is preferably oriented in a direction

generally perpendicular or transverse to a central axis of the housing of the adaptor assembly for viewing by an operator from a top end of the container.

In operation, when the shaft 64 with magnet 62 is rotated in response to movement of the float 52 (FIG. 1), the pointer 158 will rotate along a scale 160 on the dial face 141
5 of the base 140 under magnetic forces applied to the magnetic portion 156 of the dial 144 to indicate the liquid level condition of the container 14. Further details of the liquid level indicator assembly, its operation in conjunction with the sending unit 16 and variations can be found in the above-incorporated by reference International
10 Publication No. W0 2008/022340. It will be understood that other known indicators with various driving means for the indicator dial can be used.

In use, and with reference to FIGS. 1, 4 and 5, when the adaptor assembly 12 is installed on the container 14 without the fitting 42, the check valve 74 will be in the closed position, as shown in FIG. 4. In this position, the spring 108 exerts a biasing
15 force against the valve shuttle 106 which in turn pushes the seal 110 against the valve seat 84 to thereby prevent the escape of gas and/or liquid from the container 14.

When the fitting 42 (which may be associated with the pressure regulator, a hose, an external filling tank, a gas-powered appliance, and so on) is threaded into the second
20 internal threaded portion 78 of the housing 70, the lower frusto-conical surface 162 of the fitting 42 will sealingly engage the O-ring 88 to seal the fitting to the adaptor assembly. Continued threading on the fitting into the second internal threaded portion
78 causes the lower end surface 164 of the fitting to contact the head 134 of the retainer 132 and move the valve shuttle 106 against the biasing force from the spring
108 and move the seal 110 away from the valve seat 84. In this position, as shown in
25 FIG. 5, a passageway 166 is opened between the lower bore section 75 and the upper bore section 77 to allow the ingress or egress of liquid/and or gas with respect to the container 14.

Referring now to FIGS. 6-9, an adaptor assembly 170 preferably includes a housing 172 with a sending unit connector 174 attached to the lower end 173 thereof, a check valve assembly 176 located in the housing between the lower end 173 and an upper

end 175 thereof and a liquid level indicator assembly 178 removably connected to the outside of the housing 172 between the opposite ends. As shown, the indicator assembly 178 is preferably oriented in a direction generally perpendicular or transverse to a central axis 180 of the housing 172 of the adaptor assembly 170 for viewing by an operator from a top end of the container 14 (FIG. 1).

The housing 172 is somewhat similar to the housing 70 previously described and preferably includes a lower externally threaded mounting portion 182 sized to engage the internally threaded outlet port 38 of the container 14. Wrench engagement surfaces or flats 184 are formed around the outer periphery of the housing 172 above the mounting portion 182 to facilitate installation and removal of the adaptor assembly 12 with respect to the container 14 (FIG. 1) with a wrench or other hand tool. A circumferential groove 186 is preferably formed in the housing 172 and extends through each engagement surface 184 for removably mounting the indicator assembly 178, as will be described in further detail below. An upper bore section 188 and lower bore section 190 are formed in the housing 172. A first internal threaded portion 192 is located in the lower bore section 190 at the first end 173 of the housing 172 and a second internal threaded portion 194 is located in the upper bore section 188 at the second end 175. A reduced diameter portion 196 (FIG. 7) separates the upper and lower bore sections and is located between the first and second internal threaded portions. A valve seat 198 is integrally formed with the reduced diameter portion 196 and extends toward the first internal threaded portion 192. A step or groove 200 is also integrally formed with the reduced diameter portion for receiving and holding an O-ring 88.

The sending unit connector 174 preferably includes a connector body 202 having an upper bore section 204 in fluid communication with a lower bore section 205. The upper bore section is preferably larger in diameter than the lower bore section so that a lower spring seat 207 is formed at the junction of the bore sections. A circumferential flange 206 is formed on the connector body 174 and is located between a lower internal threaded portion 208 and an upper external threaded portion 210. Opposing wrench flats 212 are formed on the flange 206 for engagement by a wrench or other

hand tool during assembly and disassembly of the connector 174 with respect to the housing 172. As best shown in FIG. 7, the upper external threaded portion 210 engages the first internal threaded portion 192 of the housing 172 so that the upper bore section 204 is in fluid communication with the lower bore section 190. The lower internal threaded portion 208 also engages the upper external threaded portion 102 of the sending unit 16 when the components are assembled together. As in the previous embodiment, the connector 174 can be shaped and/or dimensioned to accommodate a wide variety of different sending units.

The check valve assembly 176 preferably includes a valve shuttle 214, a compression spring 216 positioned between the lower spring seat 207 and valve shuttle, and a seal 218 connected to the shuttle 214 for movement therewith.

The valve shuttle 214 preferably includes a circular body 220 with a lower circular receptacle 222 that serves as an upper spring seat and an upper receptacle 224 extending coaxial with the body. A post 226 extends upwardly from the upper depression 224 and preferably includes a slot 228 that functions as a passage for liquid and gas flow when the shuttle 214 is installed in the housing 172. A plurality of axially extending protrusions 230 are formed at radially spaced locations around the body 220. The protrusions 220 serve as bearings or guides during axial movement of the shuttle 14 within the housing 172 and allow the flow of fluid into and out of the container 14 (FIG. 1) when the valve shuttle 214 is in the open position. The seal 218 is located in the upper receptacle 224 of the shuttle 214 for movement therewith. The seal 110 is preferably in the form of an elastomeric washer or the like and presses against the valve seat 196 when the shuttle 214 is biased in the closed position by the compression spring 216.

When assembled, the post 226 of the valve shuttle 214 is positioned in the reduced diameter portion 196 of the body 172 for linear movement with respect thereto between open and closed positions. The spring 216 is compressed between the lower spring seat 207 of the connector 174 and the upper spring seat 222 to thereby bias the valve shuttle 214 and its accompanying seal 218 toward the closed position against the

valve seat 198. A centering sleeve 231 can be provided to ensure that the spring 216 moves in a linear fashion to prevent buckling and potential interference with the shaft 64 and/or the magnet 62 of the sending unit 16.

