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# (54) VAPORIZER COOLING UNIT

(57) A vaporizer cooling unit including a housing defining an air flow path. The air flow path having an inlet configured to receive air and vaporized compounds, and an outlet configured to deliver the air and vaporized compounds to a user. The air flow path is configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet. An adjuster may be coupled to the housing to adjust an air flow rate through the outlet. The housing may have interior and exterior walls spaced form each other such that air entering the inlet contacts the interior wall. The air flow path may include first and second sections on different planes within the housing. The cooling unit may include a mouthpiece with a hands free engagement structure for hands free holding of the unit.

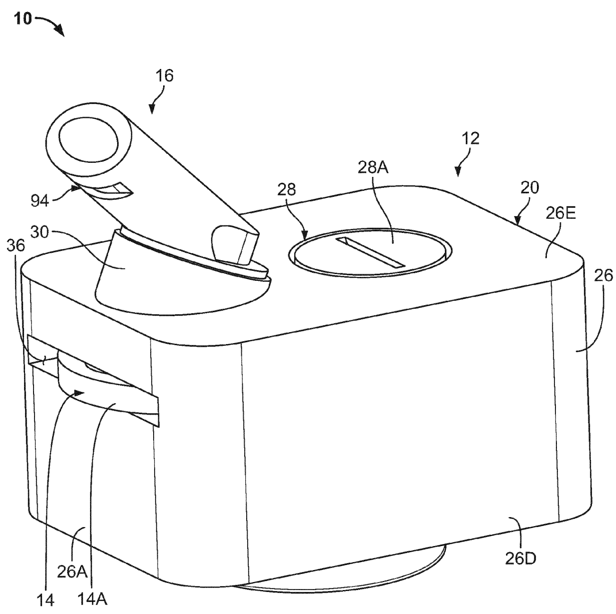


FIG. 1

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## Description

## BACKGROUND OF THE INVENTION

**[0001]** There are a variety of different types of vaporizers that are designed to heat a substance until portions of the substance vaporize for inhalation by a user. Some types of commercially available vaporizers are designed to heat the substance via convection, conduction, and/or radiation. The vaporized substance and air may be heated to a temperature that is uncomfortable for a user to inhale. Therefore, many vaporizers include a cooling pathway that allows the temperature to lower before the vaporized substance and air exit the device. These types of vaporizers, however, may be fairly large due to the space needed to effectively cool the air before it exits the device and enters a user's mouth. Some vaporizers also mix the vaporized substance and heated air with ambient air to lower the temperature to a comfortable level. Mixing the vaporized substance with ambient air, however, leads to inconsistent results each time the device is used, and reduces the aerosol density. Further, typical vaporizers are not able to be held by a user in a hands-free manner during use.

## BRIEF SUMMARY OF THE INVENTION

**[0002]** In one aspect, a cooling unit for a vaporizer includes a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user. The air flow path is configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet. An adjuster is coupled to the housing and positioned in the air flow path. The adjuster is operable to alter a cross-sectional area of the air flow path at a location between the inlet and the outlet. The alteration of the cross-sectional area adjusts an air flow rate through the outlet for a constant negative gauge pressure at the outlet. The adjuster allows a user to vary the amount of air volume inhaled by the user during a set amount of time at a constant draw pressure. For example, if the adjuster is operated to enlarge the cross-sectional area of the air flow path, a greater air volume will flow through the outlet during a set amount of time at a constant draw pressure, and if the adjuster reduces the cross-sectional area, less air volume will flow through the outlet.

**[0003]** In some embodiments, the housing may define a first opening forming part of the air flow path between the inlet and the outlet. The adjuster defines an aperture, and the adjuster is movable with respect to the housing to selectively alter the cross-sectional area of the air flow path by varying an area of the first opening that is in fluid communication with the aperture. The adjuster may be rotatable with respect to the housing between a first position, in which a first area of the first opening is in fluid communication with the aperture, and a second position, in which a second area of the first opening is in fluid communication with the aperture. The second area may be greater than the first area. The first area may be zero such that the air flow rate through the outlet is close to zero when the adjuster is in the first position, and the second area may be the entire area of the first opening such that the adjuster does not restrict air flow through the first opening when in the second position.

**[0004]** In some embodiments, a first stop of the housing may engage the adjuster when the adjuster is in the first position, and a second stop of the housing engages the adjuster when the adjuster is in the second position. The adjuster may be rotatable from the first stop to the second stop.

**[0005]** In some embodiments, a portion of the adjuster may be accessible through a second opening in an exterior wall of the housing. The adjuster includes a first seal in sealing engagement with a first surface of the housing, and a second seal in sealing engagement with a second surface of the housing. The first and second seals seal the air flow path from the second opening. The first seal may be formed by a first surface of the adjuster, and the second seal may be formed by a second surface of the adjuster. The adjuster may be positioned in a slot of the housing with an interference fit that causes the first and second surfaces of the adjuster to be pressed into sealing engagement with the first and second surfaces, respectively, of the housing. For example, the adjuster may be formed similar to a disc spring that is compressed when inserted into the slot of the housing and exerts a force on the first and second surfaces of the housing to sealingly engage the housing. Further, the first and second seals may be O-ring seals or individual silicon seals mounted on a base of the adjuster. The adjuster may be formed from a base overmolded with or coupled to a resilient material with at least one of the first and second seals formed by the resilient material.

**[0006]** In some embodiments, the adjuster may be positioned within a slot of the housing, wherein a first alignment structure of the adjuster mates with a second alignment structure of the housing when the adjuster is positioned in the slot.

**[0007]** In some embodiments, a first screen may be positioned in the housing adjacent the inlet, and a second screen may be positioned in the housing between the inlet and the outlet. The first and second screens extend across the air flow path to filter particles carried by air entering the inlet. The second screen may be configured to filter particles of a smaller size than the first screen.

**[0008]** In some embodiments, the housing may include a top section defining the outlet and a bottom section defining the inlet. A portion of the bottom section is removably received within a cavity of the top section. A fastener may removably couple the top section to the bottom section.

**[0009]** In some embodiments, the housing may include an exterior wall and an interior wall spaced apart from the exterior wall to define a gap between the exterior wall and the interior wall. The gap contains at least one of air or a thermally insulative material. The air flow path is configured so that air entering the housing through the inlet contacts the interior wall before contacting the exterior wall along the air flow path or exiting through the outlet.

**[0010]** In some embodiments, the housing may include a first end adjacent the inlet and a second end adjacent the outlet. The air flow path includes a first section that is positioned adjacent the first end, a second section that is spaced from the first section toward the second end, and a transition section that connects the first and second sections. The first section extends from the inlet to the transition section, and the second section extends from the transition section to the outlet. The adjuster may be positioned in the second section of the air flow path.

**[0011]** In some embodiments, a mouthpiece may be coupled to the housing. The mouthpiece defines a channel in fluid communication with the outlet. The mouthpiece includes a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0012]** In another aspect, a cooling unit for a vaporizer includes a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user. The air flow path is configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet. The housing includes an exterior wall and an interior wall spaced apart from the exterior wall to define a gap between the exterior wall and the interior wall. The gap contains at least one of air or a thermally insulative material. The air flow path is configured so that air entering the housing through the inlet contacts the interior wall before contacting the exterior wall along the air flow path or exiting through the outlet.

**[0013]** In some embodiments, the air flow path may be configured so that air enters the inlet in a first direction and is redirected to flow in a second direction before contacting the interior wall.

**[0014]** In some embodiments, the housing may include a first end adjacent the inlet and a second end adjacent the outlet. The air flow path includes a first section that is positioned adjacent the first end, a second section that is spaced from the first section toward the second end, and a transition section that connects the first and second sections. The first section extends from the inlet to the transition section, and the second section extends from the transition section to the outlet.

**[0015]** In some embodiments, a first screen may bepositioned in the housing adjacent the inlet, and a second screen may be positioned in the housing between the inlet and the outlet. The first and second screens extend across the air flow path to filter particles carried by air entering the inlet.

**[0016]** In some embodiments, the housing may include a top section defining the outlet and a bottom section defining the inlet. A portion of the bottom section is removably received within a cavity of the top section.

**[0017]** In some embodiments, a mouthpiece may be coupled to the housing. The mouthpiece defines a channel in fluid communication with the outlet. The mouthpiece includes a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0018]** In still another aspect, a cooling unit for a vaporizer includes a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user. The air flow path is configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet. The housing includes a first end adjacent the inlet and a second end adjacent the outlet. The air flow path includes a first section that is positioned adjacent the first end, a second section spaced from the first section toward the second end, and a transition section that connects the first and second sections. The first section extends from the inlet to the transition section. The second section extends from the transition section to the outlet.

**[0019]** In some embodiments, the first section of the air flow path may extend from the inlet toward a first side of the housing, from the first side toward a second side of the housing, and from the second side to the transition section.

**[0020]** In some embodiments, the housing may include a divider that divides the first and second sections of the air flow path. The divider extends from the first side to the second side of the housing, and the divider is positioned between the first and second ends of the housing. The divider presents an opening through which the transition section extends.

**[0021]** In some embodiments, a first screen may be positioned in the housing adjacent the inlet, and a second screen may be positioned in the housing between the inlet and the outlet. The first and second screens extend across the air flow path to filter particles carried by air entering the inlet. The second screen may be positioned between the first section of the air flow path and the transition section.

**[0022]** In some embodiments, the housing may include a top section defining the outlet and a bottom section defining the inlet. A portion of the bottom section is removably received within a cavity of the top section. The first and second sections of the air flow path may be each positioned between the top and bottom sections of the housing.

**[0023]** In some embodiments, a mouthpiece may be coupled to the housing. The mouthpiece defines a channel in fluid communication with the outlet. The mouthpiece includes a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0024]** In still another aspect, a cooling unit for a vaporizer includes a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user. The air flow path is configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet. A mouthpiece is coupled to the housing. The mouthpiece defines a channel in fluid communication with the outlet. The mouthpiece includes a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0025]** In some embodiments, the hands free engagement structure may include a tooth receiver configured to receive the at least one tooth of the user. The tooth receiver may be configured for receiving a bottom tooth of the user. The tooth receiver may be a notch defined by an outer surface of the mouthpiece.

**[0026]** Additional aspects of the invention, together with the advantages and novel features appurtenant thereto, will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following, or may be learned from the practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0027]**

Fig. 1 is a perspective view of a cooling unit for a vaporizer in accordance with one exemplary embodiment described herein;
Fig. 2 is another perspective view of the cooling unit;
Fig. 3 is a top view of the cooling unit;
Fig. 4 is a side elevational view of the cooling unit;
Fig. 5 is a perspective view of a top section of the cooling unit;
Fig. 6 is a bottom perspective view of the top section;
Fig. 7 is a perspective view of a bottom section of the cooling unit;
Fig. 8 is another perspective view of the bottom section of the cooling unit;
Fig. 9 is another view of the bottom section;
Fig. 10 is a section taken through the line 10-10 in Fig. 3;
Fig. 11 is a section taken through the line 11-11 in Fig. 3;
Fig. 12 is a section taken through the line 12-12 in Fig. 3;
Fig. 13 is a section taken through the line 13-13 in Fig. 3;
Fig. 14 is a section taken through the line 14-14 in Fig. 3;
Fig. 15A is a section taken through the line 15-15 in Fig. 4, showing an adjuster in a first, closed position;
Fig. 15B is a section similar to Fig. 15A, showing the adjuster in an intermediate, partially open position;
Fig. 15C is a section similar to Figs. 15A and 15B, showing the adjuster in a second, fully open position;
Fig. 16 is a partial sectional view showing an alternative embodiment of adjuster for use with the cooling unit described herein;
Figs. 17A-B are cross-sectional views of an alternative embodiment of cooling unit having a sliding adjuster;
Fig. 18 is a cross-sectional view of an alternative embodiment of cooling unit having a replaceable adjuster;
Fig. 19 is a cross-sectional view of an alternative embodiment of cooling unit having a slidably replaceable adjuster;
Fig. 20 is a perspective view of an alternative embodiment of cooling unit having replaceable adjusters mounted within a lower part of a housing;
Fig. 21 is a cross-sectional view of an alternative embodiment of cooling unit having a magnetically moveable adjuster;
Fig. 22 is a cross-sectional view of an alternative embodiment of cooling unit having another type of magnetically moveable adjuster;
Fig. 23 is a cross-sectional view of an alternative embodiment of cooling unit having a rotatable adjuster;
Figs. 24A-B are cross-sectional views of an alternative embodiment of cooling unit having a rotatable mouthpiece adjuster;
Fig. 25 is a cross-sectional view of an alternative embodiment of cooling unit having a trumpet or piston valve adjuster;
Fig. 26 is a cross-sectional view of an alternative embodiment of cooling unit having a threaded adjuster that can compress a section of a tube forming an air flow channel through the device;
Fig. 27 is a cross-sectional view of an alternative embodiment of cooling unit having a ball valve adjuster;
Fig. 28 is a cross-sectional view of an alternative embodiment of cooling unit having a ball valve adjuster that is biased closed with a spring;
Fig. 29 is a cross-sectional view of an alternative embodiment of cooling unit having a ball valve adjuster that is biased closed with a spring the preload of which can be adjusted;
Fig. 30 is a cross-sectional view of an alternative embodiment of cooling unit having a flexible tab adjuster;
Figs. 31A-B are cross-sectional views of an alternative embodiment of cooling unit having a moveable adjuster that can engage a seat of the housing to substantially block the flow of air through the device;
Figs. 32A-B are cross-sectional views of an alternative embodiment of cooling unit having a rotatable

adjuster with an air flow path therethrough that can be adjusted with respect to the air flow channel through the housing; and

Fig. 33 is a cross-sectional view of an alternative embodiment of cooling unit having a rotatable adjuster that can be adjusted with respect to the air flow channel through the housing to permit air to flow between the adjuster and side walls of the channel or substantially block air from flowing through the channel.

## DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENT

**[0028]** A cooling unit 10 for a vaporizer in accordance with an embodiment of the invention described herein is identified generally as 10 in Figs. 1-4 and 10. In the illustrated embodiment, the cooling unit 10 includes a bayonet connector 11 (Fig. 2) configured to engage a corresponding bayonet receiver of a vaporizer (not shown). While a bayonet connector 11 is shown, the cooling unit 10 may be configured for mounting to a vaporizer in another manner. For example, the cooling unit 10 may engage a vaporizer via a threaded connection or a magnetic connection. A heater of the vaporizer heats a substance so that compounds of the substance are vaporized for inhalation by a user. The cooling unit 10 is configured to receive heated air and vaporized compounds from the heater and cool the air and vaporized compounds to an ambient, or close to ambient, temperature prior to inhalation by a user. The cooling unit 10 may be used with any type of vaporizer, including a handheld vaporizer or a desktop vaporizer.

**[0029]** Referring to Figs. 1, 2, and 4, the cooling unit 10 includes a housing 12, an adjuster 14, and a mouthpiece 16. As will be described in greater detail herein, the housing 12 defines an air flow path indicated by reference number 18 (Fig. 10) and flow path arrows. When a user draws air through the mouthpiece 16, air and vaporized compounds flow along the air flow path 18 through the housing 12 and the mouthpiece 16. The user can rotate (broadly, actuate) the adjuster 14 to adjust a cross-sectional area of the air flow path 18 at the adjuster 14, which in turn increases or decreases an air flow rate at which the air and vaporized compounds move through the air flow path 18 for a constant negative gauge pressure at the mouthpiece 16.

**[0030]** Referring to Fig. 2, the housing 12 includes a top section 20 and a bottom section 22 receivable within a cavity 26F (Fig. 6) of the top section 20. Figs. 1, 2, 4, and 10-13 illustrate the bottom section 22 received in the top section 20. When received in the top section 20, the bottom section 22 forms a bottom wall 24 of the housing 12 at a first end of the housing 12. The top section 20 comprises a wall 26 extending upward from the bottom wall 24. Referring to Figs. 1 and 2, the wall 26 includes a front portion 26A, a rear portion 26B opposite the front portion 26A, a first side portion 26C extending between the front and rear portions 26A-B, and a second side portion 26D opposite the first side portion 26C and extending between the front and rear portions 26A-B. A top wall 26E of the top section 20 is generally parallel to the bottom wall 24 and extends between top edges of the front portion, rear portion, first side portion, and second side portion 26A-D. Together, interior sides of the top wall 26E and side portions together define a cavity 26F (Fig. 6) configured to receive the bottom section 22.

**[0031]** Referring to Figs. 1 and 5, the top wall 26E defines a fastener receiver 28 or opening configured to receive a fastener 28A (broadly, connector) for securely mounting the bottom section 22 to the top section 20. The fastener 28A can be rotated by a user in a first direction to remove the bottom section 22 from the top section 20. For example, the bottom section 22 may be removed for cleaning the interior of the device. When the bottom section 22 is inserted in the top section 20, the fastener 28A can be rotated in a second direction to securely mount the bottom section 22 to the top section 20. Referring to Fig. 10, the fastener 28A includes a gasket (broadly, seal) 28B arranged below the head of the fastener to inhibit air from inadvertently entering or exiting the air flow path 18 through the opening 28. As shown in Fig. 10, the fastener 28A is a bayonet type fastener that interlocks with mating structure 29 on the bottom section 22. The fastener 28A may be rotated 90 degrees in one direction to lock it to the bottom section 22 and 90 degrees in the opposite direction to release it from the bottom section 22. The mating structures on the fastener 28A and bottom section 22 may be inclined so that as the fastener 28A is rotated to lock the top section 20 to the bottom section 22, the bottom section 22 is pulled slightly upward into the cavity 26F. A recess defined between lower and upper surfaces 24A, 24B (Fig. 14) of the bottom wall 24 receives a gasket 58 (broadly, seal). The gasket 58 forms an air tight seal against the interior side of the exterior wall of the top section 20 when the bottom section 22 is joined to the top section 20. Referring back to Figs. 1 and 5, a collar 30 extending upward from the top wall 26E surrounds an opening 31 configured to receive a portion of the mouthpiece 16. The top and bottom sections 20, 22 can be made for example from a thermally resistant hard plastic (e.g., polyether ether ketone ("PEEK")) mixed with a glass fiber; however, other suitable materials may be used.

**[0032]** The housing 12 defines a first opening 32 (Fig. 6) configured to correspond with an aperture 34 defined by the adjuster 14 (Figs. 15A-15C), as will be described in greater detail herein. Referring to Figs. 1 and 10, a slot 36 (broadly, a second opening) defined by the front portion 26A of the top section 20 receives the adjuster 14 and is configured so that a finger engagement surface 14A (broadly, a portion) of the adjuster 14 protrudes out of the slot 36. The finger engagement surface 14A allows the user to rotate the adjuster 14 to alter a cross-sectional area of the air flow path 18, as described in more detail below. The slot 36 is defined by the top wall 26E and an intermediate wall 37, shown in Fig. 6, that extends from the front portion 26A toward the rear portion 26B. The first opening 32 is formed in the intermediate wall beneath the adjuster 14, and the first opening 32 forms a portion of the air flow path 18 through the housing 12. Rotation of the adjuster 14 alters the cross-sectional area of the air flow path 18 by blocking or exposing more or less of the first opening 32 depending on which way the adjuster 14 is rotated.

**[0033]** Referring to Figs. 10 and 11, the top section 20 of the housing includes an interior wall 38 that extends from the top wall 26E toward the bottom wall 24. The interior wall 38 extends between the first and second side portions 26C-D. The interior wall 38 is spaced from the interior side of the rear portion 26B to define a gap 40 between the interior side of the rear portion 26B and the interior wall 38. In the illustrated embodiment, the gap 40 contains air; however, it may contain a thermally insulative material.

**[0034]** Referring to Fig. 10, the top section 20 and the bottom section 22 define the air flow path 18 which starts at an inlet 42 and ends at an outlet 44. A first screen 46A and a second screen 46B (broadly, filters) filter particulate matter as the air and vaporized compound flow through the air flow path 18. As described below and shown in the drawings, the air flow path 18 follows a series of turns from the inlet 42 to the outlet 44, which ensures that the air remains within the housing 12 for a period of time sufficient to lower its temperature to a level that is comfortable for inhalation by the time it reaches the outlet 44. Contact with the interior wall 38 once the air enters the air flow path 18 through the inlet 42 further assists in cooling the air to an ambient, or close to ambient, temperature prior to inhalation, as will be described in greater detail herein. More or fewer screens and more or fewer turns can be incorporated without departing from the scope of this disclosure.

**[0035]** Referring to Figs. 10-14, the air flow path 18 includes the inlet 42 (Fig. 10), a first turn 48A (Fig. 10), a first exit 48B (Figs. 8 and 10), a first section 48C (Figs. 8 and 9), an entrance 48D (Fig. 9), a transition section 48E (Fig. 7), a second exit 48F (Fig. 7), a second section 48G (Figs. 7 and 8), and the outlet 44 (Fig. 10).

**[0036]** Starting at the inlet 42 (Fig. 10), air and vaporized compounds enter the housing 12 from the heater of a vaporizer, as described above. The air moves generally upward from the inlet 42 and passes through the first screen 46A (broadly, first filter) into a chamber formed by a dividing wall 49 extending upward from the bottom wall 24. The dividing wall 49 forces the air to turn 90 degrees at the first turn 48A toward the interior wall 38 and a first side of the housing 12, also referred to herein as the side opposite the mouthpiece 16. As the air and vaporized compounds flow to the side of the housing 12 opposite the mouthpiece 16, they flow through the first exit 48B before contacting the interior wall 38 of the top section 20. As best shown in Fig. 12, after contacting the interior wall 38, the air turns 90 degrees to flow outward toward either the first side portion 26C or the second side portion 26D and into the first section 48C of the air flow path 18. The first exit 48B is generally semi-circular in shape; however, other opening sizes or shapes may be used.

**[0037]** Referring to Fig. 8, the bottom section 22 of the housing 12 includes a divider 52 that is spaced above the bottom wall 24. The bottom wall 24 has an upper surface 24A and a lower surface 24B. The divider 52 has an upper surface 52A and a lower surface 52B. Referring to Fig. 14, the bottom section 22 further a central section 53 extending between the bottom wall 24 and the divider 52. The central section 53 has a smaller footprint than both the bottom wall 24 and the divider 52 such that, as shown in Fig. 12, there are gaps 54A-B between the central section 53 and the first and second side portions 26C-D, respectively, of the top section 20. Gaps 54C-D are also positioned between the central section 53 and the front and rear portions 26A-B, respectively, as best shown in FIG. 10. The first section 48C of the air flow path 18 is positioned in the gaps 54A-D between the central section 53, the wall 26 of the top section 20, the lower surface 52B of the divider 52, and the upper surface 24A of the bottom wall 24. The first section 48C of the air flow path 18 is generally positioned in a "first plane" of the housing 12, defined as the space between the lower surface 52B of the divider 52 and the upper surface 24A of the bottom wall 24. The first exit 48B is formed in the central section 53 adjacent the gap 54D, as shown in Fig. 10, so that air exiting the first exit 48B enters the first section 48C in the gap 54D.

**[0038]** As described above, air exiting the first exit 48B makes a 90 degree turn toward either the first side portion 26C or the second side portion 26D, as best shown in Fig. 12. The air then makes another 90 degree turn to flow either through the gap 54A or the gap 54B. The air flows through these gaps 54A and 54B of the first section 48C from the first end of the housing 12 at the interior wall 38 toward the second end of the housing 12 near the mouthpiece 16, as shown in Fig. 11. The air then encounters the front portion 26A and is forced to turn 90 degrees laterally inward into the gap 54C. As shown in Fig. 10, air in the gap 54C then turns 90 degrees to flow through the entrance 48D in a direction extending from the front portion 26A toward the rear portion 26B. The entrance 48D is formed in the central section 53 adjacent the gap 54C. Referring to Fig. 13, the entrance 48D is generally semi-circular in shape; however, other opening sizes or shapes may be used.

**[0039]** The air and vaporized compounds enter the transition section 48E of the air flow path 18 after passing through the entrance 48D. As shown in Fig. 7, the transition section 48E is formed within a central recess of the bottom section 22 extending from the divider 52 down to the bottom wall 24. The transition section 48E extends across the bottom section 22 from the entrance 48D to a wall 56 extending upward from the dividing wall 49. The wall 56 extends upward, as shown in Fig. 10, to engage the intermediate wall 37 and the top wall 26E of the top section 20. An upper surface of the wall 56 defines an opening 57 (Fig. 7) into which the fastener 28A is inserted to join the top section 20 to the bottom section 22. The seal 28B of the fastener 28A engages the upper surface of the wall 56. As shown in Fig. 14, the transition section 48E extends laterally between side walls 53A and 53B of the central section 53. As shown in Fig. 10, the transition section 48E extends vertically between the intermediate wall 37 of the top section 20 and the bottom wall 24 and dividing wall 49 of the bottom section 22. The transition section 48E allows air entering the entrance 48D to flow vertically upward from the first section 48C of the air flow path 18 to the second section 48G of the air flow path, as best shown in Fig. 7.

**[0040]** When the air and vaporized compounds enter the transition section 48E, they pass through the second screen 46B (broadly, second filter). The second screen 46B filters additional particulate matter that pass through the first screen 46A. As shown in Fig. 7, edges of the second screen 46B are received within grooves of the housing 12 to retain the second screen 46B in place. The openings of the second screen 46B may be a different size than the openings in the first screen 46A. For example, the openings of the second screen 46B may be smaller than the openings in the first screen 46A to filter smaller particulate matter within the air flow path. In one embodiment, the openings of the second screen 46B may be about half the size of the openings of the first screen 46A. The first and second screens 46A-B are spaced apart a sufficient distance along the air flow path to prevent particulate matter from accumulating on the second screen 46B in a manner that would prevent air from flowing therethrough. For example, particulate matter may accumulate on the walls of the housing 12 between the first and second screens 46A-B as it passes through the air flow path 18 to effectively filter such particulate matter before the air and vaporized compounds exit the housing 12. Spacing the first and second screens 46A-B apart along the air flow path allows additional particulate matter to accumulate on the walls of the housing 12 within the first section 48C of the air flow path. Screens with different (e.g., larger or smaller) openings may be used without departing from the scope of this disclosure. For example, in some embodiments, the second screen 46B may have openings that are the same size or larger than the openings of the first screen 46A.

