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(54) Title: CONTROL VALVE HAVING A DISPOSABLE VALVE BODY

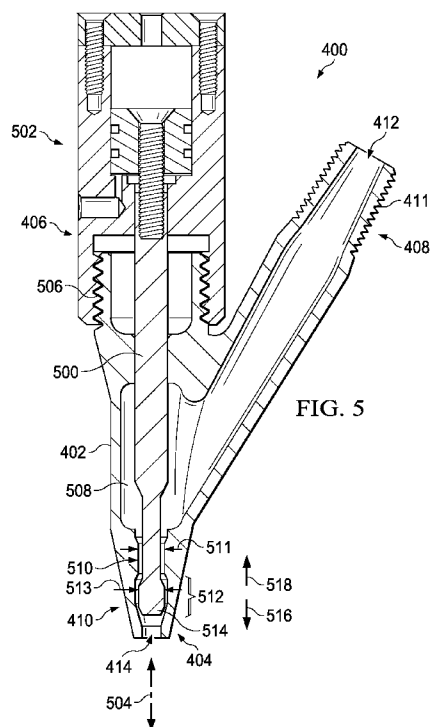


FIG. 5

(57) Abstract: A method and apparatus for controlling a flow of a fluid through a valve. In one illustrative embodiment, an apparatus comprises an elongate member, an actuation device, and a valve body. The actuation device is configured to move the elongate member, which may be associated with the actuation device, between an open position and a closed position. The valve body is configured for attachment to the actuation device such that the elongate member is positioned within the valve body. Fluid that flows into the valve body from a fluid source is allowed to flow out of the valve body when the elongate member is in the open position.

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CONTROL VALVE HAVING A DISPOSABLE VALVE BODY**BACKGROUND INFORMATION****1. Field:**

The present disclosure relates generally to fluid dispensing systems and, in particular, to a control valve for a fluid dispensing system. Still more particularly, the present disclosure relates to an apparatus and method for controlling a flow of fluid through a control valve having a disposable housing.

2. Background:

Fluid dispensing systems may be used to dispense fluids such as, for example, without limitation, sealant, adhesive, water, oil, and other types of fluids. In one illustrative example, a fluid dispensing system may be used to dispense sealant over an interface between two components. The interface may be, for example, without limitation, the interface between a first panel and a second panel, the interface between a fastener element and a surface, a joint, a seam, or some other type of interface.

Some currently available fluid dispensing systems may route a fluid, such as sealant, to a flow control valve that is located upstream of a separate dispensing tip, or nozzle.

Oftentimes, this dispensing tip may be disposable. Once fluid dispensing operations have been completed, the fluid dispensing system may need to be cleaned or purged of the fluid. In particular, the internal portion of the flow control valve may need to be cleaned. However, with the configurations of some currently available flow control valves, cleaning these flow control valves may be more difficult and/or time-consuming than desired.

Further, in some cases, the dispensing of a fluid may be halted periodically to rework the shape of the fluid that has been deposited over an interface. In particular, the fluid that has been deposited may need to be reworked to create a fluid surface resistance to inconsistencies. For example, without limitation, a separate, disposable tool may be used to rework the shape of the deposition of the fluid into a shape having a reduced likelihood of peeling away from the interface over time or separating from the surface of the components joined at the interface. The reworking of the fluid surface may include fairing the fluid surface. As used herein, "fairing" may mean smoothing, removing a portion of material from, and/or rubbing.

When the fluid is a fluid having a higher viscosity, such as a sealant, halting the dispensing of the fluid for more than a known working time of the fluid may cause the fluid within the flow control valve and/or within other components of the fluid dispensing system to be unworkable. In other words, the fluid may not flow. Consequently, the fluid dispensing system may need to be disassembled and cleaned prior to reuse. This process may require more time and/or effort than desired. Therefore, it would be desirable to have a method and apparatus that take into account at least some of the issues discussed above, as well as other possible issues.

SUMMARY

In one illustrative embodiment, an apparatus comprises an elongate member, an actuation device, and a valve body. The actuation device is configured to move the elongate member, which may be associated with the actuation device, between an open position and a closed position. The valve body is configured for attachment to the actuation device such that the elongate member is positioned within the valve body. Fluid that flows into the valve body from a fluid source is allowed to flow out of the valve body when the elongate member is in the open position.

In another illustrative embodiment, a fluid dispensing system comprises a fluid source, an elongate member, an actuation device, a disposable valve body, a first element associated with the disposable valve body, and a second element associated with the disposable valve body. The fluid source holds a fluid having a viscosity within a selected range. The actuation device is configured to move the elongate member, which may be associated with the actuation device, linearly in a direction along an axis between an open position and a closed position. The disposable valve body is configured for attachment to the actuation device such that the elongate member is positioned within the disposable valve body. The first element is configured for attachment to the fluid source. Fluid is configured to flow from the fluid source into the disposable valve body through the first element and out of the disposable valve body through the second element when the elongate member is in the open position. Removing the disposable valve body allows access to the elongate member such that the elongate member can be cleaned.

In yet another illustrative embodiment, a method for controlling a flow of fluid through a valve is provided. The fluid is received from a fluid source within a valve body of the valve. The elongate member positioned within the valve body is moved between an open

position and a closed position using the actuation device associated with the elongate member to control the flow of the fluid out of the valve body.

In still yet another illustrative embodiment, a method for dispensing fluid onto a surface is provided. A valve body is attached to an actuation device such that an elongate member associated with the actuation device is positioned within the valve body. A fluid source is attached to a first element associated with the valve body. The fluid is received from the fluid source within the valve body through the first element. The elongate member is moved into an open position using the actuation device to allow the fluid flowing into the valve body through the first element to flow out of the valve body through a second element. The fluid is dispensed through a nozzle associated with the valve body onto the surface. The nozzle is formed by at least a portion of the second element associated with the valve body. The elongate member is moved into a closed position using the actuation device to stop the fluid flowing into the valve body through the first element from flowing out of the valve body through the second element. The valve body is removed from the actuation device to allow access to the elongate member such that the elongate member can be cleaned.

In summary, according to one aspect of the invention there is provided an apparatus including an elongate member (130); an actuation device (128) configured to move the elongate member (130), which is associated with the actuation device (128), between an open position (144) and a closed position (146); and a valve body (126) configured for attachment to the actuation device (128) such that the elongate member (130) is positioned within the valve body (126) in which fluid (110) that flows into the valve body (126) from a fluid source (104) is allowed to flow out of the valve body (126) when the elongate member (130) is in the open position (144).

Advantageously the apparatus, wherein the elongate member (130) is associated with the actuation device (128) and wherein the actuation device (128) is configured to move the elongate member (130) linearly in a direction along an axis (303) to move the elongate member (130) between the open position (144) and the closed position (146).

Advantageously the apparatus, wherein the valve body (126) is disposable and wherein removing the valve body (126) from the actuation device (128) allows access to the elongate member (130) such that the elongate member (130) can be cleaned.

Advantageously the apparatus further including a first element (134) associated with the valve body (126) configured for attachment to the fluid source (104), wherein the fluid (110) flows into the valve body (126) from the fluid source (104) through the first element (134); and a second element (136) associated with the valve body (126) in which the fluid

(110) flows out of the valve body (126) through the second element (136) when the elongate member (130) is in the open position (144).

Advantageously the apparatus, wherein the first element (134) is a first protrusion (135) extending from the valve body (126) having a first channel (140) through which the fluid (110) flows.

Advantageously the apparatus, wherein the second element (136) is a second protrusion (137) extending from the valve body (126) having a second channel (142) through which the fluid (110) flows.

Advantageously the apparatus, wherein at least a portion of the second element (136) forms a nozzle (108) through which the fluid (110) is dispensed onto a surface (152).

Advantageously the apparatus, wherein moving the elongate member (130) in a direction towards the actuation device (128) moves the elongate member (130) into the closed position (146) and prevents the fluid (110) from flowing out of the second element (136).

Advantageously the apparatus, wherein moving the elongate member (130) in the direction towards the actuation device (128) creates a negative pressure within the second element (136) that prevents the fluid (110) from flowing out of the second element (136).

Advantageously the apparatus, wherein the first element (134) has a first channel (140) and the second element (136) has a second channel (142) and wherein the fluid (110) is allowed to flow into the second channel (142) from the first channel (140) when the elongate member (130) is in the open position (144) and prevented from flowing into the second channel (142) from the first channel (140) when the elongate member (130) is in the closed position (146).

Advantageously the apparatus, wherein the fluid (110) has a viscosity (118) within a selected range (120).

Advantageously the apparatus, wherein the fluid (110) having the viscosity (118) within the selected range (120) is a sealant (122).

Advantageously the apparatus further including the fluid source (104).

Advantageously the apparatus further including a nozzle (108) associated with the valve body (126) in which the fluid (110) is dispensed through the nozzle (108) onto a surface (152).

Advantageously the apparatus further including a number of fluid transfer elements (112) configured to connect the nozzle (108) to the valve body (126).

According to another aspect of the invention there is provided a fluid dispensing system (102) including a fluid source (104) holding fluid (110) having a viscosity (118) within a selected range (120); an elongate member (130); an actuation device (128) configured to move the elongate member (130), which is associated with the actuation device (128), linearly in a direction along an axis (303) between an open position (144) and a closed position (146); a disposable valve body (132) configured for attachment to the actuation device (128) such that the elongate member (130) is positioned within the disposable valve body (132); a first element (134) associated with the disposable valve body (132) configured for attachment to the fluid source (104); and a second element (136) associated with the disposable valve body (132) in which the fluid (110) is configured to flow from the fluid source (104) into the disposable valve body (132) through the first element (134) and out of the disposable valve body (132) through the second element (136) when the elongate member (130) is in the open position (144) and in which removing the disposable valve body (132) allows access to the elongate member (130) such that the elongate member (130) can be cleaned.

According to yet another aspect of the invention there is provided a method for controlling a flow of fluid (110) through a valve, the method including receiving the fluid (110) from a fluid source (104) within a valve body (126) of the valve; and moving an elongate member (130) positioned within the valve body (126) between an open position (144) and a closed position (146) using an actuation device (128) associated with the elongate member (130) to control the flow of the fluid (110) out of the valve body (126).

Advantageously the method further including attaching the valve body (126) to the actuation device (128) such that the elongate member (130) associated with the actuation device (128) is positioned within the valve body (126).

Advantageously the method wherein moving the elongate member (130) between the open position (144) and the closed position (146) includes moving the elongate member (130) into the open position (144) using the actuation device (128) to allow the fluid (110) flowing into the valve body (126) through a first element (134) associated with the valve body (126) to flow out of the valve body (126) through a second element (136) associated with the valve body (126).

Advantageously the method wherein moving the elongate member (130) between the open position (144) and the closed position (146) includes moving the elongate member (130) into the closed position (146) using the actuation device (128) to stop the fluid (110) flowing into the valve body (126) through a first element (134) associated with the valve

body (126) from flowing out of the valve body (126) through a second element (136) associated with the valve body (126).

Advantageously the method wherein moving the elongate member (130) into the closed position (146) using the actuation device (128) to stop the fluid (110) flowing into the valve body (126) through the first element (134) associated with the valve body (126) from flowing out of the valve body (126) through the second element (136) associated with the valve body (126) includes moving the elongate member (130) in a direction towards the actuation device (128) to move the elongate member (130) into the closed position (146), wherein moving the elongate member (130) in the direction towards the actuation device (128) creates a negative pressure within the second element (136) that stops the fluid (110) from flowing out of the second element (136).

Advantageously the method further including removing (1312) the valve body (126) from the actuation device (128) to allow access to the elongate member (130); and attaching a different valve body to the actuation device (128).

Advantageously the method further including attaching the valve body (126) to a nozzle (108) using a number of fluid transfer elements (112) in which the nozzle (108) is used to dispense the fluid (110) onto a surface (152).

Advantageously the method further including dispensing the fluid (110) through a nozzle (108) associated with the valve body (126) onto a surface (152), wherein the nozzle (108) is formed by at least a portion of the valve body (126).

According to still another aspect of the invention there is provided a method for dispensing fluid (110) onto a surface (152), the method including attaching a valve body (126) to an actuation device (128) such that an elongate member (130) associated with the actuation device (128) is positioned within the valve body (126); attaching (1302) a fluid source (104) to a first element (134) associated with the valve body (126); receiving the fluid (110) from the fluid source (104) within the valve body (126) through the first element (134); moving the elongate member (130) into an open position (144) using the actuation device (128) to allow the fluid (110) flowing into the valve body (126) through the first element (134) to flow out of the valve body (126) through a second element (136); dispensing (1308) the fluid (110) through a nozzle (108) associated with the valve body (126) onto the surface (152), in which the nozzle (108) is formed by at least a portion of the second element (136) associated with the valve body (126); moving the elongate member (130) into a closed position (146) using the actuation device (128) to stop the fluid (110) flowing into the valve body (126) through the first element (134) from flowing out of the valve body (126) through

the second element (136); removing the valve body (126) from the actuation device (128) to allow access to the elongate member (130); and attaching a different valve body to the actuation device (128).