As in the previous embodiment, when the fitting 42 (FIGS. 1 and 5, which may be associated with the pressure regulator, a hose, an external filling tank, a gas-powered appliance, and so on) is threaded into the second internal threaded portion 194 (FIG. 7) of the housing 172, the lower frusto-conical surface 162 of the fitting 42 will sealingly engage the O-ring 88 to seal the fitting to the adaptor assembly 170. Continued threading of the fitting into the second internal threaded portion 194 causes the lower end surface 164 of the fitting to contact the post 226 of the valve shuttle 214 and move the valve shuttle against the biasing force from the spring 216 toward the open position with the seal 218 spaced away from the valve seat 198.

As best shown in FIGS. 8 and 9, the liquid level indicator assembly 178 preferably includes a base 140, a transparent cover or lens 142, and a magnetically driven dial 144 connected between the base and cover members via needle bearings for rotation with respect thereto. A mounting bracket 234 is preferably connected to the rear of the base 140 for attaching the indicator assembly 178 to the housing 172.

The mounting bracket 234 preferably includes a first mounting portion 236 for receiving the base 140 and a second mounting portion 238 extending upwardly from the first mounting portion for connection to the housing 172. The first mounting portion 236 is preferably formed as a generally flat panel with a first opening 240. The base 140 can be removably connected to the first mounting portion 236 or permanently mounted thereto through well-known connection means such as threaded fasteners, brackets, mutually engaging members, adhesives, welding, friction fit, and so on. Likewise, the second mounting portion 238 is preferably formed as a generally flat panel with a second opening 242 formed therein for receiving the upper end 175 of the housing 172. Hook-shaped connector arms 244 are spaced circumferentially around the second opening 242 and extend downwardly from the second mounting portion 238. A lower free end of each connector arm 244 is formed with a hook or

projection 246 that extends radially inwardly to engage the circumferential groove 186 of the housing 172 in a snap-fit motion. Guide members 248 also extend downwardly from the second mounting portion 238 for engaging the flats 184 to ensure proper alignment of the mounting bracket 234 with the housing 172.

- 5 With this arrangement, the indicator assembly 178 is oriented in a direction generally perpendicular or transverse to the central axis 180 of the housing 172 of the adaptor assembly 170 for viewing by an operator from a top end of the container 14 (FIG. 1). In this orientation, a rotation axis of the dial 144 is parallel with the central axis 180 of the housing 172. However, it will be understood that the mounting bracket 234 can be
- 10 modified or otherwise constructed so that the indicator assembly is oriented in a direction generally parallel to the central axis 180 or at any angle with respect thereto without departing from the spirit and scope of the present invention. Moreover, the snap-fit arrangement of the connector arms 244 with the housing 172 facilitates installation on and removal from a container 14 when the container is exchanged.
- 15 In operation and with reference to FIGS. 10 and 11, when the shaft 64 with the magnet 62 (shown in hidden line) is rotated in response to movement of the float 52 (FIG. 1), the pointer 158 will rotate along the scale 160 on the face of the base 140 due to the mutual magnetic attraction and/or repulsion of the magnet 52 and pointer 158, as shown by their respective north and south poles, to thereby indicate the liquid level
- 20 condition of the container 14.

It will be appreciated that the above-described adaptor assembly 170 uses fewer parts than the adaptor assembly 12, thus saving on the cost of extra parts and assembly time and permits the dial to be oriented in a position that takes little vertical space, when compared to the adaptor assembly 12. In addition, the housing 172 is shorter in

25 dimension than its predecessor thus saving even more on material costs.

The above-described adaptor assembly embodiments eliminate the need for hand-operated service valves normally installed on tanks and their inherent disadvantages costs, and safety concerns. The adaptor assembly embodiments of the present invention also facilitate safe installation and removal of in-line equipment, such as the

pressure regulator when the contents of the tank are empty, while providing a structure for attachment of a sending unit inside the tank and an associated indicator outside of the tank for confirming the amount of remaining fluid therein. When the attached sending unit incorporates an overflow protection device, the adaptor assembly
5 contributes to a safe filling mechanism for the tank as well.

It will be understood that the term "preferably" as used throughout the specification refers to one or more exemplary embodiments of the invention and therefore is not to be interpreted in any limiting sense. It will be further understood that the term "connect" and its various derivatives as may be used throughout the specification refer
10 to components that may be joined together either directly or through one or more intermediate members. In addition, terms of orientation and/or position as may be used throughout the specification, such as upper, lower, inner, outer and so on, relate to relative rather than absolute orientations and/or positions.

It will be appreciated by those skilled in the art that changes could be made to the
15 embodiments described above without departing from the broad inventive concept thereof. By way of example, although the check valve assembly is shown vertically oriented when the container is vertically oriented, it will be understood that the check valve assembly can be oriented at an angle transverse to the orientation of the container in accordance with a further embodiment of the invention. It will be
20 understood, therefore, that this invention is not limited to the particular embodiments disclosed, but is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.

CLAIMS

What is claimed is:

1. An adaptor assembly for a pressurized gas container having an internally threaded outlet port for normally receiving a service valve, the adaptor assembly
5 comprising:
 - a housing having a lower externally threaded mounting portion for mating with the internally threaded outlet port;
 - a check valve operably associated with the housing, the check valve having a valve shuttle for movement between a normally closed position to prevent the transfer
10 of liquid and/or gas between the container and an exterior device and an open position to permit said transfer, said shuttle being movable toward the open position only when a fitting of the exterior device is operably connected to the check valve.
2. An adaptor assembly according to claim 1, wherein the housing further comprises an upper bore section and a lower bore section with a reduced diameter
15 portion separating the upper and lower bore sections, the valve shuttle being moveable between the closed and open positions to close and open fluid communication, respectively, between the upper and lower bore sections.
3. An adaptor assembly according to claim 2, wherein the check valve further comprises:
20
 - a seal connected to the valve shuttle for movement therewith;
 - a valve seat formed on the reduced diameter portion;
 - a spring seat fixedly secured in the lower bore section; and
 - a compression spring extending between the spring seat and the valve shuttle for biasing the seal toward the valve seat in the closed position.
- 25 4. An adaptor assembly according to claim 3, wherein a portion of the valve shuttle extends through the reduced diameter portion for contacting the exterior device fitting.
- 30 5. An adaptor assembly according to claim 4, wherein the upper bore section has internal threads for engagement with external threads of the exterior device fitting.