**[0041]** Referring to Figs. 7 and 11, air and vaporized compound exits the transition section 48E out of second exits 48F, (broadly, a second exit), and into the second section 48G. Each of the second exits 48F is an opening between a post 59 and baffle 66 of the bottom section 22 and the top wall 26E of the top section 20. The post 59 extends upward from the divider 52 to the top wall 26E. A forward edge of the post 59 engages a surface 60 (best shown in Fig. 6) that extends between the intermediate wall 37 and top wall 26E of the top section 20. The baffle 66 extends laterally outward from the wall 56 and abuts the second side portion 26D of the top section 20, and another baffle abuts the first side portion 26C. The baffle 66 extends between the divider 52 and top wall 26E. Air traveling upward within the transition section 48E turns 180 degrees around the post 59 to enter the second section 48G and begin traveling back toward the second side of the housing 12 adjacent the mouthpiece 16.

**[0042]** Like the first section 48C, the second section 48G formed from gaps 61A-C between the top section 20 and bottom section 22 of the housing 12. As shown in Fig. 13, the gaps 61A-B are positioned between the intermediate wall 37 and divider 52. The gaps 61A-B are further positioned between the first and second side portions 26C-D, respectively, and a ridge 62 that extends upward from the divider 52 to engage the intermediate wall 37. The structure of the ridge 62 is best shown in Fig. 7. The gap 61C, shown in Fig. 11, is positioned between the intermediate wall 37 and divider 52 and between the front portion 26A and ridge 62. Air flows through the gaps 61A-B from the second exit 48F to the front portion 26A, and then turns 90 degrees to enter the gap 61C. The second section 48G of the air flow path 18 is generally positioned in a "second plane" of the housing 12, defined as the space between the upper surface 52A of the divider 52 and the lower surface of the intermediate wall 37. The divider 52 divides the first and second sections 48C and 48G of the air flow path 18. The divider 52 extends from the first side of the housing 12 adjacent the interior wall 38 to the second side of the housing 12 adjacent the mouthpiece 16, and the divider 52 is positioned between the first end of the housing 12 adjacent the inlet 42 and the second end of the housing 12 adjacent the outlet 44. The divider 52 presents an opening at the second exit 48F through which the transition section 48E extends.

**[0043]** As shown in Fig. 13, from the gap 61C, the air and vaporized compounds move upward through the first opening 32 of the housing 12. In Fig. 13, the aperture 34 of the adjuster 14 (see Fig. 15A) is not aligned with the first opening 32 (i.e., the adjuster 14 is blocking air from flowing through the outlet 44). However, as described below, when the adjuster 14 is rotated to align at least a portion of the aperture 34 with the first opening 32 (e.g., the positions shown in Figs. 15B and 15C), air and vaporized compounds can flow through the adjuster 14 and outlet 44 to enter the mouthpiece 16.

**[0044]** Referring to Fig. 10, the adjuster 14 includes an opening 70 configured to mate with a post 72 of the bottom section 22 of the housing 12 when the adjuster 14 is positioned in the slot 36. The post 72 defines a pivot axis about which the adjuster 14 is rotatable. The post 72 extends upward from the ridge 62, as shown in Fig. 7.

**[0045]** Referring to Figs. 15A-15C, the slot 36 includes linear sides 74A, 74C and a rounded rear side 74B. A first stop 76A is formed where the linear side 74C meets the rounded rear side 74B. A second stop 76B is formed when the linear side 74A meets the rounded rear side 74B.

**[0046]** The adjuster 14 is rotatable with respect to the housing 12 between a first position (Fig. 15A), a second position (Fig. 15C), and any position between the first and second positions (e.g., the intermediate position shown in Fig. 15B). The adjuster 14 has a generally circular cross section except for a protrusion 78 (broadly, stop engagement structure) extending outward from a rear side of the adjuster 14. The protrusion 78 is configured to move between the first and second positions along with rounded side 74B. In the illustrated embodiment, the adjuster 14 is rotatable about the post 72 within a range of about 170° between the first and second positions. As shown in Fig. 10, the protrusion 78 (broadly, first alignment structure) extends outward from an upper portion of the adjuster 14 and is received within a notch 79 (broadly, second alignment structure) at the rear of the slot 36. When assembled, the notch 79 ensures that the adjuster 14 is positioned in the slot 36 in the correct orientation.

**[0047]** Referring to Fig. 15A, when the adjuster 14 is in the first, closed position, the protrusion 78 abuts the first stop 76A and the aperture 34 is fully out of registration with the first opening 32 such that no air passes through the aperture 34 and into the mouthpiece 16. In other words, the area of the first opening 32 that is in fluid communication with the aperture 34 is zero. A marking 80A (broadly, indicia) faces the user to indicate to the user the adjuster 14 is in the first position. In the illustrated embodiment, the marking 80A to indicate the first position is a single notch.

**[0048]** Referring to Fig. 15C, when the adjuster 14 is in the second, fully open position, the protrusion 78 abuts the second stop 76B and the aperture 34 is fully aligned with the first opening 32 such that a maximum flow rate of air passes from the first opening 32 through the aperture 34. In other words, in the second position, the entire area of the first opening 32 is in fluid communication with the aperture 34. Three notches 80C on the adjuster 14 indicate to the user that the adjuster 14 is in the second position.

**[0049]** Referring to Fig. 15B, in the intermediate position, a portion of the area of the first opening 32 is in fluid communication with the aperture 34. Fig. 15B shows approximately one half of the area of the first opening 32 aligned with the aperture 34. When the adjuster 14 is in the intermediate position, the protrusion 78 is located in an intermediate position between the first stop 76A and the second stop 76B. Two notches 80B on the adjuster 14 indicate to the user that the adjuster 14 is in the intermediate position. In the illustrated embodiment, the user can adjust the adjuster 14 to various intermediate positions to increase or decrease the air flow rate for a constant negative gauge pressure at the outlet 44 (Fig. 10). Other markings (e.g. number, color, etc.) can also be used to indicate the adjuster's position.

**[0050]** Referring to Fig. 10, the adjuster 14 is generally disc-shaped and defines a groove in a first surface 82A of the adjuster 14 that receives an o-ring seal 84 (broadly, resilient material). The seal 84 protrudes slightly above the first surface 82A to sealingly engage a surface 82B of the housing 12. A second surface 82C of the adjuster may further sealingly engage a second surface 82D of the housing 12. Although not shown, the second surface 82C of the adjuster may include a notch with an o-ring seal like the first surface 82A. The second surface 82C of the adjuster may further be formed from a resilient material that seals against the second surface 82D of the housing. The sealing engagement of the adjuster 14 against the surfaces 82B and 82D of the housing seal the air flow path inside the housing 12 from ambient air. Seals on the adjuster may also be individual, customized silicon seals.

**[0051]** Referring to Fig. 16, an alternative embodiment of adjuster 114 is shown. Adjuster 114 is similar to the adjuster 14 of Fig. 10, except with respect to the manner in which the adjuster 114 seals against the housing. Unlike the adjuster 14, the adjuster 114 does not include an o-ring seal. Instead, the adjuster 114 is formed to be a slightly curved (broadly, non-planar), resiliently deformable disc (e.g., a disc spring). For example, the adjuster 114 can be slightly bowl-shaped with an outer periphery of the adjuster curving upward from a central portion of the adjuster 114. The adjuster 114 is curved to an extent that it has a height which is slightly larger than the height of the slot 36 in the housing. In this manner, when the adjuster 114 is inserted in the slot 36, an interference fit is formed that deforms the adjuster 114 and presses its upper and lower surfaces into sealing engagement with the housing. For example, the upper surface of the outer periphery 114A of the adjuster 114 presses against the upper surface 82B of the housing 12 within the slot 36, and the lower surface of the central portion 114B of the adjuster 114 presses downward against a lower surface 82D of the housing 12 within the slot 36. The sealing engagement of the adjuster 114 against the surfaces 82B and 82D of the housing seal the air flow path inside the housing 12 from ambient air.

**[0052]** The adjuster 114 may be formed from a base overmolded with or coupled to a resilient material. The base may be a relatively hard plastic material (e.g., PEEK). The resilient material overmolded on or coupled to the base may be, for example, thermoplastic polyurethane ("TPU") or polyphenylsulfone ("PPSU"). The resilient material on the top surface of the adjuster engages the surface 82B of the housing, and the resilient material on the bottom surface of the adjuster engages the surface 82D of the housing to seal the air flow path. The top or bottom surface of the adjuster may be overmolded with or coupled to a resilient material, with the other surface of the adjuster including a seal coupled to it in a similar manner as shown in Fig. 10. The adjuster 14 described above may be formed in a similar manner omitting the seal 84 shown in Fig. 10.

**[0053]** Referring back to Fig. 10, the mouthpiece 16 comprises a body 86 which defines a channel 86A in communication with the outlet 44 of the air flow path 18. The configuration is such that when the adjuster 14 is in the open or intermediate position, air and vaporized compounds flow through the first opening 32 of the housing, aperture 34 of the adjuster 14, and the channel 86A of the mouthpiece 16. In the illustrated embodiment, the body 86 includes a neck 88A (broadly, first section) and a stem 88B (broadly, second section) extending from the neck 88A. The neck 88A is configured to be received in the collar 30. A seal 92 is located around the neck and configured to inhibit air and vaporized compounds from exiting the outlet 44 at locations other than through the channel 86A of the mouthpiece 16. Moreover, the mouthpiece 16 is configured to rotate 360 degrees. The user can rotate the mouthpiece 180 degrees from the position shown in Fig. 10 to a stowed position for more compact storage. In the stowed position, the stem 88B generally overlies the fastener 28A.

**[0054]** Still referring to Fig. 10, the mouthpiece 16 comprises a notch 94 (broadly, hands free engagement structure) configured to locate the tooth, or teeth, of a user to assist the user in holding the cooling unit 10 (and a vaporizer attached to the cooling unit) with their teeth in a hands-free manner. In the illustrated embodiment, the notch 94 is defined by a bottom side of the stem 88B so that bottom teeth of the user can be located in the notch 94 and the user's top teeth can engage the top side of the stem 88B. Referring to Fig. 1, the notch 94 comprises a recess sized and shaped to receive a tooth or teeth of the user. The user's lips or mouth may also engage the notch 94 in order to allow the user to hold the cooling unit 10 and vaporizer in a hands free manner. It is not outside the scope of this disclosure for the hands free engagement structure to protrude from the body 86 of the mouthpiece 16, or be at a different location of the body 86 (e.g., the top side). The mouthpiece 16 can be made from any suitable biocompatible material.

**[0055]** In a cycle of use, the user rotates the adjuster 14 to a desired position to adjust the cross-sectional area of the opening 32 of the housing 12 that is in fluid communication with the opening 34 of the adjuster, as described in more detail above. The user places the mouthpiece 16 in their mouth and draws air through the mouthpiece, creating a negative gauge pressure at the outlet 44. For a constant negative gauge pressure at the outlet 44, the adjuster 14 may be rotated to adjust the air flow rate through the outlet 44, as described above. Air and vaporized compounds move through the air flow path 18 in the manner described above. As the air and vaporized compounds move through the air flow path 18, they cool to a suitable temperature before inhalation by the user. The user may optionally place their teeth, lips or a portion of their mouth in the notch 94 of the mouthpiece 16 to hold the vaporizer in a hands-free manner.

**[0056]** In a cycle of cleaning the cooling unit 10, the user may remove the cooling unit 10 from the vaporizer by releasing the bayonet connection (e.g., the cooling unit 10 may be rotated 90 degrees with respect to the vaporizer). The user may then disassemble the cooling unit 10 by first rotating the fastener 28A, and then pulling the bottom section 22 out of the top section 20.

**[0057]** Figs. 17A-33 show alternative embodiments of cooling units for use with a vaporizer. Each of the alternative embodiments includes a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user. The air flow path is configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet. Each of the cooling units further includes an adjuster coupled to the housing and positioned in the air flow path. The adjuster is operable to alter a cross-sectional area of the air flow path at a location between the inlet and the outlet. Alteration of the cross-sectional area adjusts an air flow rate through the outlet for a constant negative gauge pressure at the outlet. The alternative embodiments have different types of adjusters as described in more detail below.

**[0058]** Figs. 17A-B show a cooling unit 200 having an adjuster 202 that is slidable within the slot 204 of the housing 206 to adjust whether and the extent to which an aperture 208 of the adjuster 202 is aligned and in fluid communication with a first opening 210 of the housing 206. Fig. 17A shows the adjuster 202 in a first, closed position, in which the aperture 208 is not in fluid communication with the first opening 210, and Fig. 17B shows the adjuster 202 in a second, open position, in which the aperture 208 is in fluid communication with the first opening 210. The adjuster 202 can be moved to other positions not shown, in which a desired portion of the aperture 208 is aligned with the first opening 210 to vary the air flow rate through the aperture 208. A post 212 of the housing 206 is received within a slot 214 of the adjuster 202 to limit movement of the adjuster 202 within the slot 204. As shown in Fig. 17A, when the adjuster 202 is in the first, closed position, a wall defining the slot 204 abuts the post 212 to prevent further movement of the adjuster 202 in a direction extending away from the housing 206. As shown in Fig. 17B, when the adjuster 202 is in the second, open position, an opposing wall defining the slot 204 abuts the post 212 to prevent further movement of the adjuster 202 in a direction extending toward the housing 206. Other than as described herein, the cooling unit 200 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0059]** Fig. 18 shows an alternative embodiment of cooling unit 300 in which the adjuster comprises a plurality of plates that may be interchanged to alter the air flow rate through the outlet. One plate 302 is shown in Fig. 18 positioned within a slot 304 of the housing 306. The plate 302 includes an aperture 308 that is in fluid communication with the first opening 310 of the housing 306 to allow a maximum air flow rate through the outlet. A post 312 of the housing 306 is received within an opening 314 of the plate 302 to prevent movement of the plate 302 with respect to the housing 306. The plate 302 may be interchanged with other plates having different sized openings or no openings at all in order to vary the cross-sectional area of the air flow path and the air flow rate through the outlet. For example, the top section 316 of the housing 306 may be removed from the bottom section 318 in the manner described above with respect to the cooling unit 10 in order to remove the plate 302 from the housing 306 and replace it with another plate with a different sized aperture or no aperture. Other than as described herein, the cooling unit 300 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0060]** Fig. 19 shows an alternative embodiment of cooling unit 400 with an adjuster that comprises a plurality of plates that may be interchanged to alter the air flow rate through the outlet. One plate 402 is shown in Fig. 19 positioned within a slot 404 of the housing 406. The plate 402 includes an aperture 408 that is in fluid communication with the first opening 410 of the housing 406 to allow a maximum air flow rate through the outlet. The cooling unit 400 is similar to the cooling unit 300 except that the plate 402 is freely slidable within and out of the slot 404 (i.e., the housing 406 does not have a post that prevents movement of the plate 402). The plate 402 may be moved to other positions not shown, in which a desired portion of the aperture 408 is aligned with the first opening 410 to vary the air flow rate through the aperture 408. Further, the plate 402 may be interchanged with other plates having different sized openings or no openings at all in order to vary the cross-sectional area of the air flow path and the air flow rate through the outlet, as described above in connection with cooling unit 300. Other than as described herein, the cooling unit 400 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0061]** Fig. 20 shows an alternative embodiment of cooling unit 500, in which the adjuster comprises a plurality of plates or screens that can be interchanged to alter the cross-sectional area of the air flow path and air flow rate through the outlet. Other than as described herein, the cooling unit 500 may operate and be structured in substantially the same manner as the cooling unit 10 described above. The adjustment plates or screens of the cooling unit 500 replace the second screen 46B of the cooling unit 10. Fig. 20 shows five different plates or screens 502a-e, which may be inserted into the slot 504 of the housing 506 to alter the cross-sectional area of the air flow path. The plates 502a-c have different sized central openings ranging from small with plate 502a, medium with plate 502b, and large with plate 502c. The plates 502d-e are structured as screens with a plurality of spaced apart openings. The plates 502a-e can be removed and interchanged to alter the cross-sectional area of the air flow path by removing the top section (not shown) of the housing 506 from the bottom section 508 in the manner described above with respect to the cooling unit 10.

**[0062]** Fig. 21 shows an alternative embodiment of cooling unit 600 having an adjuster 602 that is a rotatable disc positioned within the housing 604. The adjuster 602 may be formed from a ferromagnetic material such that a magnet 606 may be used to rotate the adjuster 602 within the housing 604. The adjuster 602 may also be formed from a magnetic material or any other material that would allow a user to rotate the adjuster 602 by exposing it to the magnetic field of the magnet 606. As shown in Fig. 21, the adjuster 602 includes an aperture 608 that is aligned with a first opening 610 of the housing 604. The adjuster 602 can be rotated with the magnet 606 in order to alter the extent to which the aperture 608 is aligned with the first opening 610. For example, the adjuster 602 can be rotated either clockwise or counterclockwise from the position shown in Fig. 21 using the magnet 606 to vary the cross-sectional area of the air flow path through the first opening 610 of the housing 604 and the air flow rate therethrough. The adjuster 602 can further be rotated to a position in which the aperture 608 is not aligned with the first opening 610 to substantially block all air through the air flow path. Other than as described herein, the cooling unit 600 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0063]** Fig. 22 shows an alternative embodiment of cooling unit 700 that, like the cooling unit 600, also has an adjuster 702 that is movable with a magnet 704. Instead of rotating, the adjuster 702 translates laterally within a slot 706 of the housing 708. The adjuster 702 has an aperture 710 that is aligned with a first opening 712 of the housing 708 when in the position shown in Fig. 22. The adjuster 702 can be moved with the magnet 704 in order to alter the extent to which the aperture 710 is aligned with the first opening 712. For example, the adjuster 702 can be moved to the right from the position shown in Fig. 22 using the magnet 704 to vary the cross-sectional area of the air flow path through the first opening 712 of the housing 708 and the air flow rate therethrough. The adjuster 702 can further be moved to a position in which the aperture 710 is not aligned with the first opening 712 to substantially block all air through the air flow path. The slot 706 and adjuster 702 may be rotated from the orientation shown in Fig. 22 (e.g., 90 degrees) such that the adjuster 702 is movable in a different direction with respect to the housing 708 then the direction of movement shown in Fig. 22. Other than as described herein, the cooling unit 700 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0064]** Fig. 23 shows an alternative embodiment of cooling unit 800 having a housing 802 and an adjuster 804 that is rotatable with respect to the housing 802 to alter the cross-sectional area of an air flow path extending through a first opening 806 of the housing 802. The adjuster 804 has an aperture 808 that, as shown in Fig. 23, is aligned with the first opening 806. The adjuster 804 can be rotated with respect to the housing 802 in order to alter the air flow rate through the first opening 806, in a similar manner as described above for the other cooling units described herein. The housing 802 has a second opening 810 that may also form part of the air flow path through the cooling unit 800 if the aperture 808 of the adjuster 804 is rotated to be in alignment with any portion of the second opening 810. The first and second openings 806 and 810 may have different sizes to present different options for a user of air flow rates therethrough when the aperture 808 is brought into alignment with either of the openings 806 and 810.

**[0065]** Figs. 24A-B show an alternative embodiment of cooling unit 900 in which the adjuster is part of a mouthpiece 902 that is rotatably coupled to the housing 904. The housing 904 includes a first opening 906 extending upward toward the mouthpiece 902 from a chamber 908 that forms part of the air flow path through the cooling unit 900. The mouthpiece 902 has a base 910 with an aperture 912 (Fig. 24B) extending therethrough. The mouthpiece 902 is rotatable with respect to the housing 904 to alter the extent to which the aperture 912 is aligned with the first opening 906 of the housing. For example, the mouthpiece 902 can be rotated either clockwise or counterclockwise from the position shown in Fig. 24A to vary the cross-sectional area of the air flow path through the first opening 906 of the housing 904 and the air flow rate therethrough. The mouthpiece 902 can further be rotated to a position in which the aperture 912 is not aligned with the first opening 906 to substantially block all air through the air flow path. Other than as described herein, the cooling unit 900 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0066]** Fig. 25 shows an alternative embodiment of cooling unit 1000 with an adjuster 1002 that operates similar to a piston or trumpet valve to alter the cross-sectional area of the air flow path through the housing 1004. The housing 1004 includes a channel 1006 into which a portion of the adjuster 1002 is movably mounted. The adjuster 1002 includes a head 1008 and a piston 1010, which is positioned in the channel 1006. The piston 1010 includes an aperture 1012 extending therethrough transverse to the direction of movement of the piston 1010 relative to the housing 1004. A spring 1014 engaging the piston 1010 biases the adjuster 1002 to the closed position shown in Fig. 25. The housing 1004 includes aligned openings 1016 and 1018 above and below the channel 1006 that form part of the air flow path through the housing 1004. A user may press on the head 1008 of the adjuster 1002 to move the piston 1010 through the channel 1006 and compress the spring 1014. As the piston 1010 moves through the channel 1006, the aperture 1012 through the piston 1010 opens the air flow path from the opening 1018 through the aperture 1012 and into the opening 1016. The position of the adjuster 1002 can be varied by the user to determine the cross-sectional area of the openings 1016 and 1018 that are exposed to the aperture 1012 for altering the air flow rate through the openings 1016 and 1018. Other than as described herein, the cooling unit 1000 may operate and be structured in substantially the same manner as the cooling unit 10 described above.

**[0067]** Fig. 26 shows an alternative embodiment of cooling unit 1100 with an adjuster 1102 that threadably engages an opening 1104 through the housing 1106. A channel 1108 extending through the housing 1106 in a direction transverse to the opening 1104 forms part of the air flow path through the housing 1106. Forming part of the channel 1108 is a flexible tube 1110. When the adjuster 1102 is in the position shown in Fig. 26, the channel 1108 has its maximum cross-sectional area through the tube 1110. The adjuster 1102 may be rotated to move the adjuster 1102 inward toward the tube 1110. As the adjuster 1102 rotates it compresses the tube 1110 to reduce the cross-sectional area of the air flow path through the tube 1110 and alter the air flow rate through the tube 1110. The adjuster 1102 may be rotated to an extent that substantially blocks the flow of air through the tube 1110, or to any position between blocking the flow of air and the maximum air flow rate position shown in Fig. 26.

**[0068]** Fig. 27 shows an alternative embodiment of cooling unit 1200 with an adjuster comprising a ball or weight 1202 positioned within the air flow path of the housing 1204. The housing 1204 has a channel 1206 extending therethrough that forms part of the air flow path. When air is not flowing through the channel 1206, the ball 1202 is in the position shown in Fig. 27, in which it rests on top of a tube 1208 forming part of the channel 1206. In this position, the ball 1202 blocks the flow of air through the channel 1206. When a user draws air through the mouthpiece 1210, the negative pressure pulls the ball 1202 upward allowing air to flow through the channel 1206 and around the ball 1202. A stop 1212 positioned above the ball 1202 retains the ball within the channel 1206 when the ball 1202 is moved upward to unblock the channel 1206. The mouthpiece 1210 may be removed to switch the ball 1202 with another ball having different characteristics. For example, a ball of a different weight or diameter may be used in place of the ball 1202 to alter the user experience. If a smaller weight or diameter ball is used, the air flow through the channel may be greater for a given negative draw pressure at the mouthpiece 1210 and vice versa if a greater weight or diameter ball is used. The diameter of the ball in particular determines the cross-sectional area of the channel 1206 that is partially blocked when the ball is moved upward to allow air flow through the channel 1206.

**[0069]** Fig. 28 shows an alternative embodiment of cooling unit 1300 that is similar to the cooling unit 1200 except that a spring 1302 is positioned between the ball 1304 and stop 1306 in order to bias the ball 1304 against the tube 1308 in the closed position. Negative pressure when air is drawn through the mouthpiece 1310 causes the ball 1304 to move upward and compress the spring 1302. The spring 1302 and/or ball 1304 may be replaced in order to alter the air flow rate through the cooling unit for a given draw pressure at the mouthpiece 1310. For example, altering the ball 1304 may have the effects described above with respect to the cooling unit 1200. Changing the spring 1302 with a spring that has a lower spring rate may increase the air flow rate through the cooling unit 1300 by causing there to be a greater cross-sectional area through which air can flow (i.e., the ball 1304 moves farther away from the tube 1308 due to the lower spring rate). Changing the spring 1302 with a spring that has a greater spring rate may decrease the air flow rate through the cooling unit 1300 by causing there to be a lesser cross-sectional area through which air can flow (i.e., the ball 1304 moves a lesser distance away from the tube 1308 due to the greater spring rate).

**[0070]** Fig. 29 shows an alternative embodiment of cooling unit 1400 that is similar to the cooling unit 1300 except that the stop 1402 threadably engages a portion of the housing 1404 so that the stop 1402 can be moved to alter the preload force on the spring 1406. Moving the stop 1402 toward the spring 1406 to compress the spring 1406 increases the bias force the spring 1406 exerts on the ball 1408, which may reduce the air flow rate through the housing 1404 for a given draw pressure (i.e., there is less cross-sectional area through which air can flow). Moving the stop 1402 away from the spring 1406 decreases the bias force the spring 1406 exerts on the ball 1408, which may increase the air flow rate through the housing 1404 for a given draw pressure (i.e., there is more cross-sectional area through which air can flow).

**[0071]** Fig. 30 shows an alternative embodiment of cooling unit 1500 with an adjuster that comprises a flexible tab 1502 positioned in the channel 1504 of the housing 1506 through which the air flow path extends. Fig. 30 shows the tab 1502 in a closed position, in which the air flow path through the channel 1504 is substantially blocked. Negative draw pressure at the mouthpiece 1508 causes the tab 1502 to deflect opening up the channel 1504 for air flow therethrough. The adjuster may comprise multiple such tabs that can be changed out to alter the air flow characteristics through the channel for a given draw pressure. For example, a less stiff tab may be used, which moves more for a given draw pressure opening up a larger cross-sectional area of the channel 1504 for air flow, or a more stiff tab may be used, which moves less for a given draw pressure opening up a smaller cross-sectional area of the channel 1504.

