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(54) DIAPHRAGM METERING PUMP HAVING A DEGASSING SYSTEM

MEMBRANDOSIERPUMPE MIT EINEM ENTGASUNGSSYSTEM

POMPE DOSEUSE À MEMBRANE AVEC SYSTÈME DE DÉGAZAGE

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Description

BACKGROUND OF THE INVENTION

[0001] Exemplary embodiments pertain to the art of diaphragm metering pumps and, more particularly, to a diaphragm metering pump having a degassing system.

[0002] Diaphragm metering pumps generally draw in a fluid from a source to an inlet at a first pressure, and discharge the fluid through an outlet at a second pressure. Often times, gas entrained in the fluid, or developed as a consequence of pumping, may become trapped in a head portion of the pump causing a vapor lock condition. In such cases, fluid discharge may be reduced or even arrested. In order to alleviate vapor lock, many diaphragm metering pumps include a bleed valve that is manually or automatically activated to allow trapped gas to escape. In some cases, the trapped gas is discharged to ambient. In other cases, the trapped gas, along with a portion of discharged fluid, is passed back to the source through a piping system.

[0003] US2004062662 A1 relates to a diaphragm metering pump suitable for metering an effervescent gas. The pump has a pump head with a product chamber having an inlet end with a one-way inlet valve and an outlet end with a one-way outlet valve. A displaceable diaphragm member defines a boundary of the product chamber. The diaphragm member is capable of being reciprocated to cause pumping displacements. A discharge side is disposed downstream from the outlet valve. A passageway is disposed in fluid communication between the discharge side and the product chamber. A valve is disposed in the passageway. The valve is opened intermittently to allow liquid to re-enter the product chamber in an amount effective to purge gas from the product chamber to prevent loss of prime.

[0004] DE2803470 A1 relates to a pump head that has a pumping chamber which can be linked to the suction or compression side via a pulsating lifting element. The lifting element is actuated electromagnetically and the travel is restricted. It will avoid the collection of gases in the pumping chamber. There is a solenoid valve and a pressure valve in the ventilating channel between the upper section of the pump chamber and the link for the return pipe to the reservoir.

[0005] DE3631984 relates to a dosing pump.

BRIEF DESCRIPTION OF THE INVENTION

[0006] Disclosed is a diaphragm metering pump including a pump body having a head portion including a suction side and a discharge side defining a flow path. A valve seat is arranged at the discharge side and a check valve is arranged at the valve seat. A degassing system includes a check valve actuator operatively connected to the check valve. The check valve actuator is selectively activated to unseat the check valve from the valve seat to allow gases trapped in the head portion to pass through

the discharge side.

[0007] Also disclosed is a method of degassing a diaphragm metering pump. The method includes drawing a liquid from a liquid source through a suction side of a diaphragm metering pump, passing the liquid from the suction side into a head portion of the diaphragm metering pump, guiding the liquid through a check valve from the head portion to a discharge side of the diaphragm metering pump, and initiating a check valve actuator to unseat the check valve allowing gases collected in the head portion to pass through the discharge portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The following descriptions should not be considered limiting in any way. With reference to the accompanying drawings, like elements are numbered alike:

FIG. 1 is a cross-sectional plan view of a diaphragm metering pump having a degassing system in accordance with an exemplary embodiment;

FIG. 2 is a cross-sectional plan view of the degassing system of FIG. 1;

FIG. 3 is a cross-sectional plan view of a degassing system in accordance with another aspect of an exemplary embodiment;

FIG. 4 is a cross-sectional plan view of a degassing system in accordance with still another aspect of an exemplary embodiment;

FIG. 5 is a cross-sectional plan view of a degassing system in accordance with yet another aspect of an exemplary embodiment;

FIG. 6 is a cross-sectional plan view of a degassing system in accordance with still yet another aspect of an exemplary embodiment; and

FIG. 7 is a cross-sectional plan view of a degassing system in accordance with yet still another aspect of the exemplary embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0009] A detailed description of one or more embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures.

[0010] A diaphragm metering pump in accordance with an exemplary embodiment is illustrated generally at 2 in FIG. 1. Diaphragm metering pump 2 includes a pump body 4 having an actuator portion 6 and a head portion 8. Actuator portion 6 includes a rotating shaft 10 coupled to an eccentric mechanism 12. Eccentric mechanism 12 is coupled to a connecting rod 14 that connects with a pump diaphragm 16. Eccentric mechanism 12 and connecting rod 14 create a reciprocating motion at pump diaphragm 16 that leads to pressure changes within a pump chamber 20 carried by head portion 8. At this point it should be understood that the particular form of actuator portion 6 may vary. Pump chamber 20 includes a suction

side 23 and a pressure or discharge side 25. Suction side 23 is fluidically coupled to a fluid source 28. Discharge side 25 is fluidically coupled to a discharge flow path 30 that leads to a fluid destination 32. Fluid destination 32 may take on a variety of forms.

[0011] Suction side 23 includes an inlet fitting 36 including a check valve 38 shown in the form of a check ball 40 that selectively rests upon a valve seat 43. The term "check valve" should be understood to mean a valve having a checking element configured to allow fluid to pass in one direction and arrest fluid flow in an opposing direction. Of course the particular form of check valve 38 may vary. Check valve 38 allows fluid to enter pump chamber 20 from fluid source 28 during a suction stroke and prevents fluid from exiting through inlet fitting 36 during a pressure stroke. A discharge fitting 56 is fluidically connected to discharge side 25 through a check valve 58. In the exemplary embodiment shown, check valve 58 is shown in the form of a check ball 60 that selectively rests upon a valve seat 62. Check valve 58 allows fluid to flow from pump chamber 20 toward fluid destination 32 during a pressure stroke and prevents fluid from being ingested into pump chamber 20 through discharge fitting 56 during a suction stroke.

[0012] In accordance with an exemplary embodiment, diaphragm metering pump 2 is provided with a degassing system 66 fluidically connected to discharge side 25 of pump chamber 20. As shown in FIG. 2, degassing system 66 includes a support member 71 having a mounting surface 75, and an outlet 76. Mounting surface 75 is secured to head portion 8 at discharge side 25. Outlet 76 includes a check valve receiving portion 77 that houses check ball 60 and valve seat 62. Support member 71 includes a first passage 78 and a second passage 79. First passage 78 includes a first end 83 that extends from mounting surface 75 to second end 84 that fluidically connects with check valve receiving portion 77. Second passage 79 includes a first end portion 86 to a second end portion 87 that fluidically connects with first passage 78 and check valve receiving portion 77. At this point it should be understood that second passage 79 does not conduct a fluid but rather serves as a passageway as will be described more fully below.

[0013] Degassing system 66 includes a check valve actuator 96 connected to mounting surface 75 through a mounting block 97. Check valve actuator 96 takes the form of a linear actuator 99 shown in the form of a solenoid 100. Solenoid 100 includes a coil 104 and a plunger 107. Plunger 107 acts upon an actuating pin assembly 109 that projects through second passage 79 along a path that is substantially parallel to discharge flow path 30. Specifically, upon application of an electrical current to coil 104, plunger 107 acts upon actuating pin assembly 109. Actuating pin assembly 109 extends along second passage 79, contacts and unseats check ball 60 allowing gases trapped within pump chamber 20 to pass from discharge flow path 30 to fluid destination 32. Degassing system 66 is also shown to include a sealing member

110 that takes the form of an isolation diaphragm or seal 113 that extends about actuating pin assembly 109 to prevent fluid from exiting second passage 79. In addition, check valve actuator 96 includes a return spring 115 that biases actuating pin assembly 109 into a ready position as shown in FIG. 2.

