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Remarks:

A request for correction fig21B has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) **Valve for pre-vacuum filler for products with particulates**

(57) A filler valve (30) is mounted beneath a filler bowl (32) to selectively fill containers (34) positioned at a filling station (80) beneath the valve. The filler valve includes a generally rectilinear housing (36) for receiving a rotatable filler plug (38). The filler plug is rotatable by drive rollers (166) making sequential contact with the lugs (146) of star wheel (142) located at the proximal end of the filler plug. An end plate (40) closes off the distal end portion of the valve housing, and a distribution plate (42), rotatable with the plug, is sandwiched between the plug and the end plate. With the rotation of the filler plug, the flowable content from the container passes through the filler valve to the container being filled. Also, prior to the filling of the container, the container is evacuated, and during at least part of the filling process, the container is ventilated.

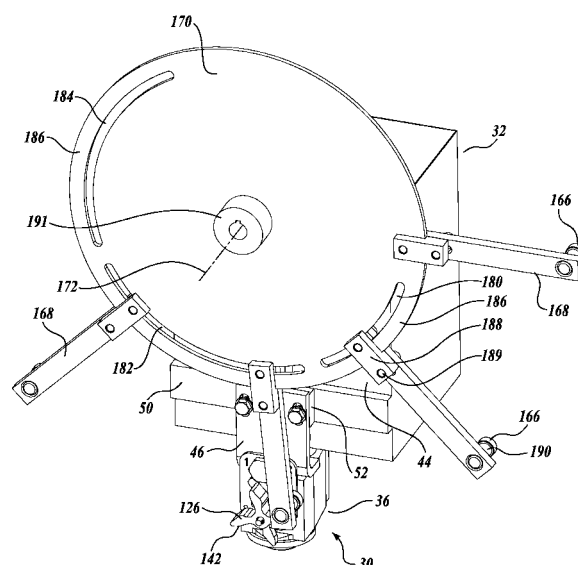


Fig.1.

Description

TECHNICAL FIELD

[0001] The present invention relates to an apparatus and process for pre-vacuumizing receptacles to be filled with product, and more particularly, to a filling valve capable of pre-vacuumizing a receptacle and then quickly and accurately filling the receptacle.

BACKGROUND

[0002] Pre-vacuumized filling machines have been in use in the industry. Vacuum fillers remove entrapped air from pre-filled products such as fruits, vegetables, or fish, and accurately fill syrup, brine, oils, or sauces to a pre-determined headspace. Typically a container enters the filling station and is positioned onto a lifter plate which raises the container against a filling valve to seal it from the atmosphere. The lifter is lifted by its lifter roller which moves onto a camtrack, called the liftercam.

[0003] During the first phase the air in the container is removed by means of vacuum. During the second phase product is drawn into the container due to the underpressure in the container. A third phase further fills the container with product to the desired filling level. This third phase can be done with or without the help of vacuum. During the fourth phase the container is connected to the atmosphere and the lifter plate is lowered before the container is being discharged out of the filler.

[0004] The different phases are achieved by a filling valve which contains typically a movable part with holes and/or grooves to connect the container with the vacuum, the filling bowl or the open atmosphere. In the last several years there has been a need to be able to fill products with particulates, such as sauces with pieces of vegetables. These particulates are a problem for the vacuum fillers because such pieces can get into the vacuum lines and clog the system, making it difficult to remove the entrapped air from the pre-filled products in the container.

SUMMARY

[0005] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0006] A filler valve is interposed between a storage bowl and a container to be filled with the liquid or a liquid and particulate mixture. The filler valve includes a housing disposed beneath the bowl. The housing has an inlet in content flow communication with the bowl and an outlet in content flow communication with a container to be filled. The housing defines portions of a vacuum passageway having an inlet at the housing content outlet and a distal connection location connectable to a source

of vacuum. The valve also includes a rotatable filler plug closely receivable within the housing, with at least one fill passageway transversely extending through the filler plug to be in registry with the housing content inlet and content outlet at a particular angular orientation of the filler plug within the housing. The filler plug is rotatable between an initial position within the housing, wherein the plug fill passageway is out of registry with the housing inlet and outlet and the vacuum passageway is operable to apply vacuum to the container at the housing outlet, and a second position wherein the filler plug fill passageway is in registry with the housing inlet and outlet to allow content to flow from the storage bowl to the container.

[0007] In another aspect, the housing includes portions that define a ventilation passageway from a ventilation inlet to the housing content outlet, thereby to provide ventilation at the housing content outlet during filling of the container with content from the storage bowl.

[0008] In accordance with a further aspect, the filler plug includes two fill passageways extending transversely therethrough. One of the fill passageways is designed to permit content to flow from the storage bowl to the container with the ventilation passageway in closed condition, and the second fill passageway designed to allow content to flow from the storage bowl to the container with the ventilation passageway open.

[0009] In accordance with a further aspect, a distribution plate is coupled to the distal end portion of the filler plug to rotate therewith, the distribution plate operable to open and close the vacuum passageway and the ventilation passageway during operation of the filler valve.

[0010] In accordance with a further aspect of the disclosed embodiments, flushing fluid is directed to the housing content outlet after a container has been filled, thereby to flush away content that may remain at the housing outlet. The flushing fluid may be routed through the filler plug and directed to the housing outlet after filling of the container has been completed.

DESCRIPTION OF THE DRAWINGS

[0011] The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a pictorial view of an embodiment of an installed filler valve;

FIGURE 2 is a cross-sectional view of FIGURE 1, taken substantially along lines 2-2 thereof and with certain components removed for clarity;

FIGURE 3 is a pictorial view of a filler valve, enlarged relative to FIGURE 1;

FIGURE 4 is a pictorial view of the valve in FIGURE 3 showing the underside of the filler valve;

FIGURE 5 is a top view of the valve of FIGURE 3;

FIGURE 6 is a cross-sectional view of the valve of FIGURE 5, taken substantially along lines 6-6 thereof;
 FIGURE 7 is a top view of the valve body;
 FIGURE 8 is a cross-sectional view of FIGURE 7, taken substantially along lines 8-8 thereof;
 FIGURE 9 is a rear elevational view of the valve body of FIGURE 7;
 FIGURE 10 is a pictorial view of a valve filler plug;
 FIGURE 11 is a cross-sectional view of FIGURE 10, taken substantially along lines 11-11 thereof;
 FIGURE 12 is an elevational view of a distribution plate;
 FIGURE 13 is a cross-sectional view of FIGURE 12, taken substantially along lines 13-13 thereof;
 FIGURE 14 is an elevational view of an end plate;
 FIGURE 15 is an elevational view of the end plate, taken from the opposite side of FIGURE 14;
 FIGURE 16 is a side edge view of the end plate shown in FIGURES 14 and 15;
 FIGURE 17 is a pictorial view of a plug;
 FIGURE 18A is a proximal end view of a filler valve;
 FIGURE 18B is an elevational cross-sectional view of the filler valve of FIGURE 18A, with FIGURES 18A and 18B showing the valve in one orientation of the filler plug;
 FIGURES 19A and 19B correspond to FIGURES 18A and 18B, but with the filler plug rotated 90°;
 FIGURES 20A and 20B correspond to FIGURES 19A and 19B, but with the filler plug rotated a further 90°; and
 FIGURES 21A and 21B correspond to FIGURES 20A and 20B, but with the filler plug rotated a further 90°.

DETAILED DESCRIPTION

[0012] Referring initially to FIGURES 1-6, a filler valve 30 is illustrated as mounted beneath filler bowl or enclosure 32, typically holding a liquid, for example, syrup, brine, oil, sauce, etc. Particulates may be present in the liquid, for example, pieces of vegetables within a sauce. The present invention is designed to efficiently and very quickly fill a container 34 with a desired liquid while removing entrapped air from the container and avoiding clogging the valve with particulates in the liquid.

[0013] The major subassemblies/components of the filler valve 30 include a housing 36 for receiving a rotatable filling plug 38 therein. An end plate 40 closes off the distal end of the housing 36, and a distribution plate 42, rotatable with the plug 38, is sandwiched between the plug and the end plate 40 to direct filling liquid through the valve as well as directing a vacuum through the valve to evacuate the container 34 prior to the filling operation, as described below. As also described below, the distribution plate functions to vent the container 34 during the filling operation.

[0014] Referring specifically to FIGURES 1 and 2, the

bowl or enclosure 32 is illustrated as a thin walled vessel of a rectangular shape. The bowl can be of other shapes, such as circular, and can be of other sizes, as desired. The filler valve 30 is positioned along a perimeter of the bowl adjacent exterior wall 44. Although only one filler valve 30 is shown, a number of filler valves may be utilized in conjunction with bowl 32, perhaps positioned side by side to each other, or positioned along other sides of the bowl.

[0015] The valve 30 is mounted to the bowl 32 by an L-shaped bracket 46 having a lower horizontal leg section connected to an upper wall 48 of the valve housing 36, and a longer upright leg section connectable to a mounting rail 50 extending horizontally along a lower portion of wall 44. A spacer 52 is disposed between the bracket upright leg and mounting rail 50 to correctly position the valve 30 relative to an outlet opening 54 formed in the bottom or floor 56 of the bowl.