**[0072]** Figs. 31A-B show an alternative embodiment of cooling unit 1600 with a screw 1602 that acts as the adjuster to alter the air flow rate through the channel 1604. The screw 1602 threadably engages a portion of the housing 1606. The screw 1602 has a conical end 1608 that can abut a conical opening 1610 of a tube forming a portion of the channel 1604. When the screw 1602 is in the position shown in Fig. 31A, a maximum cross-sectional area of the channel 1604 is open to allow air to flow therethrough. When the screw 1602 is advanced to the position shown in Fig. 31B, it engages the conical opening 1610 to substantially block off the channel 1604 and substantially prevent air from flowing therethrough. The screw 1602 may be moved to any position between the positions shown in Figs. 31A and 31B to alter the cross-sectional area of the channel 1604 through which air flows to vary the air flow rate through the channel 1604.

**[0073]** Figs. 32A-B show an alternative embodiment of cooling unit 1700 having an adjuster that is a rotatable shaft 1702 extending into a channel 1704 of the housing 1706. The channel 1704 forms a portion of the air flow path through the housing 1706. The shaft 1702 extends across the channel 1704 in a direction that is transverse to the direction of air flow through the channel 1704. A knob 1708 (Fig. 32A) is mounted on one end of the shaft 1702 to allow a user to rotate the shaft 1702 within the channel 1704. The shaft 1702 includes an aperture 1710 extending through at least a portion of the shaft 1702, as shown in Fig. 32B. When the shaft 1702 is rotated to the position shown in Fig. 32B, the aperture 1710 is aligned with the direction of air flow through the channel 1704. In this position, the cross-sectional area of the air flow path through the channel 1704 is at its maximum. The shaft 1702 may be rotated so that only a portion of the aperture 1710 is exposed to the air flow through the channel 1704 in order to reduce the air flow rate through the channel 1704. Further, the shaft 1702 may be rotated to substantially block the flow of air through the channel 1704 by orienting the aperture 1710 so that it is transverse to the direction of air flow through the channel 1704.

**[0074]** Fig. 33 shows an alternative embodiment of cooling unit 1800 that is similar to the cooling unit 1700 except that the rotating shaft 1802 of cooling unit 1800 has opposing flat sides 1804, 1806 on at least a portion of the exterior of the shaft 1802 instead of an aperture extending through the shaft. When the shaft 1802 is rotated to the position shown in Fig. 33, air can flow between the side walls of the channel 1808 and the portion of the shaft 1802 adjacent the flat sides 1804, 1806. The shaft 1802 can be rotated from the position shown in Fig. 33, to reduce the cross-sectional area of the channel 1808 through which air can flow around the shaft 1802. Further, the shaft 1802 can be rotated so that the shaft 1802 substantially blocks all air from flowing through the channel 1808.

**[0075]** From the foregoing it will be seen that this invention is one well adapted to attain all ends and objectives herein-above set forth, together with the other advantages which are obvious and which are inherent to the invention.

**[0076]** Since many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matters herein set forth or shown in the accompanying drawings are to be interpreted as illustrative, and not in a limiting sense.

**[0077]** While specific embodiments have been shown and discussed, various modifications may of course be made, and the invention is not limited to the specific forms or arrangement of parts and steps described herein, except insofar as such limitations are included in the following claims. Further, it will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

**[0078]** In the following some specific embodiments of the present invention are disclosed.

**[0079]** Embodiment 1: A cooling unit for a vaporizer, comprising:

a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user, the air flow path being configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet; and
an adjuster coupled to the housing and positioned in the air flow path, the adjuster operable to alter a cross-sectional area of the air flow path at a location between the inlet and the outlet, wherein alteration of the cross-sectional area adjusts an air flow rate through the outlet for a constant negative gauge pressure at the outlet.

**[0080]** Embodiment 2: The cooling unit of embodiment 1, wherein the housing defines a first opening forming part of the air flow path between the inlet and the outlet, wherein the adjuster defines an aperture, wherein the adjuster is movable with respect to the housing to selectively alter the cross-sectional area of the air flow path by varying an area of the first opening that is in fluid communication with the aperture.

**[0081]** Embodiment 3: The cooling unit of embodiment 2, wherein the adjuster is rotatable with respect to the housing between a first position, in which a first area of the first opening is in fluid communication with the aperture, and a second position, in which a second area of the first opening is in fluid communication with the aperture, wherein the second area is greater than the first area.

**[0082]** Embodiment 4: The cooling unit of embodiment 3, wherein the first area is zero such that the air flow rate through the outlet is close to zero when the adjuster is in the first position, and wherein the second area is the entire area of the first opening such that the adjuster does not restrict air flow through the first opening when in the second position.

**[0083]** Embodiment 5: The cooling unit of embodiment 3, wherein a first stop of the housing engages the adjuster when the adjuster is in the first position, and wherein a second stop of the housing engages the adjuster when the adjuster is in the second position, wherein the adjuster is rotatable from the first stop to the second stop.

**[0084]** Embodiment 6: The cooling unit of embodiment 2, wherein a portion of the adjuster is accessible through a second opening in an exterior wall of the housing, wherein the adjuster comprises a first seal in sealing engagement with a first surface of the housing, and a second seal in sealing engagement with a second surface of the housing, the first and second seals sealing the air flow path from the second opening.

**[0085]** Embodiment 7: The cooling unit of embodiment 6, wherein the first seal is formed by a first surface of the adjuster, and the second seal is formed by a second surface of the adjuster, wherein the adjuster is positioned in a slot of the housing with an interference fit that causes the first and second surfaces of the adjuster to be pressed into sealing engagement with the first and second surfaces, respectively, of the housing.

**[0086]** Embodiment 8: The cooling unit of embodiment 6, wherein the first and second seals comprise O-ring seals or individual silicon seals mounted on a base of the adjuster.

**[0087]** Embodiment 9: The cooling unit of embodiment 6, wherein the adjuster is formed from a base overmolded with or coupled to a resilient material, and wherein at least one of the first and second seals is formed by the resilient material.

**[0088]** Embodiment 10: The cooling unit of embodiment 1, wherein the adjuster is positioned within a slot of the housing, wherein a first alignment structure of the adjuster mates with a second alignment structure of the housing when the adjuster is positioned in the slot.

**[0089]** Embodiment 11: The cooling unit of any one of embodiments 1 - 10, further comprising a first screen positioned in the housing adjacent the inlet, and a second screen positioned in the housing between the inlet and the outlet, wherein the first and second screens extend across the air flow path to filter particles carried by air entering the inlet, and wherein the second screen is configured to filter particles of a smaller size than the first screen.

**[0090]** Embodiment 12: The cooling unit of any one of embodiments 1 - 11, wherein the housing comprises a top section defining the outlet and a bottom section defining the inlet, wherein a portion of the bottom section is removably received within a cavity of the top section.

**[0091]** Embodiment 14: The cooling unit of embodiment 12, further comprising a fastener that removably couples the top section to the bottom section.

**[0092]** Embodiment 14: The cooling unit of any one of embodiments 1 - 13, wherein the housing comprises an exterior wall and an interior wall spaced apart from the exterior wall to define a gap between the exterior wall and the interior wall, the gap containing at least one of air or a thermally insulative material, the air flow path configured so that air entering the housing through the inlet contacts the interior wall before contacting the exterior wall along the air flow path or exiting through the outlet.

**[0093]** Embodiment 15: The cooling unit of any one of embodiments 1 - 14, wherein the housing comprises a first end adjacent the inlet and a second end adjacent the outlet, wherein the air flow path comprises a first section that is positioned adj acent the first end, a second section that is spaced from the first section toward the second end, and a transition section that connects the first and second sections, wherein the first section extends from the inlet to the transition section, and the second section extends from the transition section to the outlet.

**[0094]** Embodiment 16: The cooling unit of embodiment 15, wherein the adjuster is positioned in the second section of the air flow path.

**[0095]** Embodiment 17: The cooling unit of any one of embodiments 1 - 16, further comprising a mouthpiece coupled to the housing, the mouthpiece defining a channel in fluid communication with the outlet, the mouthpiece comprising a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0096]** Embodiment 18: A cooling unit for a vaporizer, comprising:

a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user, the air flow path being configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet,
wherein the housing comprises an exterior wall and an interior wall spaced apart from the exterior wall to define a gap between the exterior wall and the interior wall, the gap containing at least one of air or a thermally insulative material, the air flow path configured so that air entering the housing through the inlet contacts the interior wall before contacting the exterior wall along the air flow path or exiting through the outlet.

**[0097]** Embodiment 19: The cooling unit of embodiment 18, wherein the air flow path is configured so that air enters the inlet in a first direction and is redirected to flow in a second direction before contacting the interior wall.

**[0098]** Embodiment 20: The cooling unit of embodiment 18 or embodiment 19, wherein the housing comprises a first end adjacent the inlet and a second end adjacent the outlet, wherein the air flow path comprises a first section that is positioned adjacent the first end, a second section that is spaced from the first section toward the second end, and a transition section that connects the first and second sections, wherein the first section extends from the inlet to the transition section, and the second section extends from the transition section to the outlet.

**[0099]** Embodiment 21: The cooling unit of any one of embodiments 18 - 20, further comprising a first screen positioned in the housing adjacent the inlet, and a second screen positioned in the housing between the inlet and the outlet, wherein the first and second screens extend across the air flow path to filter particles carried by air entering the inlet.

**[0100]** Embodiment 22: The cooling unit of any one of embodiments 18 - 21, wherein the housing comprises a top section defining the outlet and a bottom section defining the inlet, wherein a portion of the bottom section is removably received within a cavity of the top section.

**[0101]** Embodiment 23: The cooling unit of any one of embodiments 18 - 22, further comprising a mouthpiece coupled to the housing, the mouthpiece defining a channel in fluid communication with the outlet, the mouthpiece comprising a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0102]** Embodiment 24: A cooling unit for a vaporizer, comprising:

a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user, the air flow path being configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet,
wherein the housing comprises a first end adjacent the inlet and a second end adjacent the outlet, wherein the air flow path comprises a first section that is positioned adjacent the first end, a second section that is spaced from the first section toward the second end, and a transition section that connects the first and second sections, wherein the first section extends from the inlet to the transition section, and the second section extends from the transition section to the outlet.

**[0103]** Embodiment 25: The cooling unit of embodiment 24, wherein the first section of the air flow path extends from the inlet toward a first side of the housing, from the first side toward a second side of the housing, and from the second side to the transition section.

**[0104]** Embodiment 26: The cooling unit of embodiment 24, wherein the housing comprises a divider that divides the first and second sections of the air flow path, the divider extending from the first side to the second side of the housing, and the divider positioned between the first and second ends of the housing, the divider presenting an opening through which the transition section extends.

**[0105]** Embodiment 27: The cooling unit of any one of embodiments 24 - 26 further comprising a first screen positioned in the housing adjacent the inlet, and a second screen positioned in the housing between the inlet and the outlet, wherein the first and second screens extend across the air flow path to filter particles carried by air entering the inlet.

**[0106]** Embodiment 28: The cooling unit of embodiment 27, wherein the second screen is positioned between the first section of the air flow path and the transition section.

**[0107]** Embodiment 29: The cooling unit of any one of embodiments 24 - 28, wherein the housing comprises a top section defining the outlet and a bottom section defining the inlet, wherein a portion of the bottom section is removably received within a cavity of the top section.

**[0108]** Embodiment 30: The cooling unit of embodiment 29, wherein the first and second sections of the air flow path are each positioned between the top and bottom sections of the housing.

**[0109]** Embodiment 31: The cooling unit of any one of embodiments 24 - 30, further comprising a mouthpiece coupled to the housing, the mouthpiece defining a channel in fluid communication with the outlet, the mouthpiece comprising a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0110]** Embodiment 32: A cooling unit for a vaporizer, comprising:

a housing defining an air flow path with an inlet configured to receive air and vaporized compounds and an outlet configured to deliver the air and vaporized compounds to a user, the air flow path being configured so that a temperature of the air and vaporized compounds decreases from the inlet to the outlet; and
a mouthpiece coupled to the housing, the mouthpiece defining a channel in fluid communication with the outlet, the mouthpiece comprising a hands free engagement structure configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing and mouthpiece in a hands free manner.

**[0111]** Embodiment 33: The cooling unit of any one of embodiments 1 - 32, wherein the hands free engagement structure includes a tooth receiver configured to receive the at least one tooth of the user.

**[0112]** Embodiment 34: The cooling unit of embodiment 33, wherein the tooth receiver is configured for receiving a bottom tooth of the user.

**[0113]** Embodiment 35: The cooling unit of embodiment 33, wherein the tooth receiver is a notch defined by an outer surface of the mouthpiece.

## Claims

**1.** A cooling unit (10) for a vaporizer, comprising:

a housing (12) defining an air flow path (18) with an inlet (42) configured to receive air and vaporized compounds and an outlet (44) configured to deliver the air and vaporized compounds to a user, the air flow path (18) being configured so that a temperature of the air and vaporized compounds decreases from the inlet (42) to the outlet (44); and
an adjuster (14) coupled to the housing (12) and positioned in the air flow path (18), the adjuster (14) operable to alter a cross-sectional area of the air flow path (18) at a location between the inlet (42) and the outlet (44), wherein alteration of the cross-sectional area adjusts an air flow rate through the outlet (44) for a constant negative gauge pressure at the outlet (44).

**2.** The cooling unit (10) of claim 1,
wherein the housing (12) defines a first opening (32) forming part of the air flow path (18) between the inlet (42) and the outlet (44), wherein the adjuster (14) defines an aperture (34), wherein the adjuster (14) is movable with respect to the housing (12) to selectively alter the cross-sectional area of the air flow path (18) by varying an area of the first opening (32) that is in fluid communication with the aperture (34).

**3.** The cooling unit (10) of claim 2,
wherein the adjuster (14) is rotatable with respect to the housing (12) between a first position, in which a first area of the first opening (32) is in fluid communication with the aperture (34), and a second position, in which a second area of the first opening (32) is in fluid communication with the aperture (34), wherein the second area is greater than the first area
wherein optionally

- the first area is zero such that the air flow rate through the outlet (44) is close to zero when the adjuster (14) is in the first position, and wherein the second area is the entire area of the first opening (32) such that the adjuster (14) does not restrict air flow through the first opening (32) when in the second position or
- a first stop (76A) of the housing (12) engages the adjuster (14) when the adjuster (14) is in the first position, and wherein a second stop (76B) of the housing (12) engages the adjuster (14) when the adjuster (14) is in the second position, wherein the adjuster (14) is rotatable from the first stop (76A) to the second stop (76B).

**4.** The cooling unit (10) of claim 2,

wherein a portion of the adjuster (14, 114) is accessible through a second opening (36) in an exterior wall of the housing (12), wherein the adjuster (14, 114) comprises a first seal in sealing engagement with a first surface (82B) of the housing (12), and a second seal in sealing engagement with a second surface (82D) of the housing (12), the first and second seals sealing the air flow path (18) from the second opening (36),
wherein optionally

- the first seal is formed by a first surface (82A) of the adjuster (114), and the second seal is formed by a second surface (82C) of the adjuster (114), wherein the adjuster (114) is positioned in a slot (36) of the housing (12) with an interference fit that causes the first and second surfaces (82A, 82C) of the adjuster (114) to be pressed into sealing engagement with the first and second surfaces (82B, 82D), respectively, of the housing (12), or

- the first and second seals comprise O-ring seals (84) or individual silicon seals mounted on a base of the adjuster (14), or
- the adjuster (114) is formed from a base overmolded with or coupled to a resilient material, and wherein at least one of the first and second seals is formed by the resilient material.

5. The cooling unit (10) of claim 1, wherein the adjuster (14) is positioned within a slot (36) of the housing (12), wherein a first alignment structure (78) of the adjuster (14) mates with a second alignment structure (79) of the housing (12) when the adjuster (14) is positioned in the slot (36).

6. The cooling unit (10) of any one of claims 1-5, wherein the housing (12) comprises an exterior wall (26B) and an interior wall (38) spaced apart from the exterior wall (26B) to define a gap (40) between the exterior wall (26B) and the interior wall (40), the gap (40) containing at least one of air or a thermally insulative material, the air flow path (18) configured so that air entering the housing (12) through the inlet (42) contacts the interior wall (38) before contacting the exterior wall (28B) along the air flow path (18) or exiting through the outlet (44).

7. The cooling unit (10) of any one of claims 1-6, wherein the housing (12) comprises a first end adjacent the inlet (42) and a second end adjacent the outlet (44), wherein the air flow path (18) comprises a first section (48C) that is positioned adjacent the first end, a second section (48G) that is spaced from the first section (48C) toward the second end, and a transition section (48E) that connects the first and second sections (48C, 48G), wherein the first section (48C) extends from the inlet (42) to the transition section (48E), and the second section (48G) extends from the transition section (48E) to the outlet (44), wherein optionally the adjuster (14) is positioned in the second section (48G) of the air flow path (18).

8. A cooling unit (10) for a vaporizer, comprising:

a housing (12) defining an air flow path (18) with an inlet (42) configured to receive air and vaporized compounds and an outlet (44) configured to deliver the air and vaporized compounds to a user, the air flow (18) path being configured so that a temperature of the air and vaporized compounds decreases from the inlet (42) to the outlet (44),

wherein the housing (12) comprises an exterior wall (26B) and an interior wall (38) spaced apart from the exterior wall (26B) to define a gap (40) between the exterior wall (26B) and the interior wall (38), the gap (40) containing at least one of air or a thermally insulative material, the air flow path (18) configured so that air entering the housing (12) through the inlet (42) contacts the interior wall (38) before contacting the exterior wall (26B) along the air flow path (18) or exiting through the outlet (44).

9. The cooling unit (10) of claim 8, wherein the air flow path (18) is configured so that air enters the inlet (42) in a first direction and is redirected to flow in a second direction before contacting the interior wall (38).

10. The cooling unit (10) of claim 8 or claim 9, wherein the housing (12) comprises a first end adjacent the inlet (42) and a second end adjacent the outlet (44), wherein the air flow path (18) comprises a first section (48C) that is positioned adjacent the first end, a second section (48G) that is spaced from the first section (48C) toward the second end, and a transition section (48E) that connects the first and second sections (48C, 48G), wherein the first section (48C) extends from the inlet (42) to the transition section (48E), and the second section (48G) extends from the transition section (48E) to the outlet (44).

11. A cooling unit (10) for a vaporizer, comprising:

a housing (12) defining an air flow path (18) with an inlet (42) configured to receive air and vaporized compounds and an outlet (44) configured to deliver the air and vaporized compounds to a user, the air flow path (18) being configured so that a temperature of the air and vaporized compounds decreases from the inlet (42) to the outlet (44),

wherein the housing (12) comprises a first end adjacent the inlet (42) and a second end adjacent the outlet (44), wherein the air flow path (18) comprises a first section (48C) that is positioned adjacent the first end, a second section (48G) that is spaced from the first section (48C) toward the second end, and a transition section (48E) that connects the first and second sections (48C, 48G), wherein the first section (48C) extends from the inlet (42) to the transition section (48E), and the second section (48G) extends from the transition section (48E) to the outlet (44).

12. The cooling unit of claim 11,

wherein the first section (48C) of the air flow path (18) extends from the inlet (42) toward a first side (26B) of the housing (12), from the first side (26B) toward a second side (26A) of the housing (12), and from the second side (26A) to the transition section (48E), or
wherein the housing (12) comprises a divider (52) that divides the first and second sections (48C, 48G) of the air flow path (18), the divider (52) extending from the first side (26B) to the second side (26A) of the housing (12), and the divider (52) positioned between the first and second ends of the housing (12), the divider (52) presenting an opening through which the transition section (48E) extends.

**13.** The cooling unit (10) of any one of claims 1-12,

further comprising a first screen (46A) positioned in the housing (12) adjacent the inlet (42), and a second screen (46B) positioned in the housing (12) between the inlet (42) and the outlet (44), wherein the first and second screens (46A, 46B) extend across the air flow path (18) to filter particles carried by air entering the inlet (42),
wherein optionally the second screen (46B) is configured to filter particles of a smaller size than the first screen (46A).

**14.** The cooling unit (10) of claim 13 in combination with claim 11,
wherein the second screen (46B) is positioned between the first section (48C) of the air flow path (18) and the transition section (48E).

**15.** The cooling unit (10) of any one of claims 1-14,

wherein the housing (12) comprises a top section (20) defining the outlet (44) and a bottom section (22) defining the inlet (42), wherein a portion of the bottom section (22) is removably received within a cavity (26F) of the top section (20),
wherein optionally the cooling unit (10) further comprises a fastener (28A) that removably couples the top section (20) to the bottom section (22).

**16.** The cooling unit (10) of claim 15 in combination with claim 11,
wherein the first and second sections (48C, 48G) of the air flow path (18) are each positioned between the top and bottom sections (20, 22) of the housing (12).

**17.** The cooling unit (10) of any one of claims 1-16, further comprising a mouthpiece (16) coupled to the housing (12), the mouthpiece (16) defining a channel (86A) in fluid communication with the outlet (44), the mouthpiece (16) comprising a hands free engagement structure (94) configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing (12) and mouthpiece (16) in a hands free manner.

**18.** A cooling unit (10) for a vaporizer, comprising:

a housing (12) defining an air flow path (18) with an inlet (42) configured to receive air and vaporized compounds and an outlet (44) configured to deliver the air and vaporized compounds to a user, the air flow path (18) being configured so that a temperature of the air and vaporized compounds decreases from the inlet (42) to the outlet (44); and
a mouthpiece (16) coupled to the housing (12), the mouthpiece (16) defining a channel (86A) in fluid communication with the outlet (44), the mouthpiece (16) comprising a hands free engagement structure (94) configured for engaging at least one tooth of a user or the user's lips or mouth so that the user can hold the housing (12) and mouthpiece (16) in a hands free manner.

**19.** The cooling unit (10) of claim 17 or claim 18,

wherein the hands free engagement structure (94) includes a tooth receiver configured to receive the at least one tooth of the user,
wherein optionally

- the tooth receiver is configured for receiving a bottom tooth of the user or
- the tooth receiver is a notch (94) defined by an outer surface of the mouthpiece (16).