[0014] Reference will now be made to FIG. 3, wherein like reference numbers represent corresponding parts in the respective views, in describing a degassing system 120 in accordance with another aspect of the exemplary embodiment. Degassing system 120 includes a support member 124 having a first mounting surface 126 and a second mounting surface 128. First mounting surface 126 is coupled to head portion 8. Support member 124 also includes an outlet 133 and a check valve receiving portion 136 that houses check ball 60 and valve seat 62. Outlet 133 is arranged opposite to check valve receiving portion 136 and is fluidically connected with discharge fitting 56. First and second passages 140 and 141 extend within support member 124. First passage 140 includes a first end 144 that extends from check valve receiving portion 136 to a second end 145 fluidically connected to outlet 133. Second passage 141 includes a first end portion 147 that extends from check valve receiving portion 136 to a second end portion 148 at second mounting surface 128.

[0015] Degassing system 120 is also shown to include a check valve actuator 154 supported from second mounting surface 128. Check valve actuator 154 takes the form of a linear actuator 156. Linear actuator 156 is shown as a solenoid 158 having a plunger 161 that acts upon an actuating pin 162 through a spacer 163 and a diaphragm seal 164. Solenoid 158 is also shown to include a return spring 165 that biases actuating pin 162 into a ready position such as shown in FIG. 3. Actuating pin 162 is selectively acted upon by plunger 161 to shift check ball 60 from valve seat 62 to allow gases accumulating in head portion 8 to flow through discharge fitting 56. Actuating pin 162 projects through second passage 141 along a path that is substantially perpendicular to discharge flow path 30 to directly contact and unseat check ball 60.

[0016] Reference will now be made to FIG. 4, wherein like reference numbers represent corresponding parts in the respective views, in describing a degassing system 170 in accordance with another aspect of the exemplary embodiment. Degassing system 170 includes a support member 174 having a first mounting surface 176, a second mounting surface 178, and a third mounting surface 179. First mounting surface 176 is connected to head portion 8. Support member 174 is also shown to include an outlet 183 fluidically connected to discharge fitting 56 and a check valve receiving portion 186 extending into second end 195. Check valve receiving portion 186 houses valve seat 62. Support member 174 includes a first passage 190 and a second passage 191. First passage 190 includes a first end 194 that extends from check valve receiving portion 186 to a second end 195 through an

angled portion 196. Second end 195 is fluidically connected to outlet 183. Second passage 191 includes a first end portion 197 that extends from third mounting surface 179 to a second end portion 198 that connects with first passage 190 at angled portion 196.

[0017] Degassing system 170 includes a check valve actuator 204 mounted to third mounting surface 179. Check valve actuator 204 is shown in the form of a linear actuator 206. Linear actuator 206 is depicted as a solenoid 208 supported from third mounting surface 179 through a generally U-shaped bracket 210. Solenoid 208 includes a plunger 211 that is coupled to an actuating pin 214. Actuating pin 214 includes a first end section 216 mechanically linked to plunger 211 and a second end section 217 that defines a check valve 219 in the form of a check ball 220. Actuating pin 214 passes into second passage 191 through a sealing member 222 and is surrounded, in part, by a return spring 225. Return spring 225 is configured to bias actuating pin 214 into a ready position. Actuating pin 214 is configured to respond to pressure changes in pump chamber 20 to allow fluid to pass into first passage 190 and on through discharge fitting 56. Actuating pin 214 is also configured to be acted upon by solenoid 208 through plunger 211 to selectively unseat check ball 220 from valve seat 62 allowing gases accumulating in head portion 8 to pass through discharge fitting 56. In the exemplary arrangement shown, actuating pin 214 is selectively shifted along a path that substantially coincides with discharge flow path 30.

[0018] Reference will now be made to FIG. 5, wherein like reference numbers represent corresponding parts in the respective views, in describing a degassing system 230 in accordance with yet another aspect of the exemplary embodiment. Degassing system 230 includes a support member 232 having a first support element 233 joined to a second support element 234 through a joint or interface 235. First support element 233 includes a first mounting surface 236 coupled to head portion 8. Second support element 234 includes a second mounting surface 238. First support element 233 is also shown to include an outlet 243 fluidically connected to discharge fitting 56. A check valve receiving portion 246 is encapsulated within first support element 233 at interface 235.

[0019] Support member 232 houses a first passage 250, and a second passage 251. A third passage 252 is housed in second support element 234. First passage 250 includes a first end 256 that extends from discharge flow path 30 to a second end 257 that terminates at interface 235 and is selectively fluidically connected with check valve receiving portion 246. Second passage 251 includes a first end portion 259 that extends from interface 235 and fluidically connects with check valve receiving portion 246 to a second end portion 260 through an angled portion 261. Second end portion 260 terminates at and is fluidically connected with outlet 243. Third passage 252 includes a first end section 263 that extends from second mounting surface 238 to a second end section 264 that terminates at interface 235.

[0020] Degassing system 230 includes a check valve actuator 268 shown in the form of a linear actuator 270. Linear actuator 270 takes the form of a solenoid 272 mounted to second mounting surface 238 through a generally U-shaped bracket 274. Solenoid 272 includes a plunger 277. Plunger 277 is mechanically linked to a coupler 279. Coupler 279 is mechanically linked to an actuating pin 282 that extends through third passage 252. Actuating pin 282 includes a first end 284 that extends to a second end 285. First end 284 includes a clip 286 that detachably engages with coupler 279. Second end 285 connects with a diaphragm valve 287 that serves as a check valve. A return spring 290 is linked to actuating pin 282 and is configured to bias actuating pin 282 into a ready position. With this arrangement, diaphragm valve 287 responds to pressure changes within pump chamber 20 to allow fluid to flow through first and second passages 250 and 251 and pass through discharge fitting 56. Diaphragm valve 287 also responds to changes in position of plunger 277 to selectively allow gases trapped within head portion 8 to pass through discharge fitting 56.

[0021] Reference will now be made to FIG. 6, wherein like reference numbers represent corresponding parts in the respective views, in describing a degassing system 300 in accordance with still yet another aspect of the exemplary embodiment. Degassing system 300 includes a support member 304 having a first mounting surface 307 coupled to head portion 8 and a second mounting surface 308. Support member 304 also includes an outlet 311 that receives discharge fitting 56 and a check valve receiving portion 314 that houses valve seat 62. Support member 304 is further shown to include a first passage 317 and a second passage 318. First passage 317 includes a first end 320 that extends from first mounting surface 307 to a second end 321. Second passage 318 includes a first end portion 323 that extends from and is fluidically connected with an intermediate portion (not separately labeled) to a second end portion 324 that fluidically connects with outlet 311.