6. An adaptor assembly according to claim 5, and further comprising a liquid level sending unit connected to the housing and extending downwardly therefrom.

7. An adaptor assembly according to claim 6, and further comprising a liquid level indicator connected to the housing and operably associated with the sending unit for displaying the amount of liquid within the container.

8. An adaptor assembly according to claim 7, wherein the sending unit comprises a float connected to a float arm and a shaft connected to the float arm for rotation when the float arm is pivoted in response to a change in liquid level in the container.

9. An adaptor assembly according to claim 8, wherein the indicator comprises a rotatable dial and further comprising a first magnet connected to an upper end of the shaft for rotation therewith and a second magnet connected to the dial, the second magnet being operable to rotate the dial upon rotation of the first magnet on the shaft.

10. An adaptor assembly according to claim 9, and further comprising a connector fixedly secured to a lower end of the housing, the sending unit being fixedly secured to the connector.

11. An adaptor assembly according to claim 10, wherein a portion of the connector fits within the lower bore portion, the connector further comprising a central bore for receiving the rotating shaft of the sending unit.

12. An adaptor assembly according to claim 9, and further comprising a mounting bracket with a first mounting portion connected to the indicator and a second mounting portion for connection to the housing, the second mounting portion including an opening sized to receive at least a portion of the housing.

13. An adaptor assembly according to claim 12, and further comprising:
a groove formed on the housing; and
a plurality of hook-shaped connector arms positioned around the opening of the second mounting portion and being oriented for snap-fit engagement with the groove for removably attaching the indicator to the housing.

14. An adaptor assembly according to claim 13, wherein the dial is rotatable about an axis generally parallel with a central axis of the housing.

15. An adaptor assembly according to claim 9, wherein the dial is rotatable about an axis that extends transverse to a central axis of the housing.

5 16. An adaptor assembly according to claim 6, wherein the sending unit includes an overflow protection device to arrest the inflow of fluid when a full condition of the container has been reached.

17. A system for use with a pressurized gas container having an internally threaded outlet port for normally receiving a service valve, the system comprising:

10 a fitting associated with at least one of a pressure regulator, a supply hose and a gas-powered appliance, the fitting including a hollow connection portion with outer threads;

an adaptor assembly comprising:

15 a housing having a lower externally threaded mounting portion for mating with the internally threaded outlet port, an upper bore section with an upper internal threaded portion for mating with the outer threads of the fitting and a lower bore section with a reduced diameter portion separating the upper and lower bore sections;

20 a check valve having a valve shuttle positioned in the housing for movement between closed and open positions to close and open fluid communication, respectively, between the upper and lower bore sections, said shuttle being movable toward the open position only when the fitting is threaded into the upper internal threaded portion of the upper bore section;

25 a liquid level sending unit connected to the housing and extending downwardly therefrom; and

a liquid level indicator connected to the housing and operably associated with the sending unit for displaying the amount of liquid within the container.

18. An adaptor assembly according to claim 13, wherein the check valve further comprises:

30 a seal connected to the valve shuttle for movement therewith;

a valve seat formed on the reduced diameter portion;

a spring seat fixedly secured in the lower bore section; and
a compression spring extending between the spring seat and the valve shuttle for biasing the seal toward the valve seat in the closed position.

5 19. An adaptor assembly according to claim 18, wherein a portion of the valve shuttle extends through the reduced diameter portion for contacting the exterior device fitting.

10 20. An adaptor assembly according to claim 17, wherein the sending unit comprises a float connected to a float arm and a shaft connected to the float arm for rotation when the float arm is pivoted in response to a change in liquid level in the container.

15 21. An adaptor assembly according to claim 20, wherein the indicator comprises a rotatable dial and further comprising a first magnet connected to an upper end of the shaft for rotation therewith and a second magnet connected to the dial, the second magnet being operable to rotate the dial upon rotation of the first magnet on the shaft.

22. An adaptor assembly according to claim 21, and further comprising a mounting bracket with a first mounting portion connected to the indicator and a second mounting portion for connection to the housing, the second mounting portion including an opening sized to receive at least a portion of the housing.

20 23. An adaptor assembly according to claim 22, and further comprising:
a groove formed on the housing; and
a plurality of hook-shaped connector arms positioned around the opening of the second mounting portion and being oriented for snap-fit engagement with the groove for removably attaching the indicator to the housing.

25 24. An adaptor assembly according to claim 23, wherein the dial is rotatable about an axis generally parallel with a central axis of the housing.