5 The features and functions can be achieved independently in various embodiments of the present disclosure or may be combined in yet other embodiments in which further details can be seen with reference to the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

10 The novel features believed characteristic of the illustrative embodiments are set forth in the appended claims. The illustrative embodiments, however, as well as a preferred mode of use, further objectives and features thereof, will best be understood by reference to the following detailed description of an illustrative embodiment of the present disclosure when read in conjunction with the accompanying drawings, wherein:

15 **Figure 1** is an illustration of a manufacturing environment in the form of a block diagram in accordance with an illustrative embodiment;

Figure 2 is an illustration of an isometric view of a control valve in accordance with an illustrative embodiment;

20 **Figure 3** is an illustration of a cross-sectional view of a control valve in accordance with an illustrative embodiment;

Figure 4 is another illustration of an isometric view of a control valve in accordance with an illustrative embodiment;

Figure 5 is an illustration of a cross-sectional view of a control valve in accordance with an illustrative embodiment;

25 **Figure 6** is an illustration of a cross-sectional view of a control valve with an elongate member in a closed position in accordance with an illustrative embodiment;

Figure 7 is another illustration of an isometric view of a control valve in accordance with an illustrative embodiment;

30 **Figure 8** is an illustration of a cross-sectional view of a control valve in accordance with an illustrative embodiment;

Figure 9 is an illustration of an isometric view of a fluid dispensing system in accordance with an illustrative embodiment;

Figure 10 is another illustration of an isometric view of a control valve in accordance with an illustrative embodiment;

Figure 11 is an illustration of a cross-sectional view of a control valve in accordance with an illustrative embodiment;

Figure 12 is an illustration of a process for controlling a flow of fluid through a valve in the form of a flowchart in accordance with an illustrative embodiment;

5 **Figure 13** is an illustration of a method for dispensing fluid onto a surface in the form of a flowchart in accordance with an illustrative embodiment;

Figure 14 is an illustration of an aircraft manufacturing and service method in the form of a flowchart in accordance with an illustrative embodiment; and

10 **Figure 15** is an illustration of an aircraft in the form of a block diagram in which an illustrative embodiment may be implemented.

DETAILED DESCRIPTION

The illustrative embodiments recognize and take into account different considerations. For example, the illustrative embodiments recognize and take into account that it may be
15 desirable to have a fluid dispensing system having a flow control valve that can be easily cleaned. Further, the illustrative embodiments recognize and take into account that it may be desirable to have a fluid dispensing system capable of dispensing fluid with a greater precision as compared to some currently available fluid dispensing systems.

Thus, the illustrative embodiments provide a fluid dispensing system having a control
20 valve with a disposable valve body. This disposable valve body may be removed from the control valve to allow access to the internal wetted portions of the control valve. The disposable valve body may then be discarded after use allowing for the inner portion of the control valve to be accessible and cleaned with ease. A different disposable valve body may then be attached to the control valve to enable optimum performance of the control valve and
25 improved dispensing of the fluid. This new disposable body may have a same or different configuration compared to the first disposable body. In one illustrative embodiment, the disposable housing may be configured such that a portion of the disposable housing forms a nozzle through which the fluid may be dispensed.

Referring now to the figures and, in particular, with reference to **Figure 1**, an
30 illustration of a manufacturing environment is depicted in the form of a block diagram in accordance with an illustrative embodiment. In this illustrative example, manufacturing environment **100** may be an example of an environment in which fluid dispensing system **102** may be used. As depicted, fluid dispensing system **102** may include fluid source **104**, control valve **106**, and nozzle **108**.

Fluid source **104** may hold fluid **110**. Control valve **106** may receive fluid **110** from fluid source **104** and allow fluid **110** to flow to nozzle **108**. In particular, control valve **106** may control the flow of fluid **110** to nozzle **108**. Nozzle **108** may control the portion of fluid dispensing system **102** through which fluid **110** is dispensed. In other words, fluid **110** may exit fluid dispensing system **102** through nozzle **108**.

In some illustrative examples, nozzle **108** may be formed by a portion of control valve **106**. In this manner, nozzle **108** may be considered part of control valve **106** in these examples. In other illustrative examples, number of fluid transfer elements **112** may be used to connect control valve **106** to nozzle **108**. In particular, fluid **110** may flow through control valve **106** to nozzle **108** through number of fluid transfer elements **112**.

As used herein, a “number of” items may be one or more items. In this manner, number of fluid transfer elements **112** may be one or more fluid transfer elements. Further, as used herein, a “fluid transfer element,” such as one of number of fluid transfer elements **112** may be any element configured to allow fluid **110** to flow through a channel located within the element. In one illustrative example, number of fluid transfer elements **112** may take the form of number of tubes **114**. In another illustrative example, number of fluid transfer elements **112** may take the form of number of hoses **116**.

Fluid **110**, in this illustrative example, may have viscosity **118** within selected range **120**. Viscosity **118** may be a measure of the resistance of fluid **110** to gradual deformation by shear stress or tensile stress. In particular, viscosity **118** may indicate the resistance of fluid **110** to flow. A fluid having a higher viscosity may be more resistant to flow than a fluid having a lower viscosity. Selected range **120** may be the range of viscosities between about 1 centipoise to about 20 centipoise. Of course, some other range may be selected in other illustrative examples.

In one illustrative example, fluid **110** may take the form of sealant **122** and fluid source **104** may take the form of sealant cartridge **124** configured to hold sealant **122**. Sealant **122** may have viscosity **118** within selected range **120**.

As depicted, control valve **106** may include valve body **126**, actuation device **128**, elongate member **130**, first element **134**, and second element **136**. Valve body **126** may be configured for attachment to both actuation device **128** and fluid source **104**. Valve body **126** may have attachment element **138** associated with valve body **126**. Attachment element **138** may be configured to allow valve body **126** to be attached to actuation device **128**.

As used herein, when one component is “associated” with another component, the association is a physical association in the depicted examples. For example, without

limitation, a first component, such as attachment element **138**, may be considered to be associated with a second component, such as valve body **126**, by being secured to the second component, bonded to the second component, mounted to the second component, welded to the second component, fastened to the second component, and/or connected to the second component in some other suitable manner. The first component also may be connected to the second component using a third component. Further, the first component may be considered to be associated with the second component by being formed as part of and/or as an extension of the second component.

In this illustrative example, elongate member **130** may be associated with actuation device **128**. As used herein, elongate member **130** may be an object that is long with respect to the width or diameter of the object. The object may be extended along a longitudinal axis through the object. In some cases, elongate member **130** may be referred to as an elongated member. Valve body **126** may be attached to actuation device **128** in a manner such that elongate member **130** extends within valve body **126**. In other words, valve body **126** may be attached to actuation device **128** such that elongate member **130** is positioned within valve body **126**.

In this illustrative example, valve body **126** may take the form of disposable valve body **132**. In other words, valve body **126** may be disposable. Valve body **126** may be attached to actuation device **128** and fluid source **104** for use, then removed from actuation device **128** and fluid source **104** and discarded after use.

Valve body **126** may be attached to fluid source **104** using first element **134**. First element **134** may be associated with valve body **126**. In one illustrative example, first element **134** may take the form of first protrusion **135** extending from valve body **126**. In this example, first protrusion **135** may have threads configured to engage corresponding threads on fluid source **104** to attach valve body **126** to fluid source **104**.

First element **134** may have first channel **140**. First channel **140** may be configured to receive fluid **110** from fluid source **104**. In this manner, fluid **110** may flow into valve body **126** through first channel **140** within first element **134**.

Further, second element **136** may be associated with valve body **126**. In one illustrative example, second element **136** may take the form of second protrusion **137** extending from valve body **126**. In some cases, at least a portion of second element **136** may form nozzle **108**. In other examples, second element **136** may be configured for association with nozzle **108** through number of fluid transfer elements **112**. For example, without limitation, second protrusion **137** may have threads configured to engage corresponding

threads on one of number of fluid transfer elements **112** to attach valve body **126** to number of fluid transfer elements **112**.

Second element **136** may have second channel **142**. First channel **140** of first element **134** may open into second channel **142** of second element **136** such that fluid **110** may flow from first channel **140** into second channel **142**. Fluid **110** may flow out of valve body **126** through second channel **142**.

Actuation device **128** may be used to control the flow of fluid **110** through first channel **140** into second channel **142**. In particular, actuation device **128** may be used to control whether first channel **140** opens up into second channel **142** or whether second channel **142** is closed off from first channel **140**.

In this illustrative example, elongate member **130** may extend through valve body **126** and may be moved between open position **144** and closed position **146** by actuation device **128**. When elongate member **130** is moved into open position **144**, fluid **110** may be allowed to flow through second channel **142** from first channel **140**. However, when elongate member **130** is moved into closed position **146**, fluid **110** may be stopped from flowing through second channel **142** from first channel **140**.

In one illustrative example, elongate member **130** may have shape **148** configured such that moving elongate member **130** between open position **144** and closed position **146** controls the flow of fluid **110** into second channel **142**. In some cases, shape **148** may be configured such that the diameter of elongate member **130** changes along the length of elongate member **130**. For example, without limitation, shape **148** may be configured such that a middle portion of elongate member **130** has a smaller diameter than the end portions of elongate member **130**.

Actuation device **128** may take a number of different forms, depending on the implementation. In one illustrative example, actuation device **128** may take the form of linear actuator **150**. Linear actuator **150** may be configured to linearly move elongate member **130** in a direction along an axis to move elongate member **130** between open position **144** and closed position **146**. Linear actuator **150** may be implemented using, for example, without limitation, an electrical actuator, an electromechanical actuator, a mechanical actuator, a pneumatic actuator, a hydraulic actuator, a piston device, and/or some other type of actuation device.

When fluid **110** is allowed to flow through second channel **142**, fluid **110** may be dispensed from fluid dispensing system **102** through nozzle **108** onto surface **152**. In other words, fluid **110** may exit fluid dispensing system **102** through nozzle **108**.

Elongate member **130** may be moved to open position **144** when nozzle **108** fully covers fastener element **154** to allow fluid **110** to fully cover fastener element **154**. Elongate member **130** may then be moved to closed position **146** and nozzle **108** removed from fastener element **154**.

5 Fastener element **154** may be any type of fastener element. Fastener element **154** may take the form of, for example, without limitation, a nut, a screw, a portion of a fastener, a bolt, a bolt head, a hinge, a bracket, or some other type of fastener element.

After use of fluid dispensing system **102**, valve body **126** may be removed from actuation device **128** to provide access to elongate member **130**. Further, valve body **126**
10 may be removed from fluid source **104**. Valve body **126** may be configured such that only the portion of elongate member **130** exposed within valve body **126** is wetted when fluid **110** flows into and out of valve body **126**. Valve body **126** may be removed and discarded after use such that the wetted portion of elongate member **130** may be cleaned with ease. In this manner, different types of valve bodies may be used with the same fluid source **104**,
15 actuation device **128**, and elongate member **130**.

This type of configuration for control valve **106** and valve body **126**, in particular, may reduce the overall time needed to dispense fluid **110** during manufacturing operations, assembly operations, and/or other types of operations that may be performed within manufacturing environment **100**. Further, having disposable valve body **132** may allow the
20 cleaning of control valve **106** to be performed more quickly and easily as compared to cleaning the interior of a control valve to which access is limited.

The illustration of manufacturing environment **100** and fluid dispensing system **102** in **Figure 1** is not meant to imply physical or architectural limitations to the manner in which an illustrative embodiment may be implemented. Other components in addition to or in place of
25 the ones illustrated may be used. Some components may be optional. Also, the blocks are presented to illustrate some functional components. One or more of these blocks may be combined, divided, or combined and divided into different blocks when implemented in an illustrative embodiment.

For example, without limitation, number of fluid transfer elements **112** may not be
30 used to connect second element **136** to nozzle **108**. In some cases, nozzle **108** may be a separate member that may be directly connected to second element **136**.

In another illustrative example, first element **134** may allow attachment of valve body **126** to fluid source **104** and another fluid source (not shown) such that fluid **110** held within

fluid source **104** and the fluid (not shown) within the other fluid source (not shown) may both be received and mixed within first channel **140**.

With reference now to **Figure 2**, an illustration of an isometric view of a control valve is depicted in accordance with an illustrative embodiment. In **Figure 2**, control valve **200** may be an example of one implementation for control valve **106** in **Figure 1**. As depicted, control valve **200** may include valve body **202**, nozzle **204**, and actuation device **206**. Valve body **202**, nozzle **204**, and actuation device **206** may be examples of implementations for valve body **126**, nozzle **108**, and actuation device **128**, respectively, in **Figure 1**.

In this illustrative example, valve body **202** includes first element **208** and second element **210**. First element **208** and second element **210** may be examples of implementations for first element **134** and second element **136**, respectively, in **Figure 1**. First element **208** may have threads **211** configured to engage corresponding threads (not shown) on a fluid source (not shown) to attach valve body **202** to that fluid source. Further, first element **208** may have first channel **212** configured to receive a fluid (not shown) from the fluid source.

The fluid that flows into valve body **202** through first element **208** may be configured to flow out of valve body **202** through second element **210**. In particular, the fluid that flows through first channel **212** of first element **208** may flow through second channel **214** of second element **210**. Actuation device **206** may be used to control this flow of fluid. First channel **212** and second channel **214** may be examples of implementations for first channel **140** and second channel **142**, respectively, in **Figure 1**.

In this illustrative example, at least a portion of second element **210** may form nozzle **204**. The fluid may be dispensed through nozzle **204** onto some type of surface.