[0022] A check valve actuator 329 is attached to support member 304 at second mounting surface 308. Check valve actuator 329 is shown in the form of an electromagnetic actuator 331. Electro-magnetic actuator 331 takes the form of a solenoid 333 having a coil 334. Coil 334 is configured to generate an electro-motive force that acts upon a plunger 336. Plunger 336 includes an integral check valve 338 that takes the form of a check ball 340. Plunger 336 and check ball 340 return to a ready position under force of gravity. With this arrangement, check ball 340 responds to pressure changes within pump chamber 20 to allow fluid to flow from flow path 30, through first and second passages 317 and 318, and pass through discharge fitting 56. Check ball 340 is also unseated when electro-magnetic actuator 331 is energized drawing plunger 336 toward coil 334 to selectively allow gases trapped within head portion 8 to pass through discharge fitting 56.

[0023] Reference will now be made to FIG. 7, wherein

like reference numbers represent corresponding parts in the respective views, in describing a degassing system 350 in accordance with yet still another aspect of the exemplary embodiment. Degassing system 350 includes a support member 354 having a first mounting surface 357 coupled to head portion 8 and a second mounting surface 358. Support member 354 also includes an outlet 360 that fluidically connects with discharge fitting 56 and a check valve receiving portion 362. Check valve receiving portion 362 is arranged adjacent to first mounting surface 357 and houses check valve 60 and valve seat 62. Support member 354 is further shown to include a first passage 364 and a second passage 365. First passage 364 includes a first end 367 that extends from and fluidically connects with check valve receiving portion 362 to a second end 368 that fluidically connects with outlet 360. Second passage 365 includes a first end portion 370 that extends from, and fluidically connects with, check valve receiving portion 362 to a second end portion 371 that is fluidically exposed at second mounting surface 358.

[0024] A check valve actuator 375 is supported at second mounting surface 358. Check valve actuator 375 takes the form of a linear actuator 377. Linear actuator 377 is shown in the form of a solenoid 379 including a plunger 380 operatively connected to a reservoir member 381 coupled to second mounting surface 358. Reservoir member 381 includes a reservoir 383 and a diaphragm 387. Diaphragm 387 is connected to plunger 380. With this arrangement, check valve 60 responds to changes in pressure in pump chamber 20. More specifically, check valve actuator 375 acts indirectly upon check valve 60. In the event of gas build up in head portion 8, solenoid 379 is activated to shift plunger 380 causing diaphragm 387 to deliver a pulse of liquid through second passage 365. The pulse of liquid unseats check ball 60 from valve seat 62 allowing any trapped gases to pass through first passage 364 and out from discharge fitting 56.

[0025] At this point it should be understood that the exemplary embodiments provide a system for alleviating gas build up in a head portion of a diaphragm metering pump. The exemplary embodiments include an actuator that acts directly upon a discharge check valve or indirectly on the discharge check valve to allow built up gases to flow to through an outlet. In addition, in contrast to prior art systems that bleed off a portion of the liquid to the liquid source to degas, the exemplary embodiments allow built up gases to flow through the pump outlet to the liquid destination. In this manner, the exemplary embodiments eliminate the need for additional plumbing, valves or other hardware and also ensure that all liquid passing through the discharge is passed from the outlet. Also, while described as using a linear actuator, the exemplary embodiments may use various actuators, including pneumatic actuators, hydraulic actuators, electric actuators, or actuators that are not linear, to unseat the check valve allowing gases to pass from the outlet.

[0026] Additionally, while the check valve is shown and

described as a check ball and a diaphragm valve, other types of checking elements may be employed. For example, the exemplary embodiments may employ poppet valves, flapper valves, reed valves, wafer type valves or other elements that may be employed to allow fluid flow through a passage in one direction and to check or arrest fluid flow through the passage in an opposing direction. Further, while the mounting brackets are described as being generally U-Shaped, other types of brackets including a wide range of geometries may be employed. Still further, it should be understood that the accumulation of gases may be sensed using various techniques/devices and check valves may be unseated to alleviate gas build up based on these techniques and/or signals from these devices or, alternatively, the check valve may be periodically unseated on a time basis.

[0027] While the invention has been described with reference to an exemplary embodiment or embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims.

Claims

1. A diaphragm metering pump (2) comprising:

a pump body (4) having a head portion (8) including a suction side (23) and a discharge side (25) defining a flow path (30) from a fluid source (28) to a fluid destination (32), wherein the discharge (25) side comprises an outlet (76) including a valve seat (62) arranged at the discharge side and a check valve (58) arranged at the valve seat (62); and
a degassing system (66) including a check valve actuator (96) operatively connected to the check valve (58), the check valve actuator (96) being selectively activated to unseat the check valve (58) from the valve seat (62) to allow the gases trapped in the head portion (8) to pass through the discharge side (25); and
wherein the gases and all liquid passing through the discharge side (25) are passed from the outlet (76) to the fluid destination (32).

2. The diaphragm metering pump (2) according to claim 1, wherein the check valve actuator (96) is configured and disposed to act upon the check valve (58) along an axis substantially parallel to the flow path.

3. The diaphragm metering pump (2) according to claim 1, wherein check valve actuator (96) is configured and disposed to act upon the check valve (58) along an axis extending at an angle relative to the flow path. 5
4. The diaphragm metering pump (2) according to claim 1, wherein the check valve actuator (96) is configured and disposed to act upon the check valve (58) along an axis that coincides with the flow path. 10
5. The diaphragm metering pump (2) according to claim 1, wherein the check valve actuator (96) comprises a solenoid having a plunger (107). 15
6. The diaphragm metering pump (2) according to claim 5, wherein the plunger (107) acts upon actuator pin that acts directly upon the check valve (58). 20
7. The diaphragm metering pump (2) according to claim 5, wherein the plunger (107) acts indirectly upon the check valve (58). 25
8. The diaphragm metering pump (2) according to claim 5, wherein the check valve (58) is integrally formed with the plunger (107). 30
9. The diaphragm metering pump (2) according to claim 5, wherein the check valve (58) is detachably connected to the plunger (107). 35
10. The diaphragm metering pump (2) according to claim 1, wherein the check valve (58) comprises a check ball (60). 40
11. The diaphragm metering pump (2) according to claim 1, wherein the check valve (58) comprises a diaphragm valve (287). 45
12. A method of degassing a diaphragm metering pump comprising: 50

drawing a liquid from a liquid source through a suction side (23) of a diaphragm metering pump (2);

passing the liquid from the suction side (23) into a head portion (8) of the diaphragm metering pump (2);

guiding the liquid through a check valve (58) from the head portion (8) to a discharge side (25) of the diaphragm metering pump (2), wherein the discharge side (25) comprises an outlet including a valve seat (62) with the check valve (58) arranged at the valve seat (62); and

initiating a check valve actuator (96) to unseat the check valve (58) allowing gases collected in the head portion (8) and all the liquid to pass through the outlet at the discharge side (25) to a fluid destination. 55

13. The method of claim 12, further comprising: sensing a parameter of the liquid passing from the discharge side (25) of the diaphragm metering pump (2), wherein the check valve actuator (96) is initiated in response to the parameter of the liquid passing from the discharge side (25) of the pump (2).
14. The method of claim 12, wherein the check valve actuator (96) is initiated in response to passage of a predetermined amount of time.
15. The method of claim 12, wherein initiating the check valve actuator (96) includes activating a linear actuator having a plunger (107).