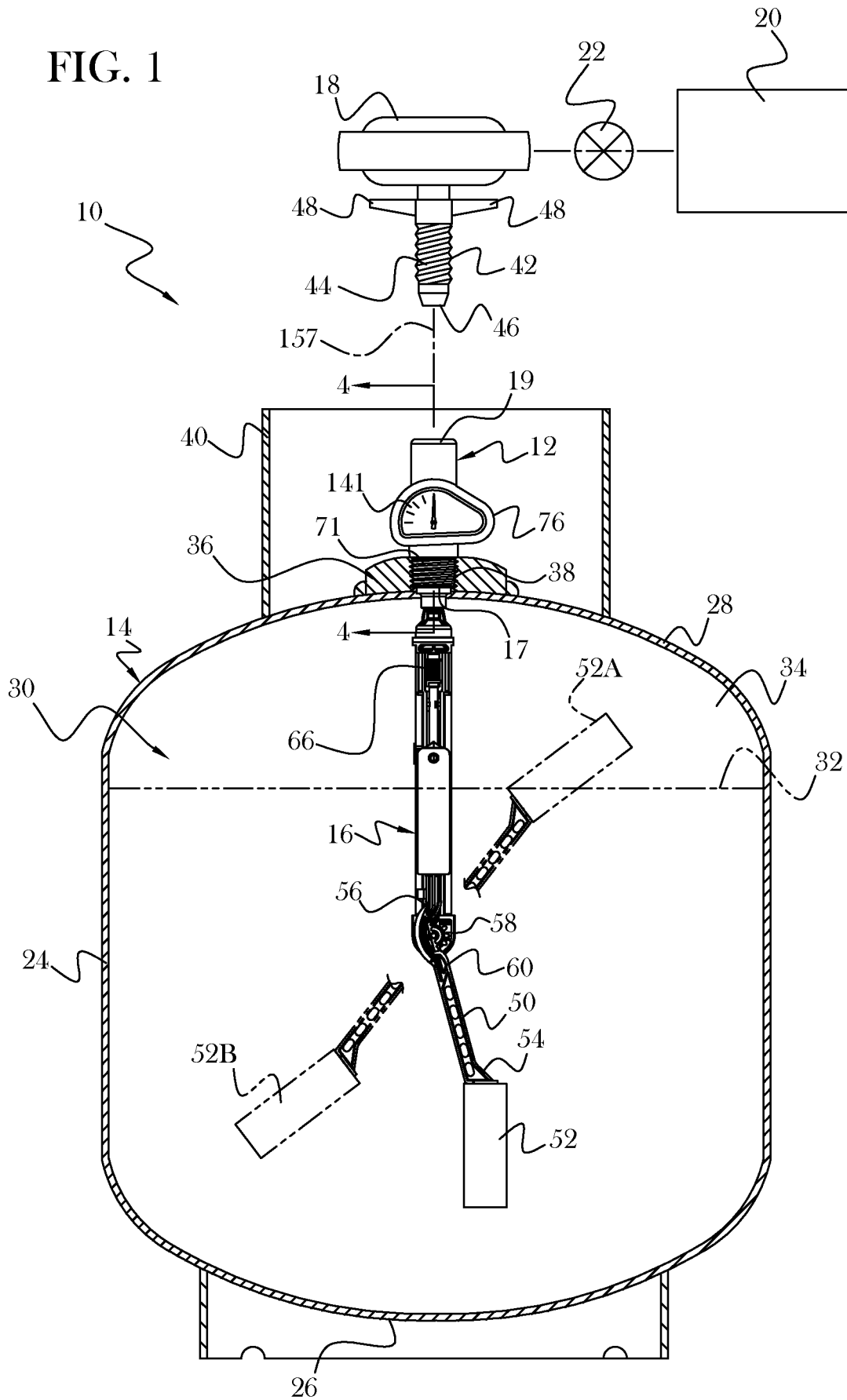
25. An adaptor assembly according to claim 21, wherein the dial is rotatable about an axis that extends transverse to a central axis of the housing.

30 26. An adaptor assembly according to claim 20, and further comprising a connector fixedly secured to a lower end of the housing, the sending unit being fixedly secured to the connector.

27. An adaptor assembly according to claim 26, wherein a portion of the connector fits within the lower bore portion, the connector further comprising a central bore for receiving the rotating shaft of the sending unit.

28. An adaptor assembly according to claim 17, wherein the sending unit
5 includes an overflow protection device to arrest the inflow of fluid when a full condition of the container has been reached.