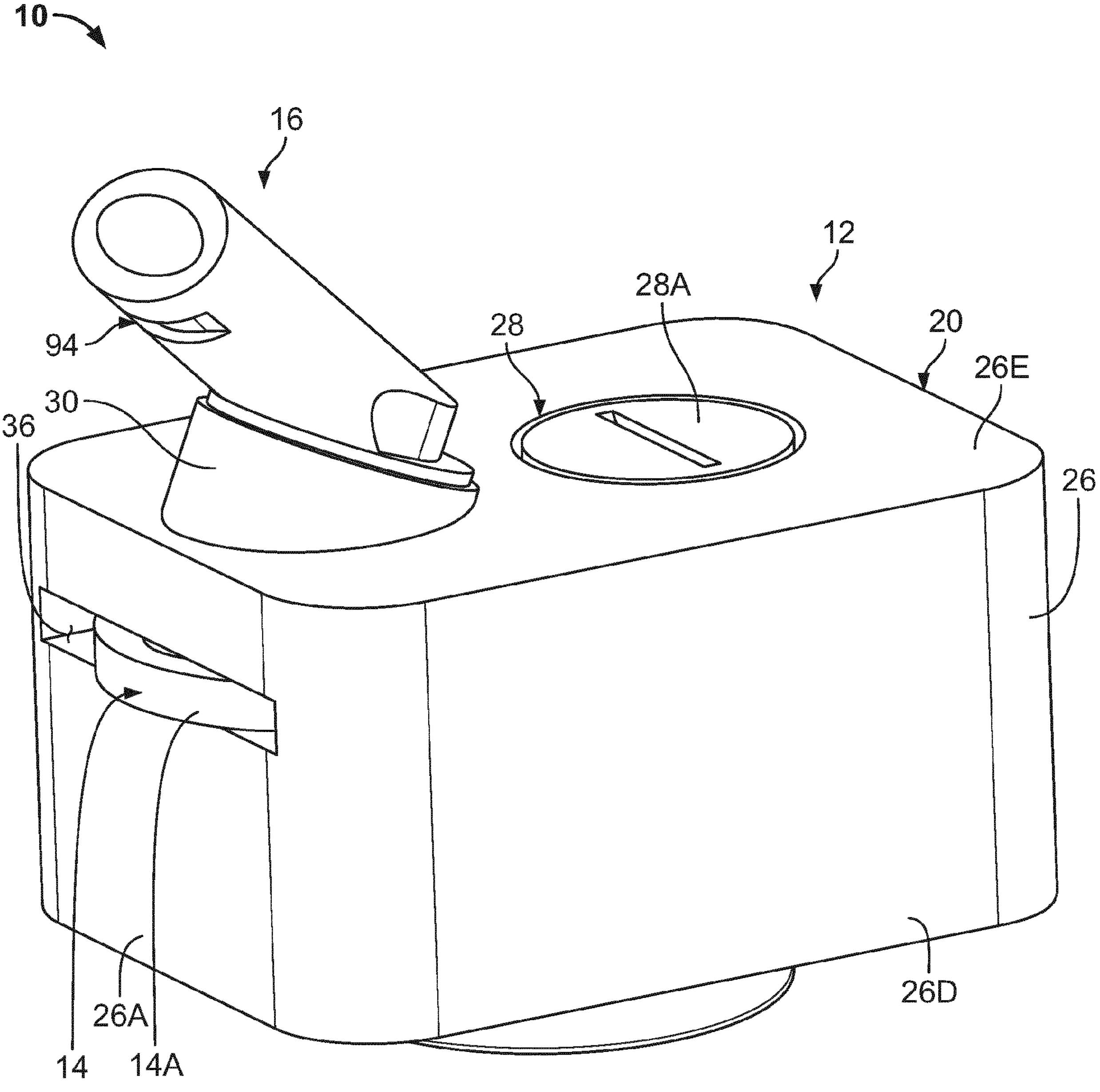



FIG. 1

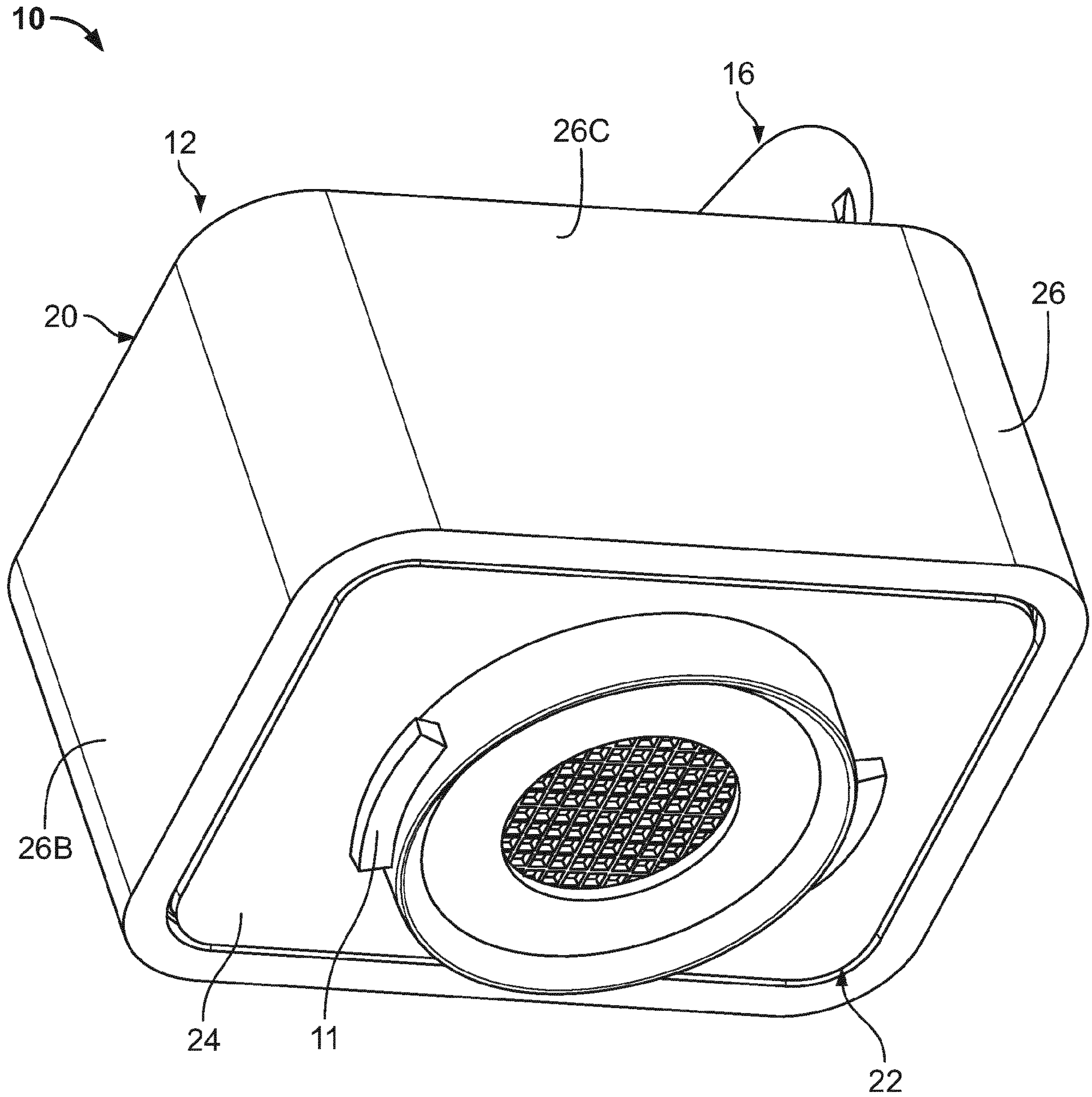



FIG. 2

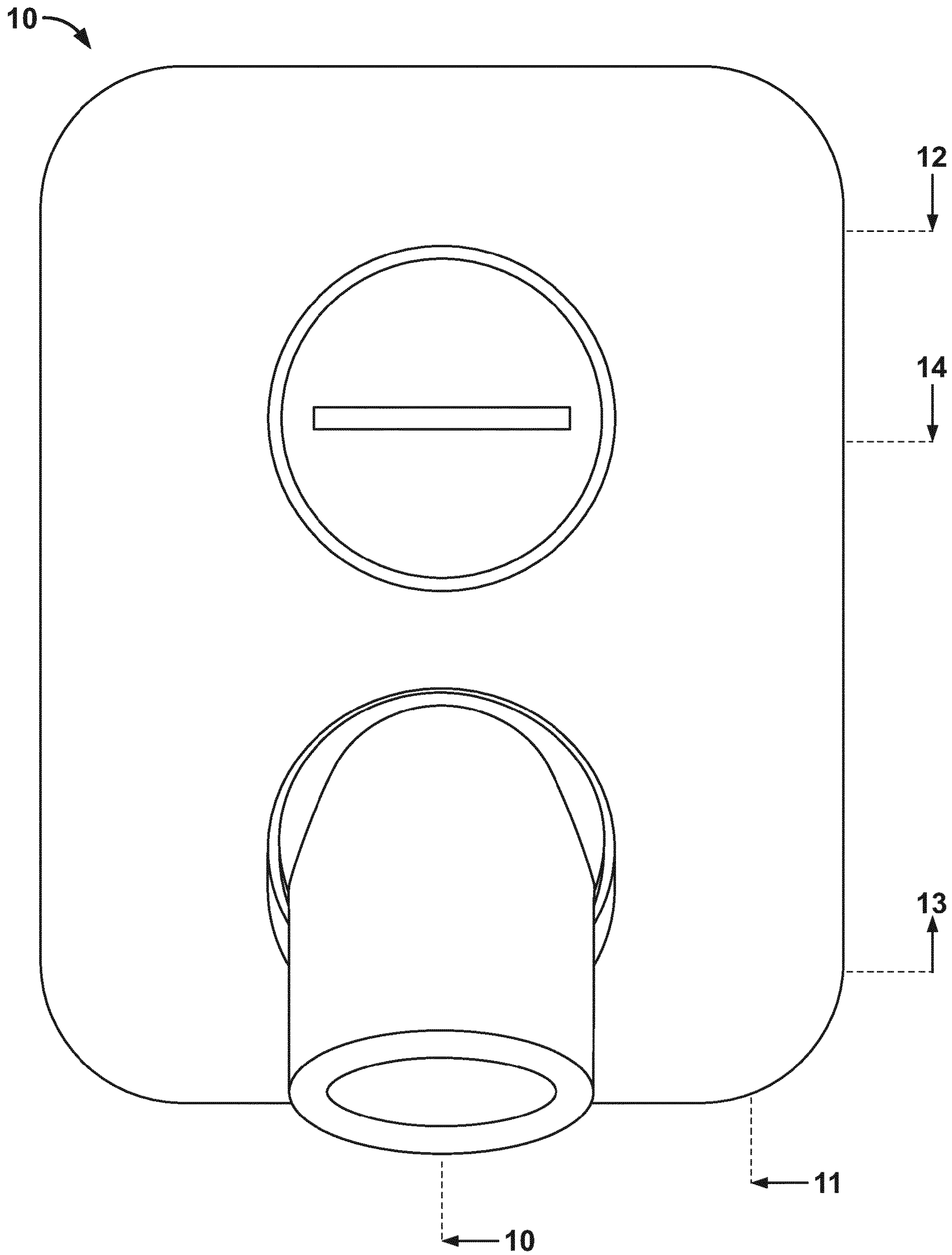



FIG. 3

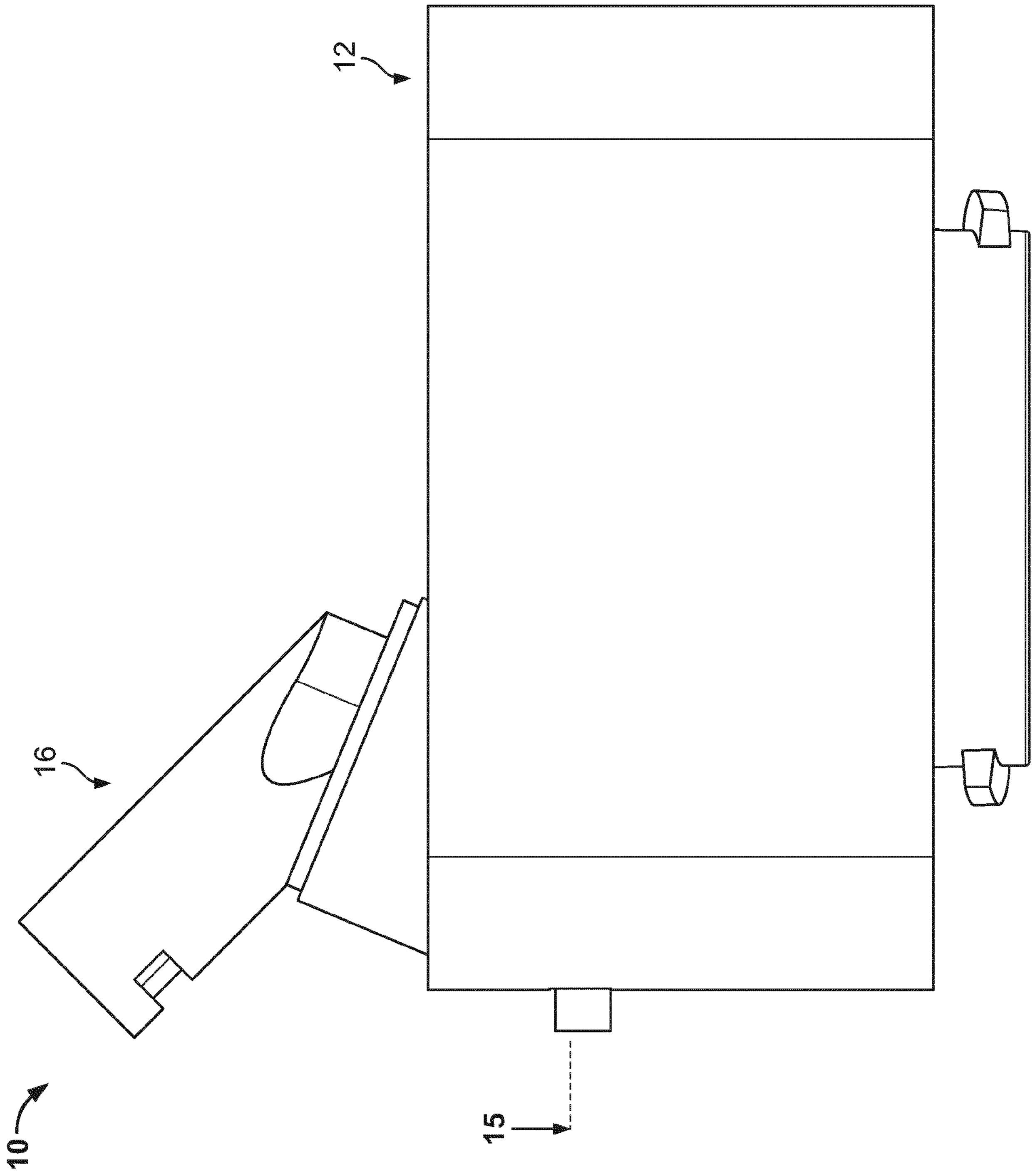



FIG. 4

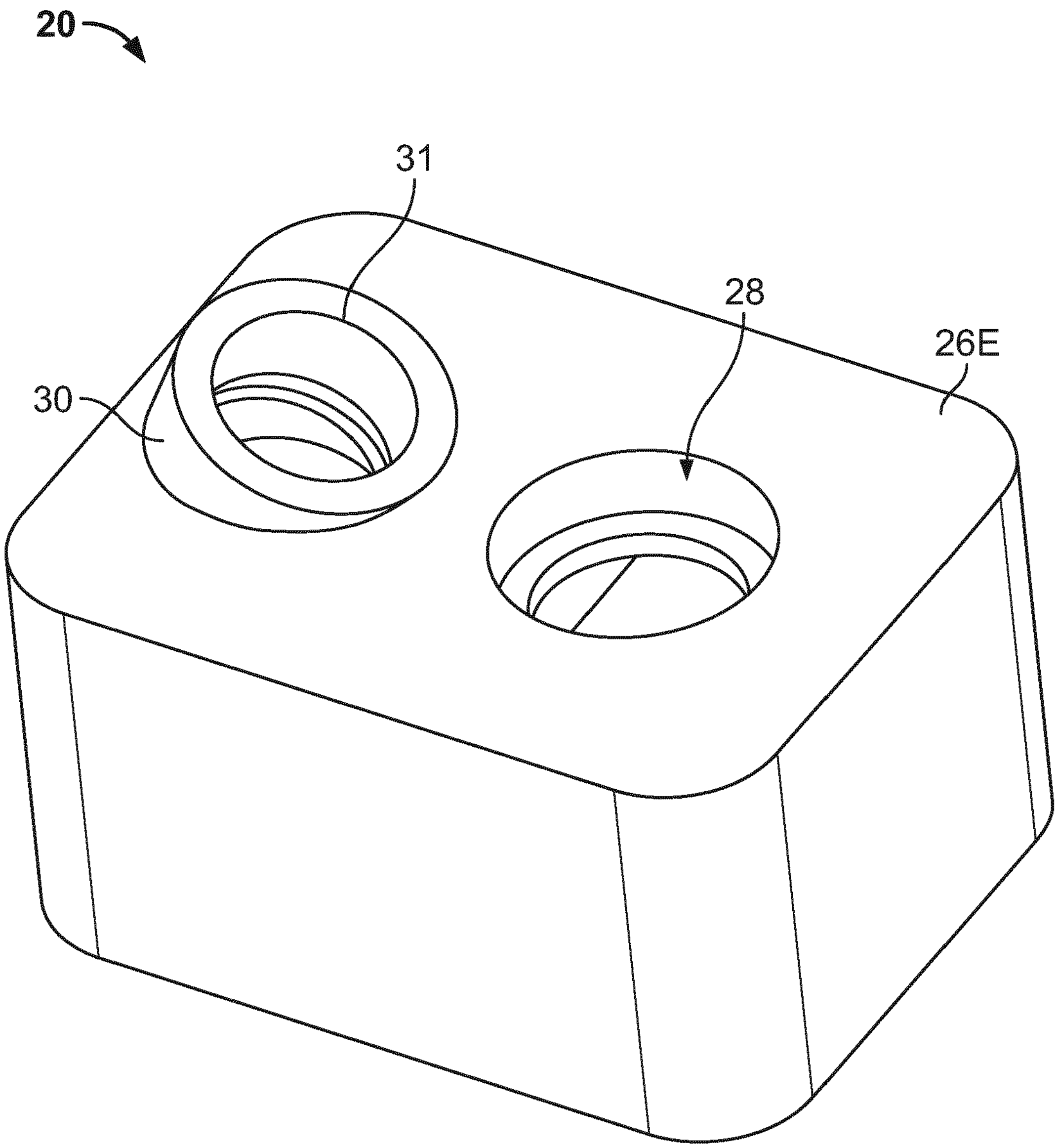



FIG. 5

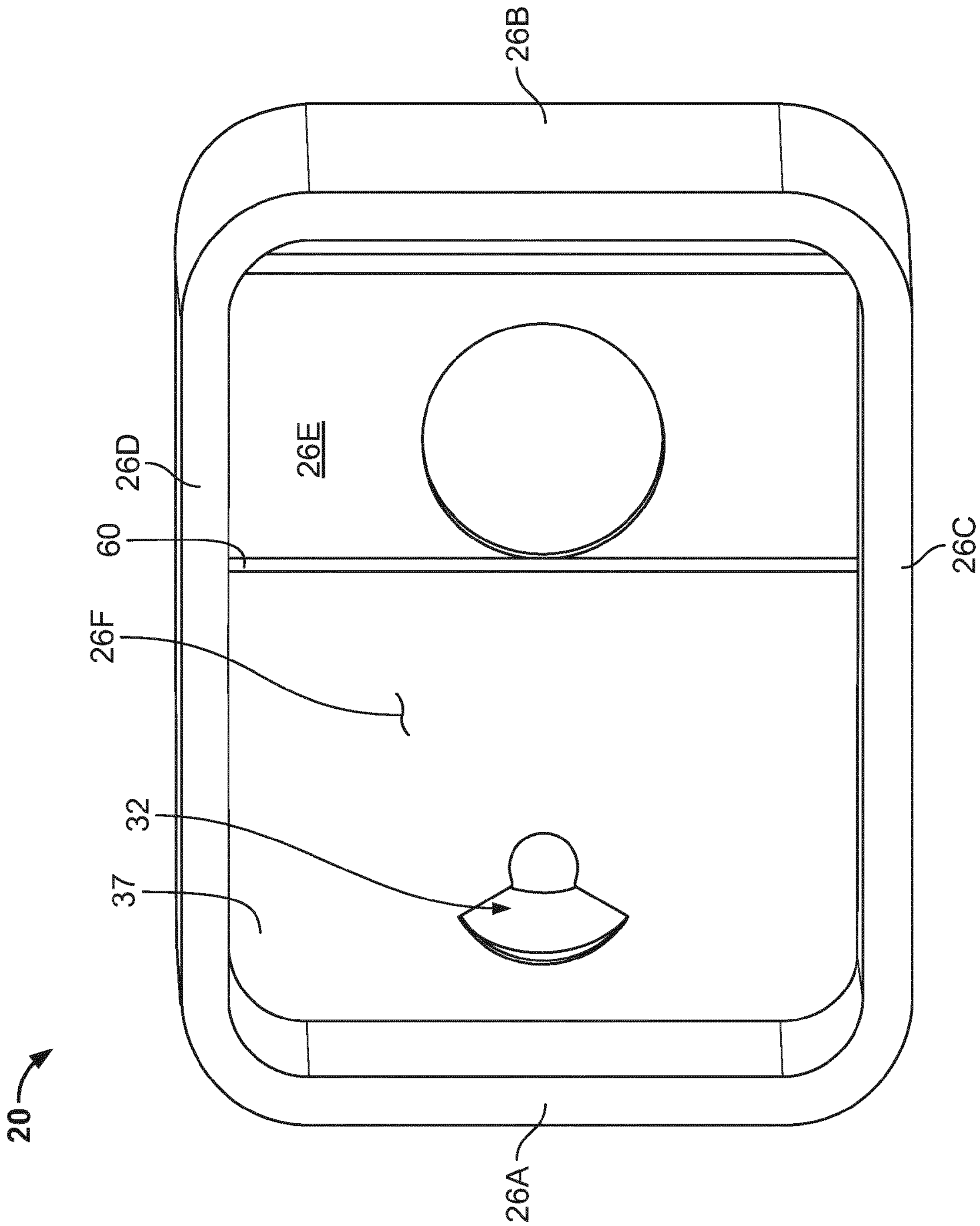



FIG. 6

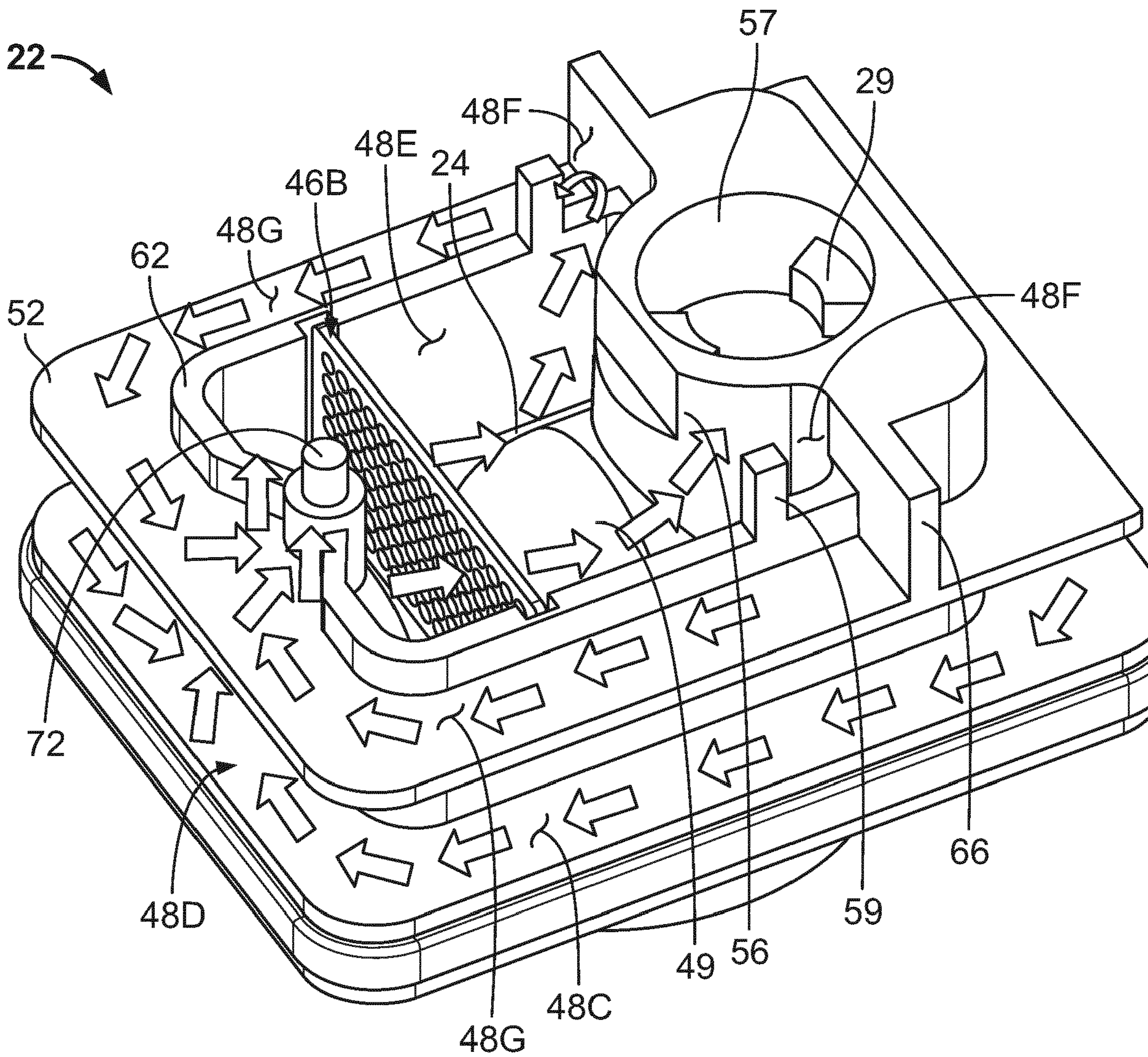



FIG. 7

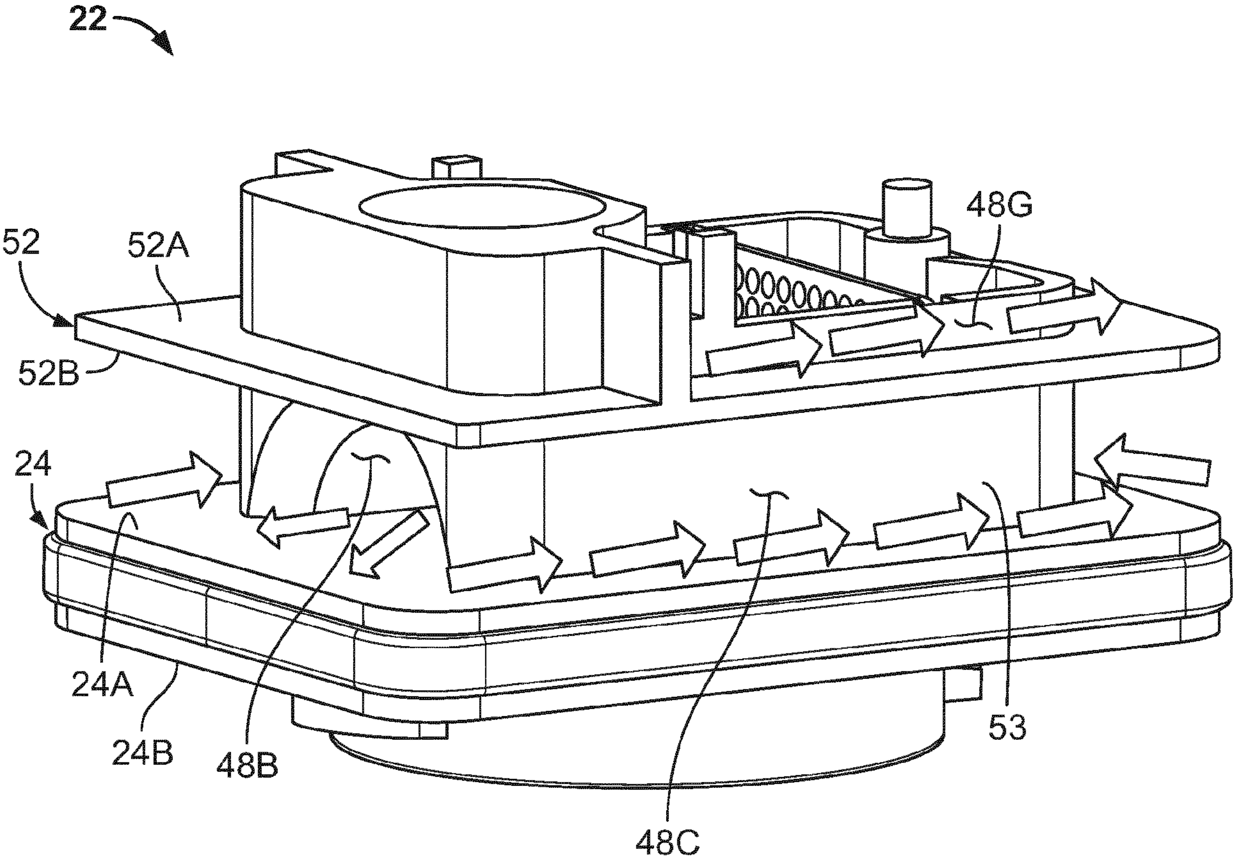



FIG. 8

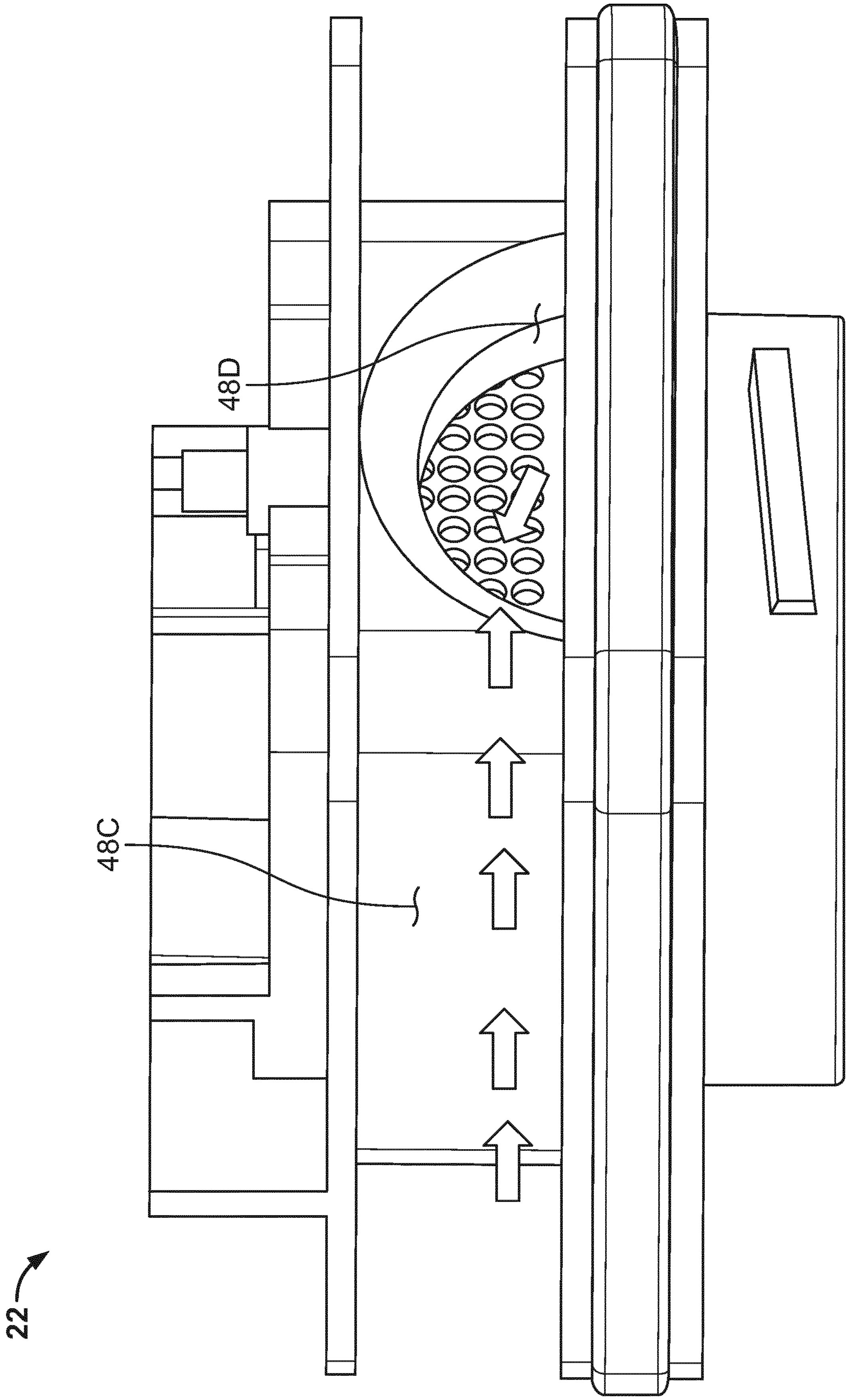
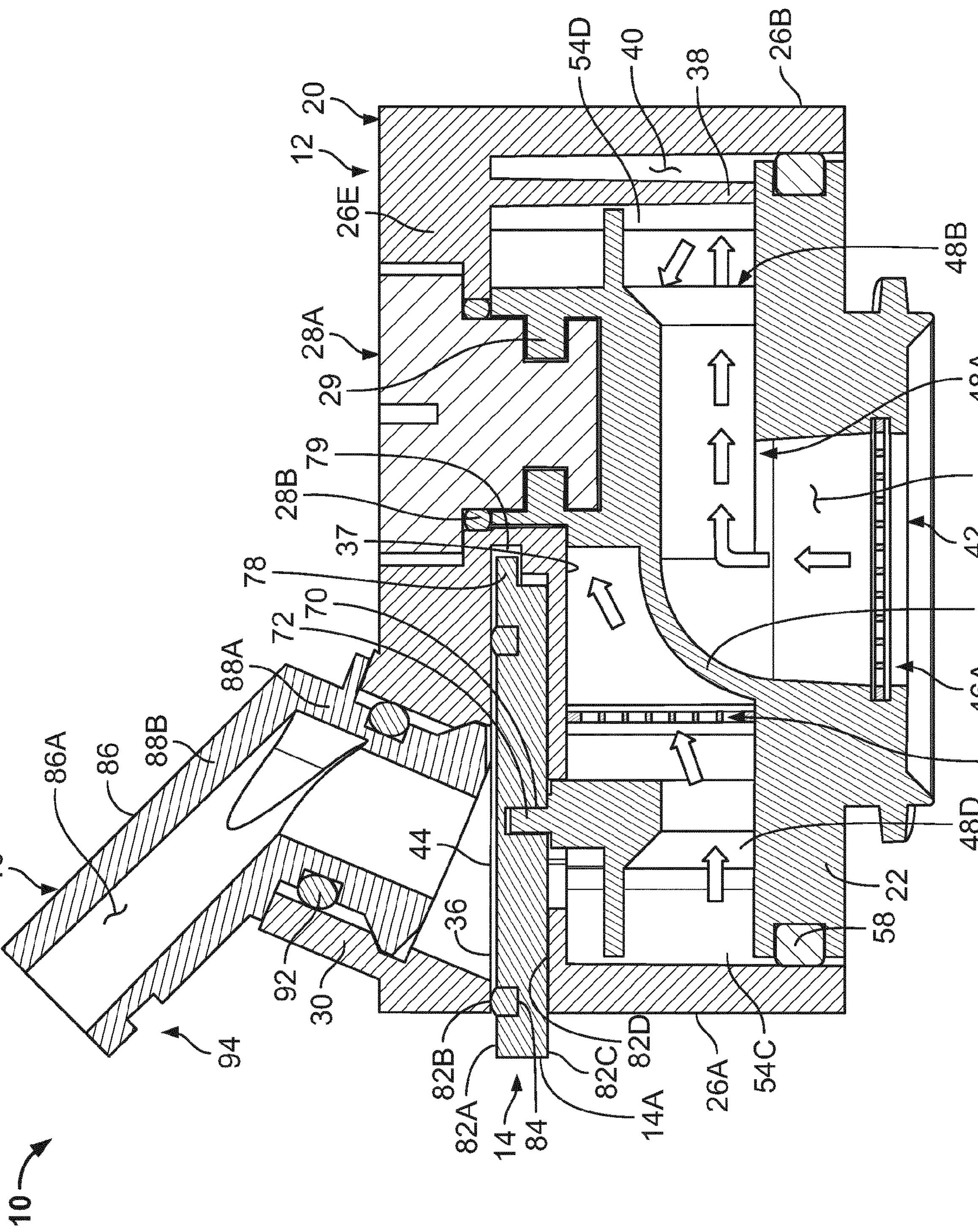



FIG. 9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38
26B
48B
48A
18
42
49
46A
46B
48D
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82B