Patentansprüche

1. Membrandosierpumpe (2), umfassend:

einen Pumpenkörper (4) mit einem Kopfabschnitt (8), der eine Saugseite (23) und eine Druckseite (25) aufweist, die einen Strömungspfad (30) von einer Fluidquelle (28) zu einem Fluidziel (32) definieren, wobei die Druckseite (25) einen Auslass (76) mit einem Ventilsitz (62), der auf der Druckseite angeordnet ist, und ein Rückschlagventil (58) umfasst, das auf dem Ventilsitz (62) angeordnet ist; und

ein Entgasungssystem (66) mit einem Rückschlagventilstellglied (96), das funktionell mit dem Rückschlagventil (58) verbunden ist, wobei das Rückschlagventilstellglied (96) selektiv aktiviert wird, um das Rückschlagventil (58) vom Ventilsitz (62) zu lösen, damit die im Kopfabschnitt (8) eingeschlossenen Gase durch die Auslassseite (25) gelangen können; und

wobei die Gase und die gesamte Flüssigkeit, die durch die Auslassseite (25) strömen, von dem Auslass (76) zu dem Flüssigkeitsziel (32) geleitet werden.
2. Membrandosierpumpe (2) nach Anspruch 1, wobei das Rückschlagventilstellglied (96) konfiguriert und angeordnet ist, um auf das Rückschlagventil (58) entlang einer im Wesentlichen parallel zum Strömungsweg verlaufenden Achse einzuwirken.
3. Membrandosierpumpe (2) nach Anspruch 1, wobei das Rückschlagventilstellglied (96) konfiguriert und angeordnet ist, um auf das Rückschlagventil (58) entlang einer Achse einzuwirken, die sich in einem Winkel zum Strömungsweg erstreckt.
4. Membrandosierpumpe (2) nach Anspruch 1, wobei das Rückschlagventilstellglied (96) konfiguriert und angeordnet ist, um auf das Rückschlagventil (58) entlang einer Achse einzuwirken, die mit dem Strömungsweg verläuft.

mungsweg übereinstimmt.

5. Membrandosierpumpe (2) nach Anspruch 1, wobei das Rückschlagventilstellglied (96) eine Magnetspule mit einem Kolben (107) umfasst. 5
6. Membrandosierpumpe (2) nach Anspruch 5, wobei der Kolben (107) auf einen Stellgliedstift wirkt, der direkt auf das Rückschlagventil (58) wirkt. 10
7. Membrandosierpumpe (2) nach Anspruch 5, wobei der Kolben (107) indirekt auf das Rückschlagventil (58) wirkt.
8. Membrandosierpumpe (2) nach Anspruch 5, wobei das Rückschlagventil (58) integral mit dem Kolben (107) ausgebildet ist. 15
9. Membrandosierpumpe (2) nach Anspruch 5, wobei das Rückschlagventil (58) lösbar mit dem Kolben (107) verbunden ist. 20
10. Membrandosierpumpe (2) nach Anspruch 1, wobei das Rückschlagventil (58) eine Rückschlagkugel (60) umfasst. 25
11. Membrandosierpumpe (2) nach Anspruch 1, wobei das Rückschlagventil (58) ein Membranventil (287) umfasst. 30
12. Verfahren zum Entgasen einer Membrandosierpumpe, umfassend:
 - Ansaugen einer Flüssigkeit aus einer Flüssigkeitsquelle durch eine Saugseite (23) einer Membrandosierpumpe (2); 35
 - Leiten der Flüssigkeit von der Saugseite (23) in einen Kopfabchnitt (8) der Membrandosierpumpe (2);
 - Führen der Flüssigkeit durch ein Rückschlagventil (58) vom Kopfabchnitt (8) zu einer Druckseite (25) der Membrandosierpumpe (2), wobei die Druckseite (25) einen Auslass mit einem Ventilsitz (62) und dem am Ventilsitz (62) angeordneten Rückschlagventil (58) umfasst.; 40
 - und
 - Einleiten eines Rückschlagventilstellglieds (96), um das Rückschlagventil (58) zu lösen, so dass im Kopfabchnitt (8) angesammelte Gase und die gesamte Flüssigkeit durch den Auslass an der Auslassseite (25) zu einem Flüssigkeitsziel gelangen. 45
13. Verfahren nach Anspruch 12, ferner umfassend: Erfassen eines Parameters der von der Druckseite (25) der Membrandosierpumpe (2) strömenden Flüssigkeit, wobei das Rückschlagventilstellglied (96) als Reaktion auf den Parameter der von der Druckseite 55

(25) der Pumpe (2) strömenden Flüssigkeit ausgelöst wird.

14. Verfahren nach Anspruch 12, wobei das Rückschlagventilstellglied (96) als Reaktion auf das Verstreichen einer vorbestimmten Zeitspanne ausgelöst wird.
15. Verfahren nach Anspruch 12, wobei das Auslösen des Rückschlagventilstellglieds (96) das Aktivieren eines Linearstellglieds mit einem Kolben (107) beinhaltet.

Revendications

1. Pompe doseuse à membrane (2) comportant :

un corps de pompe (4) ayant une partie de tête (8) comprenant un côté aspiration (23) et un côté refoulement (25) définissant un trajet d'écoulement (30) depuis une source de fluide (28) vers une destination de fluide (32), le côté refoulement (25) comportant une sortie (76) comprenant un siège de soupape (62) disposé du côté refoulement et un clapet anti-retour (58) disposé sur le siège de soupape (62) ; et
un système de dégazage (66) comprenant un actionneur de clapet anti-retour (96) connecté de manière opérationnelle au clapet anti-retour (58), l'actionneur de clapet anti-retour (96) étant activé de manière sélective pour détacher le clapet anti-retour (58) du siège de soupape (62) afin de permettre aux gaz piégés dans la partie de tête (8) de passer à travers le côté refoulement (25) ;
et les gaz et tout le liquide sortant côté refoulement (25) s'écoulent depuis la sortie (76) vers la destination du fluide (32).

2. Pompe doseuse à membrane (2) selon la revendication 1, dans laquelle l'actionneur de clapet anti-retour (96) est configuré et disposé pour agir sur le clapet anti-retour (58) le long d'un axe sensiblement parallèle au trajet d'écoulement.
3. Pompe doseuse à membrane (2) selon la revendication 1, dans laquelle l'actionneur de clapet anti-retour (96) est configuré et disposé pour agir sur le clapet anti-retour (58) le long d'un axe s'étendant selon un angle par rapport au trajet d'écoulement.
4. Pompe doseuse à membrane (2) selon la revendication 1, dans laquelle l'actionneur de clapet anti-retour (96) est configuré et disposé pour agir sur le clapet anti-retour (58) le long d'un axe qui coïncide avec le trajet d'écoulement.