[0016] Rather than utilizing a bracket, such as bracket 46, to mount the valve 30 to bowl 32, the bowl instead could be mounted directly to the bowl by hardware members extending between the bowl and the valve housing 36.

[0017] Next referring additionally to FIGURES 7-9, the valve housing 36 is shown as being generally rectilinear in shape, having a substantially flat upper wall 48, as described above, to which the housing mounting bracket 46 is attached. The housing also includes a generally cylindrically shaped throughbore 58 extending horizontally through the housing from front face 60 to rear face 62 to closely receive filler plug 38 therein. Product inlet (liquid mixture) 64 extends downwardly through the upper wall 48 in alignment with product outlet 66 formed in the housing lower wall 68. As shown in FIGURES 2, 6, and 8, the housing inlet and outlet 64 and 68 extend diagonally relative to the longitudinal centerline 70 of the throughbore 58.

[0018] A container filling station 80 is formed in the bottom of valve 30 for receiving containers to be filled. The filling station is defined by a circular seat 82 formed in the housing bottom wall 68. A seal or gasket 84 overlies the seat 82 so as to achieve an airtight interconnection with the outer opening of the container 34. As will be appreciated, the seal/gasket may be composed of various types of materials, for example, natural or synthetic rubber, such as neoprene, nitril-butyl rubber or silicon rubber. A short nozzle portion 86 extends downwardly from a central portion of the seat 82, through which the lower product outlet 66 extends.

[0019] Referring specifically to FIGURE 2, a bridging block 90 is interposed between the upper side of housing 36 and the underside of bowl 32. The block 90 is sized lengthwise to snugly fit between the upper surface of housing top wall 48 and the lower surface of the bowl floor 56. The bridging block 90 includes a vertical throughbore 92 sized and located to form a passageway between bowl opening 54 and housing inlet 64. The block 90 can be secured and placed between the bowl 32 and housing

36 by any convenient method, including the use of threaded fasteners 94 extending through a washer plate 96 positioned against the top surface of the bowl 32 through the bowl floor 56 to engage within threaded openings formed in the bridge block 90. As shown in FIGURE 2, O-rings or other types of seals may be employed at the interface of the bridging block and bowl floor 56, as well as at the interface between the bridging block and the housing upper wall 48, thereby to help prevent leakage of the filler liquid as it passes from the bowl to the valve 30.

[0020] Referring specifically to FIGURES 6-9, a vacuum passageway 100 extends from container connection station 80 through the housing 36 to the back/rear face 62 of the housing. The passageway 100 has a short diagonal section 102 extending upwardly from the nozzle 86 to intersect with a horizontal longitudinal section 106 extending through the lower wall 68 of the housing to terminate at an opening 108 formed in the housing rear face 60. The vacuum passageway 100 is shown as circular in cross-section, but may be of other cross-sectional shapes. A check valve 110 is positioned in the diagonal section of the vacuum passageway to close off the passageway when a vacuum is not being applied to the container filling station. The function of the vacuum passageway is discussed below.

[0021] Housing 36 also includes a vent passageway 112 extending downwardly from the top of the valve 30 and then rearwardly to the rear face 62 of the housing. Referring to FIGURES 3, 7, and 8, a vent stack 114 extends upwardly a short distance from the upper surface or wall 48 of the housing. A vent tube 116 extends upwardly from the stack 114 to an elevation toward the upper portion of the bowl 32 so as to be above the height of the liquid when the bowl is filled. The vent passageway 112 has a vertical section 118 extending downwardly through the vent stack 114 to intersect with an elongate horizontal section 120 extending horizontally through the housing upper wall 48 to terminate at an outlet opening 122 formed in the rear face 64 of the housing. The function of the vent passageway 112 is described below. It is to be appreciated that both the vacuum passageway and ventilation passageway may be routed differently through the housing 36 than described and illustrated.

[0022] Next, referring specifically to FIGURES 2, 6, 10, and 11, the filler plug 38 is illustrated as including an elongate, circular plug body 130 sized to be closely receivable within a horizontal housing bore 58. A cylindrical sleeve 132 fits closely over plug body portion 130 to enable the filler plug 38 to anti-frictionally rotate within the housing 36. The sleeve may be composed of or coated with an inert anti-friction material, for example an anti-galling nickel alloy. The plug body includes a shoulder or rim portion 134 of a circumference larger than the sleeve 132 to overlap the housing front face 60, see particularly FIGURES 2 and 6. An O-ring or other type of seal 136 may be positioned between the housing front face 60 and the adjacent surface of the shoulder/rim 134.

[0023] Two transverse, diagonal filler holes or pas-

sageways 138 and 140 extend through the plug body. The filler holes 138 and 140 are positioned and sized to be in alignment with housing product inlet 64 and outlet 66 when the plug 38 is at a particular rotational position relative to the housing 36. The filler holes 138 and 140 are disposed 90° relative to each other.

[0024] The filler plug 38 further includes a drive wheel shown in the form of a star wheel 142 spaced from the proximal end of the plug body 30 corresponding to the rim 134. (The "proximal" and "distal" ends of the plug 38 and the housing 36 are designated for reference only for convenience in describing the embodiment of the valve.) A reduced diameter neck portion 144 is used to space the star wheel 142 outwardly from the shoulder/rim 134. The star wheel 142 includes four radially extending lug portions 146 shaped substantially identically to each other and positioned 90° apart from each other about the longitudinal center line 148 of the filler plug 38. Each of the lug portions 146 has an engagement side or surface 150 defining a camming surface composed of a radially inwardly located rising surface portion 152 that "rises" in the radially outward direction to transition into a lobe portion 154 and then transitions into a declining, tapering portion 156 to a rounded tip or end portion 158.

[0025] The lug portions 146 are in registry with rollers 166 mounted in the radially outwardly end portions of drive arm 168 extending radially from a circular drive plate 170, shown in FIGURE 1. The drive arms 168 extend radially from the rotational center 172 of the drive plate 170. Each of the drive arms 168 may be connected to the drive plate 170 by numerous techniques, including that shown in FIGURE 1. In this regard, the drive arms 168 are connected to the drive plate 170 through perimeter slots 180, 182, and 184. The perimeter slots are arcuate and also are concentric with the rotational axis 172 of the drive plate 170. The outer rim portion 186 of the drive plate 170, located between a corresponding slot 180, 182, 184 and the outer circumference of the drive plate, is sandwiched between a radially inwardly end portion of the drive arm 168 and a keeper block 188. The keeper block 188 overlaps the drive plate 170 to bear against the surface of the drive plate on both sides of the slots 180, 182, and 184. The keeper plate may have a relief or undercut portion to accommodate the thickness of the drive plate 170. Threaded fasteners 189, or other types of fasteners, extend between the drive arm 168 and the keeper plate 188, with one of the fasteners passing through the slots 180, 182, and 184. It will be appreciated that by the foregoing construction the drive arms 168 may be positioned at different locations along corresponding slots 180, 182, and 184, thereby to control or alter the rotational position of the filler plug 38 relative to the angular orientation of the drive plate 170. This enables the stages of the valve operation and duration of the stages to be altered or selected.

[0026] As can be appreciated, as the drive plate 70 rotates in the clockwise direction shown in FIGURE 1, drive rollers 66 engage against the engagement surface

150 of the star wheel lug portions 146, initially radially inwardly of the lobe portions 154 of lugs, and then roll over the lobe portions themselves, and then along the declining portion 156 of the lug and past a tip portion 158 of the lug, thereby disengaging from the lug. As shown in FIGURE 1 the drive rollers 146 are spaced from the drive arm 168 by a shaft 190 extending laterally from the end portions of the drive arms 168. Ball bearings or other provisions, not shown, may be employed between the shaft 180 and the drive roller 168 to define an anti-friction relationship therebetween.

[0027] The drive plate 170 is rotated about center axis 172 by any convenient means, including by a variable speed motor (not shown). The motor can be directly coupled to the drive plate 170 through use of center hub 191. Also, a drive system composed of a drive shaft and other components can be used to connect the drive motor to the drive plate 170.

[0028] It is to be understood that the filler plug can be rotated by numerous other systems. As one example, a stepper motor may be in rotational drive connection with the filler plug to rotate the filler plug through designated angular increments and at angular speeds as desired.

[0029] Referring specifically to FIGURES 1-6, the filler plug 138 is retained within housing 36 and loaded therein by an adjustable keeper assembly 192. The keeper assembly includes a generally rectangularly shaped keeper plate 193 vertically supported adjacent the front face 60 of the housing 36 by a pair of threaded pins 194 that extend through vertical slots 195 formed in the keeper plate to engage within threaded blind holes formed in the upper portion of the housing 36. The slots 195 extend upwardly from the lower edge of the keeper plate. The slots vertically retain the keeper plate but allow the keeper plate to pivot or tilt about the pins 194. Bearing buttons 196 are mounted adjacent the lower corners of the keeper plate to extend toward the adjacent end of the filler plug end portion. The buttons 196 may have semi-spherical heads or other shapes to apply a load against the adjacent end of the filler plug, while still allowing the filler plug to rotate within the housing. An arcuate clearance slot is formed in the lower central portion of the keeper plate to provide clearance for the neck portion 144 extending between the star wheel 142 and the plug body 130.