With reference now to **Figure 3**, an illustration of a cross-sectional view of control valve **200** from **Figure 2** is depicted in accordance with an illustrative embodiment. In this illustrative example, a cross-sectional view of control valve **200** from **Figure 2** is depicted taken along lines 3-3 in **Figure 2**.

As depicted, control valve **200** may also include elongate member **300**. Elongate member **300** may be an example of one implementation for elongate member **130** in **Figure 1**. Elongate member **300** may have flanged portion **301** and plug portion **302**.

Flanged portion **301** may be used to associate elongate member **300** with actuation device **206**. Actuation device **206** may be configured to move elongate member **300** linearly in a direction along axis **303**. In this illustrative example, actuation device **206** may take the form of pneumatic actuator **304**. Valve body **202** may have attachment element **305**

configured to attach to pneumatic actuator **304**. Attachment element **305** may be an example of one implementation for attachment element **138** in **Figure 1**.

Plug portion **302** may be used to plug second channel **214**. In particular, plug portion **302** may be used to stop fluid flowing within first channel **212** from flowing into second channel **214**. As depicted, valve body **202** may have hollow portion **306**. Hollow portion **306** may connect first channel **212** to second channel **214**. In other words, fluid flowing through first channel **212** may flow into second channel **214** through hollow portion **306** of valve body **202**.

Opening **308** may connect hollow portion **306** to second channel **214**. As depicted, opening **308** may have a smaller diameter than hollow portion **306**. Elongate member **300** may be sized such that fluid may be allowed to flow around elongate member **300** within hollow portion **306**. Further, fluid may be allowed to flow into second channel **214** when elongate member **300** is not positioned within second channel **214**.

However, elongate member **300** may be moved in the direction of arrow **310** into second channel **214** to plug second channel **214**. When elongate member **300** is at least partially positioned within second channel **214**, fluid within hollow portion **306** may not be allowed to pass through opening **308** into second channel **214**. Consequently, fluid may be prevented from flowing out of valve body **202** through second channel **214** of second element **210**. In other words, no fluid may be dispensed through nozzle **204**.

Elongate member **300** may then be moved in the direction of arrow **312** out of second channel **214** to allow fluid within hollow portion **306** to pass through opening **308** into second channel **214**. In this manner, fluid may be dispensed through nozzle **204**.

With reference now to **Figure 4**, another illustration of an isometric view of a control valve is depicted in accordance with an illustrative embodiment. In **Figure 4**, control valve **400** may be an example of one implementation for control valve **106** in **Figure 1**. As depicted, control valve **400** may include valve body **402**, nozzle **404**, and actuation device **406**. Valve body **402**, nozzle **404**, and actuation device **406** may be examples of implementations for valve body **126**, nozzle **108**, and actuation device **128**, respectively, in **Figure 1**.

In this illustrative example, valve body **402** includes first element **408** and second element **410**. First element **408** and second element **410** may be examples of implementations for first element **134** and second element **136**, respectively in **Figure 1**. First element **408** may have threads **411** configured to engage corresponding threads (not shown) on a fluid source (not shown) to attach valve body **402** to that fluid source. Further,

first element **408** may have first channel **412** configured to receive a fluid (not shown) from that fluid source.

The fluid that flows into valve body **402** through first element **408** may be configured to flow out of valve body **402** through second element **410**. In particular, the fluid that flows through first channel **412** of first element **408** may flow through second channel **414** of second element **410**. Actuation device **406** may be used to control this flow of fluid. First channel **412** and second channel **414** may be examples of implementations for first channel **140** and second channel **142**, respectively, in **Figure 1**.

In this illustrative example, at least a portion of second element **410** may form nozzle **404**. The fluid may be dispensed through nozzle **404** onto some type of surface.

Turning now to **Figure 5**, an illustration of a cross-sectional view of control valve **400** from **Figure 4** is depicted in accordance with an illustrative embodiment. In this illustrative example, a cross-sectional view of control valve **400** from **Figure 4** is depicted taken along lines **5-5** in **Figure 4**.

As depicted, control valve **400** may also include elongate member **500**. Elongate member **500** may be an example of one implementation for elongate member **130** in **Figure 1**. Elongate member **500** may be associated with actuation device **406**. In this illustrative example, actuation device **406** may take the form of piston device **502**. Piston device **502** may be configured to move elongate member **500** linearly in a direction along axis **504**.

In this illustrative example, valve body **402** may have attachment element **506** used to attach valve body **402** to piston device **502**. Attachment element **506** may be an example of one implementation for attachment element **138** in **Figure 1**.

As depicted, valve body **402** may have hollow portion **508**. Hollow portion **508** may connect first channel **412** to second channel **414**. In other words, fluid flowing through first channel **412** may flow into second channel **414** through hollow portion **508** of valve body **402**.

Further, hollow portion **508** may be connected to second channel **414** through connecting channel **510**. Connecting channel **510** may be narrower than both hollow portion **508** and second channel **414**. As depicted, connecting channel **510** may have diameter **511**.

Elongate member **500** may have plug portion **512** with diameter **513**. Diameter **513** may be substantially equal to diameter **511**, or just slightly smaller than diameter **511** such that plug portion **512** may form a tight fit with connecting channel **510** when plug portion **512** is moved into connecting channel **510**. In some cases, diameter **513** may be sized such that

plug portion **512** may form an interference fit with connecting channel **510** when plug portion **512** is moved into connecting channel **510**.

In this illustrative example, elongate member **500** may be in open position **514**. In particular, elongate member **500** may have been moved in the direction of arrow **516** into open position **514**. In open position **514**, plug portion **512** of elongate member **500** may be located outside of connecting channel **510**.

Consequently, fluid may be allowed to flow from first channel **412**, into hollow portion **508**, through connecting channel **510**, and into second channel **414**. In particular, the fluid may flow around plug portion **512** within second channel **414** because diameter **513** of plug portion **512** may be smaller than the diameter of second channel **414**. This fluid may then exit second channel **414** and be dispensed through nozzle **404**.

From open position **514**, elongate member **500** may be moved in the direction of arrow **518** into a closed position (not shown). In this closed position, plug portion **512** may be located within connecting channel **510**. Elongate member **500** may be shown in a closed position in **Figure 6** below.

With reference now to **Figure 6**, an illustration of the cross-sectional view of control valve **400** from **Figure 5** with elongate member **500** in a closed position is depicted in accordance with an illustrative embodiment. In **Figure 6**, the cross-sectional view of control valve **400** in **Figure 5** is depicted with elongate member **500** in closed position **600**.

In particular, elongate member **500** has been moved in the direction of arrow **518** such that plug portion **512** is positioned within connecting channel **510**. In this manner, plug portion **512** may be pulled upwards in the direction of arrow **518** towards piston device **502** to plug connecting channel **510**.

By plugging connecting channel **510**, plug portion **512** of elongate member **500** may prevent fluid from entering second channel **414**. Further, when plug portion **512** is pulled towards piston device **502** such that plug portion **512** plugs connecting channel **510**, negative pressure may be created within second channel **414**. This negative pressure may prevent any fluid from flowing out of second channel **414**. In particular, the negative pressure may cause leftover fluid within second channel **414** to be sucked back into second channel **414** in the direction of arrow **518** when plug portion **512** plugs connecting channel **510**. In this manner, control valve **400** may be referred to as a “snuff-back” valve.

With reference now to **Figure 7**, another illustration of an isometric view of a control valve is depicted in accordance with an illustrative embodiment. In this illustrative example, control valve **700** may be an example of one implementation for control valve **106** in **Figure**

1. As depicted, control valve **700** may include valve body **702** and actuation device **704**. Valve body **702** and actuation device **704** may be examples of implementations for valve body **126** and actuation device **128**, respectively in **Figure 1**.

Valve body **702** may include first element **705**, second element **706**, and vent **708**.

5 First element **705** and second element **706** may be examples of implementations for first element **134** and second element **136**, respectively, from **Figure 1**. In this illustrative example, first element **705** and second element **706** take the form of protrusions that extend from valve body **702**. Second element **706** may not form a nozzle in this illustrative example.

As depicted, first element **705** may have first channel **710** and second element **706**
10 may have a second channel (not shown in this view). In this illustrative example, first element **705** may have threads **712** configured to engage corresponding threads (not shown) on a fluid source (not shown) for use in attaching valve body **702** to the fluid source.

With reference now to **Figure 8**, an illustration of a cross-sectional view of control valve **700** from **Figure 7** is depicted in accordance with an illustrative embodiment. In this
15 illustrative example, a cross-sectional view of control valve **700** from **Figure 7** is depicted taken along lines **8-8** from **Figure 7**.

As depicted, control valve **700** may include elongate member **800**. Elongate member **800** may be an example of one implementation for elongate member **130** in **Figure 1**. Elongate member **800** may be associated with actuation device **704**. In this illustrative
20 example, actuation device **704** may take the form of piston device **802**. Further, valve body **702** may have attachment element **803** configured for attaching valve body **702** to piston device **802**. Piston device **802** may be configured to move elongate member **800** linearly in a direction along axis **804**.

As depicted, second element **706** may have second channel **806**. Valve body **702** may
25 have hollow portion **808**. Hollow portion **808** of valve body **702** may connect first channel **710** within first element **705** to second channel **806** within second element **706**.

Elongate member **800** may have plug portion **810** and narrow portion **812**. When narrow portion **812** is located in front of second channel **806**, fluid may be allowed to flow around narrow portion **812** and into second channel **806**. However, elongate member **800**
30 may be moved such that plug portion **810** is positioned in front of second channel **806**. Plug portion **810** may be sized such that fluid may be stopped from flowing into second channel **806**.

With reference now to **Figure 9**, an illustration of an isometric view of a fluid dispensing system is depicted in accordance with an illustrative embodiment. In this

illustrative example, fluid source **900** has been attached to valve body **702** of control valve **700** from **Figure 7**. Further, hose **902** has been attached to valve body **702**.

Together, control valve **700**, fluid source **900**, and hose **902** may form fluid dispensing system **904**. Fluid dispensing system **904** may be an example of one implementation for fluid dispensing system **102** in **Figure 1**. In this illustrative example, fluid dispensing system **102** may also include a nozzle (not shown) attached to hose **902**. Fluid within fluid source **900** may be allowed to flow through control valve **700**, through hose **902**, and then dispensed through this nozzle. Control valve **700** may be used to determine whether fluid flows into hose **902** or not.

With reference now to **Figure 10**, another illustration of an isometric view of a control valve is depicted in accordance with an illustrative embodiment. In this illustrative example, control valve **1000** may include valve body **1002** and actuation device **1004**. Valve body **1002** and actuation device **1004** may be examples of implementations for valve body **126** and actuation device **128**, respectively, in **Figure 1**.

Valve body **1002** may include first element **1006** and second element **1008**. First element **1006** and second element **1008** may be examples of implementations for first element **134** and second element **136**, respectively, from **Figure 1**. First element **1006** may have threads **1007** that allow first element **1006** to be attached to a fluid source (not shown). Fluid may flow from this fluid source into valve body **1002** through first element **1006**. Fluid may flow out of valve body **1002** through channel **1010** within second element **1008**.

With reference now to **Figure 11**, an illustration of a cross-sectional view of control valve **1000** from **Figure 10** is depicted in accordance with an illustrative embodiment. In this illustrative example, a cross-sectional view of control valve **1000** from **Figure 10** is depicted taken along lines **11-11** from **Figure 10**.

As depicted, control valve **1000** may include elongate member **1100**. Elongate member **1100** may be an example of one implementation for elongate member **130** in **Figure 1**. Elongate member **1100** may be associated with actuation device **1004**. In this illustrative example, actuation device **1004** may take the form of piston device **1102**.

Further, valve body **1002** may have attachment element **1104** configured for attaching valve body **1002** to piston device **1102**. Piston device **1102** may be configured to move elongate member **1100** linearly in a direction along axis **1106**.

As depicted, first element **1006** may have channel **1108**. Channel **1108** within first element **1006** may be configured to open directly into channel **1010** within second element **1008**. In this manner, fluid may be allowed to flow in the direction of arrow **1110**. Elongate

member **1100** may be moved in a direction along axis **1106** to either allow fluid to flow from channel **1108** into channel **1010** or stop fluid from flowing from channel **1108** into channel **1010**.

In this illustrative example, second element **1008** may have threads **1111** configured to engage corresponding threads (not shown) on a fluid transfer element (not shown). The fluid transfer element may be, for example, a hose having a fitting with threads configured to engage threads **1111**.

Control valve **1000** may also be referred to as a “spitting” valve in some cases. Control valve **1000** may be used to “spit out” fluid. In particular, elongate member **1100** may be moved from an open position that allows fluid to flow into channel **1010** to a closed position that stops fluid from flowing into channel **1010** periodically such that fluid flows out of valve body **1002** in spurts.

The illustrations of control valve **200** in **Figures 2-3**, control valve **400** in **Figures 4-6**, control valve **700** in **Figures 7-8**, fluid dispensing system **904** in **Figure 9**, and control valve **1000** in **Figures 10-11** are not meant to imply physical or architectural limitations to the manner in which an illustrative embodiment may be implemented. Other components in addition to or in place of the ones illustrated may be used. Some components may be optional.

The different components shown in **Figures 2-11** may be illustrative examples of how components shown in block form in **Figure 1** can be implemented as physical structures. Additionally, some of the components in **Figures 2-11** may be combined with components in **Figure 1**, used with components in **Figure 1**, or a combination of the two.