5. Pompe doseuse à membrane (2) selon la revendication 1, dans laquelle l'actionneur de clapet anti-retour (96) comprend un solénoïde ayant un piston (107).
6. Pompe doseuse à membrane (2) selon la revendication 5, dans laquelle le piston (107) agit sur la broche de l'actionneur qui agit directement sur le clapet anti-retour (58).
7. Pompe doseuse à membrane (2) selon la revendication 5, dans laquelle le piston (107) agit indirectement sur le clapet anti-retour (58).
8. Pompe doseuse à membrane (2) selon la revendication 5, dans laquelle le clapet anti-retour (58) est formé d'un seul tenant avec le piston (107).
9. Pompe doseuse à membrane (2) selon la revendication 5, dans laquelle le clapet anti-retour (58) est relié de manière amovible au piston (107).
10. Pompe doseuse à membrane (2) selon la revendication 1, dans laquelle le clapet anti-retour (58) comprend une bille anti-retour (60).
11. Pompe doseuse à membrane (2) selon la revendication 1, dans laquelle le clapet anti-retour (58) comprend un clapet à membrane (287).
12. Procédé de dégazage d'une pompe doseuse à membrane comprenant les étapes consistant à:
- aspirer un liquide d'une source de liquide à travers un côté aspiration (23) d'une pompe doseuse à membrane (2);
- faire passer le liquide du côté aspiration (23) dans une partie de tête (8) de la pompe doseuse à membrane (2);
- guider le liquide à travers un clapet anti-retour (58) depuis la partie de tête (8) vers un côté refoulement (25) de la pompe doseuse à membrane (2);
- le côté refoulement (25) comportant une sortie comprenant un siège de soupape (62) avec le clapet anti-retour (58) disposé sur le siège de la soupape (62); et
- initier un actionneur de clapet anti-retour (96) pour ouvrir la valve anti-retour (58) afin de permettre aux gaz recueillis dans la partie de tête (8) et à tout le liquide de passer à travers la sortie du côté refoulement (25) vers une destination de fluide.
13. Procédé selon la revendication 12, comprenant en outre: la détection d'un paramètre du liquide sortant du côté refoulement (25) de la pompe doseuse à membrane (2), dans lequel l'actionneur de clapet anti-retour (96) est déclenché en réponse au paramètre du liquide sortant du côté refoulement (25) de la pompe (2).
14. Procédé selon la revendication 12, dans lequel l'actionneur de clapet anti-retour (96) est déclenché en réponse au passage d'une durée prédéterminée.
15. Procédé selon la revendication 12, dans lequel le déclenchement de l'actionneur de clapet anti-retour (96) comprend l'activation d'un actionneur linéaire ayant un piston (107).