[0030] An adjustment pin 197 is threadably engaged within a central upper portion of the keeper plate so that the standout of the pin may be adjusted by rotating the pin using an enlarged head portion 198, shown as of hexagonal shape. Of course, other shapes may be utilized, including a circular knurled head portion, not shown. The leading end of the pin 197 is in the form of a rounded tip portion 199 that is positioned to bear against the adjacent portion of bowl 32. It will be appreciated that when the pin 197 is adjusted to extend toward the bowl 32, the lower end of the keeper plate is pressed against the adjacent end of the filler plug 38 to load the filler plug into the housing 36. The amount of load desired can be readily adjusted by rotation of the adjusting pin 197. A

spring 200 is engaged over the shaft portion of the pin 197 and held captive between an enlarged head portion and the adjacent surface of the keeper plate. The spring provides a sufficient load between the tip and keeper plate to tend to restrain the pin from rotating once adjusted. Of course, other methods can be used to prevent or retard rotation of the pin 197, including for example, using a lock nut or a self-locking insert in the threaded portion of the pin 197.

[0031] Referring to FIGURE 6, a central blind bore 260 is formed in the portion of filler plug 38 extending centrally along axis 148 beginning at the star wheel 142 and extending toward the longitudinal center portion of the plug body 130. At the distal end of the central bore 260, a plurality of lateral passageways 262, 264, and 266 extend from the central bore 260 radially toward the outer circumference of the plug body 130 in alignment with corresponding through holes formed in the sleeve 132. Although three lateral passageways are illustrated, the number of passageways may be increased or decreased as desired depending on the specific design of the filler valve 30. When the filler plug 38 is in a specific orientation within the housing 36, see FIGURES 6 and 18B, the distal end portions of the transverse passageways 262, 264, and 266 are in registry with the housing product outlet 66 of the housing. As described below, a source of pressurized air may be connected to the entrance end 268 of the bore 260 thereby to direct the pressurized air through the central bore and through the lateral passageways and into the housing product outlet 66. Any product in the outlet nozzle 86 will be flushed or otherwise removed from the valve. When this particular function is not required, the central bore 260 may be closed off with an elongate pin 270 that substantially fills the bore 260. O-rings 272 may be seated on the pin 270 so as to form an airtight seal between the pin and the bore 260. It will be appreciated that the O-rings 272 may be replaced with other types of sealing systems. A cross hole 274 may be formed in the proximal end portion of pin 270 that extends outwardly from the bore 260 to receive a line, a tool, or other method for conveniently grasping the pin 270 to either engage or disengage the pin from the central bore 260.

[0032] Next, referring specifically to FIGURES 6, 12, and 13, a circular, generally disk-shaped distribution plate 42 is sized and shaped to be closely receivable within the distal end portion of filler plug sleeve 132 that extends beyond the adjacent end of the plug body 130. A shallow counterbore is formed in the sleeve 132 to snugly and closely receive the distribution plate 42. The distribution plate 42 is held in registry with the plug body 130 by a pin 201 extending through aligned blind holes 202 and 203 formed in the adjacent end of the plug body and the distribution plate at an outer perimeter portion of the distribution plate. The distribution plate 42 includes a shoulder or rim portion 204 to overlap the end of the sleeve 132. It is to be appreciated that the distribution plate 42 may be coupled to the plug body 130 otherwise

than described above. Also, the distribution plate could be incorporated into the structure of the plug body.

[0033] Referring specifically to FIGURES 12 and 13, a shallow radial groove 206 extends from the center of the distribution plate outwardly in a straight line toward the outer perimeter of the distribution plate in the side of the distribution plate corresponding to the rim 204. In the same portion of the distribution plate, a shallow arcuate groove 208 is formed to be concentric about the center of the distribution plate. As shown in FIGURE 12, the arcuate groove is positioned generally in the radially opposite portion of the distribution plate from the location of the radial groove 206.

[0034] Next, referring specifically to FIGURES 14-16, the end plate 40 is in the form of a generally rectangular plate having a rounded lower edge portion 220. The plate, as noted above, serves to close off the distal portion of the housing 36. In this regard, a plurality of threaded fasteners 221 extend through clearance holes formed in the end plate to engage within aligned, threaded blind holes formed in the housing 36. A shallow circular rim portion 222 extends outwardly from the inward face of the plate to engage within a close fitting shoulder portion of the housing, thereby to form a seal therebetween. The end plate includes a central throughhole 224 through which a vacuum is introduced into the valve 30, as described below. A nipple 226 is in fluid flow connection with the throughhole 224 to receive the adjacent end of a vacuum line. The nipple 226 may be integrally formed with the end plate 40 or formed separately and then attached to the end plate in a well known manner.

[0035] Referring to FIGURE 14, a shallow radial groove 228 is formed in the inward face portion of the end plate. Also, a vent passageway 230 is formed within the wall of the end plate 40. The vent passageway 230 is generally radially oriented relative to the center of the end plate and has a radially inward opening 232 that is positioned to be in registry with arcuate groove 208 of the distribution plate at a certain orientation of the valve plug 38 and also has a radially outwardly opening 234 which is in registry with the adjacent end of the vent outlet opening 122 in the upper wall portion of the housing 36. The end plate 40 also has a generally radially oriented vacuum passageway 240 formed within the wall of the end plate. The vacuum passageway 240 has a first radially inwardly positioned opening 242 that is in registry with the radial groove 206 formed in the distribution plate 42 when the filler plug 38 is in particular orientation relative to the housing 36. The vacuum passageway has a second, radially outward opening 246 which is in registry with opening 108 at the longitudinal end of vacuum passageway 106 extending through the lower wall 68 of the housing when the filler plug 38 is in specific orientation relative to the housing 36, as described below.

[0036] The operation of valve 30 will be explained in conjunction with the figures of the present application, specifically FIGURES 18A-21B. Referring initially to FIGURES 18A and 18B, a valve 30 is shown at "0" phase.

In this phase, the filler plug 38 is angularly orientated so that filler holes 138 and 140 are out of registry with bowl outlet opening 54. Also, the vacuum source connected to the valve 30 via nipple 226 is closed off by the distribution plate 42. As shown in FIGURE 18A, the radial groove 206 extending from the center of the distribution plate radially outwardly toward the perimeter is not lined up with any opening in the housing rear face 62. Also, the venting passageway 112 is closed off by the distribution plate. As shown in FIGURE 18A, the vent outlet opening 122 is not in registry with any opening or groove in the distribution plate.

[0037] Phase "1" of the operation of valve 30 is initiated by a first roller 166 pushing against the lug engagement surface 150 of a lug portion 146 of the star wheel 142 thereby to rotate the star wheel and filler plug 90° from the orientation shown in FIGURES 18A and 18B to the orientation shown in FIGURES 19A and 19B. Just prior to this phase, a container 34 enters the filling station 80 and the container is lifted upwardly to seat 82 so that the upper edge of the container bears against the seal 84. With the filler plug 38 and distribution plate 42 in the orientation shown in FIGURES 19A and 19B, a vacuum is applied at nozzle 86. In this regard, the radial groove 206 of the distribution plate 42 is aligned with the vacuum passageway opening 108 at the housing rear face 62. This enables the vacuum from nipple 226 to enter the vacuum passageway 100 and the passageway 102 at the nozzle 86 thereby connecting the vacuum with the container 34. In this manner, the air in the container is evacuated. The speed and level of evacuation can be selectively controlled, and may depend on the ability of the container to withstand a vacuum.

[0038] The next phase is initiated by a second drive roller 166 pushing against an engagement surface 150 of a second lug 146 of the star wheel 42, thereby to rotate the filler plug 38 and distribution plate 42 from the position shown in FIGURES 19A and 19B to the position shown in FIGURES 20A and 20B corresponding to phase 2. In this phase, a first filler hole 138 is in registry with the housing product inlet 64 and in registry with the housing product outlet 66. In this phase, filling of the container 34 is initiated with product from the filler bowl primarily by the vacuum within the container. Filling occurs until the pressure within the container equals the pressure in the product bowl 32. It will be appreciated that due to the relatively large diameter of the filler hole 138, particulates in the liquid flow from bowl 32 to container 34 without becoming lodged in the filler valve 30.

[0039] As shown in FIGURE 20A, in phase 2, the vent passageway 112 is in registry with the arcuate groove 208 formed in the distribution plate 42. Also, the radial groove 206 of the distribution plate 106 is in registry with the arcuate groove 228 of the end plate which in turn is in registry with the arcuate groove 208 of the distribution plate. As a result, a vacuum is applied to the venting passageway 112. The function of this arrangement is described more fully below.