FIG. 1



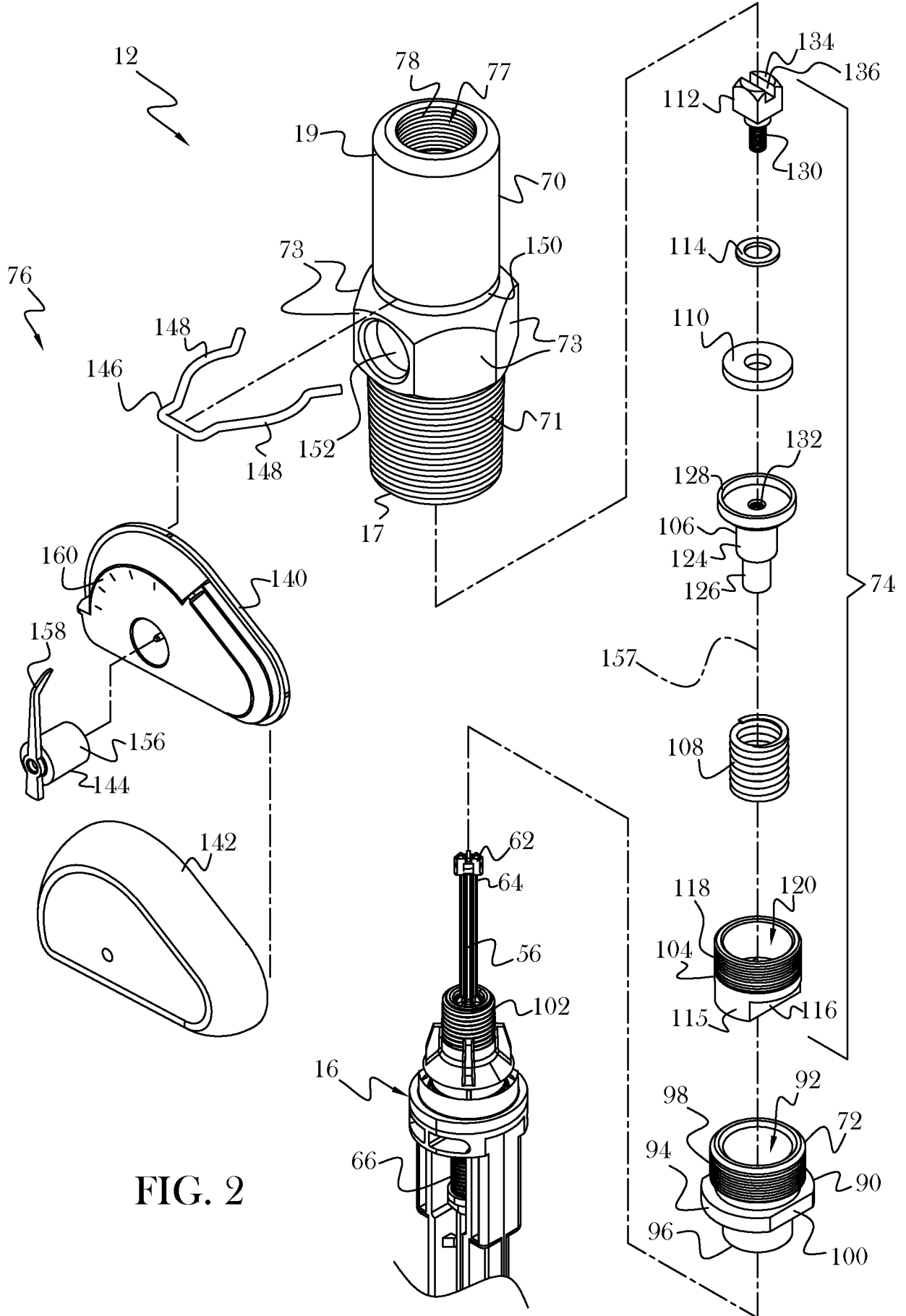


FIG. 2

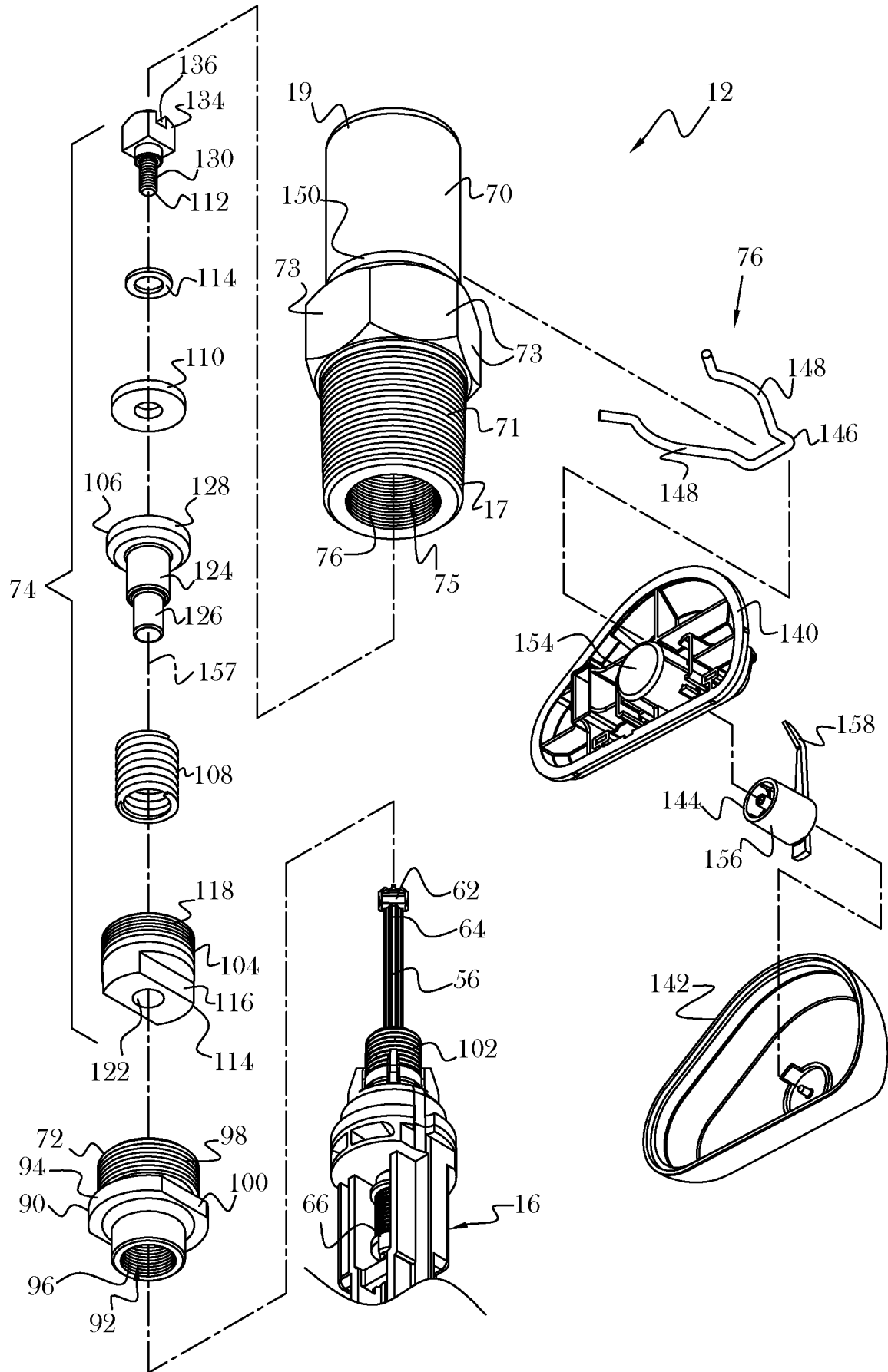


FIG. 3

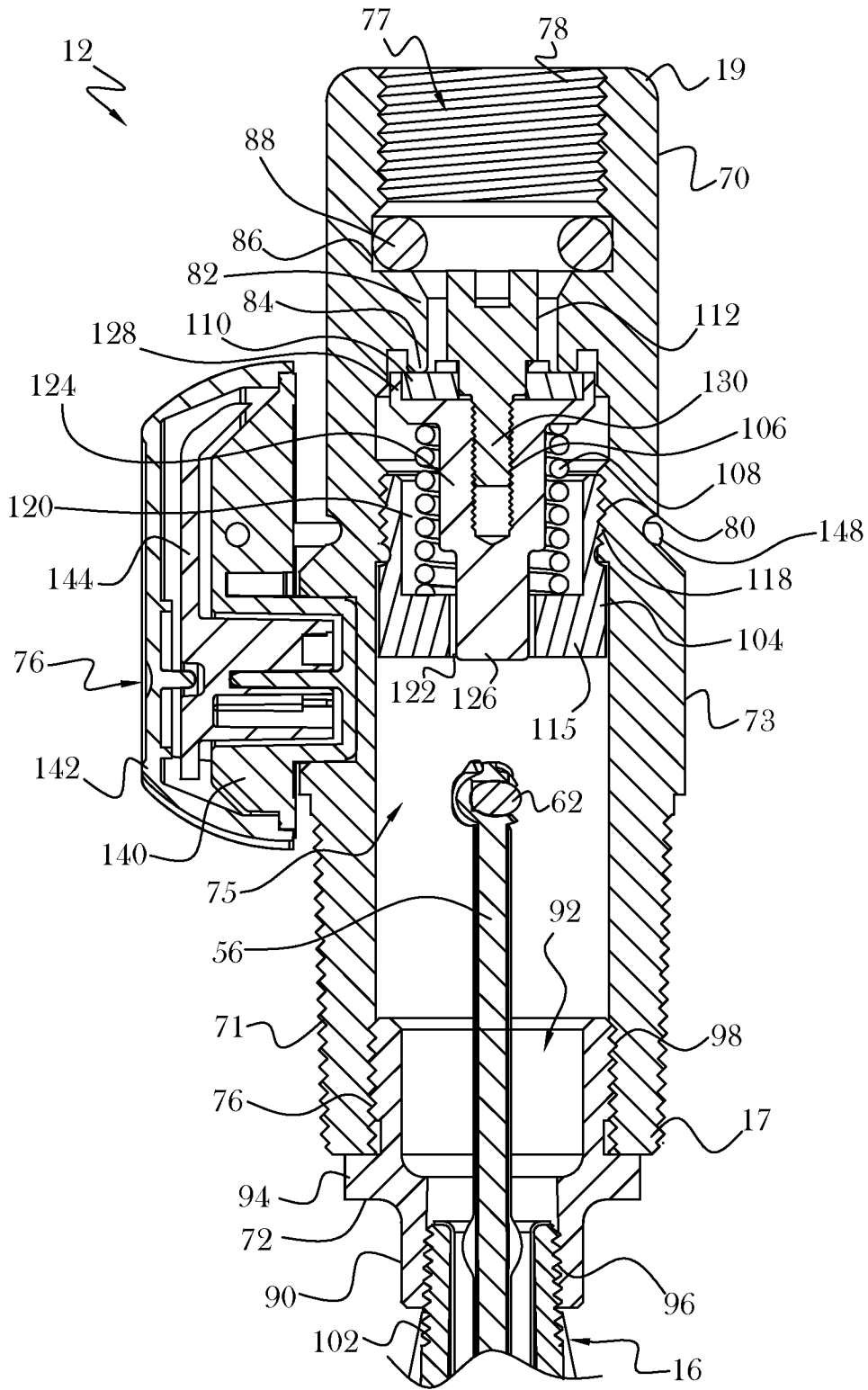


FIG. 4

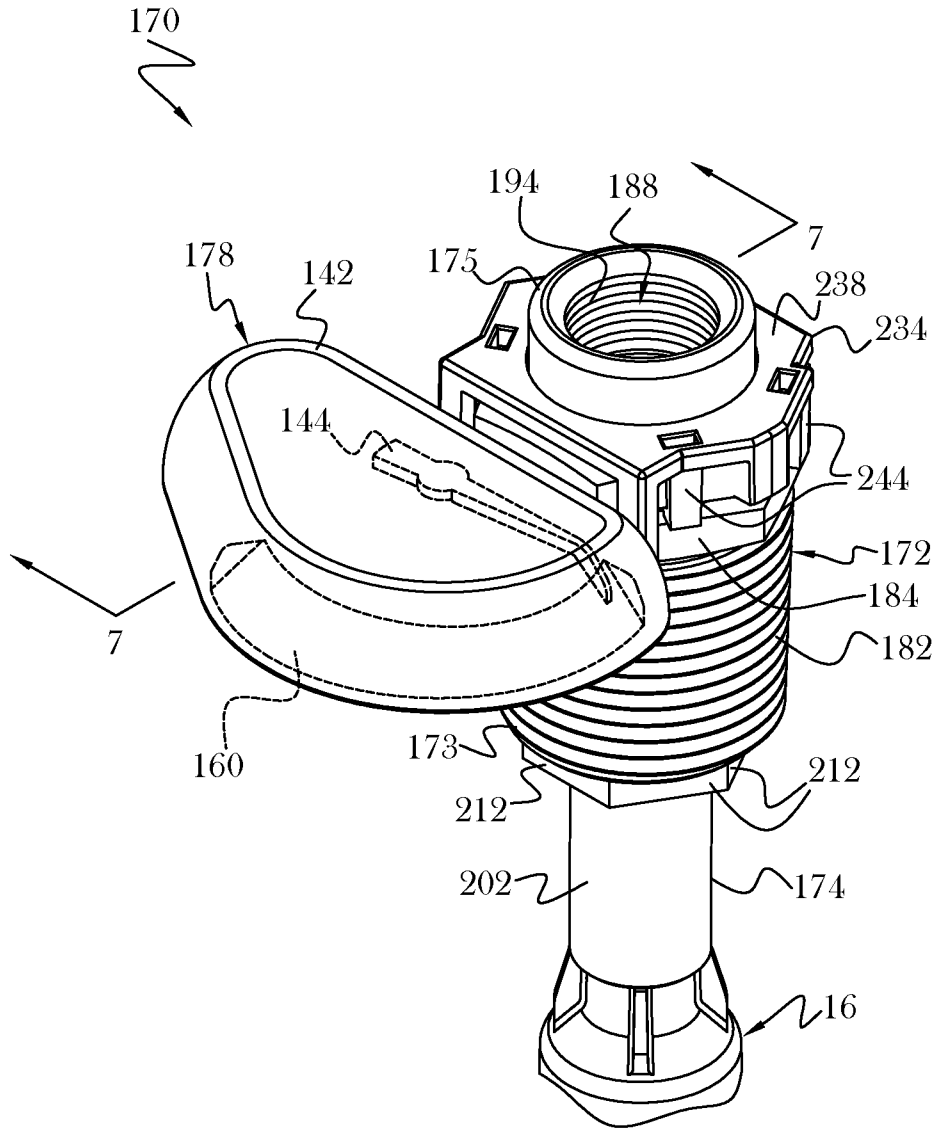


FIG. 6

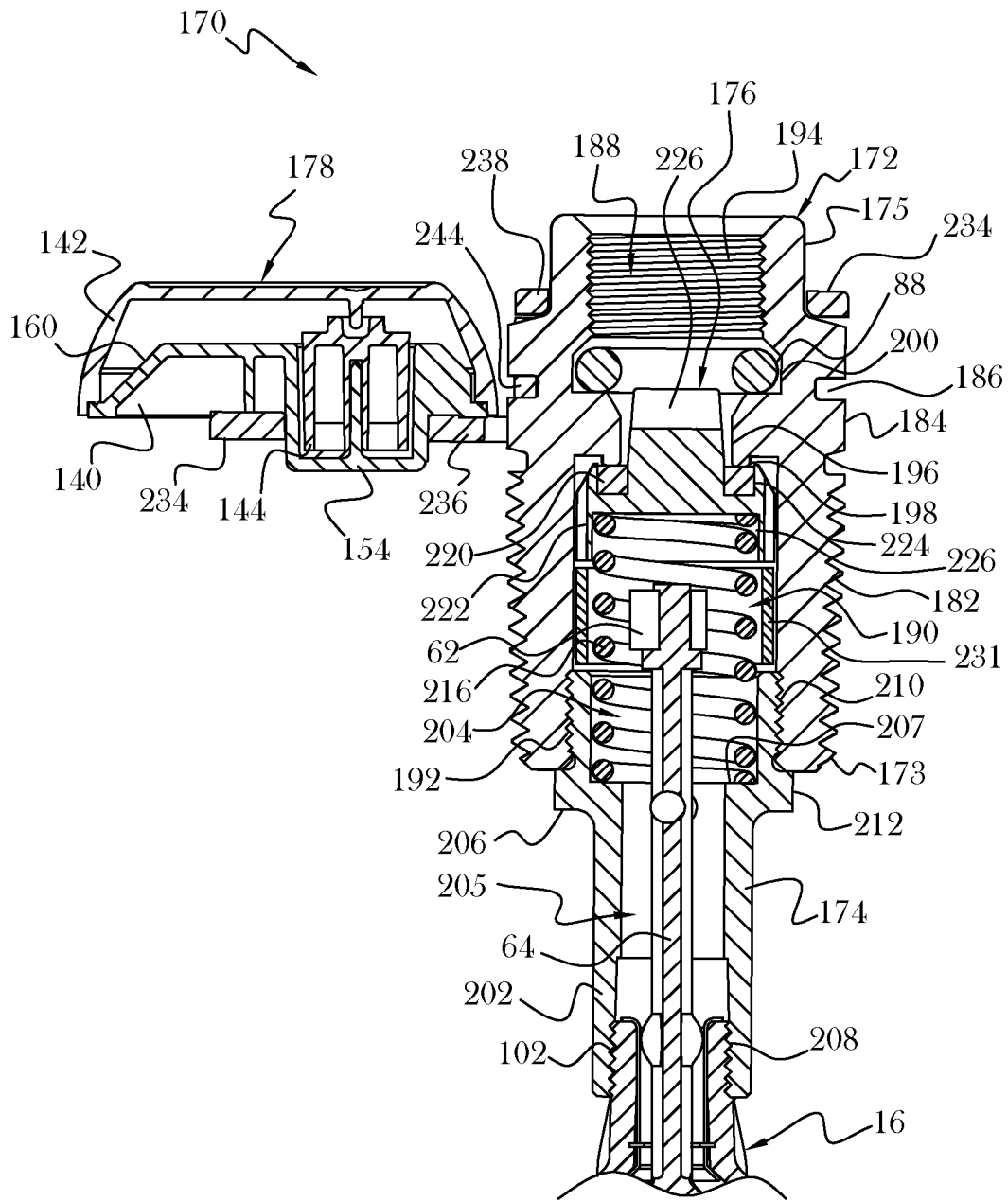


FIG. 7

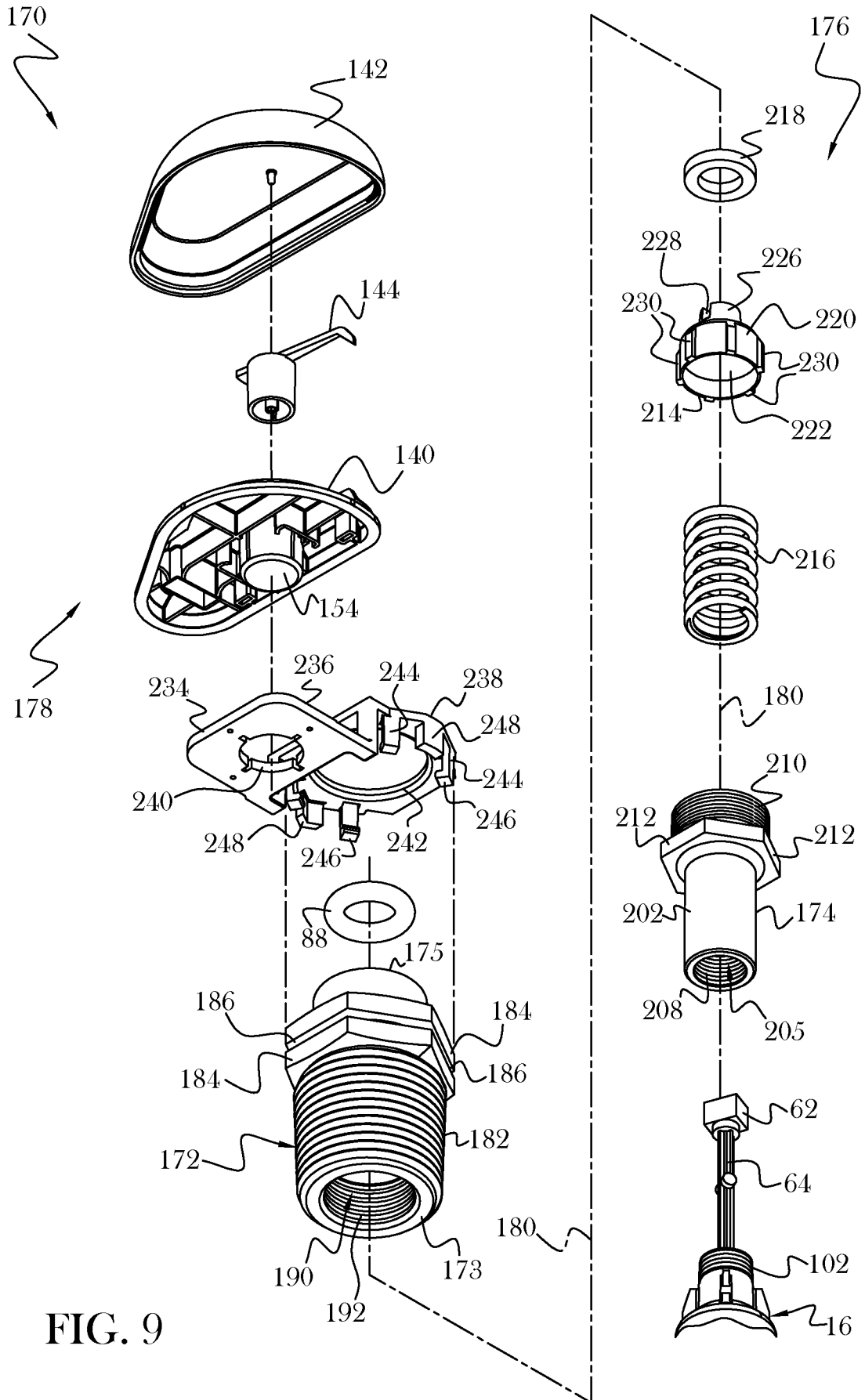


FIG. 9

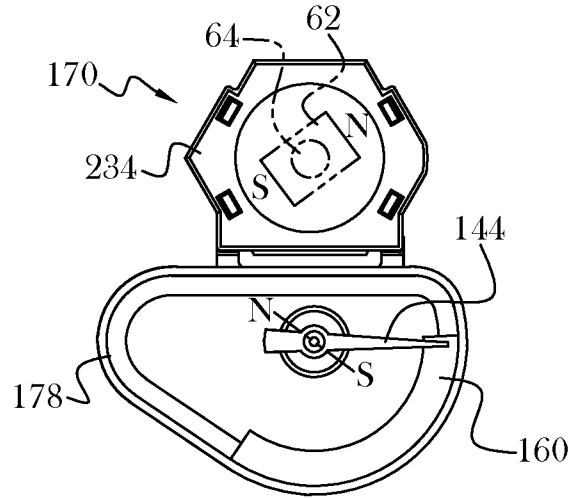