FIG. 1

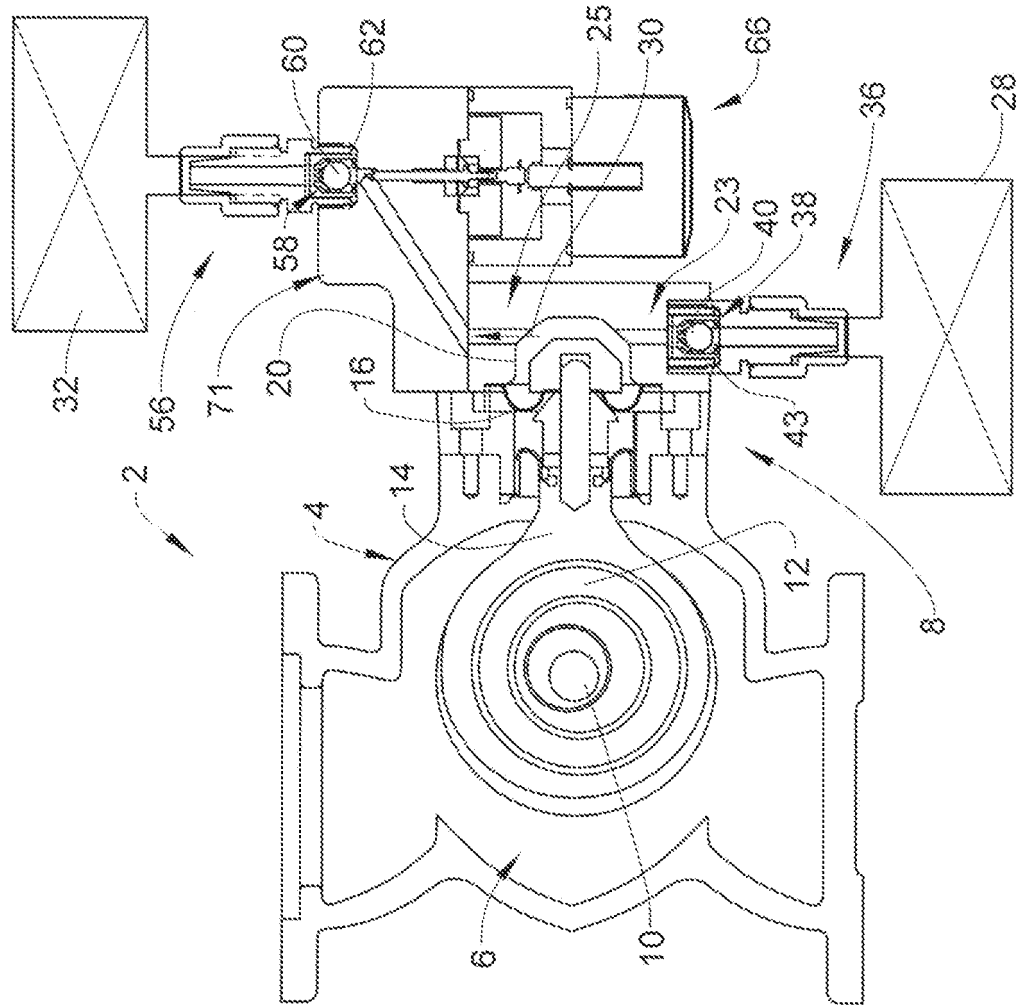


FIG. 2

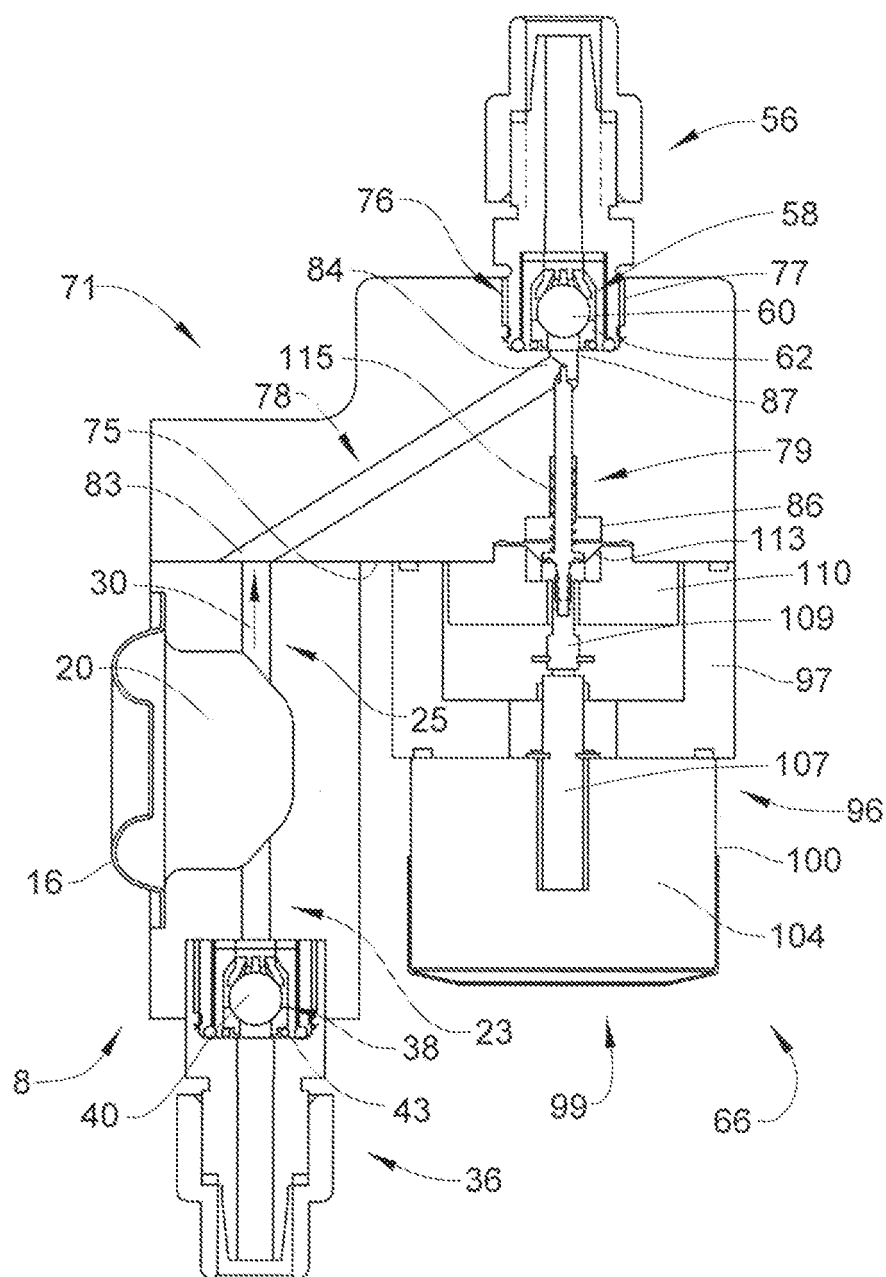


FIG. 3