With reference now to **Figure 12**, an illustration of a process for controlling a flow of fluid through a valve is depicted in the form of a flowchart in accordance with an illustrative embodiment. The process illustrated in **Figure 12** may be implemented using control valve **106** in **Figure 1**.

The process may begin by attaching valve body **102** of control valve **106** to actuation device **128** such that elongate member **130** associated with actuation device **128** may be positioned within valve body **126** (operation **1200**). In particular, operation **1200** may be performed such that elongate member **130** may extend into a hollow portion of valve body **126**.

Next, fluid source **104** may be attached to valve body **126** through first element **134** associated with valve body **126** (operation **1202**). Fluid **110** from fluid source **104** may then be received within valve body **126** through first element **134** (operation **1204**).

Thereafter, elongate member **130** may be moved between open position **144** and closed position **146** using actuation device **128** to control the flow of fluid **110** through second element **136** associated with valve body **126** from first element **134** (operation **1206**), with the process terminating thereafter. Operation **1206** may be performed by moving
5 elongate member **130** from closed position **146** to open position **144** and/or from open position **144** to closed position **146** any number of times to control the flow of fluid **110** out of valve body **126** through second element **136**.

With reference now to **Figure 13**, an illustration of a method for dispensing fluid onto a surface is depicted in the form of a flowchart in accordance with an illustrative
10 embodiment. The process illustrated in **Figure 13** may be implemented using fluid dispensing system **102** in **Figure 1**.

The process may begin by attaching valve body **126** of control valve **106** in fluid dispensing system **102** to actuation device **128** in control valve **106** such that elongate member **130** associated with actuation device **128** may be positioned within valve body **126**
15 (operation **1300**). Next, fluid source **104** may be attached to first element **134** associated with valve body **126** (operation **1302**).

Fluid **110** from fluid source **104** may be received within valve body **126** through first channel **140** within first element **134** (operation **1304**). Thereafter, elongate member **130** may be moved into open position **144** using actuation device **128** to allow fluid **110** flowing
20 into valve body **126** through first channel **140** in first element **134** to flow out of valve body **126** through second channel **142** within second element **136** (operation **1306**).

Fluid **110** may be dispensed through nozzle **108** associated with valve body **126** onto surface **152** (operation **1308**). In this illustrative example, at least a portion of second element **136** may form nozzle **108** associated with valve body **126**. Once dispensing
25 operations have been completed, elongate member **130** may be moved into closed position **146** using actuation device **128** to stop fluid **110** flowing into valve body **126** through first channel **140** within first element **134** from flowing out of valve body **126** through second channel **142** within second element **136** (operation **1310**).

Thereafter, valve body **126** may be removed from actuation device **128** to allow
30 access to elongate member **130** such that elongate member **130** can be cleaned (operation **1312**), with the process terminating thereafter. In particular, removing valve body **126** may allow the wetted portion of elongate member **130**, wetted by fluid **110**, to be cleaned. Valve body **126** may then be discarded. In this manner, valve body **126** may take the form of disposable valve body **132**.

Further, in some cases, after operation **1310** has been performed, the sequence of performing operations **1306**, **1308**, and **1310** may be repeated any number of times prior to performing operation **1312**. In some illustrative examples, these operations may be performed such that fluid **110** may be deposited along surface **152** according to some selected patterns.

Illustrative embodiments of the disclosure may be described in the context of aircraft manufacturing and service method **1400** as shown in **Figure 14** and aircraft **1500** as shown in **Figure 15**. Turning first to **Figure 14**, an illustration of an aircraft manufacturing and service method is depicted in the form of a flowchart in accordance with an illustrative embodiment.

During pre-production, aircraft manufacturing and service method **1400** may include specification and design **1402** of aircraft **1500** in **Figure 15** and material procurement **1404**.

During production, component and subassembly manufacturing **1406** and system integration **1408** of aircraft **1500** in **Figure 15** takes place. Thereafter, aircraft **1500** in **Figure 15** may go through certification and delivery **1410** in order to be placed in service **1412**. While in service **1412** by a customer, aircraft **1500** in **Figure 15** is scheduled for routine maintenance and service **1414**, which may include modification, reconfiguration, refurbishment, and other maintenance or service.

Each of the processes of aircraft manufacturing and service method **1400** may be performed or carried out by a system integrator, a third party, and/or an operator. In these examples, the operator may be a customer. For the purposes of this description, a system integrator may include, without limitation, any number of aircraft manufacturers and major-system subcontractors; a third party may include, without limitation, any number of vendors, subcontractors, and suppliers; and an operator may be an airline, a leasing company, a military entity, a service organization, and so on.

With reference now to **Figure 15**, an illustration of an aircraft is depicted in the form of a block diagram in which an illustrative embodiment may be implemented. In this example, aircraft **1500** is produced by aircraft manufacturing and service method **1400** in **Figure 14** and may include airframe **1502** with systems **1504** and interior **1506**. Examples of systems **1504** include one or more of propulsion system **1508**, electrical system **1510**, hydraulic system **1512**, and environmental system **1514**. Any number of other systems may be included. Although an aerospace example is shown, different illustrative embodiments may be applied to other industries, such as the automotive industry.

Apparatuses and methods embodied herein may be employed during at least one of the stages of aircraft manufacturing and service method **1400** in **Figure 14**. In particular,

fluid dispensing system **102** from **Figure 1** may be used for dispensing, for example, without limitation, sealant **122**, over various surfaces during any one of the stages of aircraft manufacturing and service method **1400**. For example, without limitation, fluid dispensing system **102** from **Figure 1** may be used for sealing fastener elements installed for aircraft

5 **1500** during at least one of component and subassembly manufacturing **1406**, system integration **1408**, routine maintenance and service **1414**, or some other stage of aircraft manufacturing and service method **1400**.

In one illustrative example, components or subassemblies produced in component and subassembly manufacturing **1406** in **Figure 14** may be fabricated or manufactured in a

10 manner similar to components or subassemblies produced while aircraft **1500** is in service **1412** in **Figure 14**. As yet another example, one or more apparatus embodiments, method embodiments, or a combination thereof may be utilized during production stages, such as component and subassembly manufacturing **1406** and system integration **1408** in **Figure 14**. One or more apparatus embodiments, method embodiments, or a combination thereof may be

15 utilized while aircraft **1500** is in service **1412** and/or during maintenance and service **1414** in **Figure 14**. The use of a number of the different illustrative embodiments may substantially expedite the assembly of and/or reduce the cost of aircraft **1500**.

The flowcharts and block diagrams in the different depicted embodiments illustrate the architecture, functionality, and operation of some possible implementations of

20 apparatuses and methods in an illustrative embodiment. In this regard, each block in the flowcharts or block diagrams may represent a module, a segment, a function, and/or a portion of an operation or step.

In some alternative implementations of an illustrative embodiment, the function or functions noted in the blocks may occur out of the order noted in the figures. For example, in

25 some cases, two blocks shown in succession may be executed substantially concurrently, or the blocks may sometimes be performed in the reverse order, depending upon the functionality involved. Also, other blocks may be added in addition to the illustrated blocks in a flowchart or block diagram.

The description of the different illustrative embodiments has been presented for

30 purposes of illustration and description, and is not intended to be exhaustive or limited to the embodiments in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. Further, different illustrative embodiments may provide different features as compared to other desirable embodiments. The embodiment or embodiments selected are chosen and described in order to best explain the principles of the

embodiments, the practical application, and to enable others of ordinary skill in the art to understand the disclosure for various embodiments with various modifications as are suited to the particular use contemplated.

CLAIMS:

What is claimed is:

- 5 1. An apparatus comprising:
an elongate member (130);
an actuation device (128) configured to move the elongate member (130), which is
associated with the actuation device (128), between an open position (144) and a closed
position (146); and
10 a valve body (126) configured for attachment to the actuation device (128) such that
the elongate member (130) is positioned within the valve body (126) in which fluid (110) that
flows into the valve body (126) from a fluid source (104) is allowed to flow out of the valve
body (126) when the elongate member (130) is in the open position (144).
- 15 2. The apparatus of claim 1, wherein the elongate member (130) is associated with the
actuation device (128) and wherein the actuation device (128) is configured to move the
elongate member (130) linearly in a direction along an axis (303) to move the elongate
member (130) between the open position (144) and the closed position (146).
- 20 3. The apparatus of claim 1, wherein the valve body (126) is disposable and wherein
removing the valve body (126) from the actuation device (128) allows access to the elongate
member (130) such that the elongate member (130) can be cleaned.
4. The apparatus of claim 1 further comprising:
25 a first element (134) associated with the valve body (126) configured for attachment
to the fluid source (104), wherein the fluid (110) flows into the valve body (126) from the
fluid source (104) through the first element (134); and
a second element (136) associated with the valve body (126) in which the fluid (110)
flows out of the valve body (126) through the second element (136) when the elongate
30 member (130) is in the open position (144).
5. The apparatus of claim 4, wherein the first element (134) is a first protrusion (135)
extending from the valve body (126) having a first channel (140) through which the fluid
(110) flows.

6. The apparatus of claim 4, wherein the second element (136) is a second protrusion (137) extending from the valve body (126) having a second channel (142) through which the fluid (110) flows.

5 7. The apparatus of claim 4, wherein at least a portion of the second element (136) forms a nozzle (108) through which the fluid (110) is dispensed onto a surface (152).

8. The apparatus of claim 4, wherein moving the elongate member (130) in a direction towards the actuation device (128) moves the elongate member (130) into the closed position (146) and prevents the fluid (110) from flowing out of the second element (136).
10

9. The apparatus of claim 8, wherein moving the elongate member (130) in the direction towards the actuation device (128) creates a negative pressure within the second element (136) that prevents the fluid (110) from flowing out of the second element (136).
15

10. The apparatus of claim 4, wherein the first element (134) has a first channel (140) and the second element (136) has a second channel (142) and wherein the fluid (110) is allowed to flow into the second channel (142) from the first channel (140) when the elongate member (130) is in the open position (144) and prevented from flowing into the second channel (142) from the first channel (140) when the elongate member (130) is in the closed position (146).
20

11. The apparatus of claim 1, wherein the fluid (110) has a viscosity (118) within a selected range (120).

25 12. The apparatus of claim 11, wherein the fluid (110) having the viscosity (118) within the selected range (120) is a sealant (122).

13. The apparatus of claim 1 further comprising:
the fluid source (104).

30

14. The apparatus of claim 1 further comprising:
a nozzle (108) associated with the valve body (126) in which the fluid (110) is dispensed through the nozzle (108) onto a surface (152).

15. The apparatus of claim 14 further comprising:
a number of fluid transfer elements (112) configured to connect the nozzle (108) to the valve body (126).

5 16. A fluid dispensing system (102) comprising:
a fluid source (104) holding fluid (110) having a viscosity (118) within a selected range (120);
an elongate member (130);
an actuation device (128) configured to move the elongate member (130), which is
10 associated with the actuation device (128), linearly in a direction along an axis (303) between an open position (144) and a closed position (146);
a disposable valve body (132) configured for attachment to the actuation device (128) such that the elongate member (130) is positioned within the disposable valve body (132);
a first element (134) associated with the disposable valve body (132) configured for
15 attachment to the fluid source (104); and
a second element (136) associated with the disposable valve body (132) in which the fluid (110) is configured to flow from the fluid source (104) into the disposable valve body (132) through the first element (134) and out of the disposable valve body (132) through the
20 second element (136) when the elongate member (130) is in the open position (144) and in which removing the disposable valve body (132) allows access to the elongate member (130) such that the elongate member (130) can be cleaned.

17. A method for controlling a flow of fluid (110) through a valve, the method comprising:
25 receiving the fluid (110) from a fluid source (104) within a valve body (126) of the valve; and
moving an elongate member (130) positioned within the valve body (126) between an open position (144) and a closed position (146) using an actuation device (128) associated with the elongate member (130) to control the flow of the fluid (110) out of the valve body
30 (126).

18. The method of claim 17 further comprising:

attaching the valve body (126) to the actuation device (128) such that the elongate member (130) associated with the actuation device (128) is positioned within the valve body (126).

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19. The method of claim 17, wherein moving the elongate member (130) between the open position (144) and the closed position (146) comprises:

moving the elongate member (130) into the open position (144) using the actuation device (128) to allow the fluid (110) flowing into the valve body (126) through a first element (134) associated with the valve body (126) to flow out of the valve body (126) through a second element (136) associated with the valve body (126).

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20. The method of claim 17, wherein moving the elongate member (130) between the open position (144) and the closed position (146) comprises:

moving the elongate member (130) into the closed position (146) using the actuation device (128) to stop the fluid (110) flowing into the valve body (126) through a first element (134) associated with the valve body (126) from flowing out of the valve body (126) through a second element (136) associated with the valve body (126).

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21. The method of claim 20, wherein moving the elongate member (130) into the closed position (146) using the actuation device (128) to stop the fluid (110) flowing into the valve body (126) through the first element (134) associated with the valve body (126) from flowing out of the valve body (126) through the second element (136) associated with the valve body (126) comprises:

moving the elongate member (130) in a direction towards the actuation device (128) to move the elongate member (130) into the closed position (146), wherein moving the elongate member (130) in the direction towards the actuation device (128) creates a negative pressure within the second element (136) that stops the fluid (110) from flowing out of the second element (136).