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44
30
92
94

FIG. 10

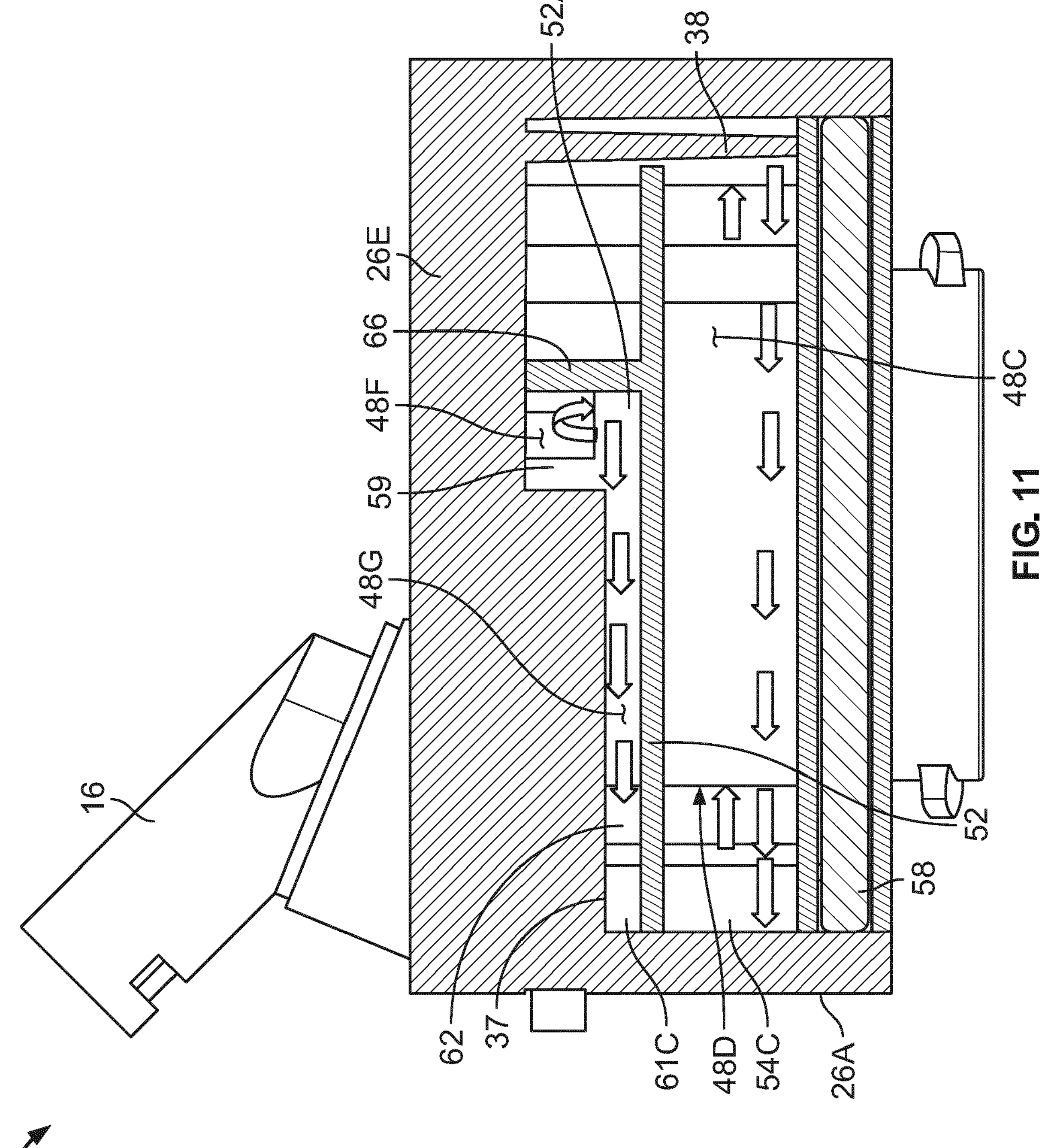



FIG. 11

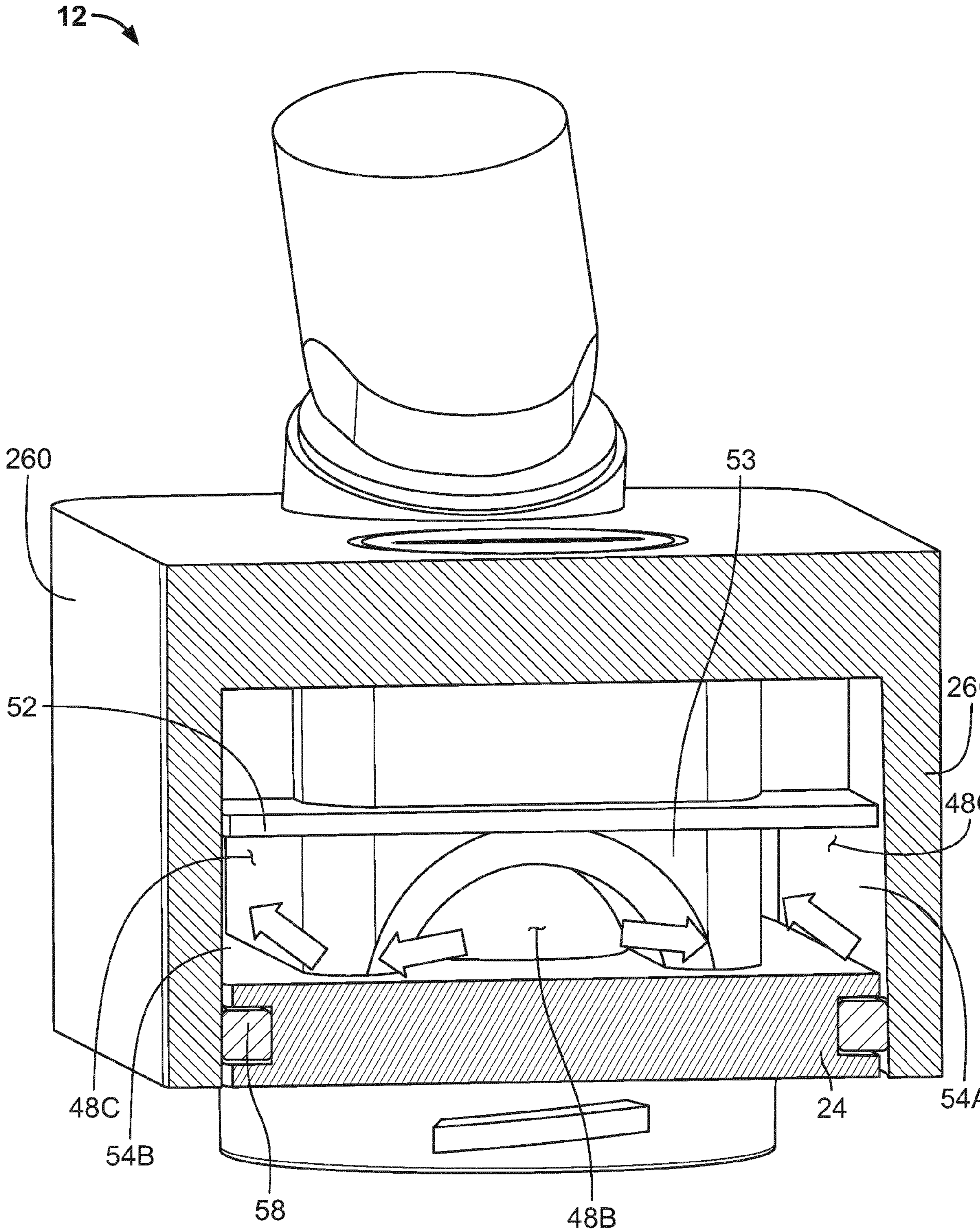



FIG. 12

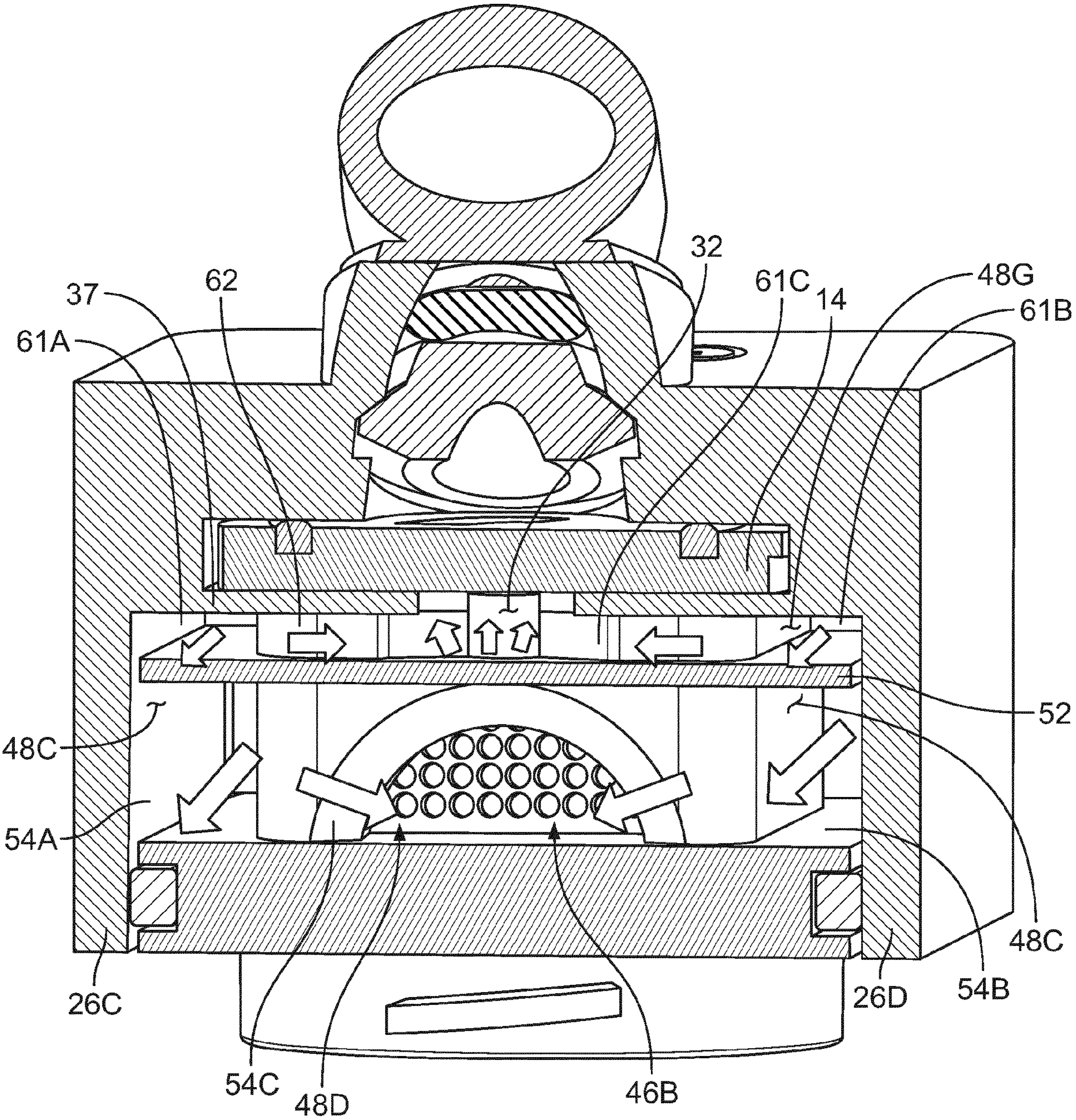
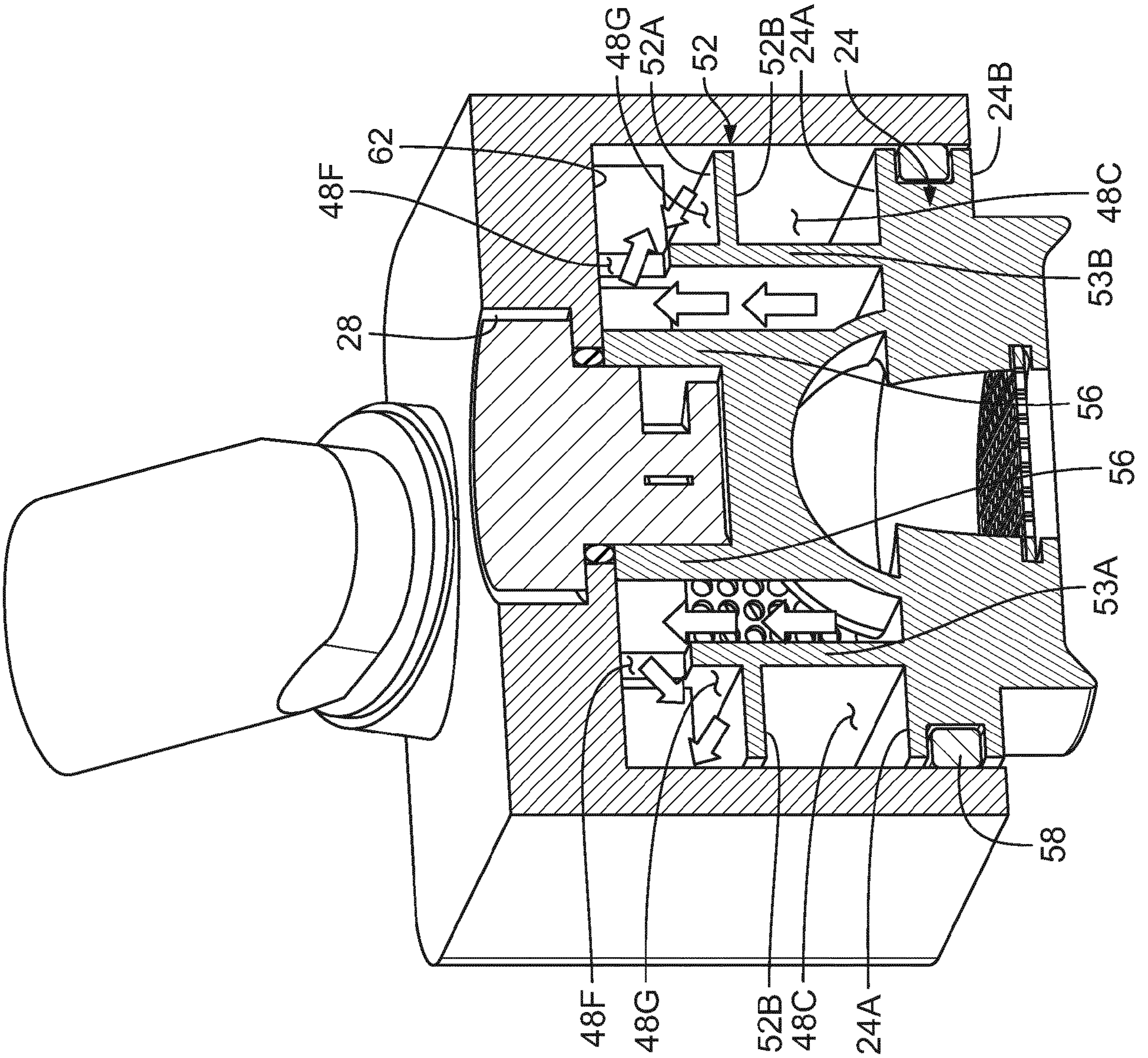



FIG. 13


48G
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52B
24A
24
24B
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48F
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48C
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56
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53A
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52B
48C
24A