[0040] Phase "3" is achieved by a third drive roller 166 pushing against lug engagement surface 150 of a third lug 146 of the star wheel 142 thereby to rotate the filler plug 138 and distribution plate 42 90° further from the orientation shown in FIGURES 20A and 20B to the orientation shown in FIGURES 21A and 21B. In phase "3," the second filler hole 140 is in registry with the product bowl outlet opening 54 and also in registry with the filler nozzle 86 so that the container 134 is now filled by gravity and also the vacuum in the container. Also, at least toward the end of this phase, the arcuate groove 208 in the distribution plate 42 is orientated to be in registry with the vacuum passageway 112 and also in registry with the venting passageway 118. As such, the upper portion of the container 34 is vented to atmosphere. In this phase, the venting tube 116 is filled with product to the same level as product in the bowl 32.

[0041] A fourth drive roller 166 engages a fourth lug portion 146 to ride along the lug engagement surface 150 thereby to rotate the filler plug 38 and distribution plate 42 a further 90° to the starting position shown in FIGURES 18A and 18B. The filled container 34 is then lowered from the filling station 80 and routed to its next processing location.

[0042] As mentioned above, during the rotation of the filler plug 38 from the position in phase 1 to phase 2, the product in the vent tube from the prior phase 3 is evacuated using vacuum. As shown in FIGURES 20A and 20B during this rotation of the filler plug, the radial groove 206 of the distribution plate 42 is in registry with the arcuate groove 224 of the end plate 40, and simultaneously this groove 228 is in registry with the arcuate groove 208 of the distribution plate. The arcuate groove 208 is also in registry with the vent outlet opening 22 of the vent passageway 120. In this way, the venting tube 116 is connected for a short while with the vacuum, thereby drawing the product that might be in the vent tube 116, vent stack 114, and vent passageway 118 out through nipple 226. The length of time needed to empty the venting tube 116 can be altered by increasing or decreasing the length of the arcuate groove 228 in the distribution plate 42.

[0043] When the filler plug 38 returns to the 0 phase position, the passageways 262, 264, and 266, leading between the central bore 260 in the filler plug 38 to the outer perimeter of the filler plug are in registry with the housing product outlet 66 thereby to direct pressurized air through the center bore 266 and to the outlet 66, thereby flushing or blowing out the nozzle 86 with each cycle of the valve 30. When this function is not required, a plug pin 270 is engaged within the central bore 260, as shown in FIGURES 18A-21B. A plug pin 270 may be removed and a source of clean pressurized air attached to the center bore 260 at the star wheel 142 in a well known manner.

[0044] It will be appreciated that, by the foregoing construction, relatively large cross or filler passageways 138 and 140 can be formed through the plug body 130. Such

passageways can be, for example, at least 25 mm in diameter. These large size filler passageways are possible, at least in part, because of the horizontal orientation of the plug body 130 thereby enabling the filler passageways to extend transversely through the plug body.

[0045] Moreover, the filler plug body is designed so as not to require the portions of the vacuum or ventilation passageways to be formed therein. Rather, the vacuum and ventilation passageways are primarily formed in the housing, with the opening and closing of these passageways achieved by a distribution plate 42 coupled to the distal end of the plug body.

[0046] Further, the filler valve 30 is designed to be easily serviced and maintained. Access to the filler valve is easily achieved since the valve is positioned along the lower perimeter of the storage bowl 32. Moreover, the filler plug 38 is readily accessible by simply disassembling the keeper assembly 192 and withdrawing the filler plug from the housing 36.

[0047] While illustrative embodiments have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention. For example, the vacuum and ventilation passageways 100 and 112 may be routed otherwise than described above; for example, via lines exterior or separate from the housing 36.

Claims

1. A valve for filling containers with a flowable content, comprising:

(a) a valve housing having a content inlet connectible in content flow communication with a source of content and a content outlet connectible in content flow communication with a container to be filled, said valve housing further comprising portions defining a vacuum passageway extending between an inlet location adjacent the housing content outlet and a vacuum source connection location connectible to a source of vacuum;

(b) a rotatable filler plug closely receivable within the housing, the filler plug defining at least one fill passageway extending through the filler plug, the fill passageway in simultaneous registry with both the housing content inlet and the housing content outlet at a particular position of the filler plug within the housing, and out of registry with at least one of the housing content inlet and housing content outlet at another position of the filler plug relative to the housing; and

(c) wherein in an out of registry position of the filler plug with at least one of the housing content inlet and housing content outlet, the vacuum passageway is in vacuum flow connection between the vacuum passageway inlet and the

- vacuum source connection location.
2. A filler valve according to Claim 1, further comprising a ventilation system for providing ventilation at a location adjacent the housing content outlet as a container is being filled. 5
 3. A filler valve according to Claim 2, wherein said housing having portions defining at least part of the ventilation system. 10
 4. A filler valve according to Claim 3, wherein said ventilation system comprises a passageway comprising at least a part of the vacuum passageway.
 5. A filler valve according to Claim 1, wherein said rotatable filler plug having a body portion closely receivable within a receiving cavity formed in the housing and the fill passageway comprising a through hole extending laterally through the body portion between the housing content inlet and the housing content outlet during a specific relative position of the filler plug body within the housing receiving cavity. 20
 6. A filler valve according to Claim 5, wherein the filler plug further comprising: 25
 - (a) a drive wheel; and
 - (b) drive rollers making sequential driving engagement with the drive wheel to rotate the filler plug through selected angular distances. 30
 7. A filler valve according to Claim 6, wherein: 35
 - said drive wheel comprises a star wheel having a plurality of radially extending lugs; and
 - said drive rollers coupled to rotatable drive arms, said drive rollers making sequential rolling contact with the lugs of the star wheel. 40
 8. A filler valve according to Claim 1, wherein said valve housing further defining a connection station for receiving a container to be filled, said connection station corresponding to the housing content outlet location and the location of the inlet to the vacuum passageway. 45
 9. A filler valve according to Claim 8, wherein the container connection station is located at the underside of the valve housing. 50
 10. A filler valve according to Claim 1, wherein said filler plug having at least two fill passageways extending therethrough to be in registry with the valve housing content inlet and content outlet at two separate orientations of the filler plug relative to the valve housing. 55
 11. A filler valve according to Claim 10, wherein at one of the orientations of the filler plug wherein a filler plug passageway is in registry with the valve housing content inlet and housing content outlet, ventilating is provided at a location adjacent the valve housing content outlet.
 12. A filler valve according to Claim 1, further comprising a distribution plate rotatable relative to the housing to connect the vacuum passageway with a source of vacuum at a specific orientation of the filler plug with the valve housing so that a vacuum is directed to a location adjacent the housing content outlet.
 13. A filler valve according to Claim 12:
 - further comprising a ventilation system for providing ventilation at a location adjacent the housing content outlet, said ventilation system comprises a ventilation passageway defined, at least in part, by said valve housing; and
 - wherein said distribution plate rotatable relative to the valve housing to selectively block and unblock the ventilation passageway at a specific orientation of the filler plug with the housing.
 14. A valve for filling a container with content composed of a liquid or a liquid and particulate mixture, comprising:
 - (a) a valve housing having a content inlet connectible to a source of content and a content outlet connectible to a container to be filled;
 - (b) a rotatable filler plug closely receivable within the housing, the filler plug having portions defining a fill passageway extending between the housing content inlet and the housing content outlet at a particular rotational orientation of the filler plug relative to the valve housing;
 - (c) a vacuum passageway at least partially incorporated within the valve housing extending from the housing content outlet to a vacuum connection location distal from the housing content outlet, the vacuum passageway openable and closeable depending on the angular orientation of the filler plug within the housing; and
 - (d) a ventilation passageway at least partially incorporated within the valve housing, said ventilation passageway extending between a ventilation inlet and a ventilation outlet location adjacent the housing content outlet, the ventilation passageway openable and closable depending on the angular position of the filler plug within the housing.
 15. A valve according to Claim 14, wherein:
 - the filler plug comprising an elongate body por-