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22. The method of claim 17 further comprising:

removing (1312) the valve body (126) from the actuation device (128) to allow access to the elongate member (130); and

attaching a different valve body to the actuation device (128).

23. The method of claim 17 further comprising:

attaching the valve body (126) to a nozzle (108) using a number of fluid transfer elements (112) in which the nozzle (108) is used to dispense the fluid (110) onto a surface (152).

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24. The method of claim 17 further comprising:

dispensing the fluid (110) through a nozzle (108) associated with the valve body (126) onto a surface (152), wherein the nozzle (108) is formed by at least a portion of the valve body (126).

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25. A method for dispensing fluid (110) onto a surface (152), the method comprising:

attaching a valve body (126) to an actuation device (128) such that an elongate member (130) associated with the actuation device (128) is positioned within the valve body (126);

15 attaching (1302) a fluid source (104) to a first element (134) associated with the valve body (126);

receiving the fluid (110) from the fluid source (104) within the valve body (126) through the first element (134);

20 moving the elongate member (130) into an open position (144) using the actuation device (128) to allow the fluid (110) flowing into the valve body (126) through the first element (134) to flow out of the valve body (126) through a second element (136);

dispensing (1308) the fluid (110) through a nozzle (108) associated with the valve body (126) onto the surface (152), in which the nozzle (108) is formed by at least a portion of the second element (136) associated with the valve body (126);

25 moving the elongate member (130) into a closed position (146) using the actuation device (128) to stop the fluid (110) flowing into the valve body (126) through the first element (134) from flowing out of the valve body (126) through the second element (136);

removing the valve body (126) from the actuation device (128) to allow access to the elongate member (130); and

30 attaching a different valve body to the actuation device (128).

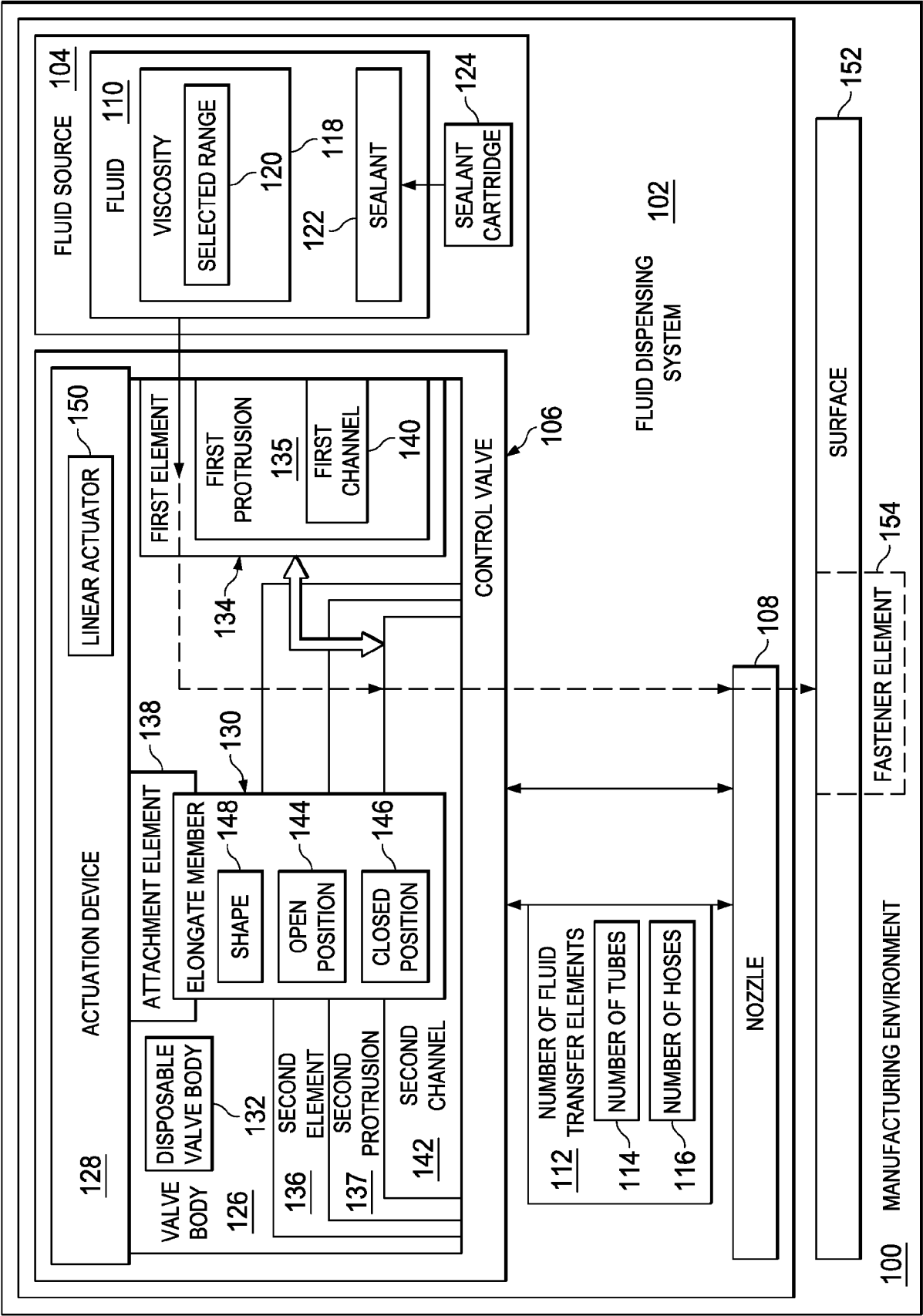
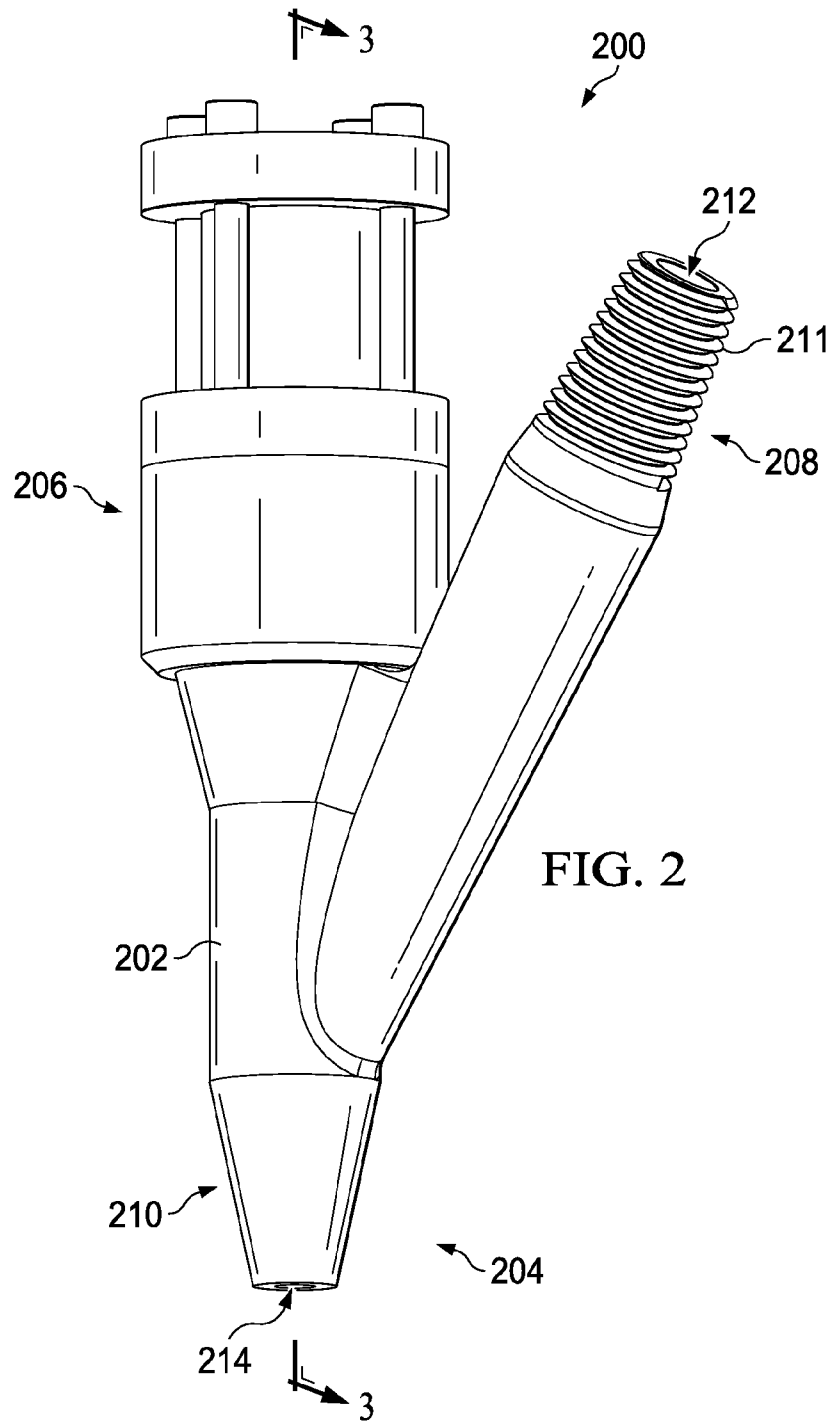
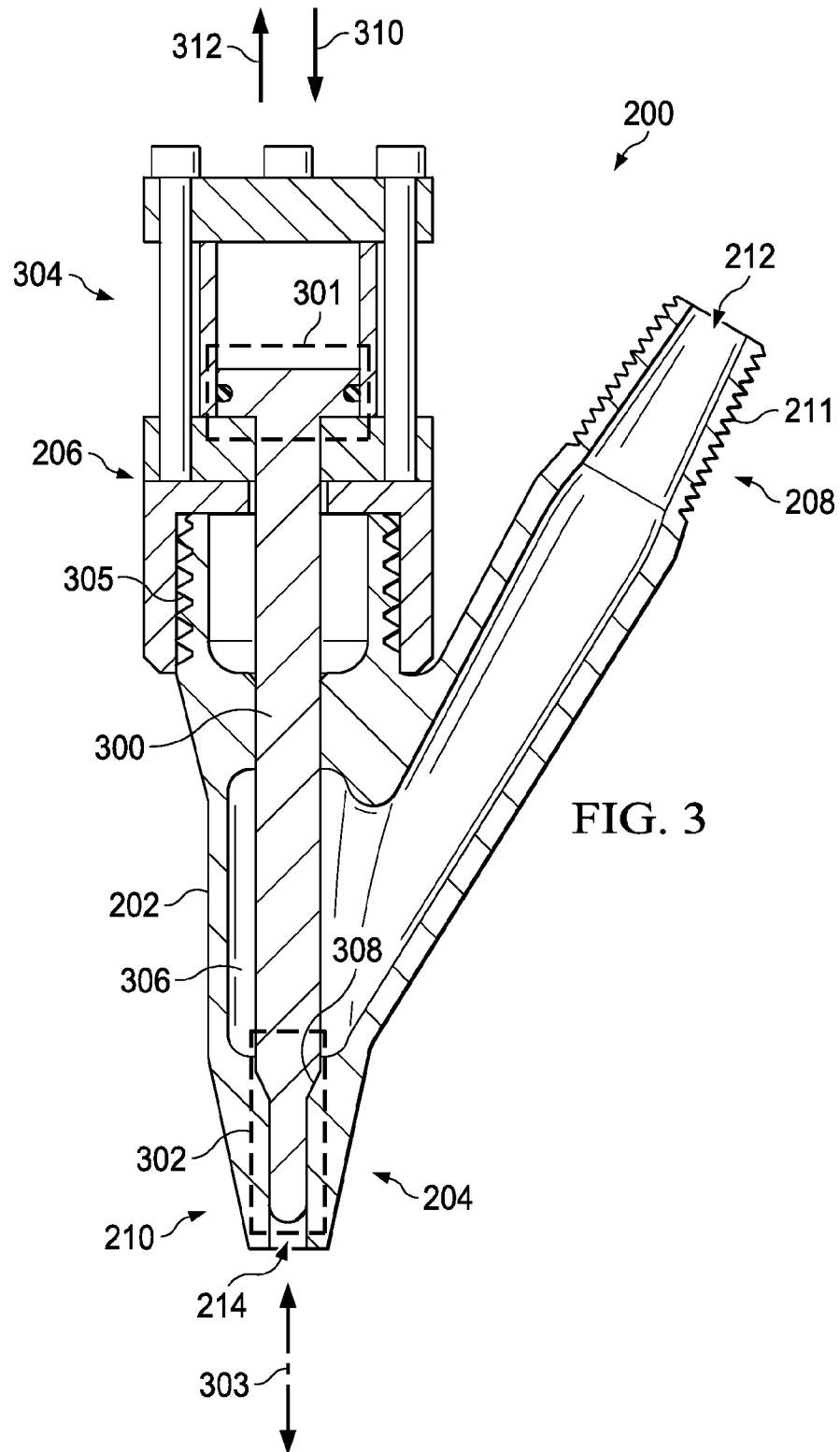