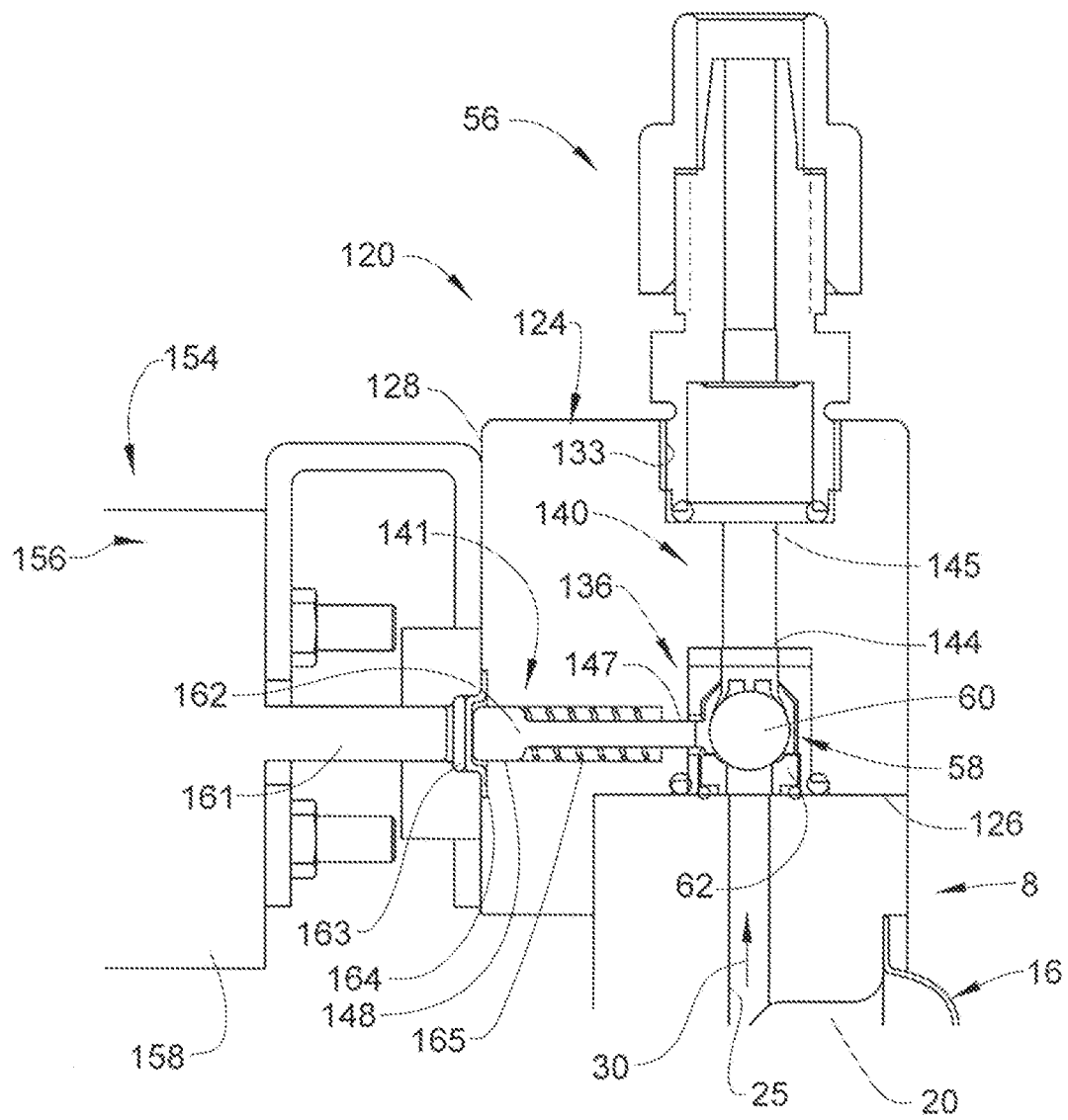


FIG. 4

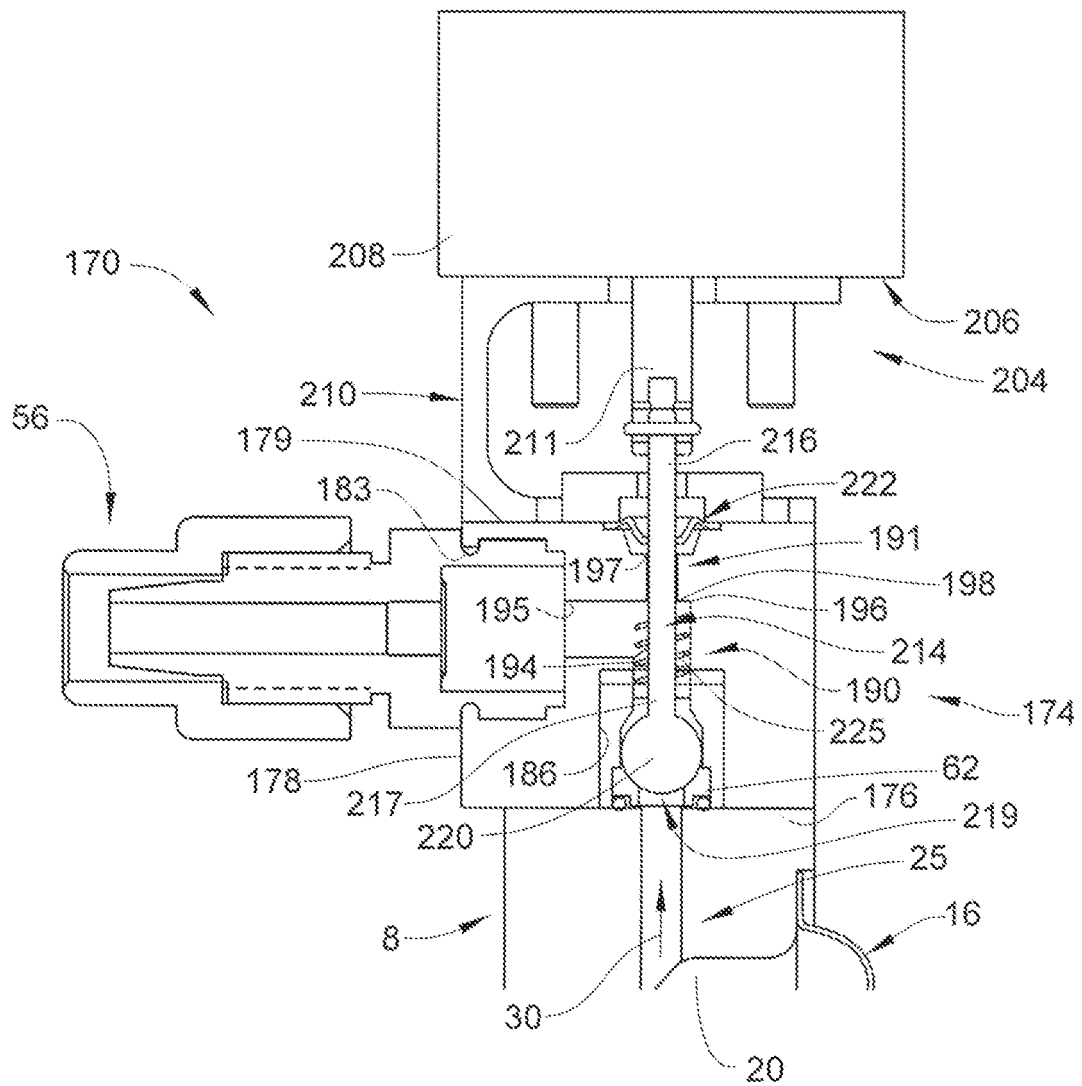
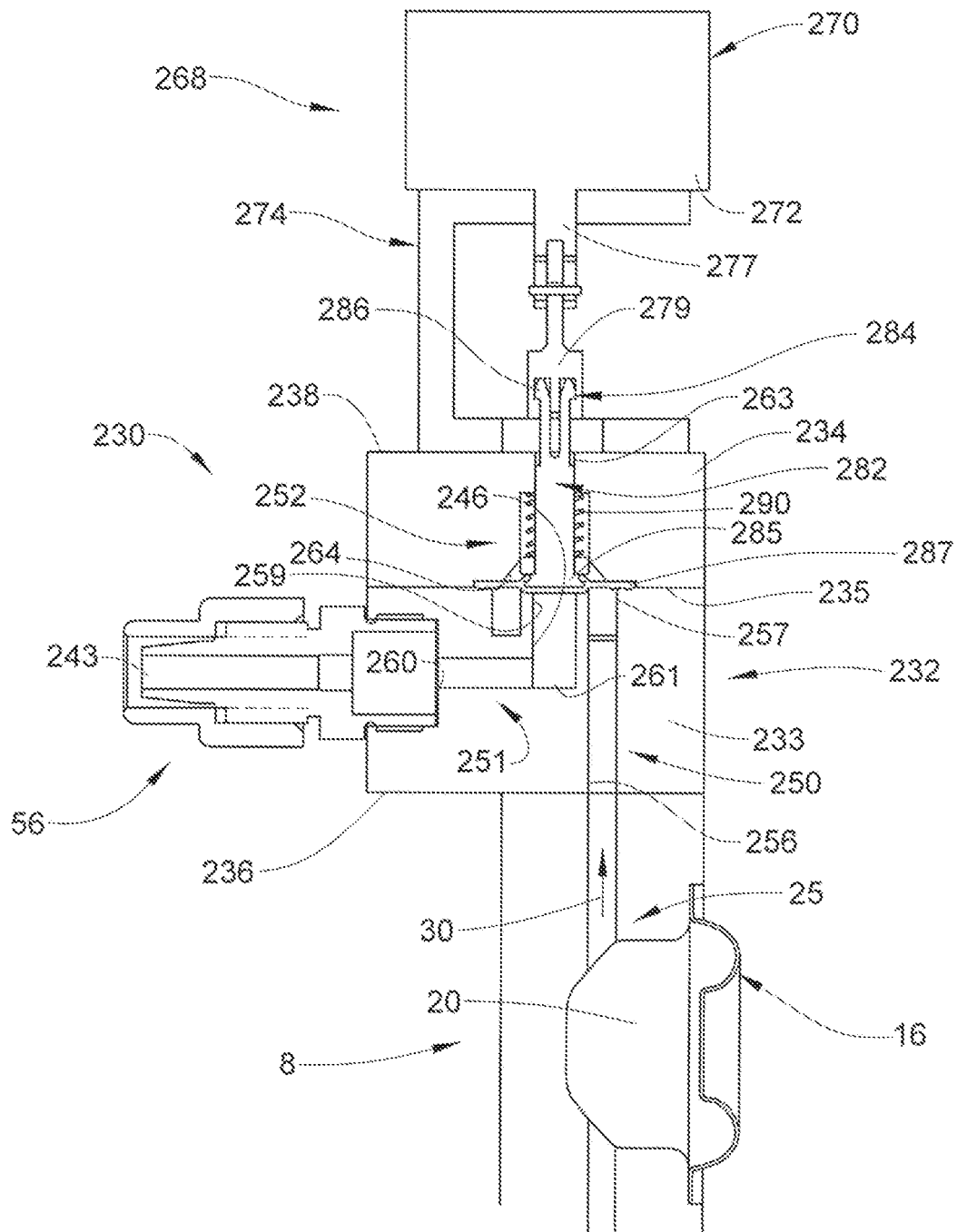