- tion closely engageable with the valve housing;
and
the fill passageway comprising a cross hole
formed in the filler plug body.
16. A valve according to Claim 15, wherein the valve
body having portions defining at least two cross
holes comprising fill passageways, said at least two
cross holes being individually in registry with the
housing content inlet and housing content outlet
based on the angular orientation of the filler plug with-
in the valve housing.
17. A valve according to Claim 14, further comprising a
drive system for rotating the filler plug relative to the
valve housing between at least:
- a first position wherein the filler plug fill passage-
way is not in registry with the housing content
inlet and housing content outlet, and the vacuum
passageway is in open position to apply a vac-
uum source to a location adjacent the housing
content outlet;
- a second position wherein the fill passageway
of the filler plug is in registry with the housing
content inlet and housing content outlet to permit
flow of content through the valve to a container
to be filled, and wherein the vacuum passage-
way is in closed position during at least a portion
of the time a container is being filled and the vent
passageway is in open position during at least
a portion of the time a container is being filled;
and
- a third position wherein the fill passageway is
not in registry with the housing content inlet and
housing content outlet and the vacuum pas-
sageway is in closed position.
18. A valve according to Claim 14, further comprising a
fluid flushing system incorporated into the valve to
direct flushing fluid to the housing content outlet to
flush content from the housing content outlet.
19. A valve according to Claim 18, wherein said flushing
system comprising a flushing fluid passageway ex-
tending through portions of the filler plug and con-
nectible to a source of flushing fluid to direct the flush-
ing fluid to the housing content outlet.
20. A valve according to Claim 14, wherein said valve
housing having portions defining a receiving station
for receiving a container to be filled, said receiving
station being at the housing content outlet and the
vacuum passageway inlet.
21. A valve according to Claim 14, wherein portions of
the vent passageway are defined by portions of the
vacuum passageway.
22. A valve according to Claim 14, further comprising
distribution plate rotatable to open and close the vac-
uum passageway and to open and close the venti-
lation passageway based on the rotational orienta-
tion of the distribution plate.
23. A valve according to Claim 22, wherein the distribu-
tion plate is rotatable with the filler plug.
24. A valve according to Claim 22, wherein said filler
plug comprising:
- a first end portion connectible to a drive system
for rotating the filler plug; and
a second end portion in driving engagement with
the distribution plate.
25. An apparatus for filling a container with a flowable
product, comprising:
- (a) a product storage enclosure;
- (b) a container filling station for filling a container
with product from the product container; and
- (c) a filler valve for selectively transmitting prod-
uct from the product container to the filling sta-
tion, said filler valve comprising:
- (i) a housing having portions defining a
product inlet in communication with the
product storage enclosure and a product
outlet in communication with the container
filling station;
- (ii) a rotatable plug having an elongate body
portion closely receivable within said valve
housing, said body portion defining a cross
hole in alignment with the housing inlet and
housing outlet at a particular angular orien-
tation of the plug body portion within the
housing;
- (iii) a vacuum passageway at least in part
defined by portions of the housing, said vac-
uum passageway having an inlet at the
housing product outlet and an outlet at a
location connectible to a source of vacuum,
said vacuum passageway operable be-
tween a closed condition wherein a vacuum
is precluded from extending from the vacu-
um passageway inlet and the vacuum pas-
sageway outlet and an open condition
wherein a vacuum extends from the vacu-
um passageway inlet to the vacuum pas-
sageway outlet; and
- (iv) a ventilation passageway at least in part
defined by portions of the housing, said ven-
tilation passageway connectible between a
ventilation inlet and a ventilation outlet at a
location adjacent the housing product out-
let, said ventilation passageway operable

between a closed condition wherein ventilation air is precluded from flowing between the ventilation passageway inlet and outlet and an open condition wherein ventilation air is capable of flowing between the ventilation passageway inlet and outlet; and

(d) the filler valve operable between at least a first position wherein the plug cross hole is not in registry with the housing inlet and outlet and the vacuum passageway is in open condition; and a second position wherein the filler plug body cross hole is in registry with the housing inlet and outlet, the vacuum passageway is in closed condition and the ventilation passageway is in open condition.

26. A filling apparatus station according to Claim 25, wherein:

the body portion of the rotatable plug defining two cross holes, each individually alignable with the housing inlet and housing outlet at a particular angular orientation of the plug body portion within the housing; and the filler valve rotatable between at least three positions comprising:

a first position wherein neither of the cross holes of the plug body are in registry with the housing inlet and housing outlet and the vacuum passageway is in open condition to apply a vacuum to a container at the container filling station;

a second position wherein one of the cross holes of the plug body portion is in registry with the housing inlet and outlet to enable product to flow from the storage container to a container being filled, and simultaneously the ventilation passageway in closed condition; and

a third position wherein the other of the two cross holes of the plug body portion is in registry with the housing inlet and housing outlet to enable product to flow between the product storage container and the container filling station, and simultaneously the ventilation passageway being in open condition.

27. A filling apparatus according to Claim 26, wherein the filler valve is positionable in a fourth position, wherein neither of the two cross holes of the plug body portion are in registry with the housing inlet and outlet, the vacuum passageway is in closed condition, and the housing outlet is in fluid flow communication with a source of flushing fluid.

28. A filling apparatus according to Claim 25, wherein

said filler valve further comprising a distribution plate operable in conjunction with the rotatable plug to operate the vacuum passageway between a closed condition and an open condition; and to operate the ventilation passageway between a closed condition and an open condition.

29. A filling apparatus according to Claim 28, wherein the distribution plate is operably coupled to the rotatable plug.

30. A filling apparatus according to Claim 29, wherein rotatable plug is coupled to a drive system for sequentially rotating the filler plug and the distribution plate through selected angular distances corresponding to the positions of the first and second positions of the filler valve.

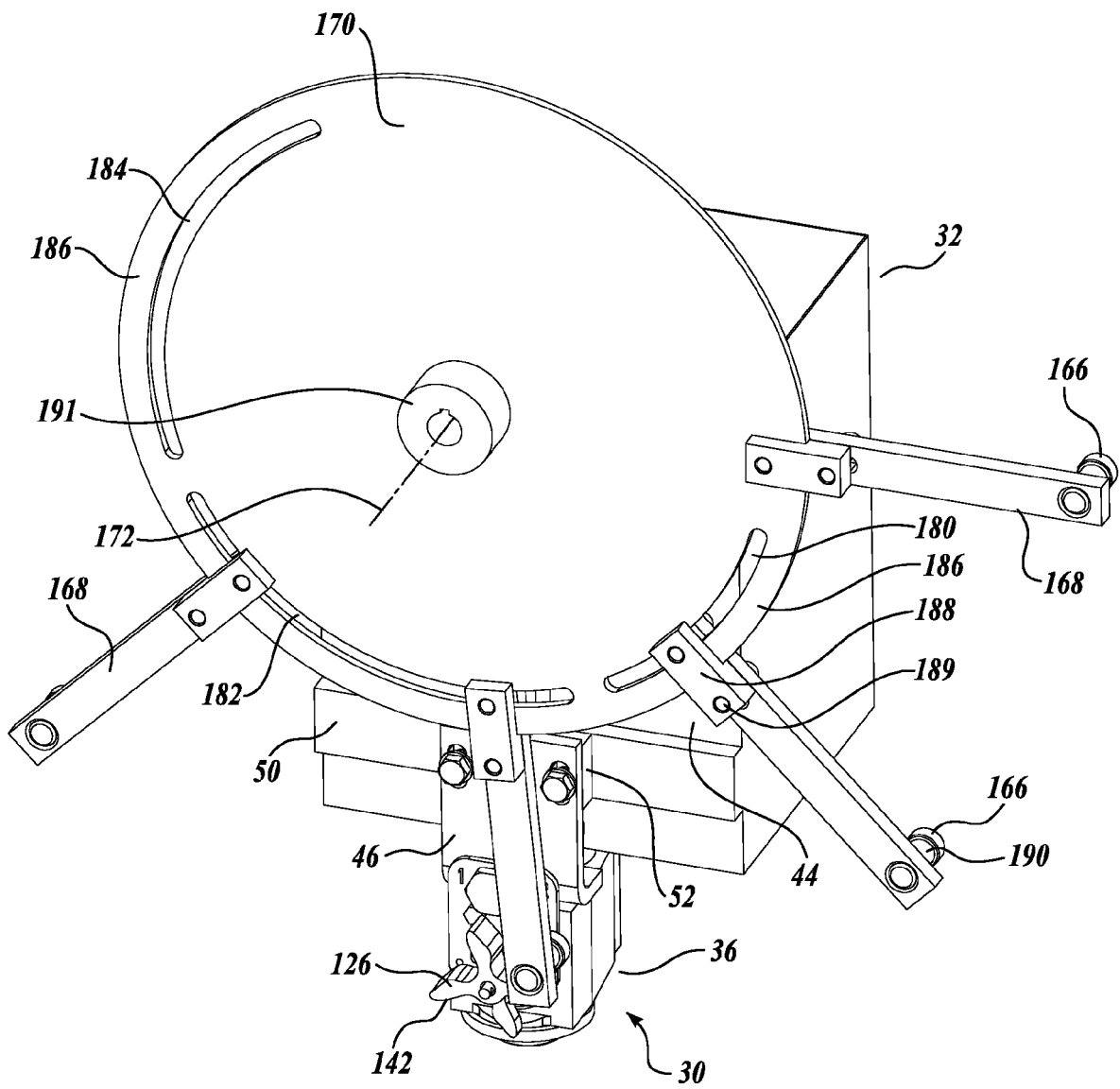
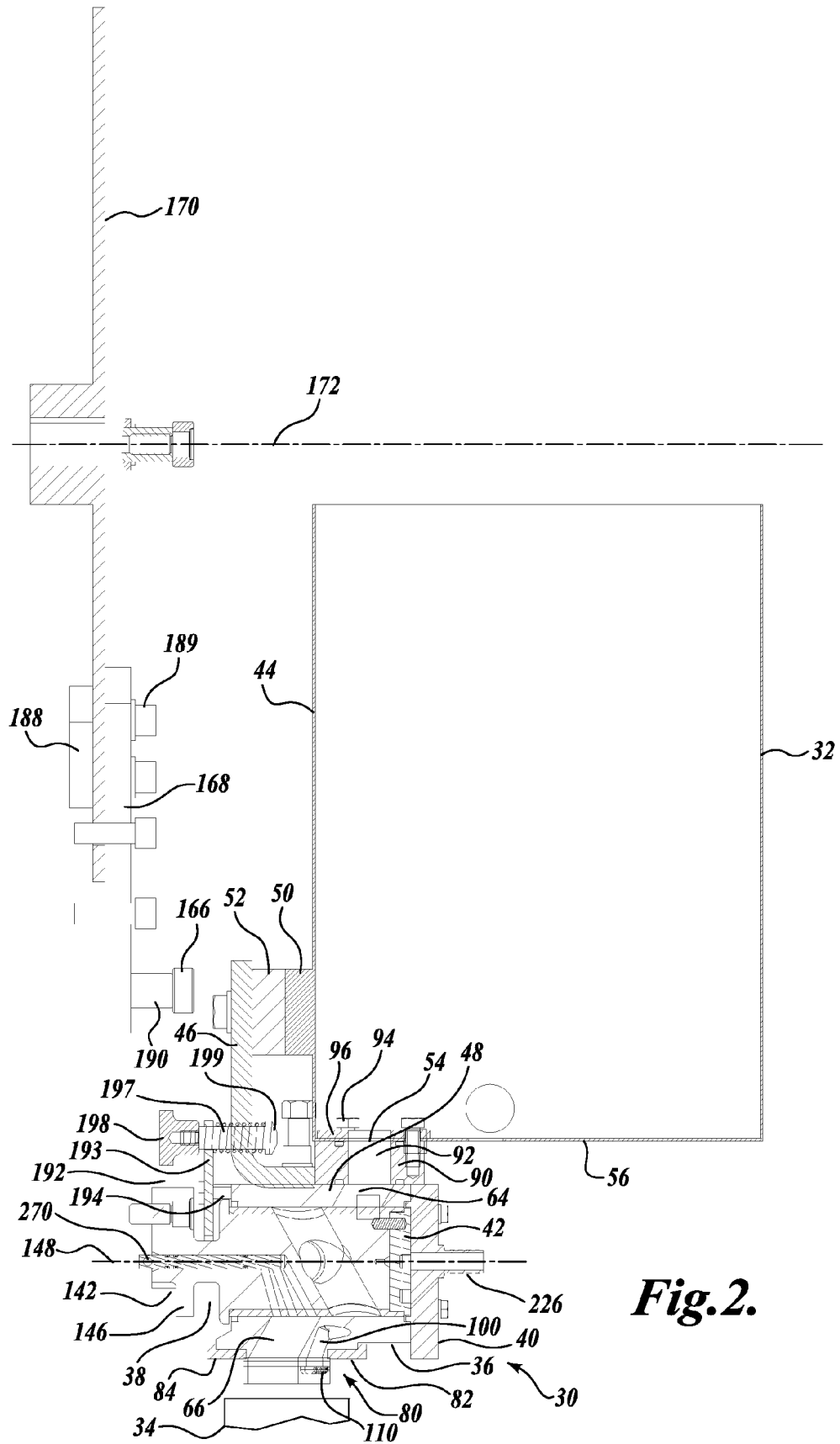