FIG. 1

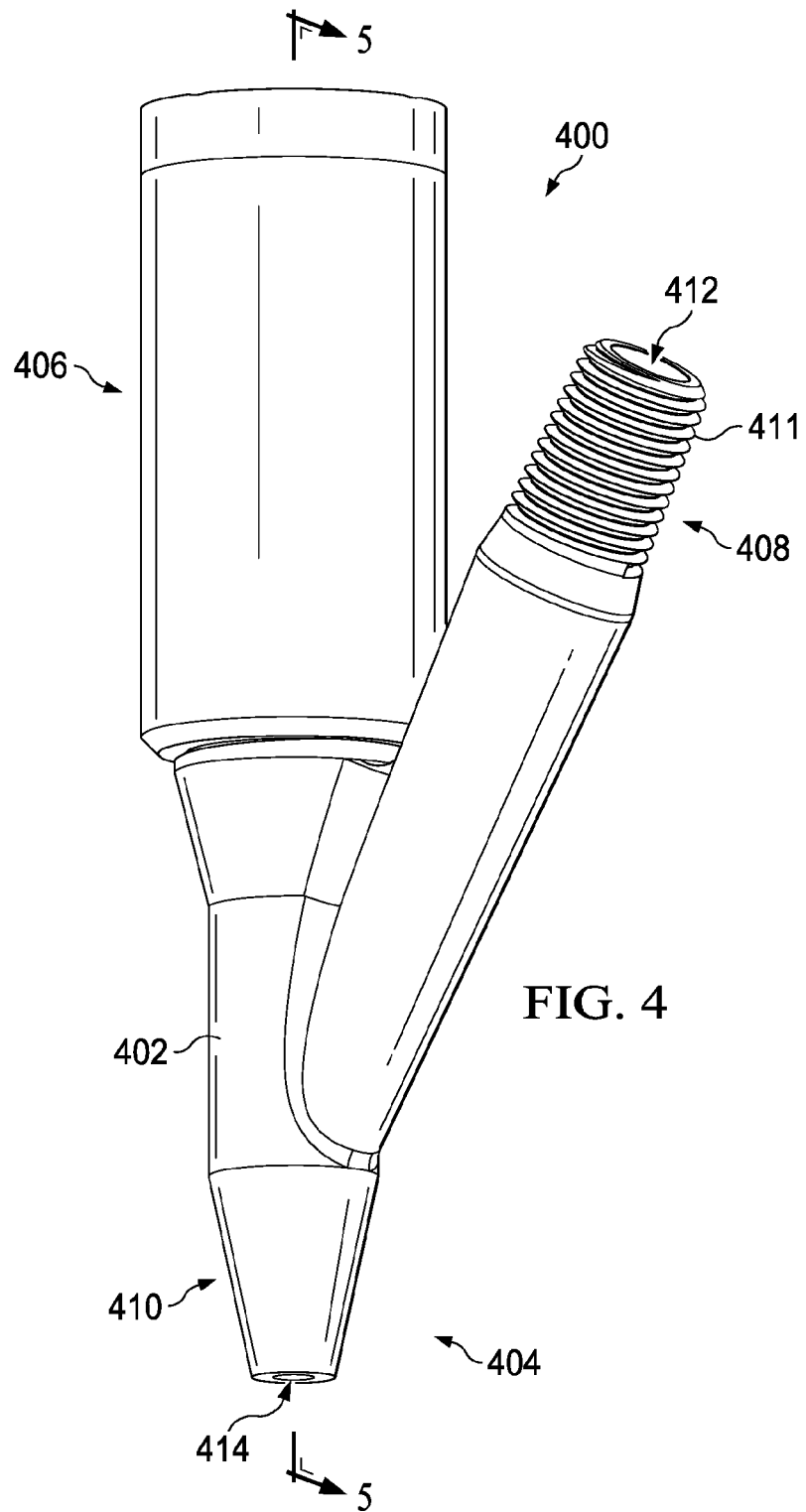
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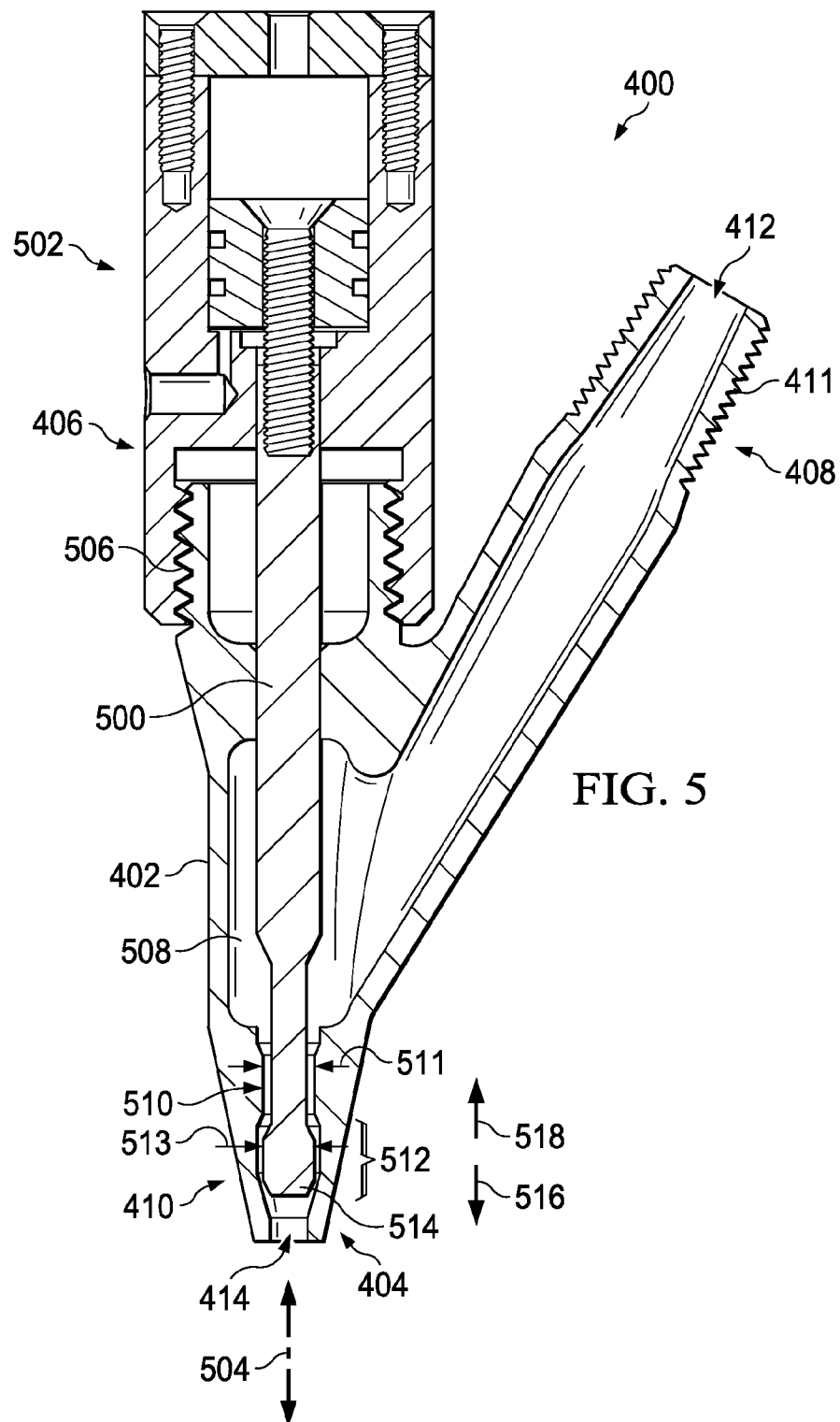
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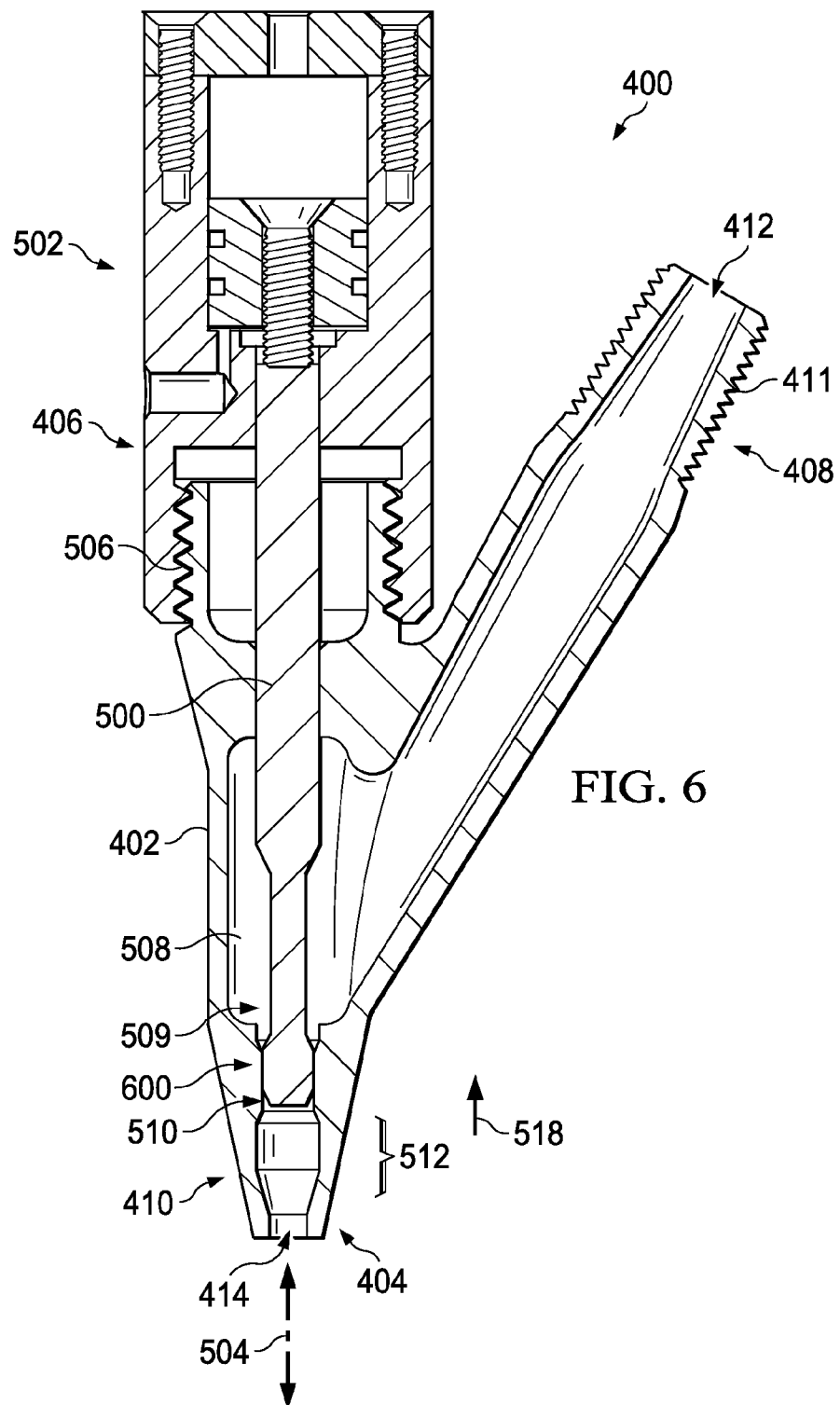
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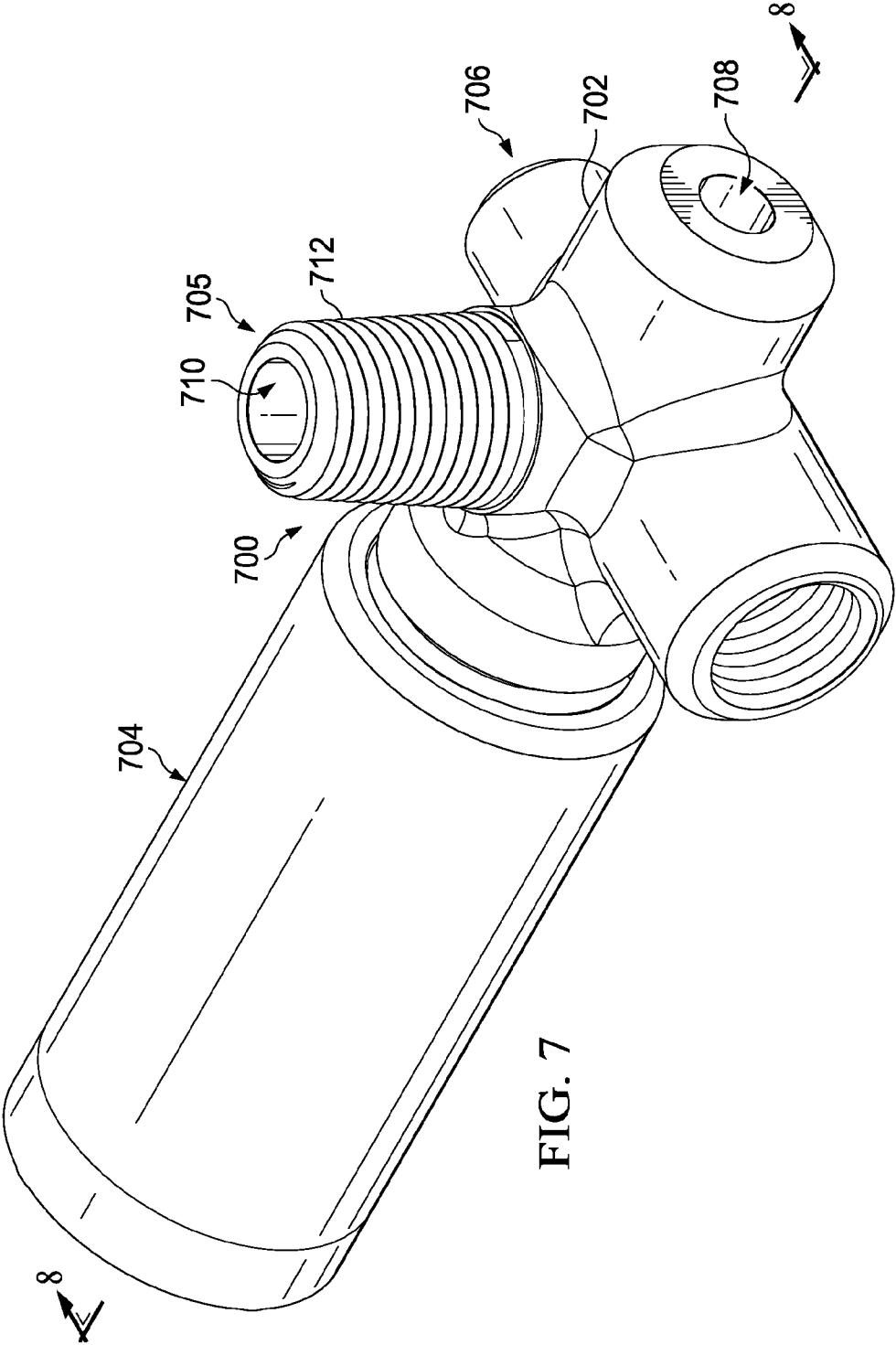