FIG. 10

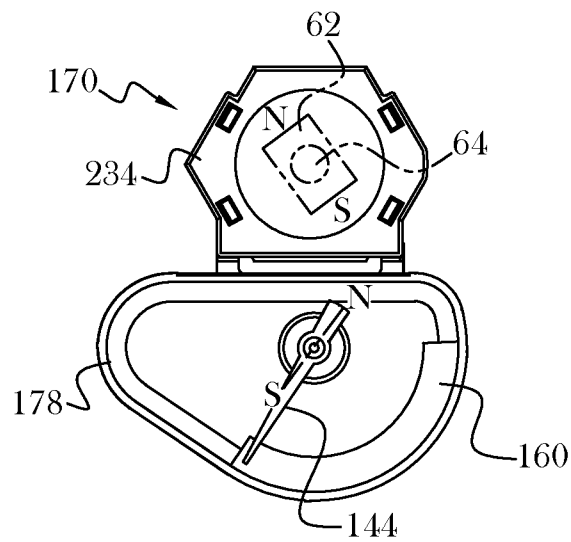


FIG. 11

A. CLASSIFICATION OF SUBJECT MATTER*F17C 13/04(2006.01)i, F17C 13/08(2006.01)i, F17C 13/02(2006.01)i*

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F17C 13/04; F17C 5/02; F16K 27/00; F16K 15/18

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: check, valve, charge, gas

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-0696209 B1 (Kim chung-Kyun) 20 March 2007	1-5
A	See the figs	6-28
A	JP 2002-147697 A (NERIKI:KK) 22 May 2002 See the whole docs	1-28
A	JP 2003-185097 A (ITO KOKI KK) 03 July 2003 See the whole docs	1-28

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29 APRIL 2011 (29.04.2011)

Date of mailing of the international search report

29 APRIL 2011 (29.04.2011)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2010/043234

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 10-0696209 B1	20.03.2007	None	
JP 2002-147697 A	22.05.2002	JP 04-596632 B2 US 2002-0056476 A1 US 6626204 B2	01.10.2010 16.05.2002 30.09.2003
JP 2003-185097 A	03.07.2003	None	