Fig.1.



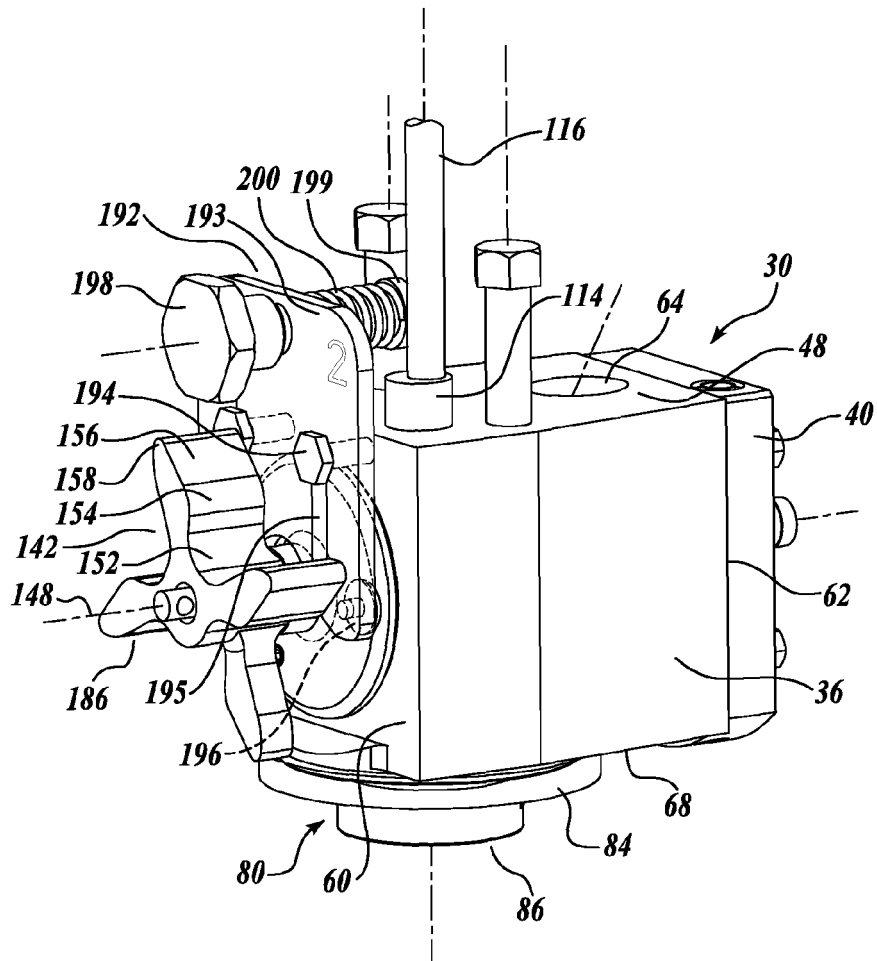


Fig.3.

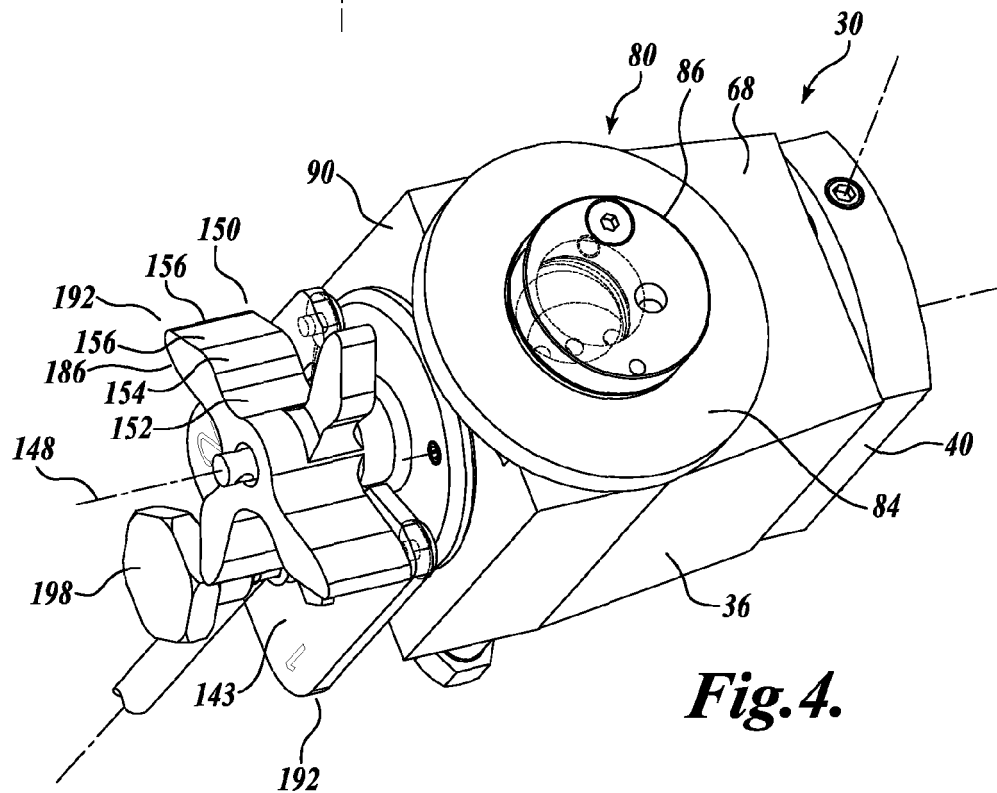


Fig.4.