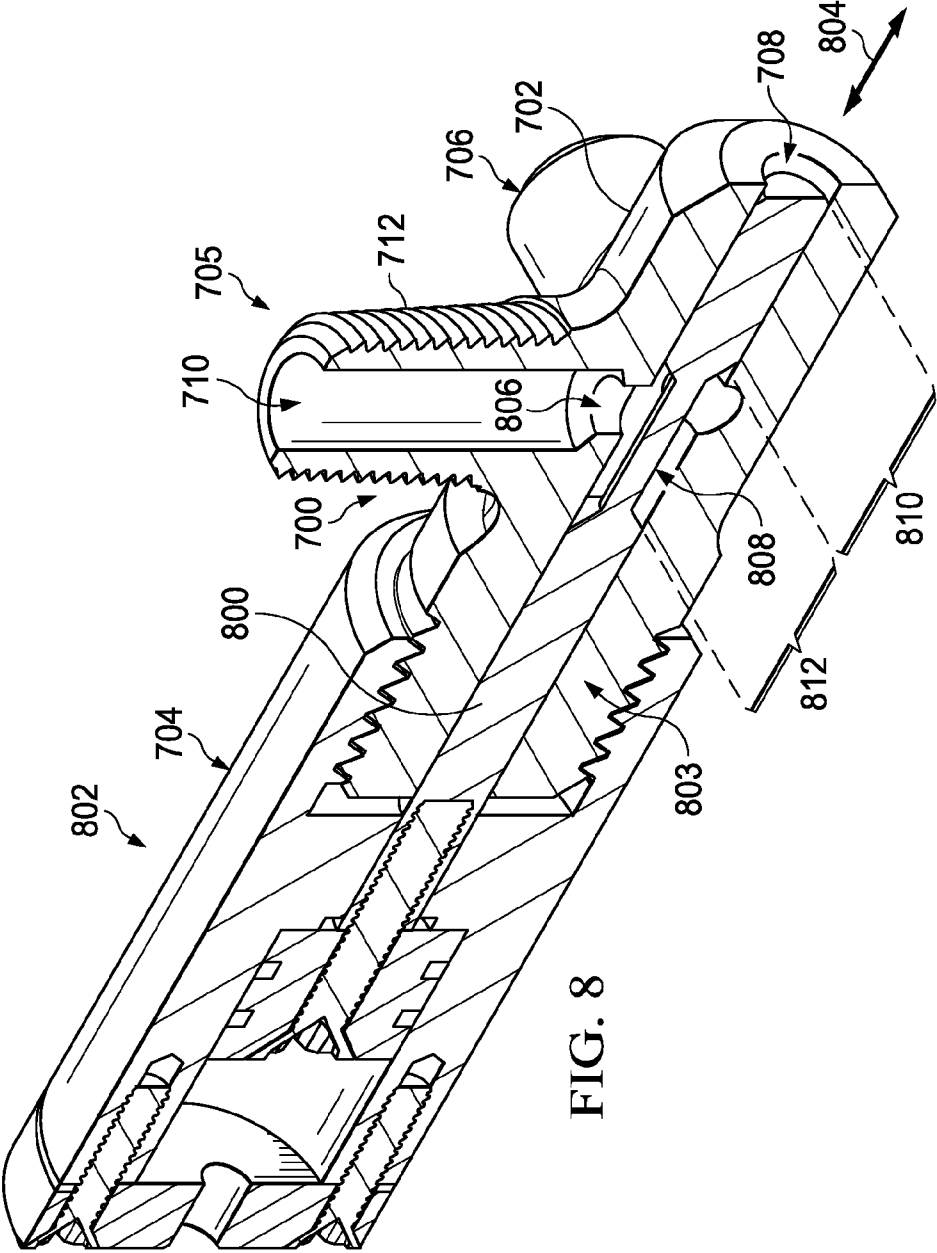
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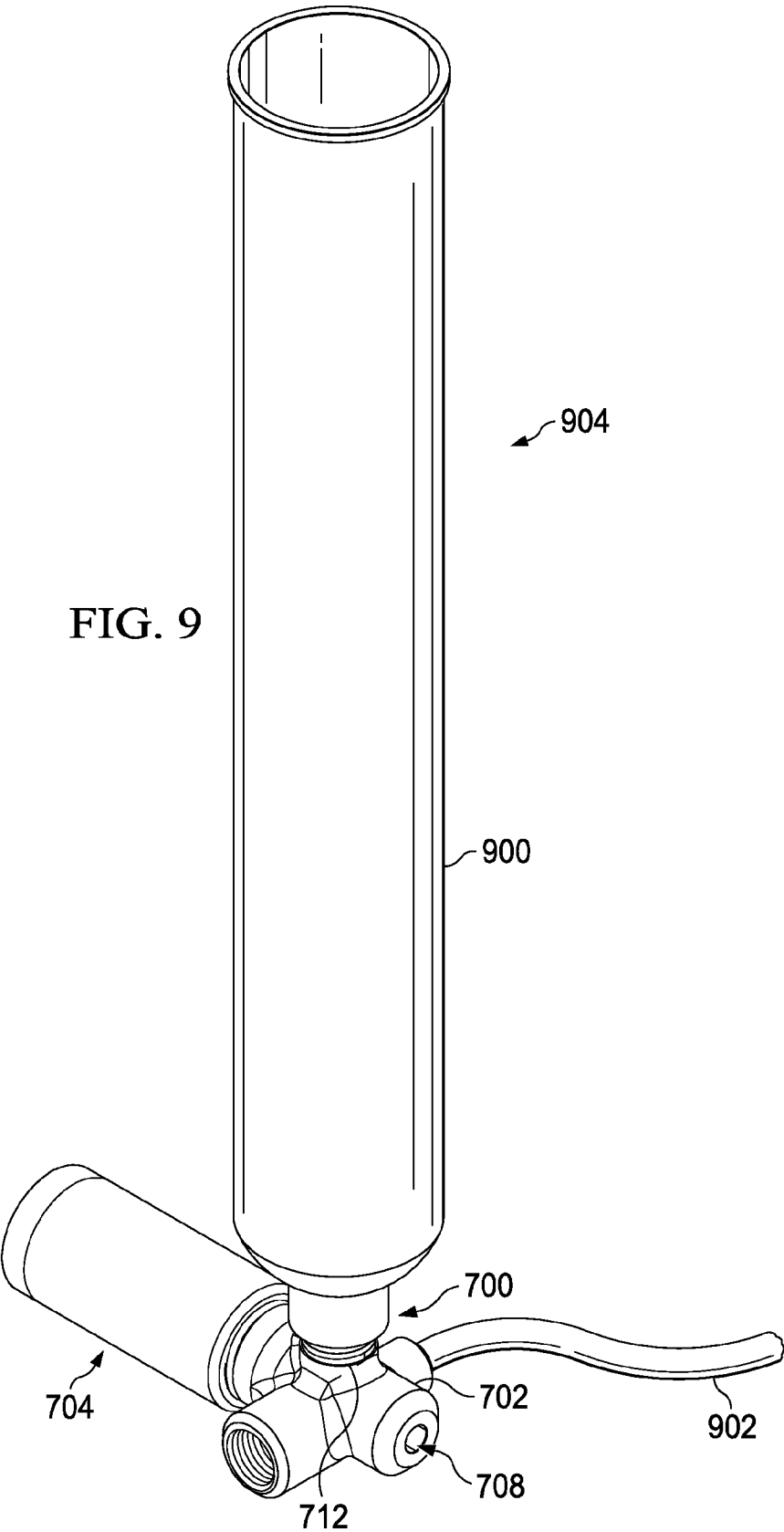