FIG. 5



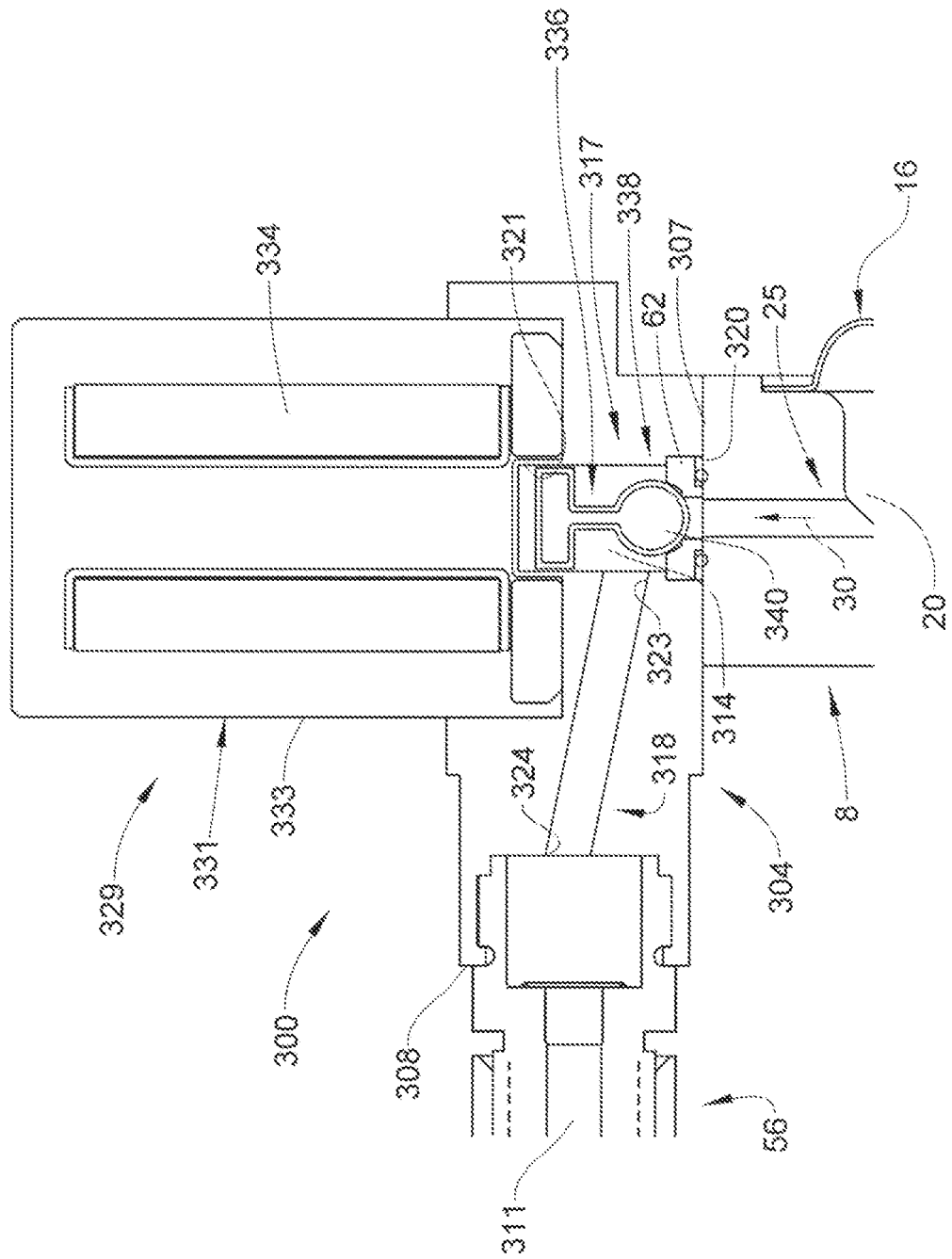
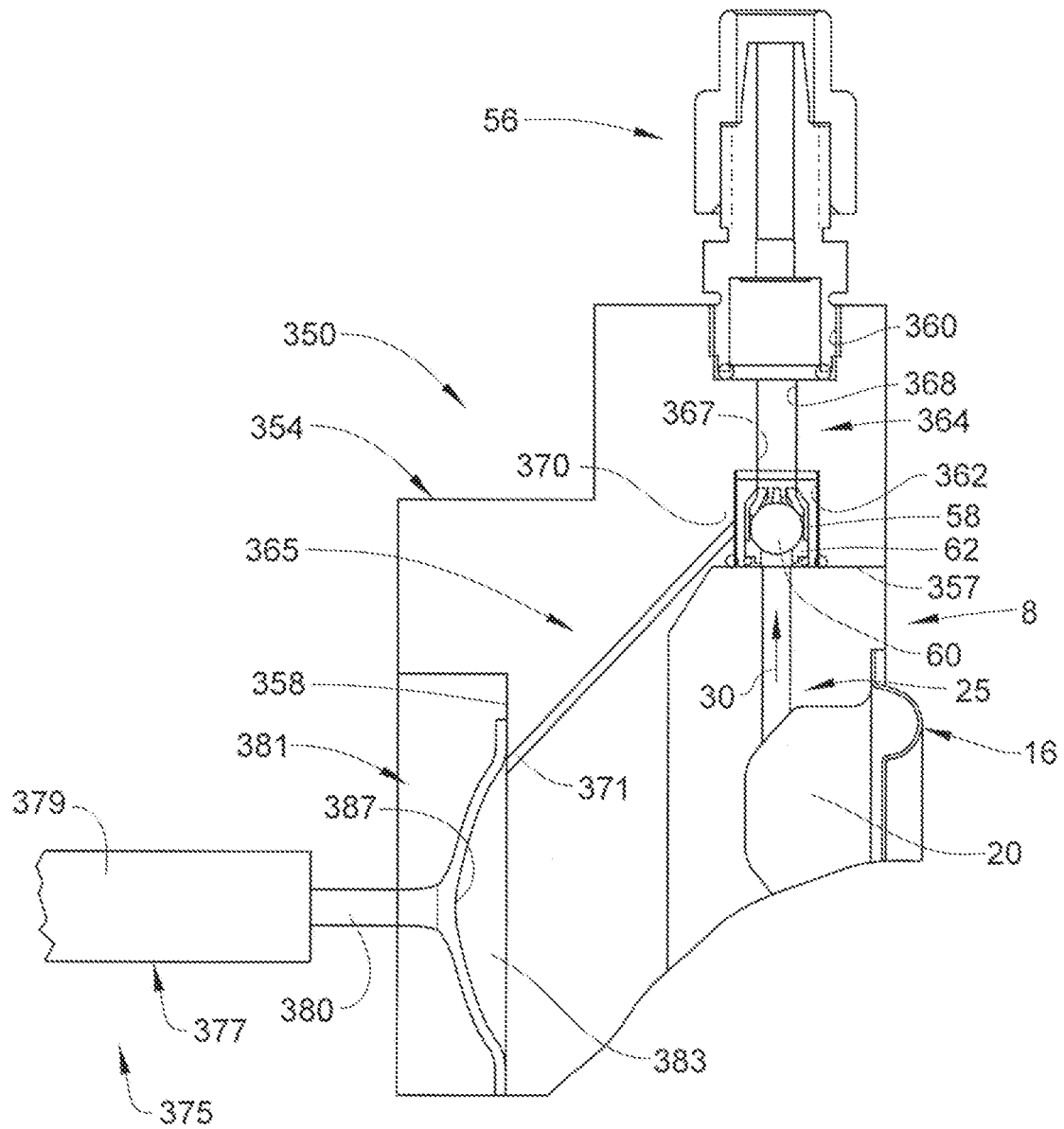


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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