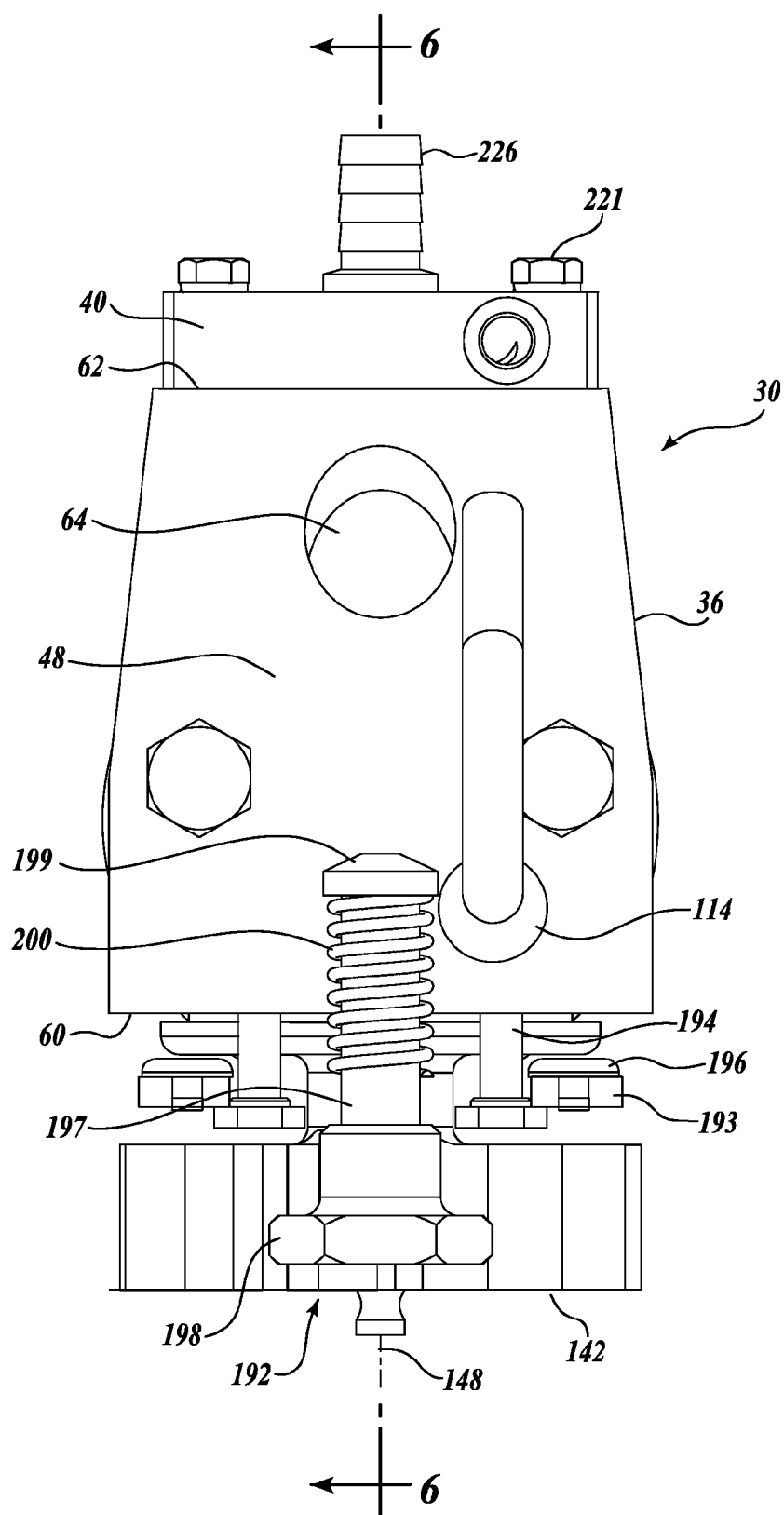


Fig. 5.

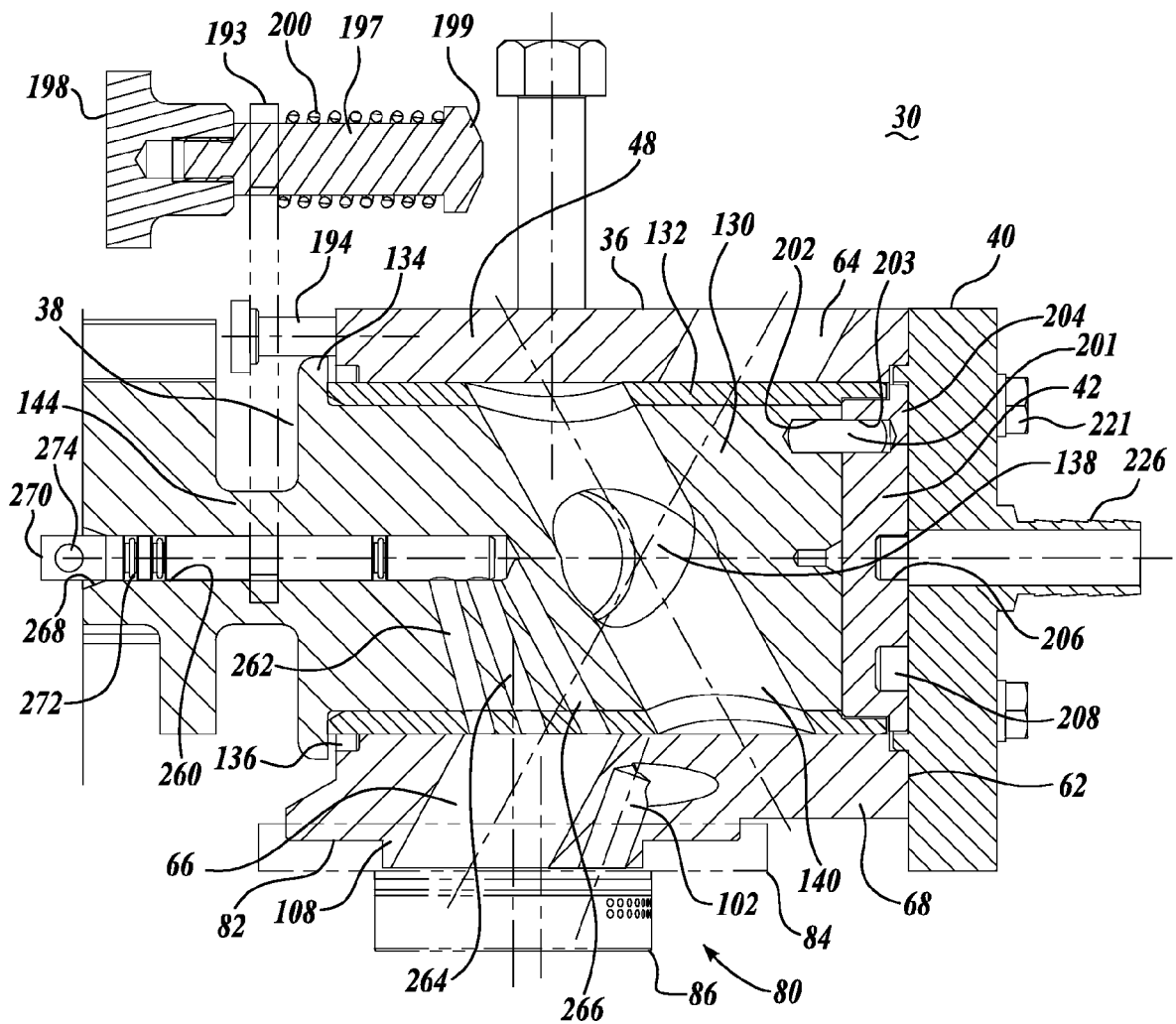


Fig. 6.

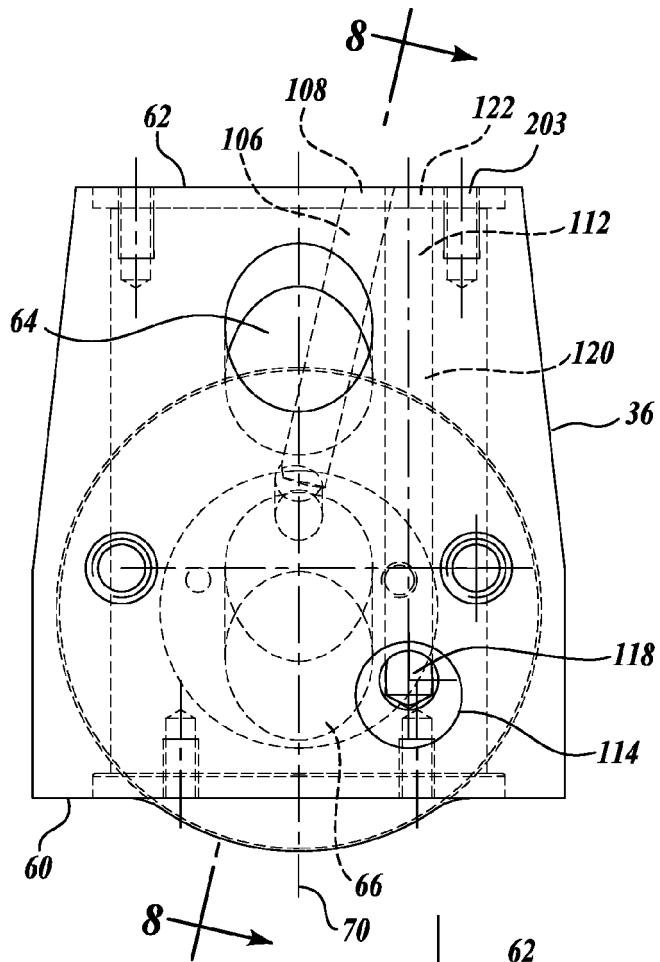


Fig. 7.