FIG. 14

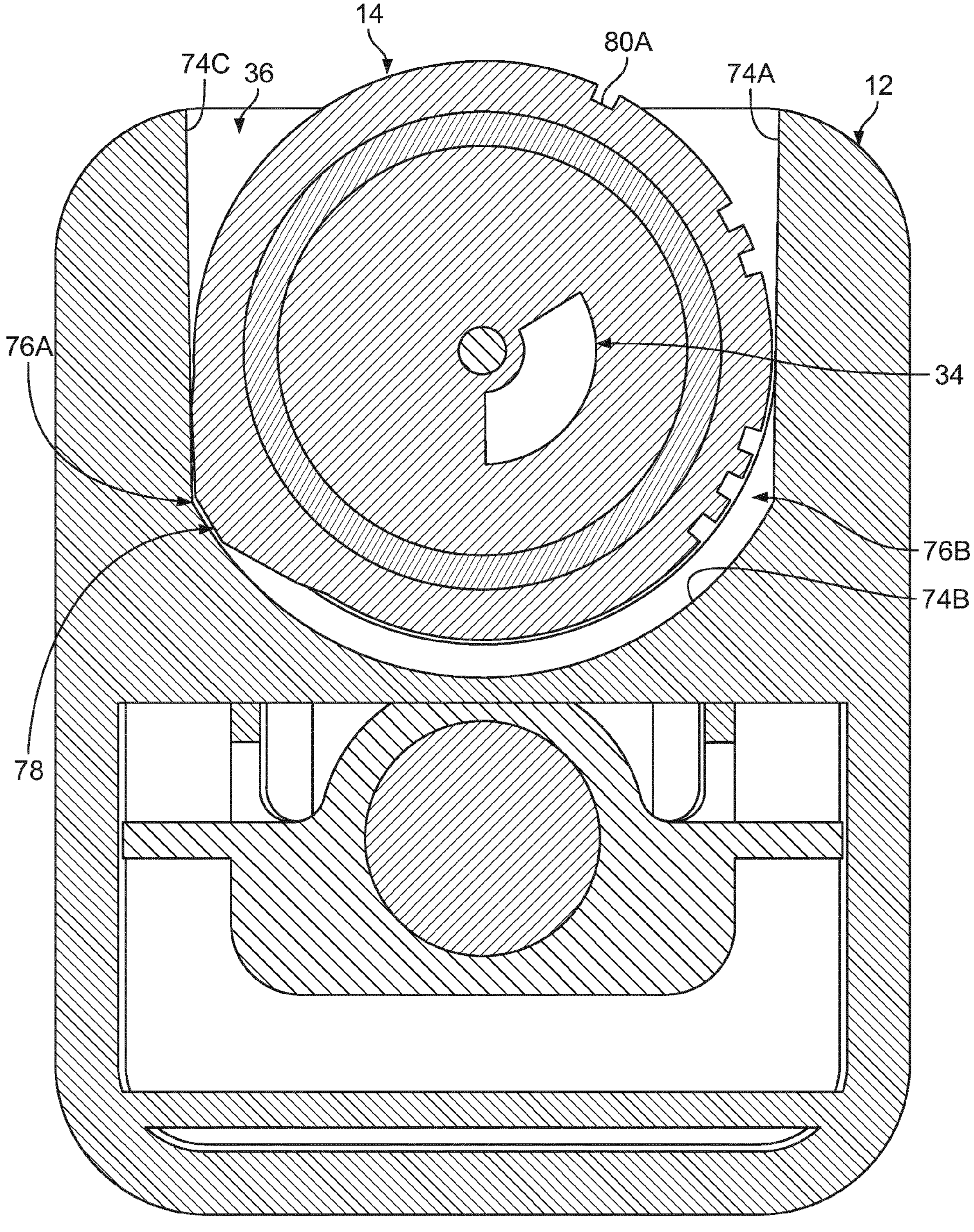


FIG. 15A

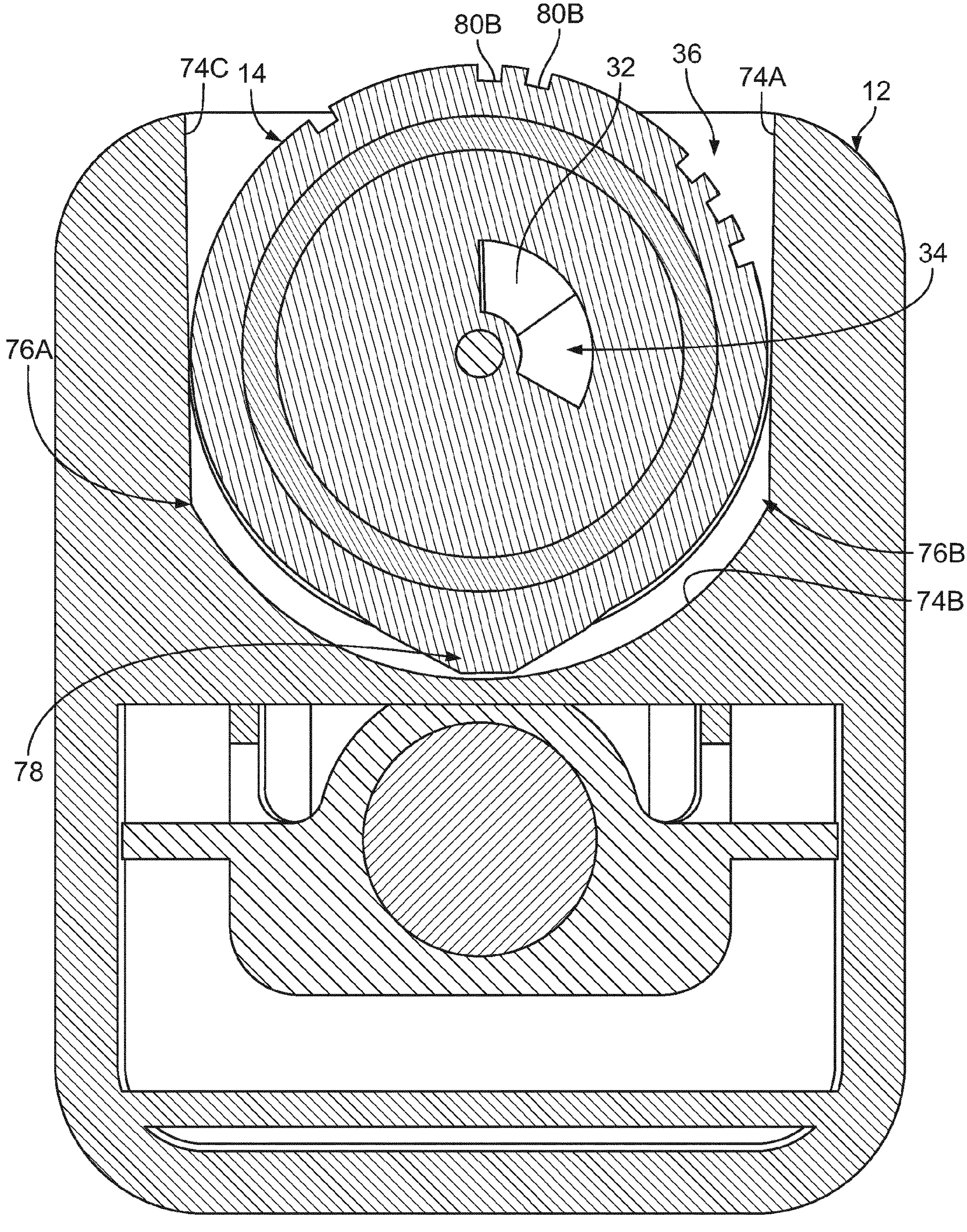


FIG. 15B

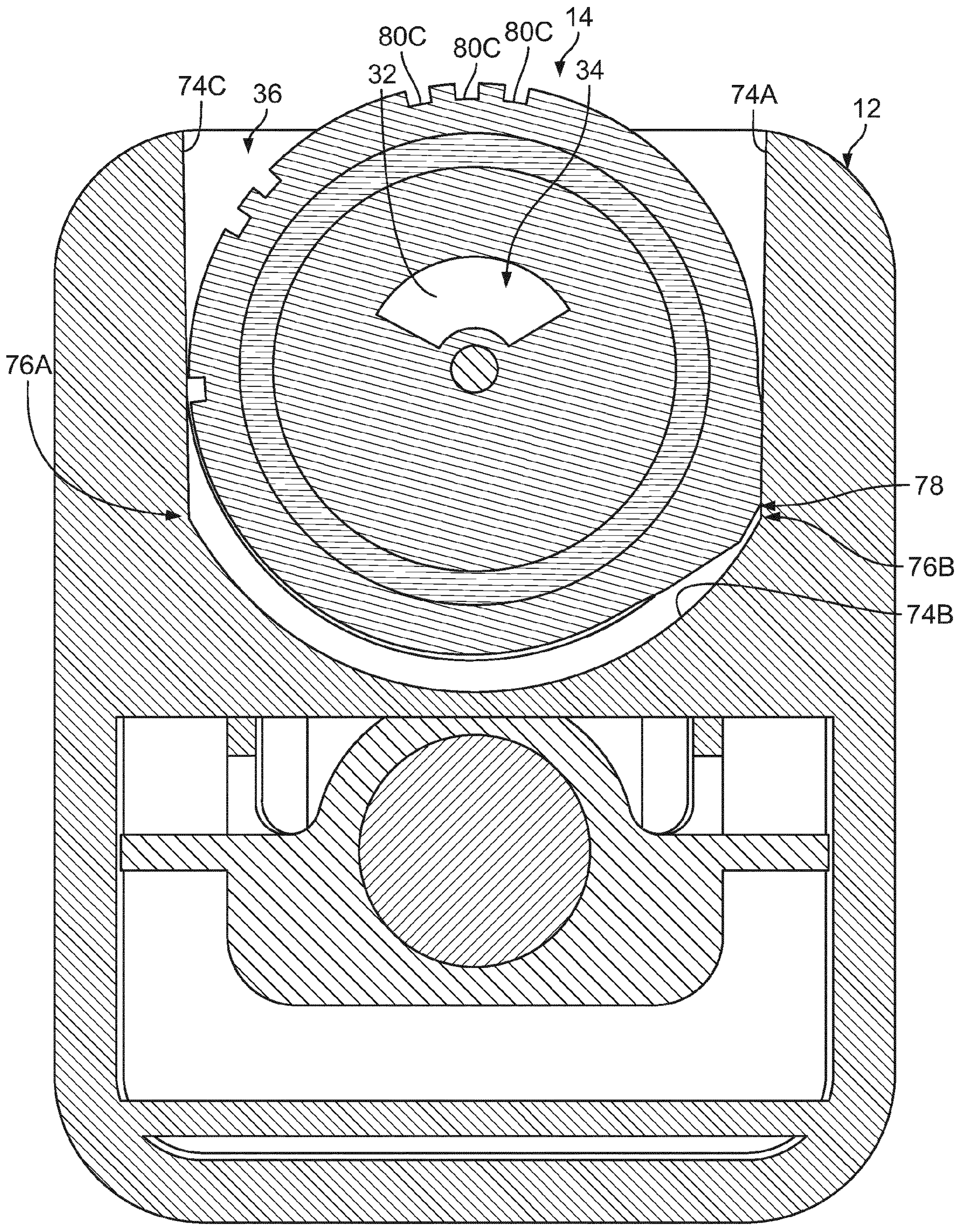


FIG. 15C

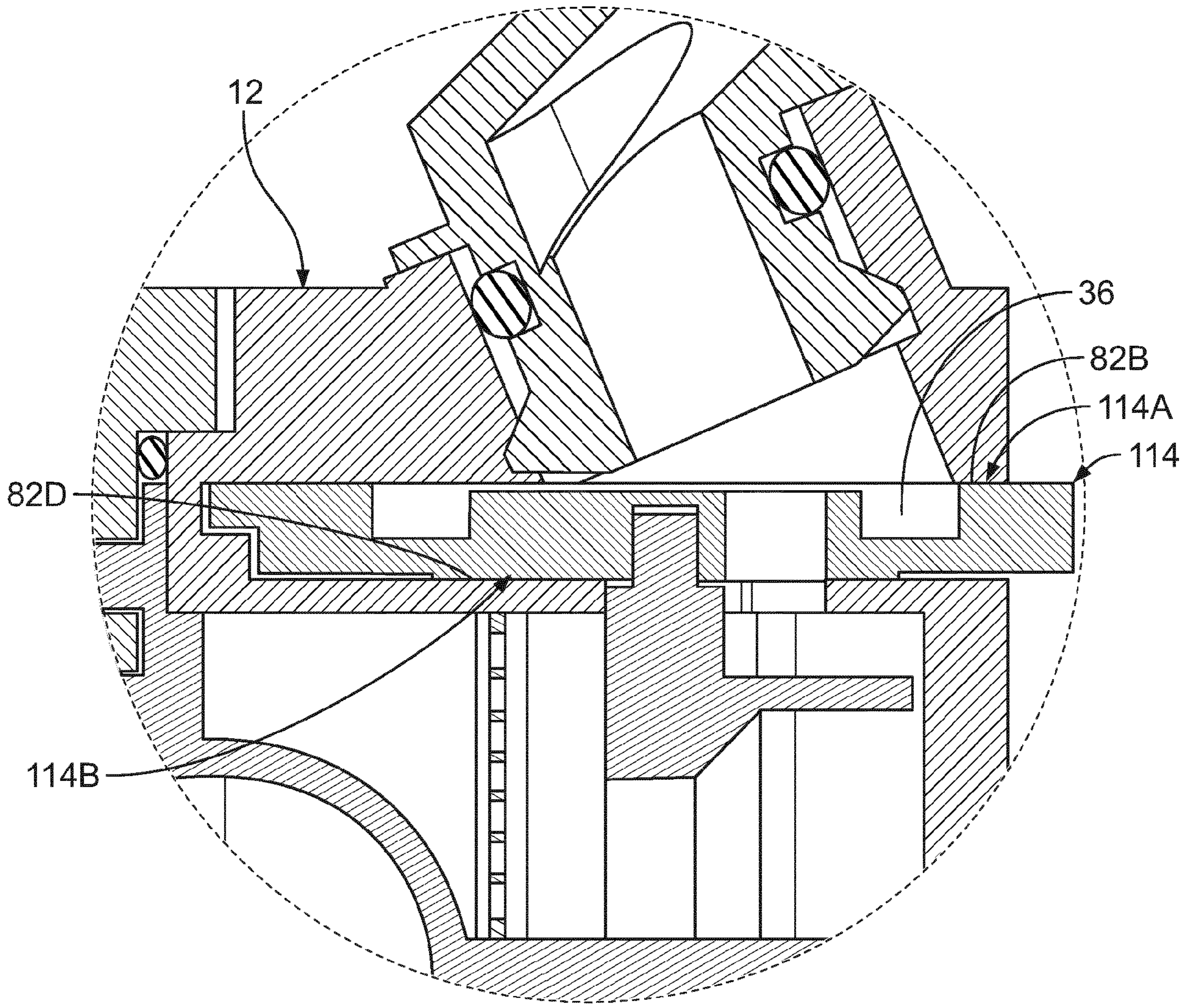


FIG. 16

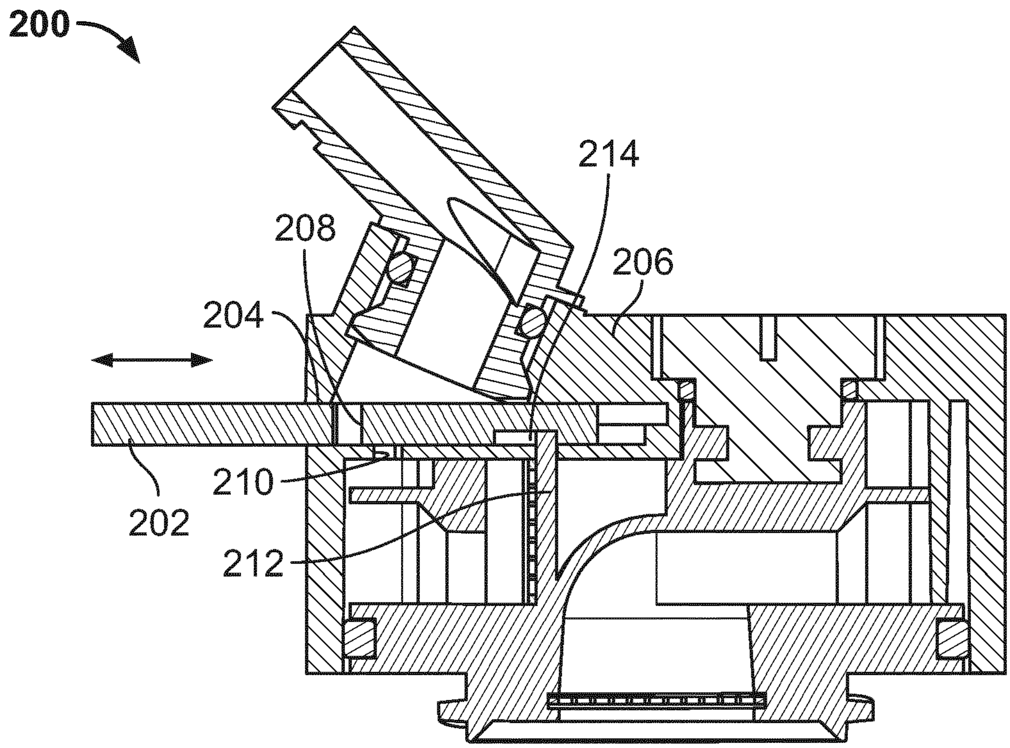


FIG. 17A

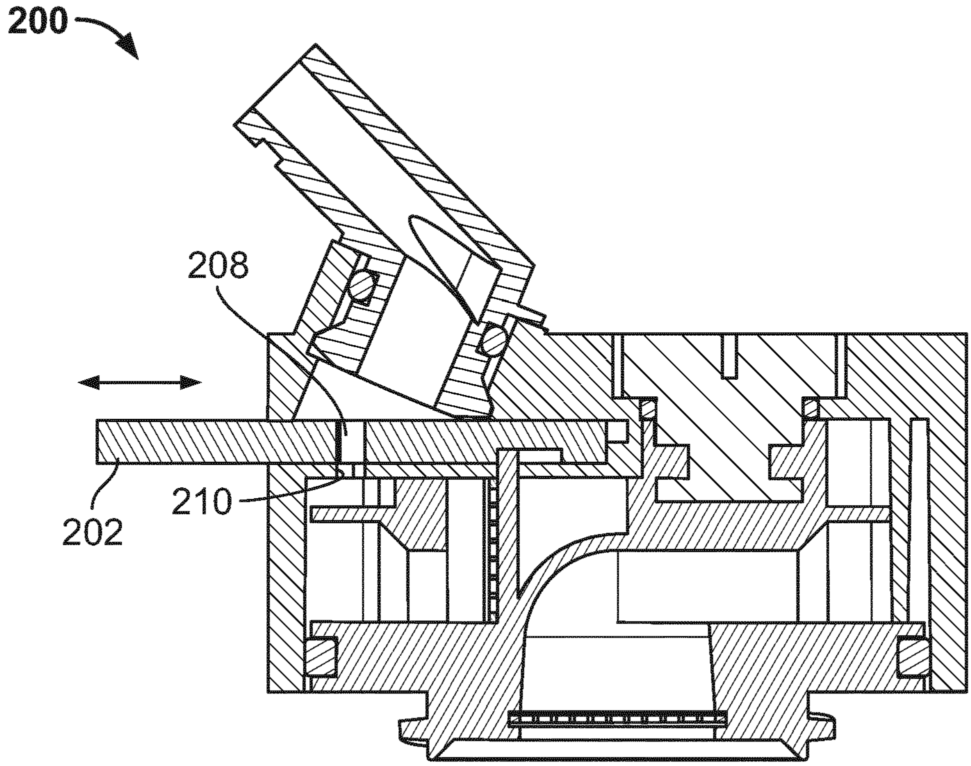


FIG. 17B

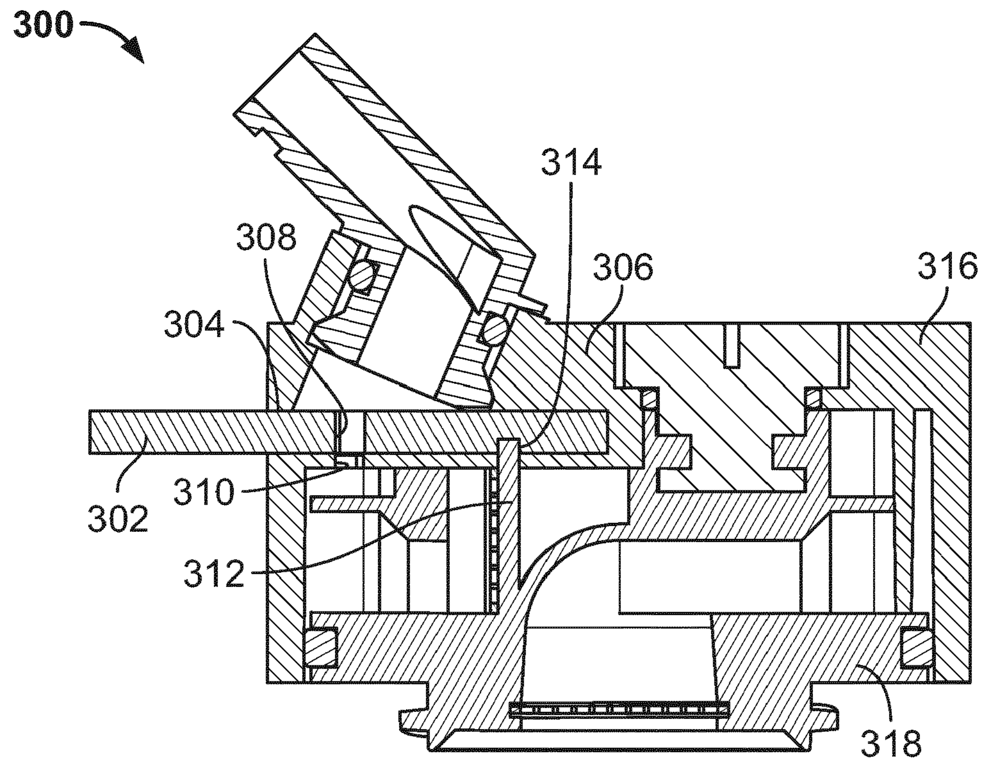


FIG. 18

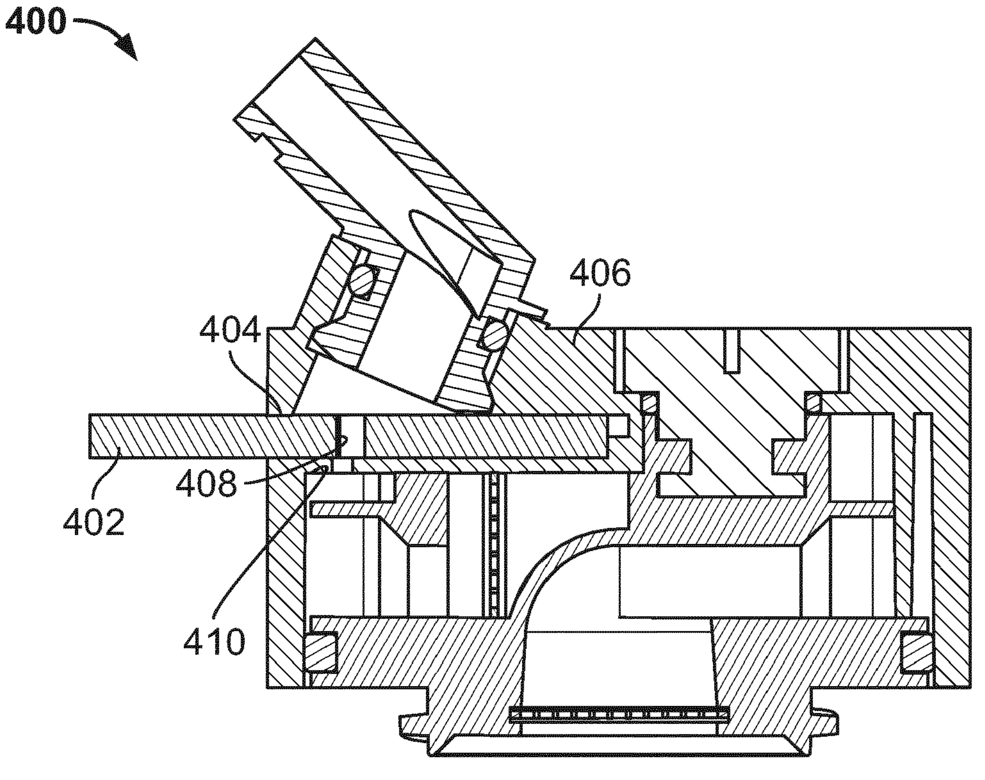


FIG. 19

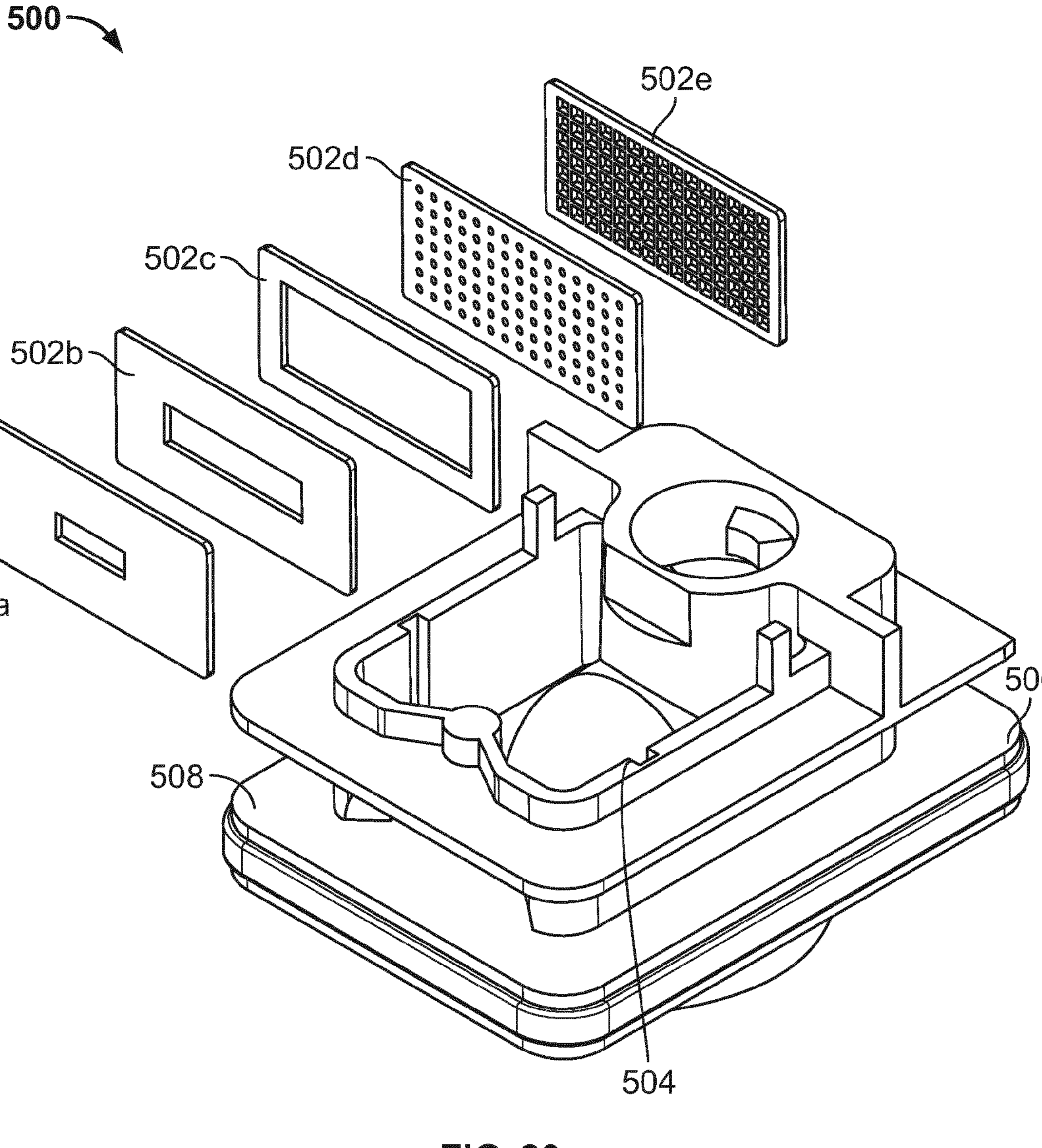


FIG. 20

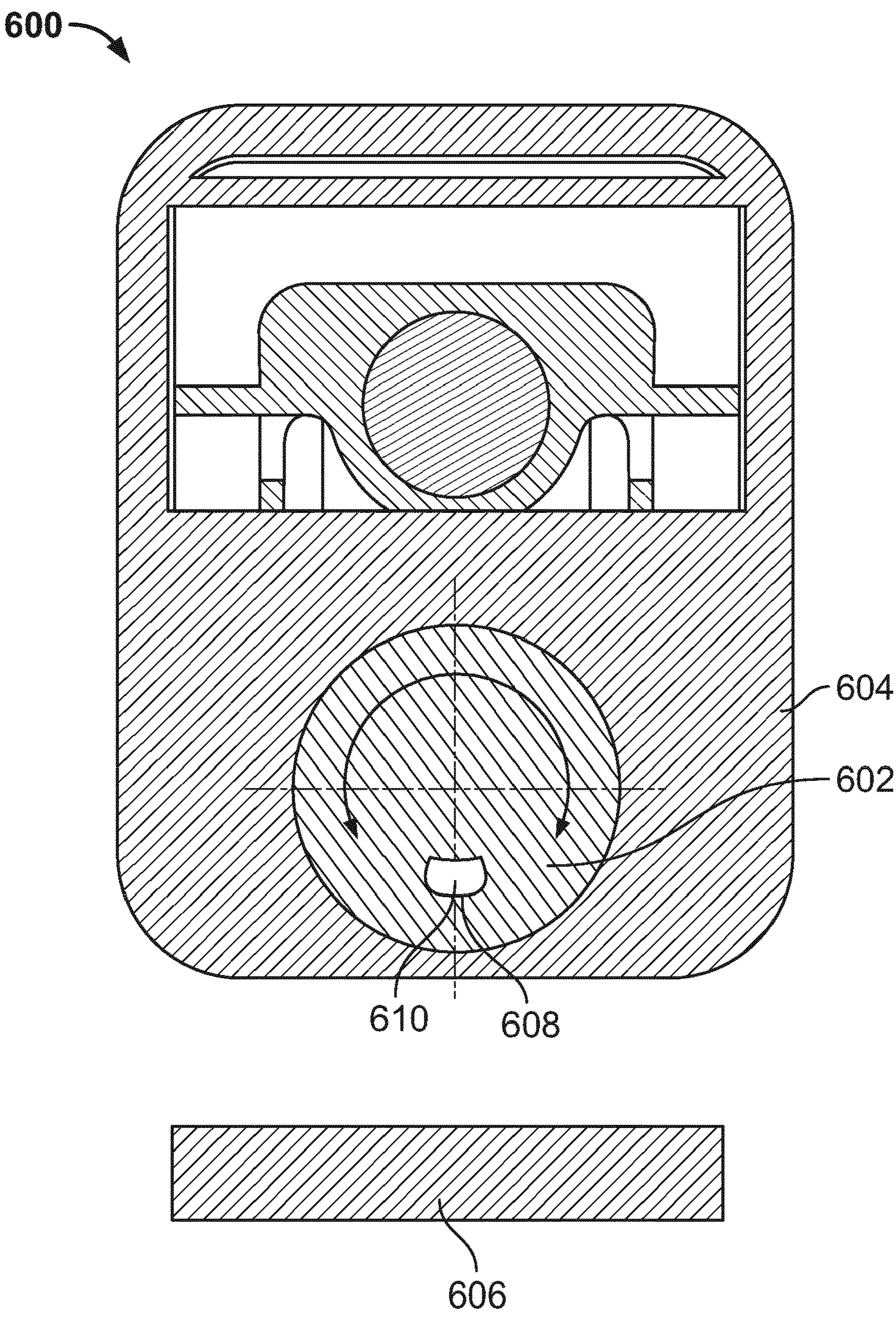


FIG. 21

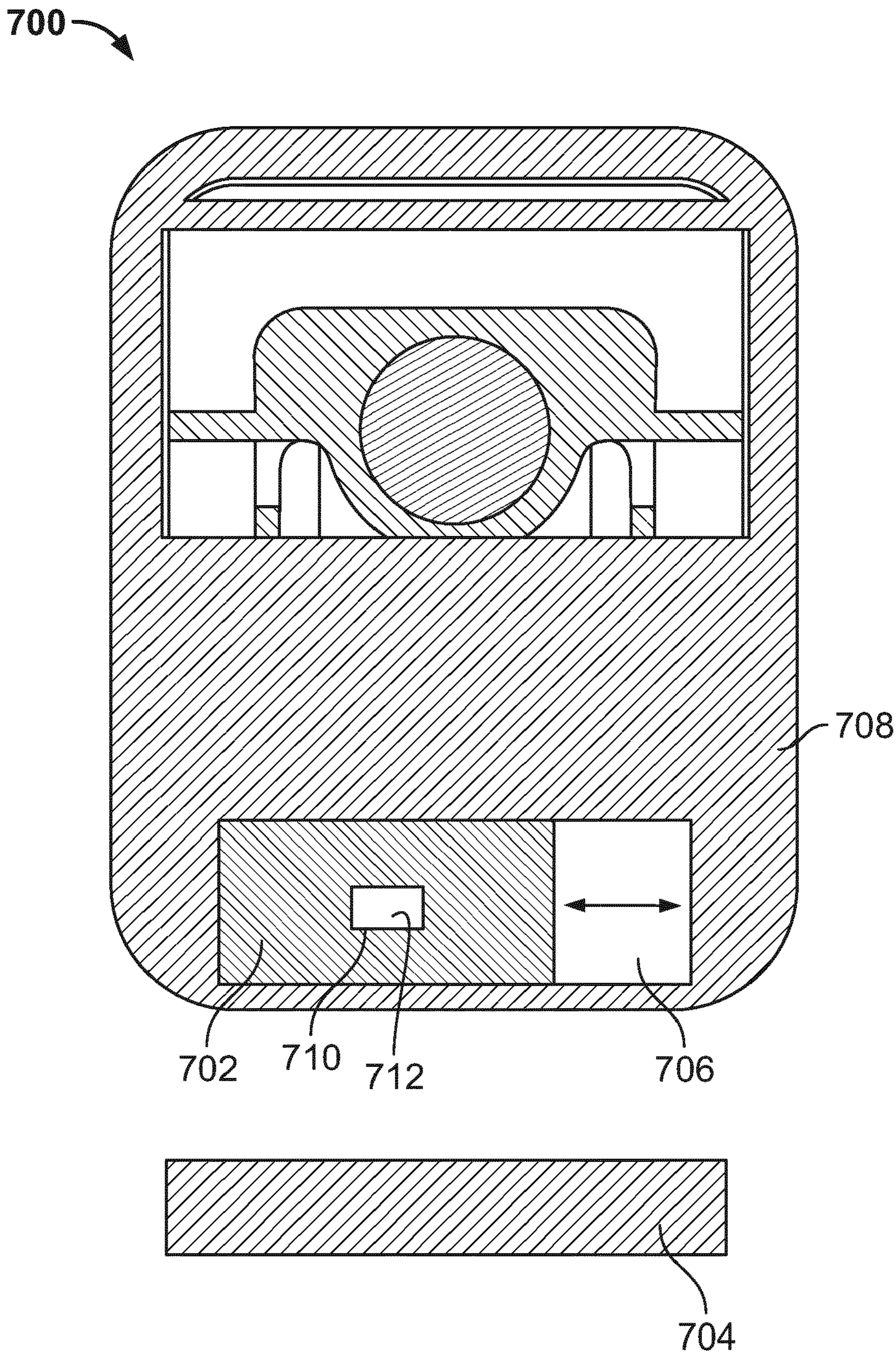


FIG. 22

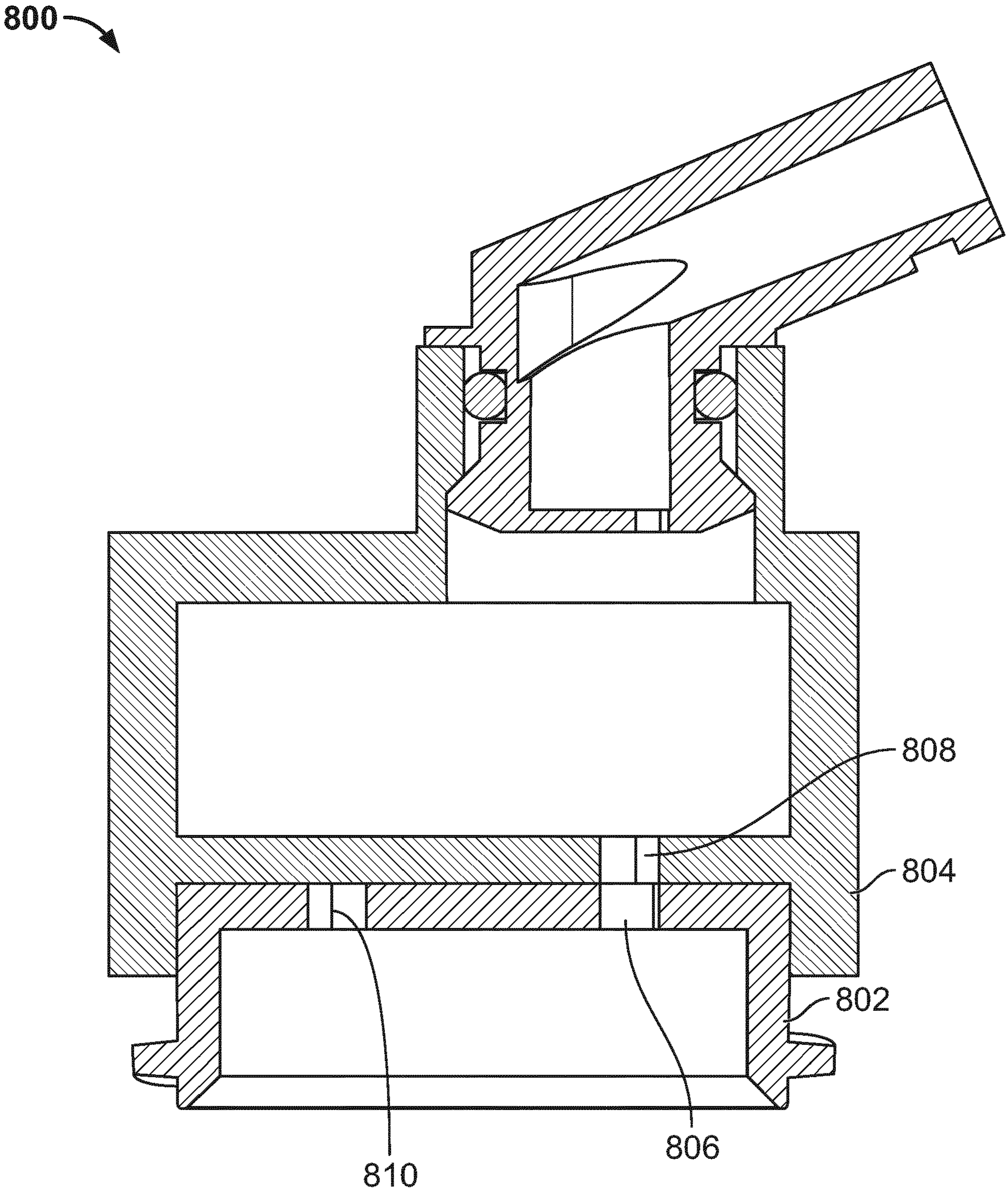


FIG. 23

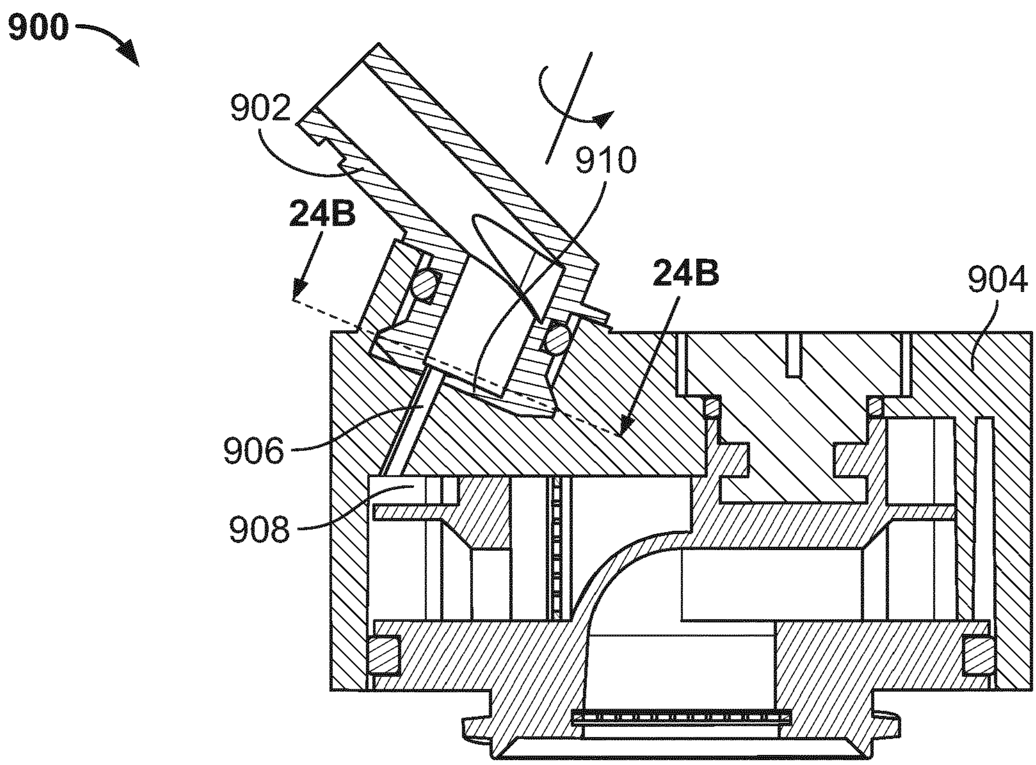


FIG. 24A

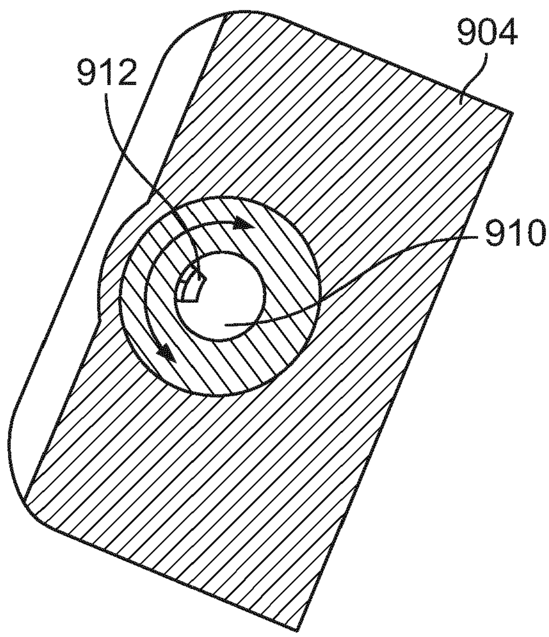


FIG. 24B