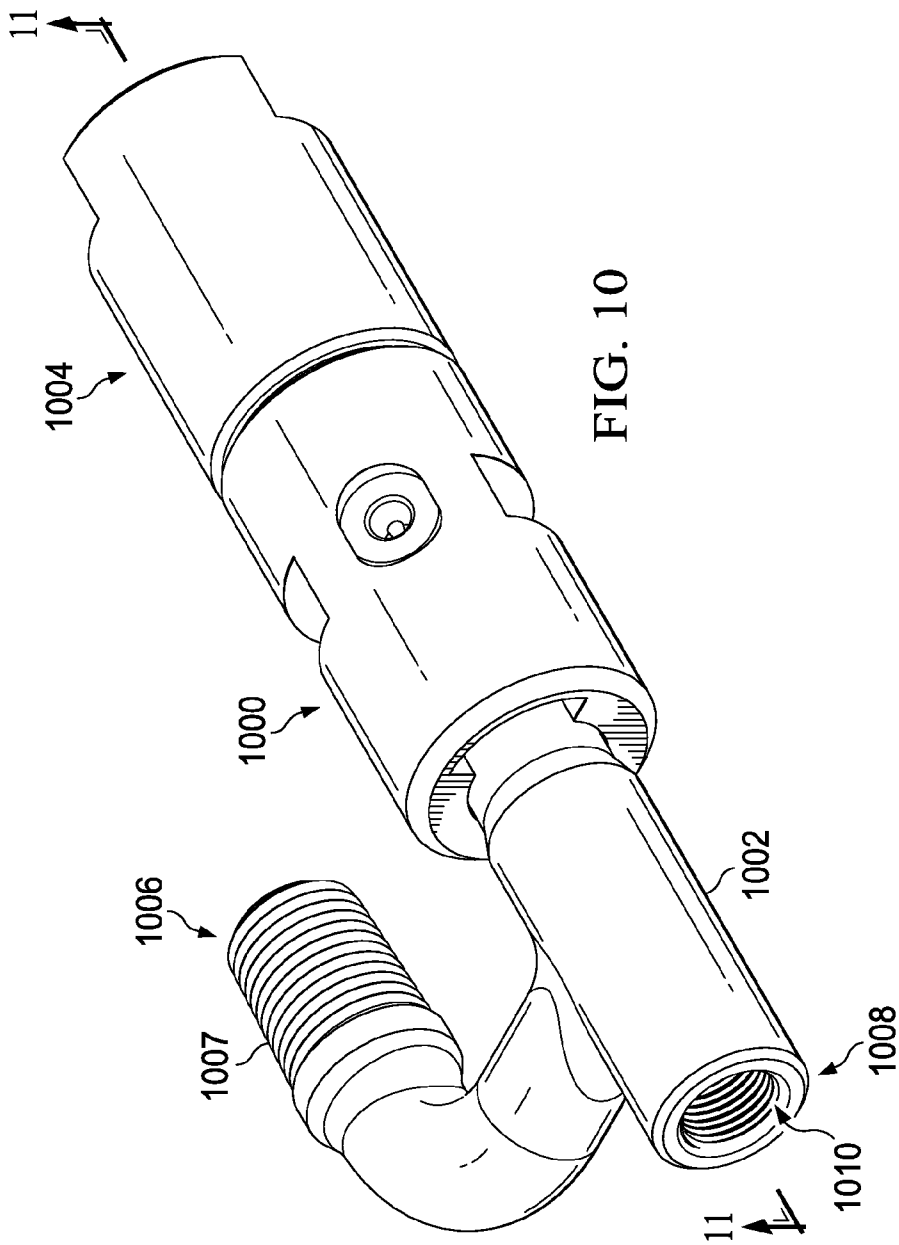




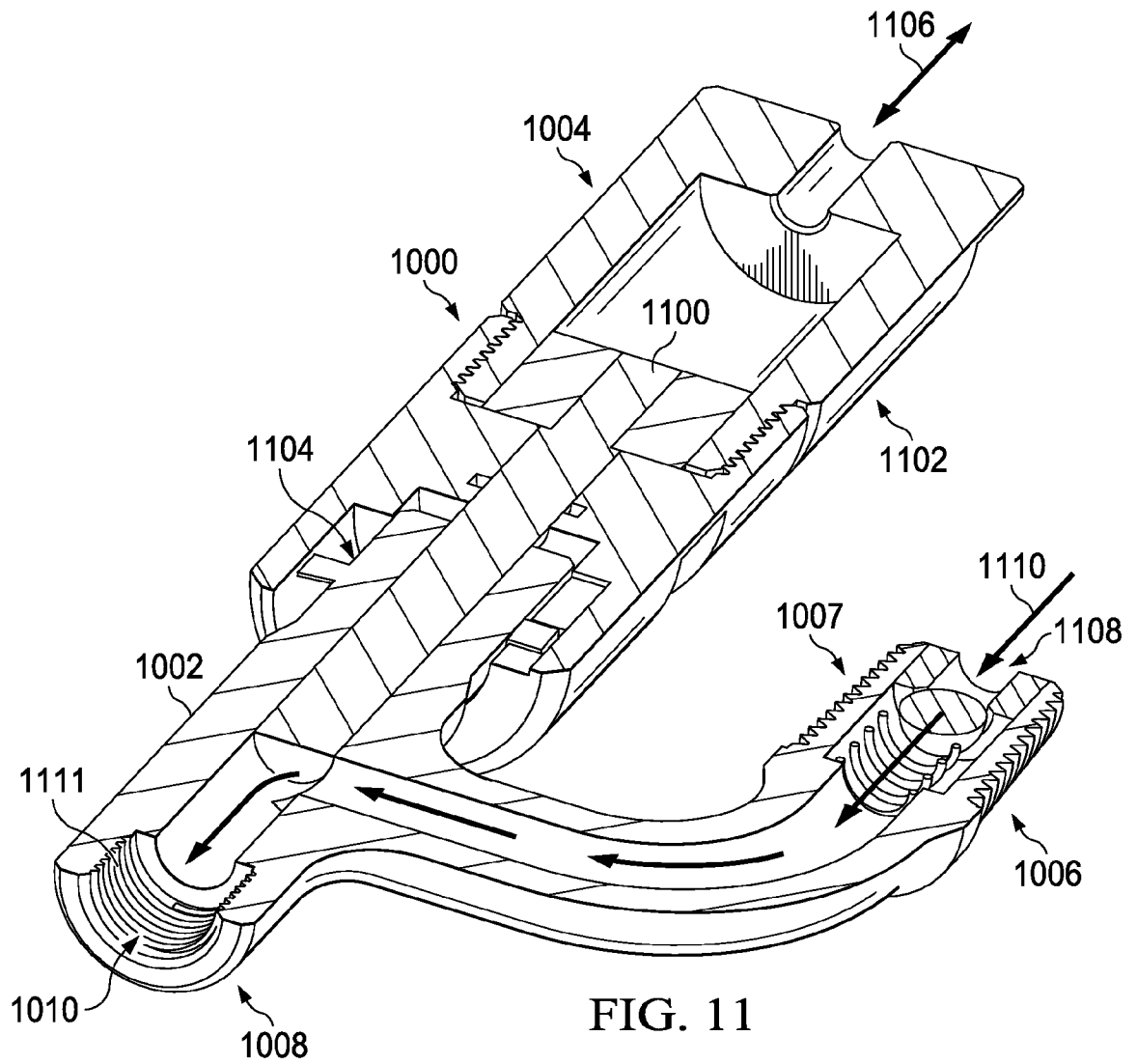
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FIG. 9





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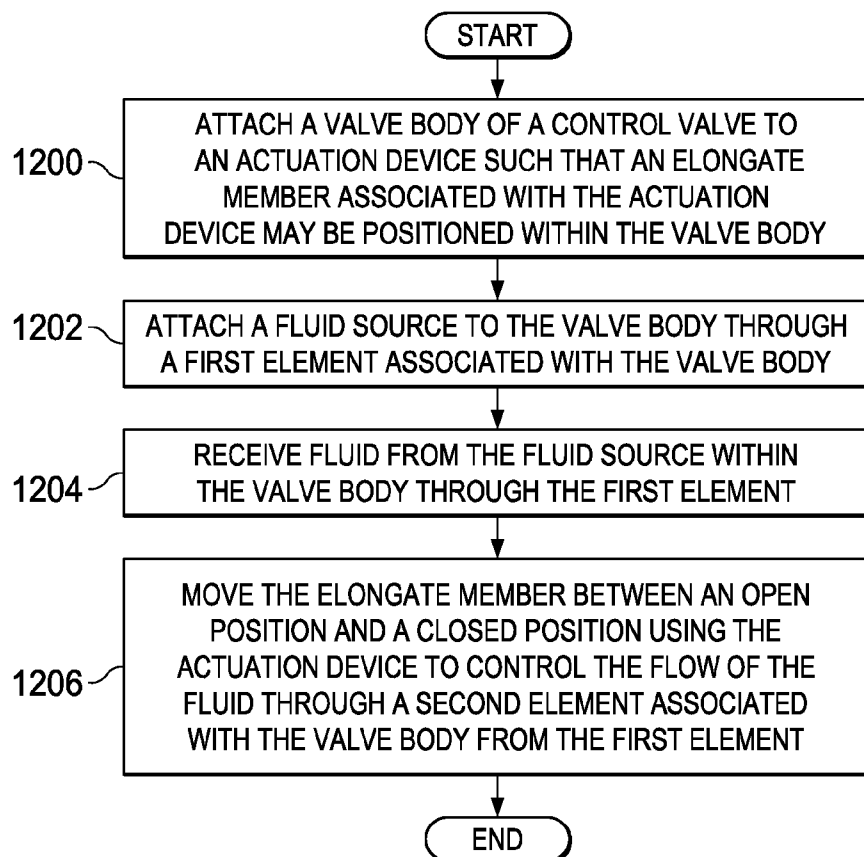


FIG. 12

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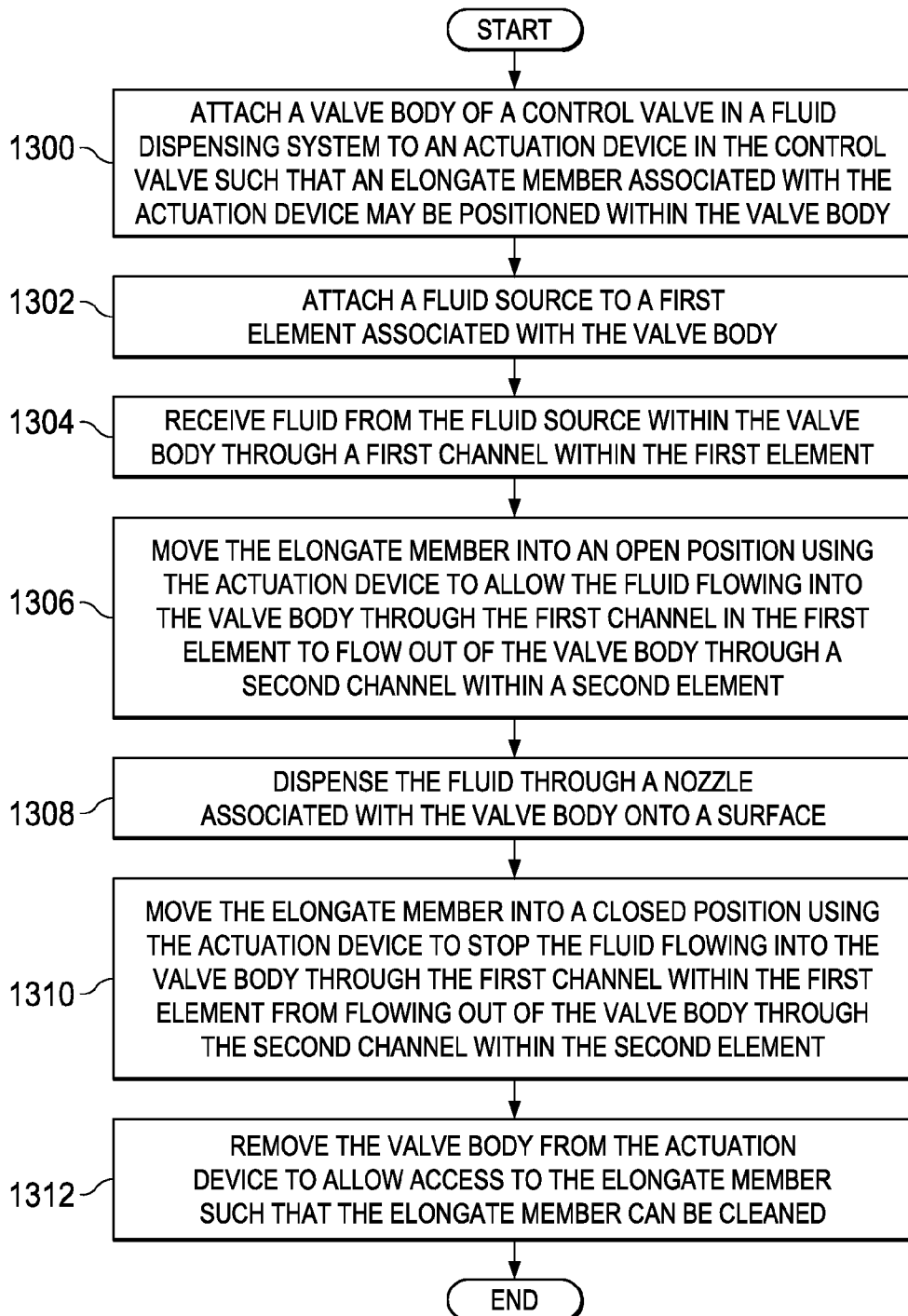
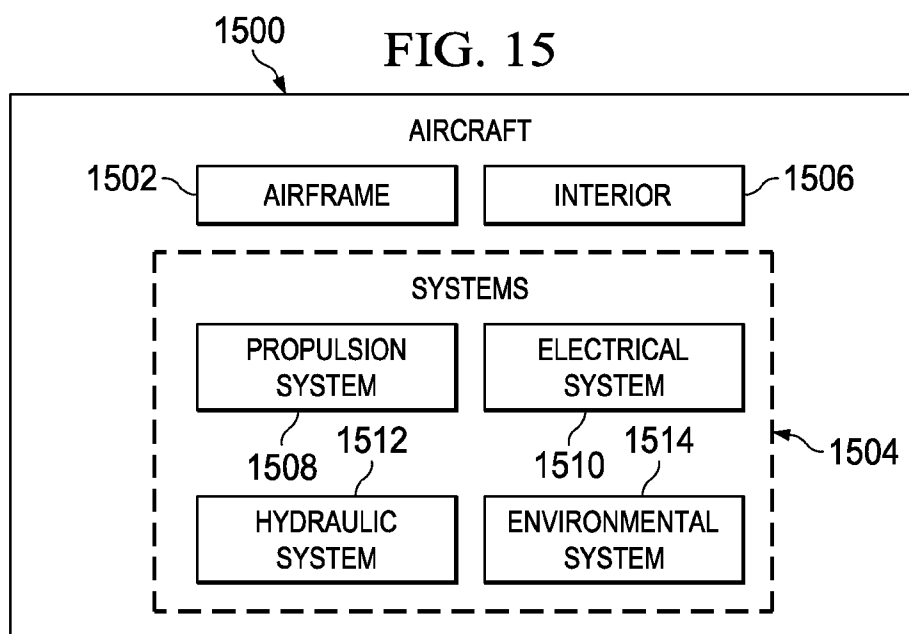
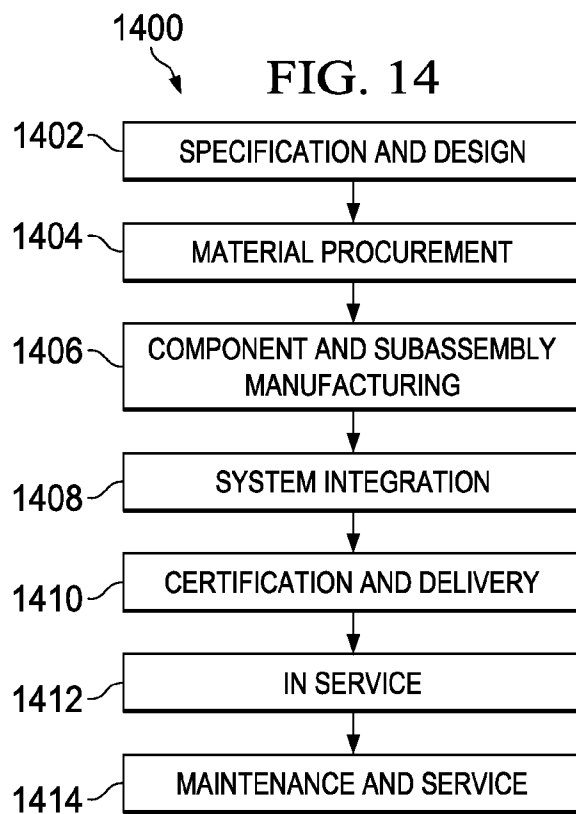


FIG. 13

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/033738

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05B1/30 B05C5/02 F16K23/00 F16K31/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B05B B05C F16K

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	DE 20 2005 005619 U1 (LANGER PETER [DE]) 2 February 2006 (2006-02-02) paragraph [0010] -----	1-25
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X	DE 10 2008 010169 A1 (HERPA MINIATURMODELLE GMBH [DE]) 3 September 2009 (2009-09-03) the whole document ----- -/-	1-25



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

28 May 2014

Date of mailing of the international search report

04/06/2014

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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