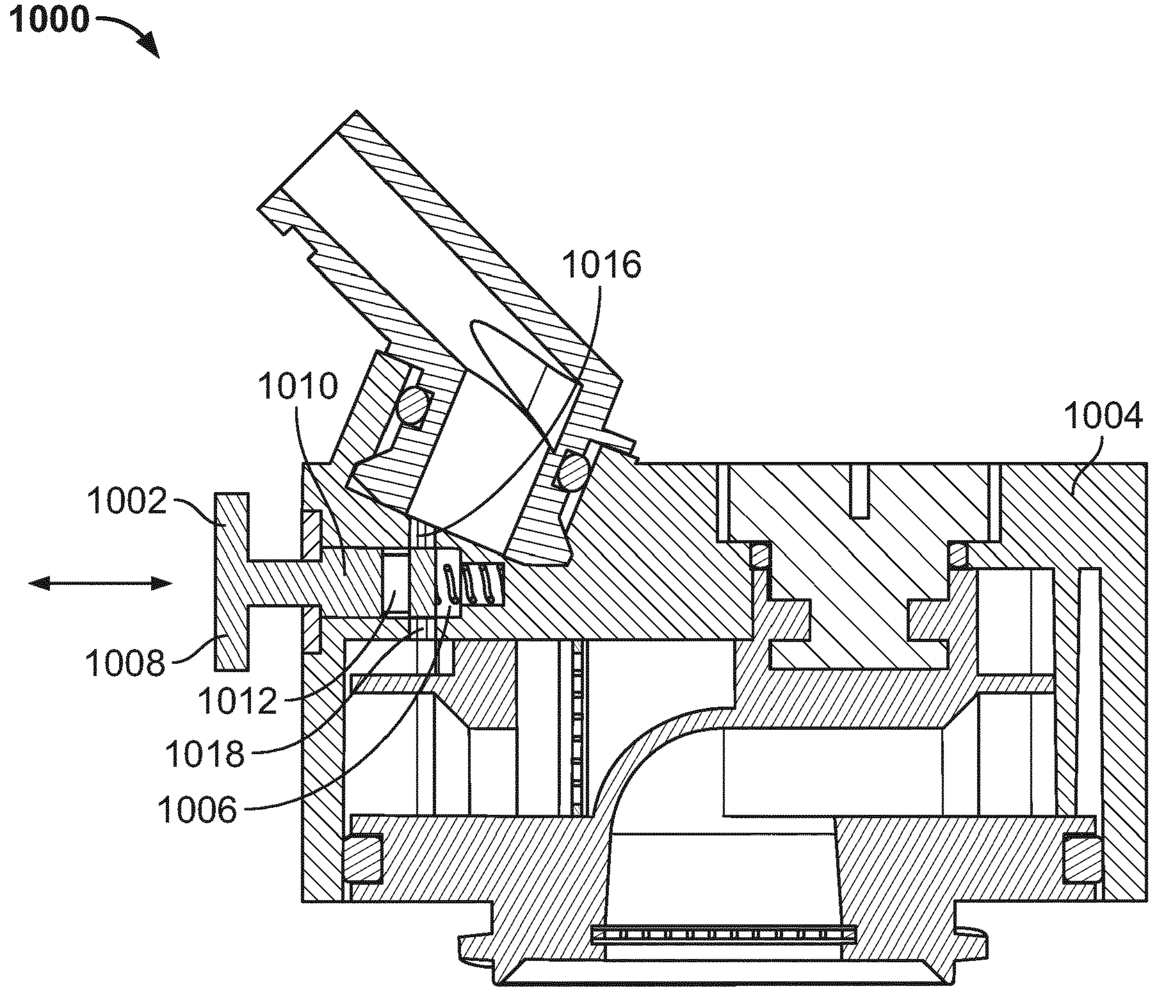


FIG. 25

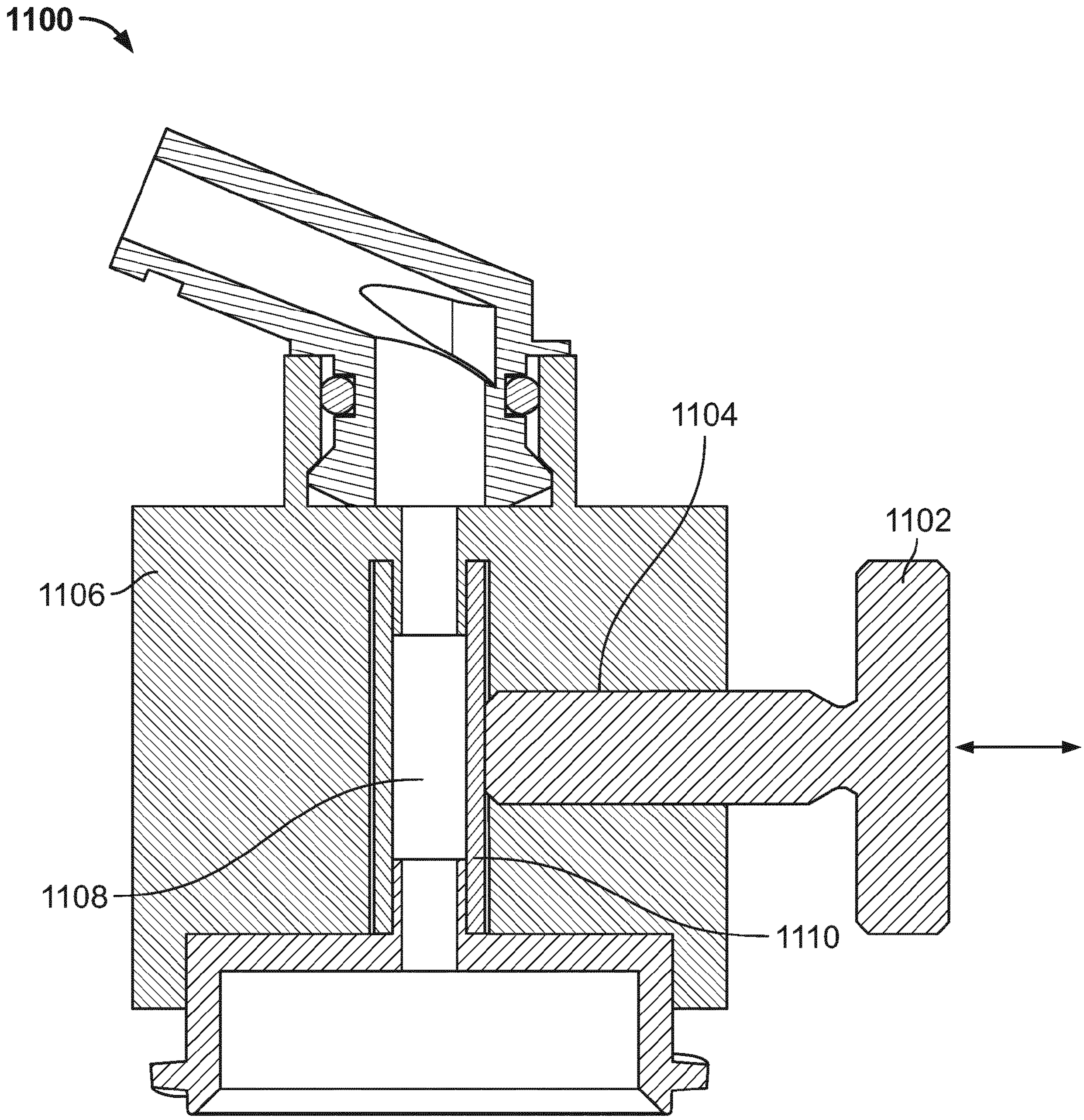


FIG. 26

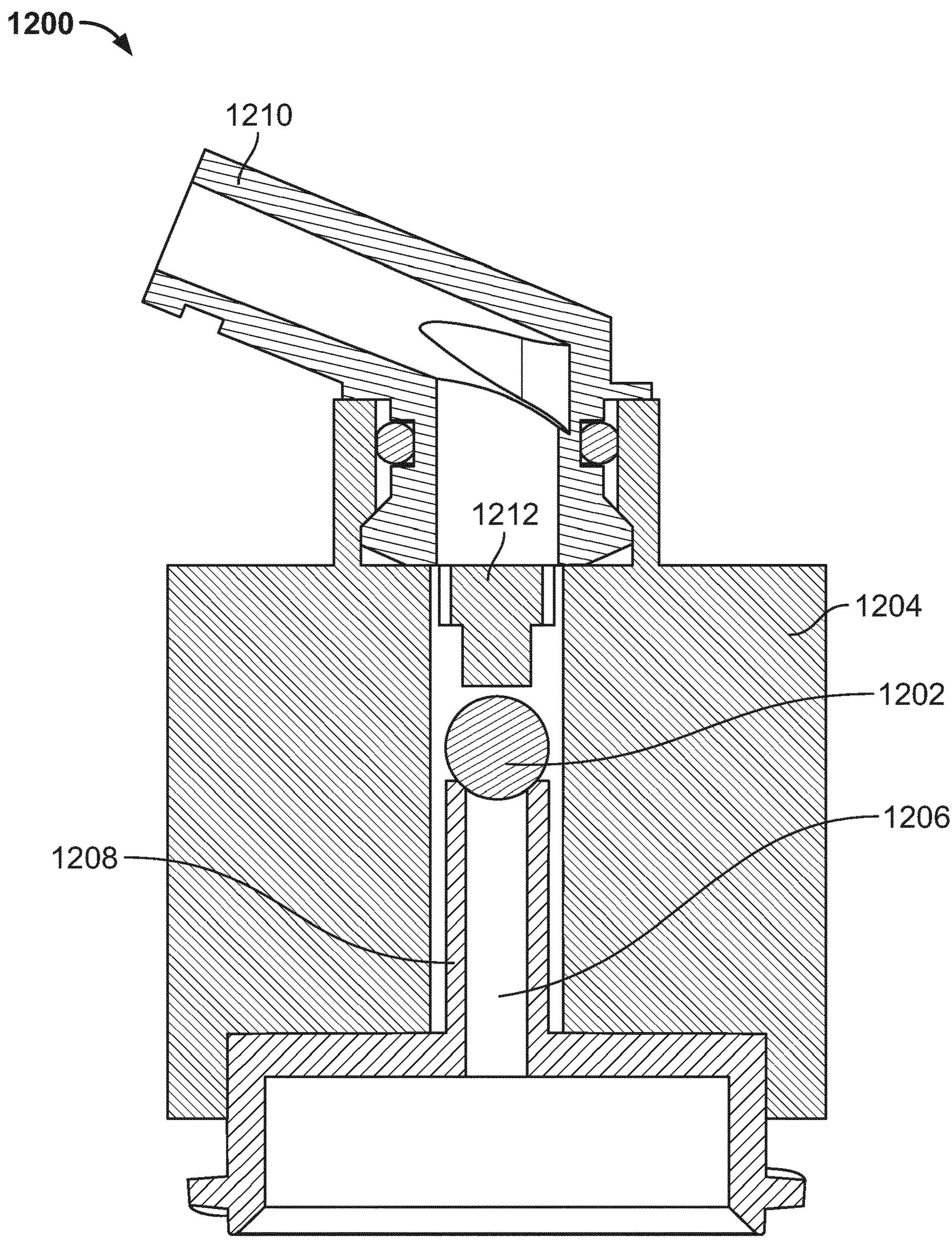


FIG. 27

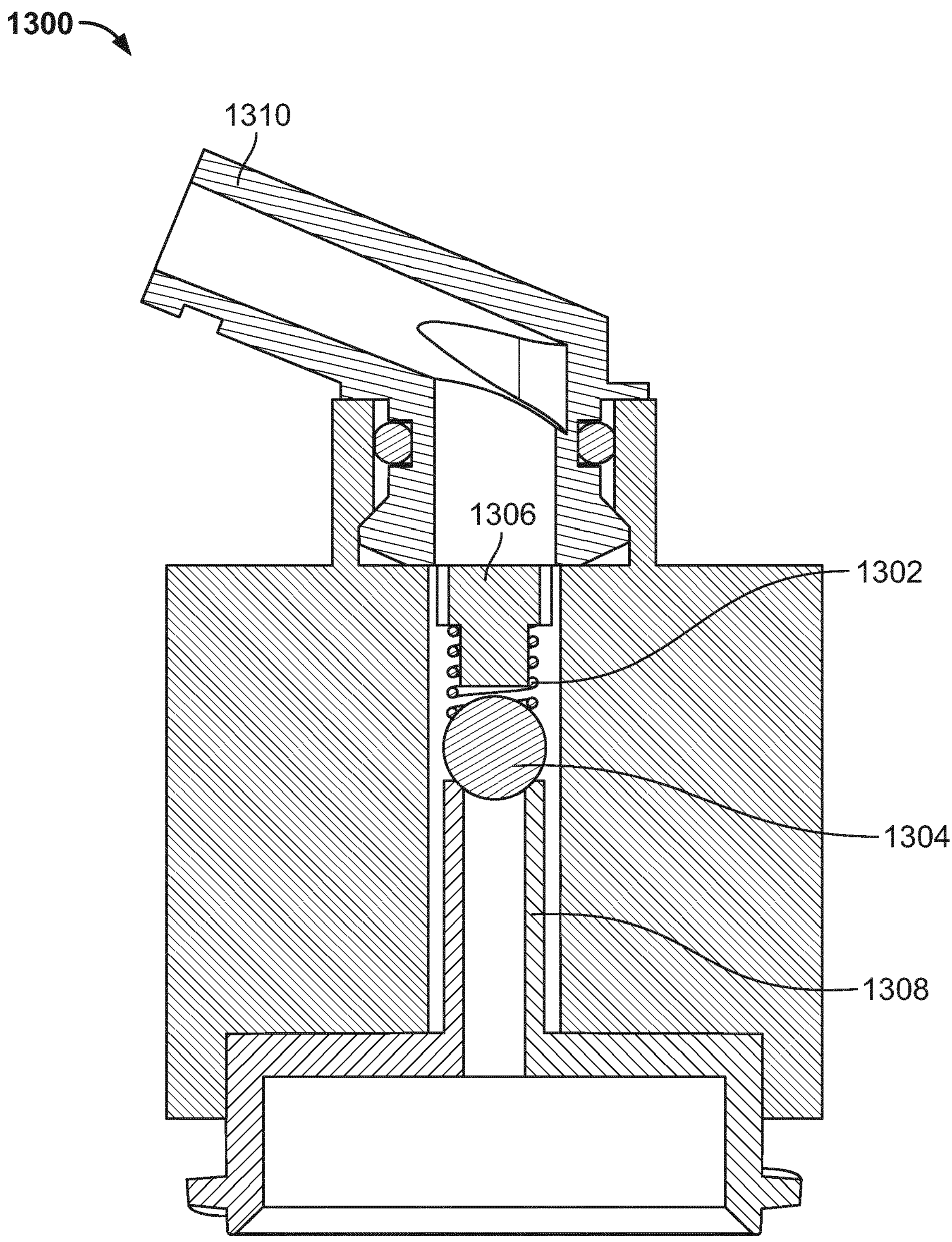


FIG. 28

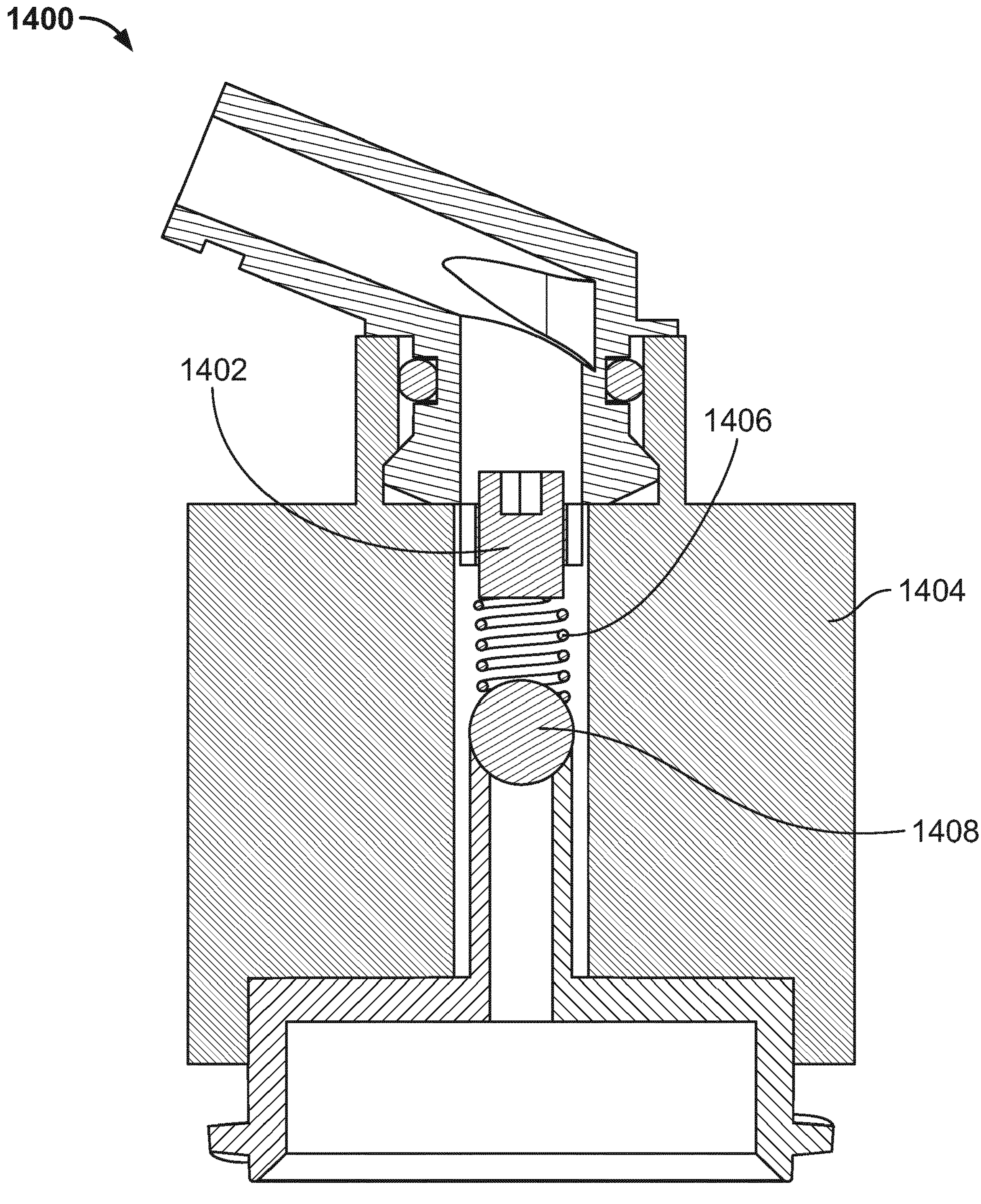


FIG. 29

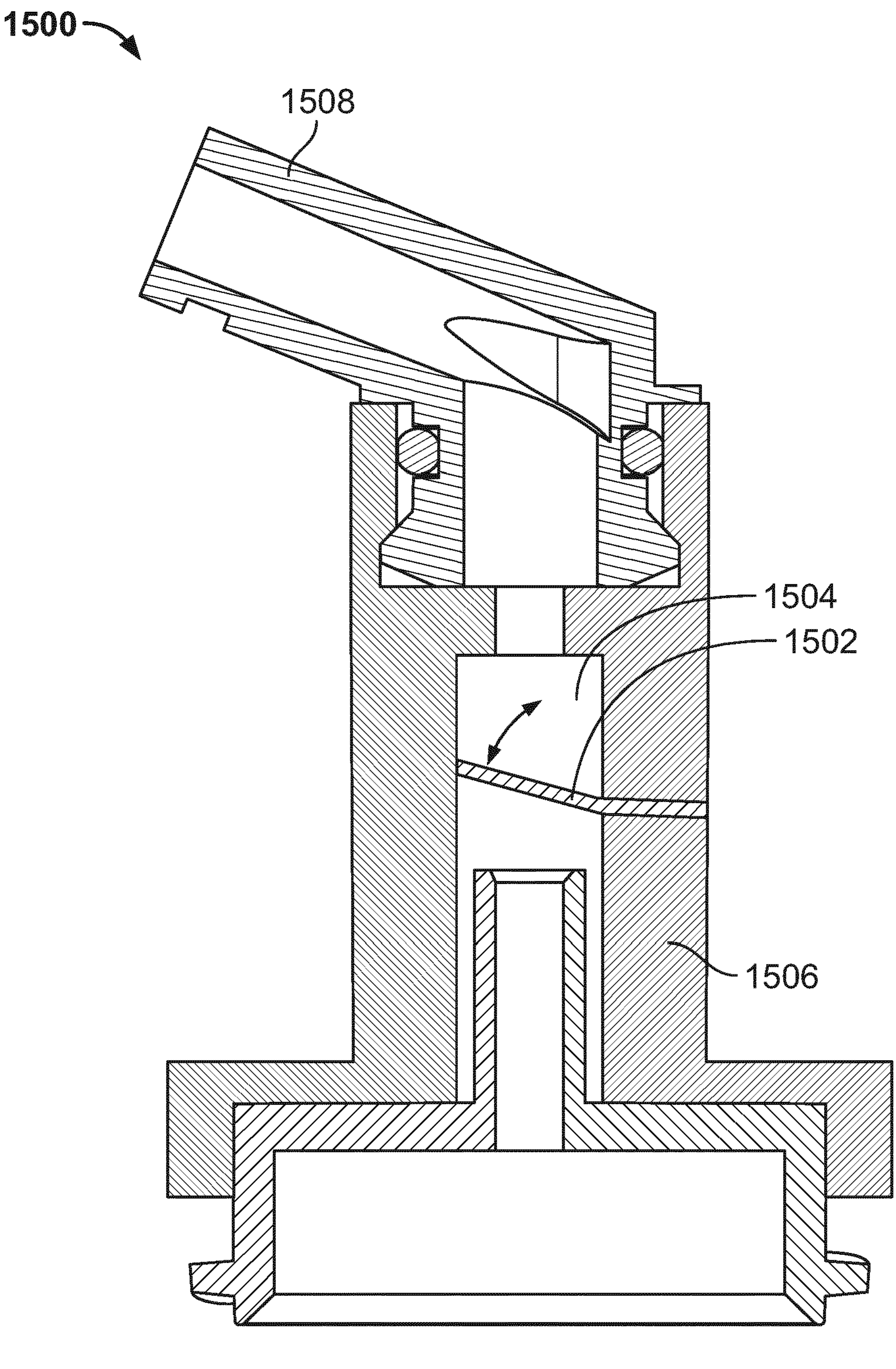


FIG. 30

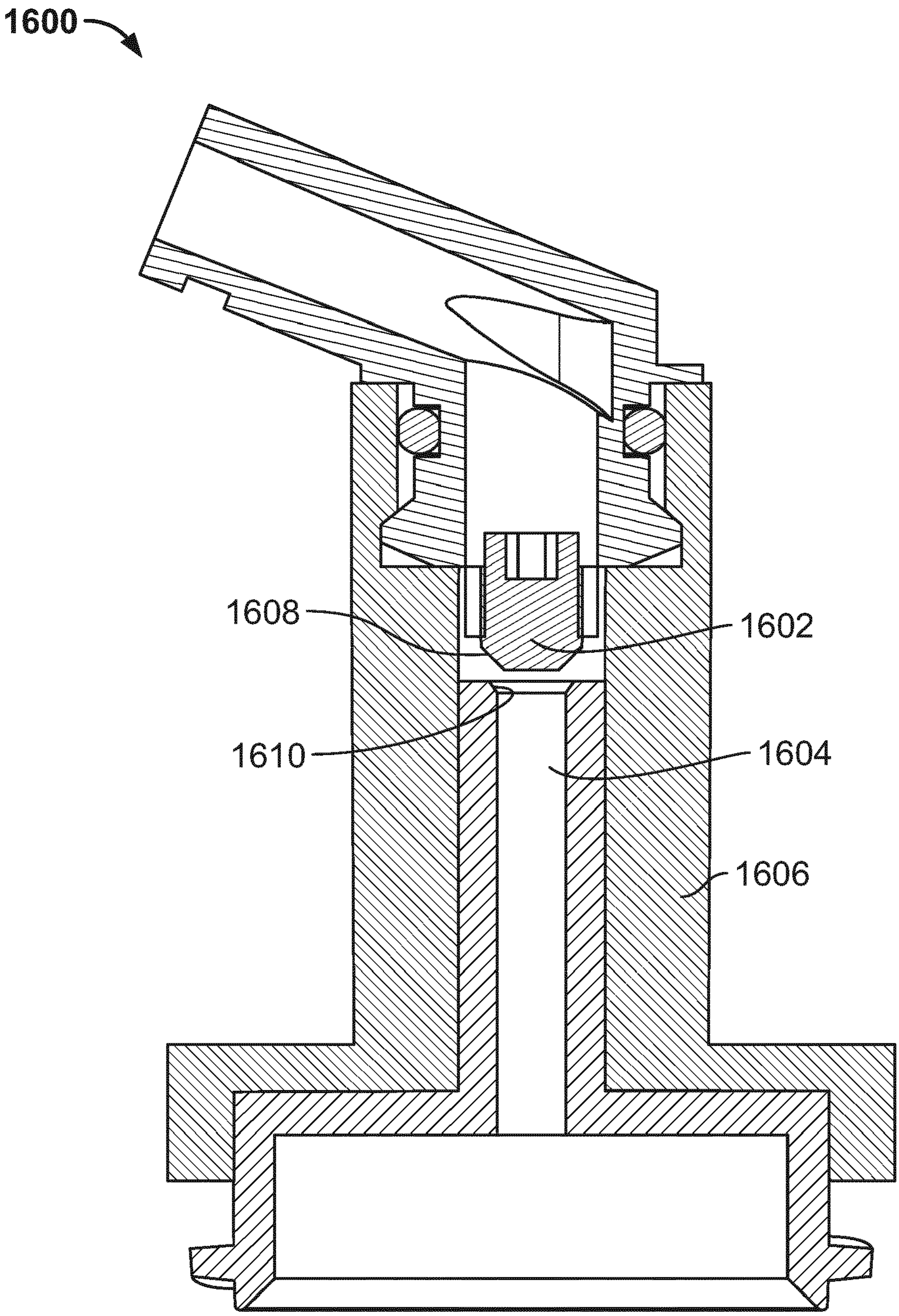


FIG. 31A

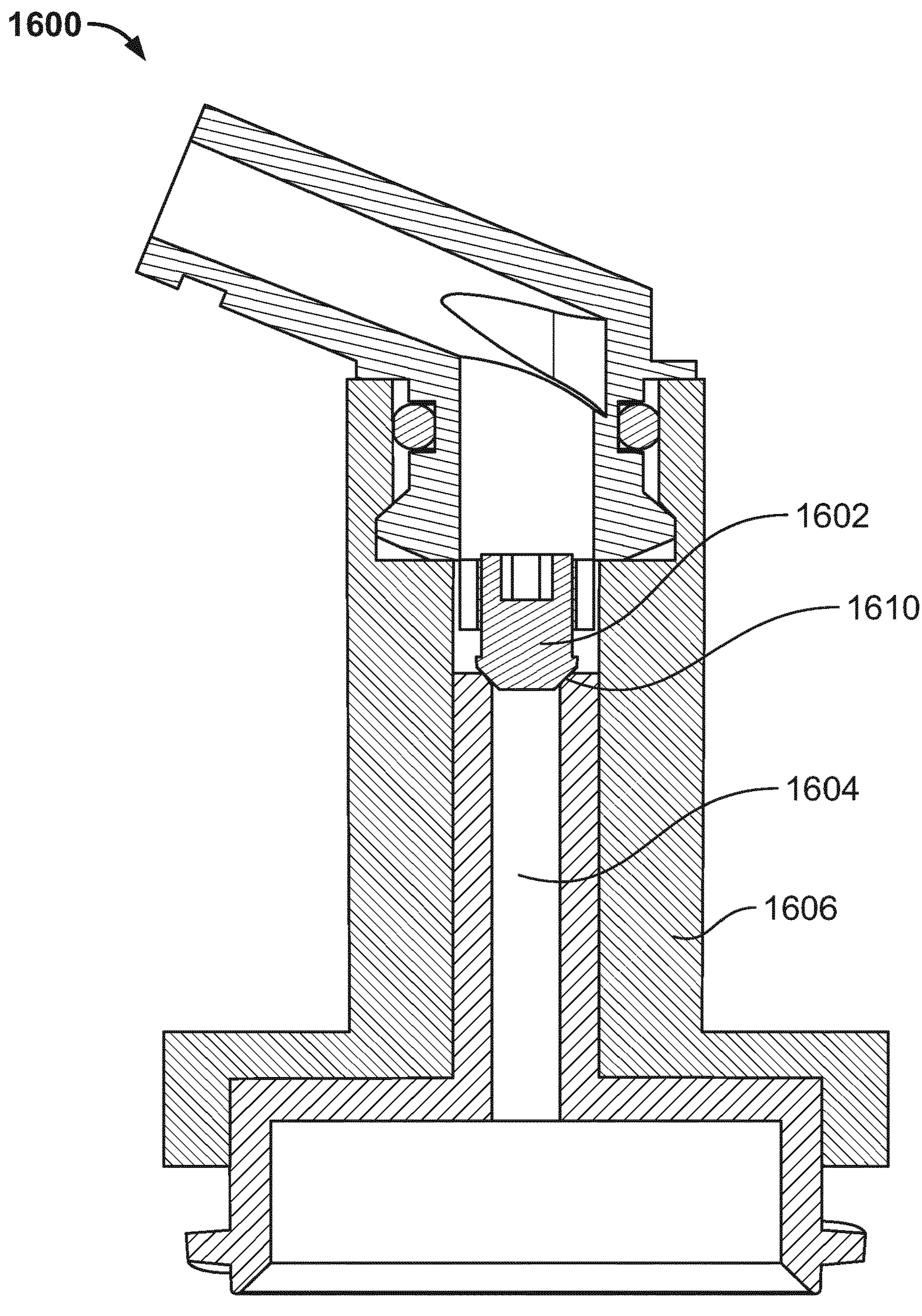


FIG. 31B

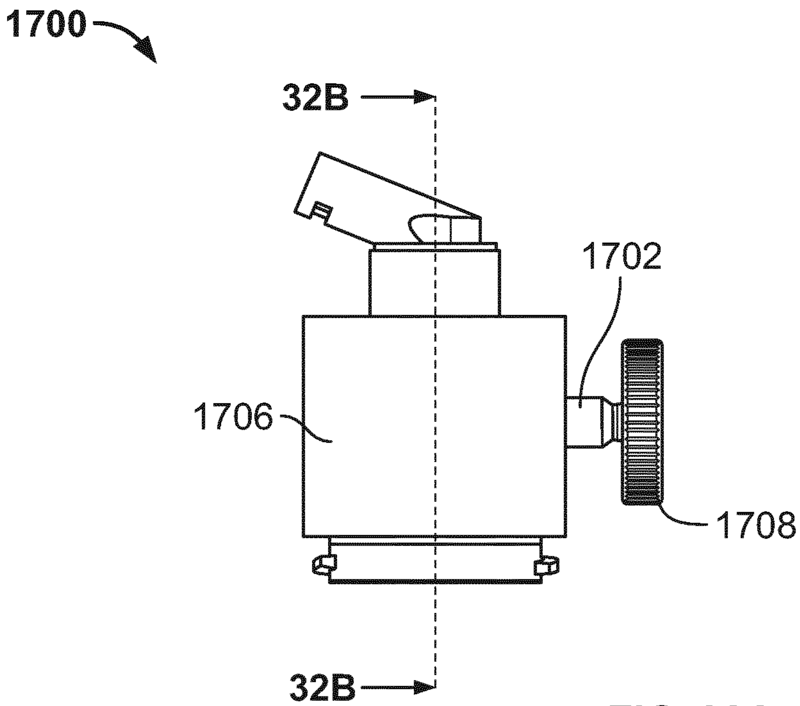


FIG. 32A

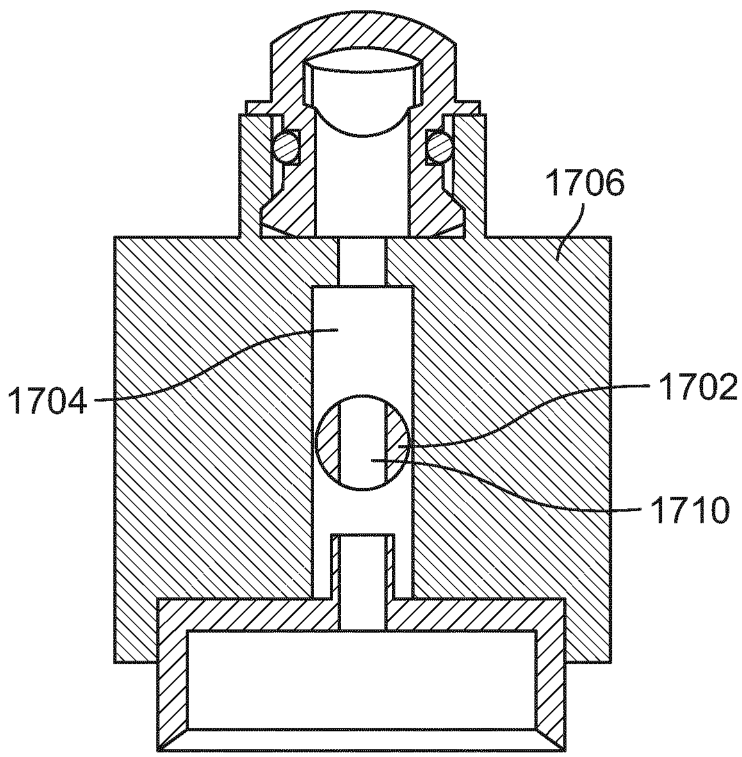


FIG. 32B

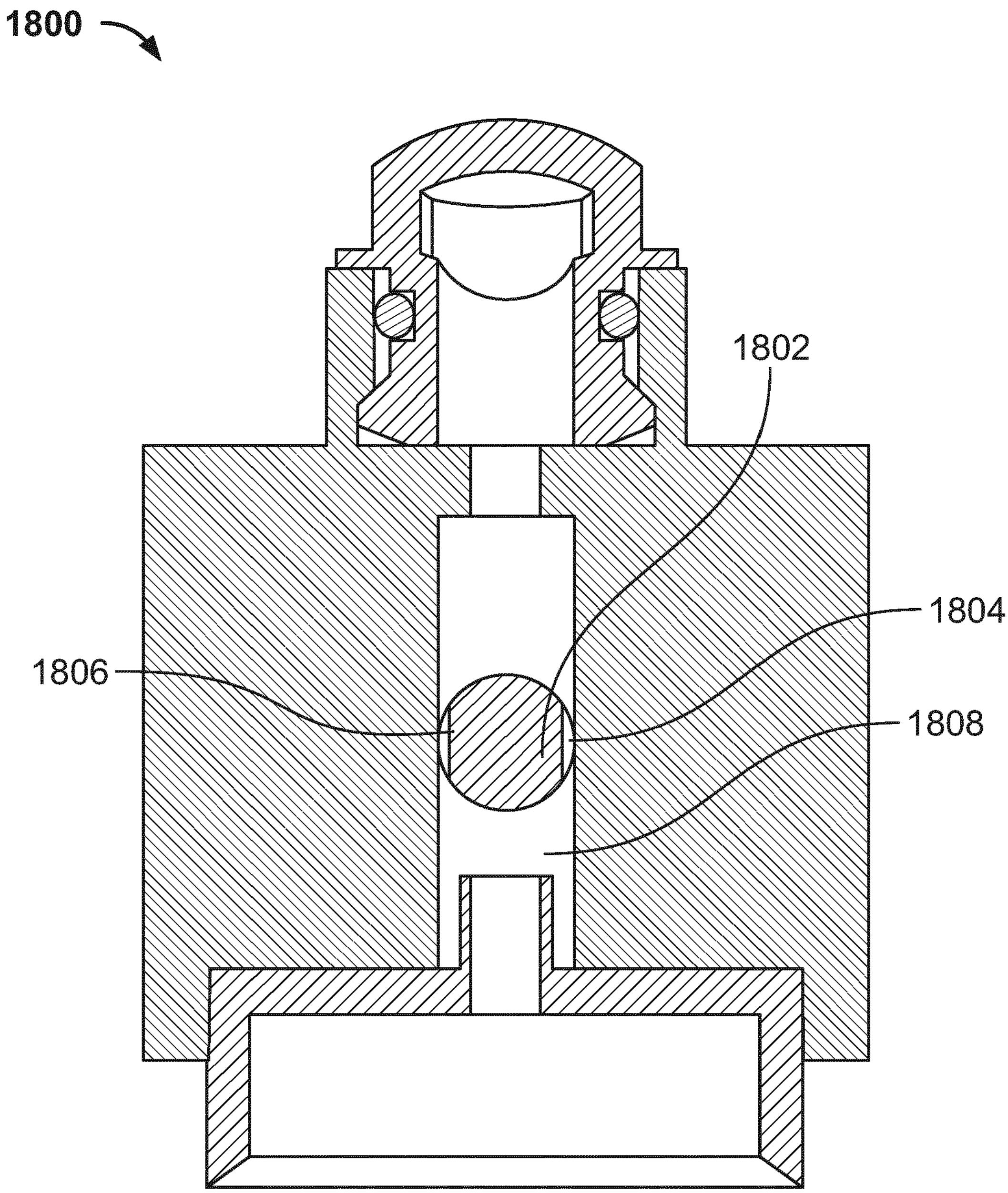


FIG. 33

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# EUROPEAN SEARCH REPORT

Application Number
EP 23 20 2588

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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| X | US 2018/256834 A1 (HEPWORTH RICHARD [GB] ET AL) 13 September 2018 (2018-09-13) | 1-5 | INV. A24F40/485 A24F40/57 |
| Y | * paragraphs [0002], [0007] - [0013], [0043] - [0054]; figures 1-5 * | 6,7 | |
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| A | * paragraphs [0010] - [0011], [0067] - [0070], [0093] - [0097], [0103] - [0105]; figures 1,3-5 * | 4,6,7 | |
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A24F

The present search report has been drawn up for all claims

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| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 10 May 2024 | Kock, Søren |

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