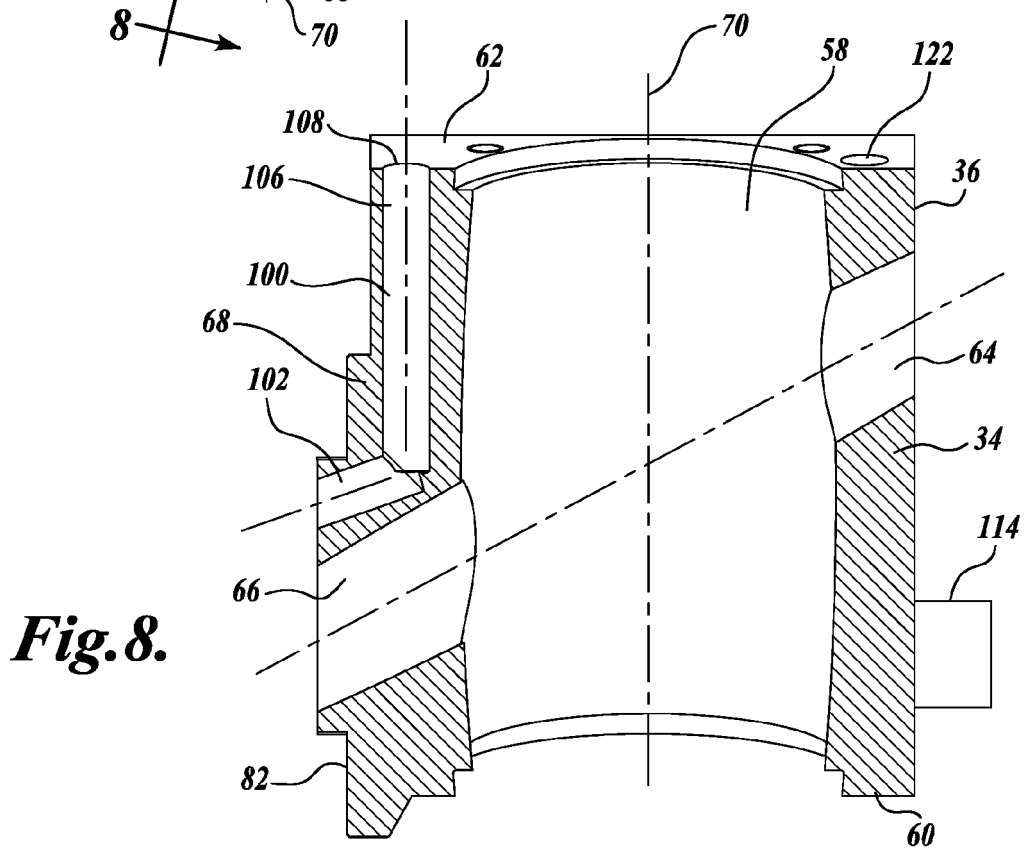


Fig. 8.

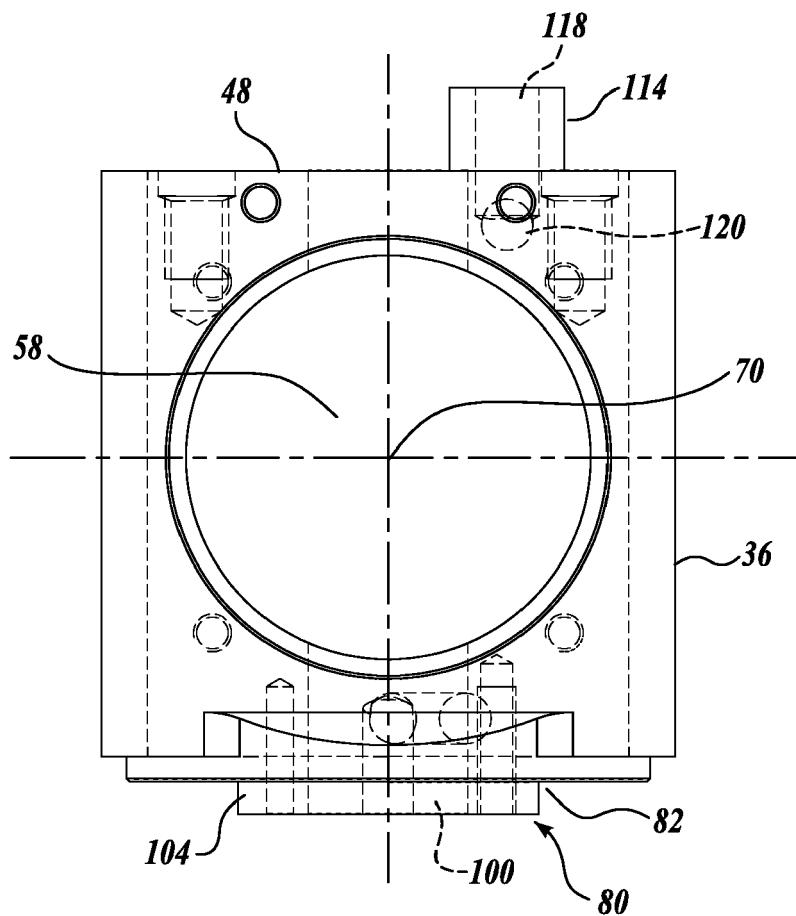


Fig. 9.

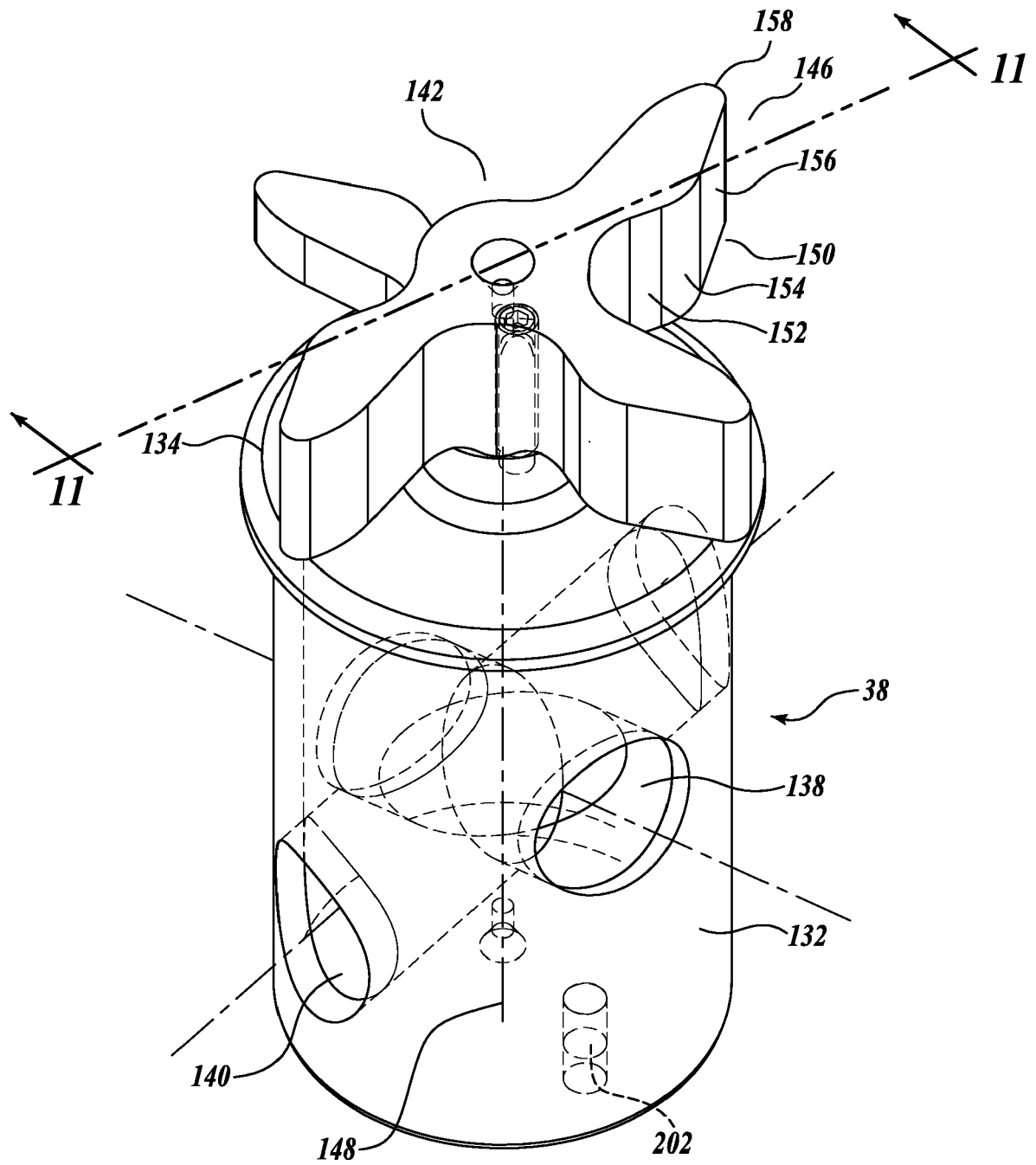


Fig. 10.

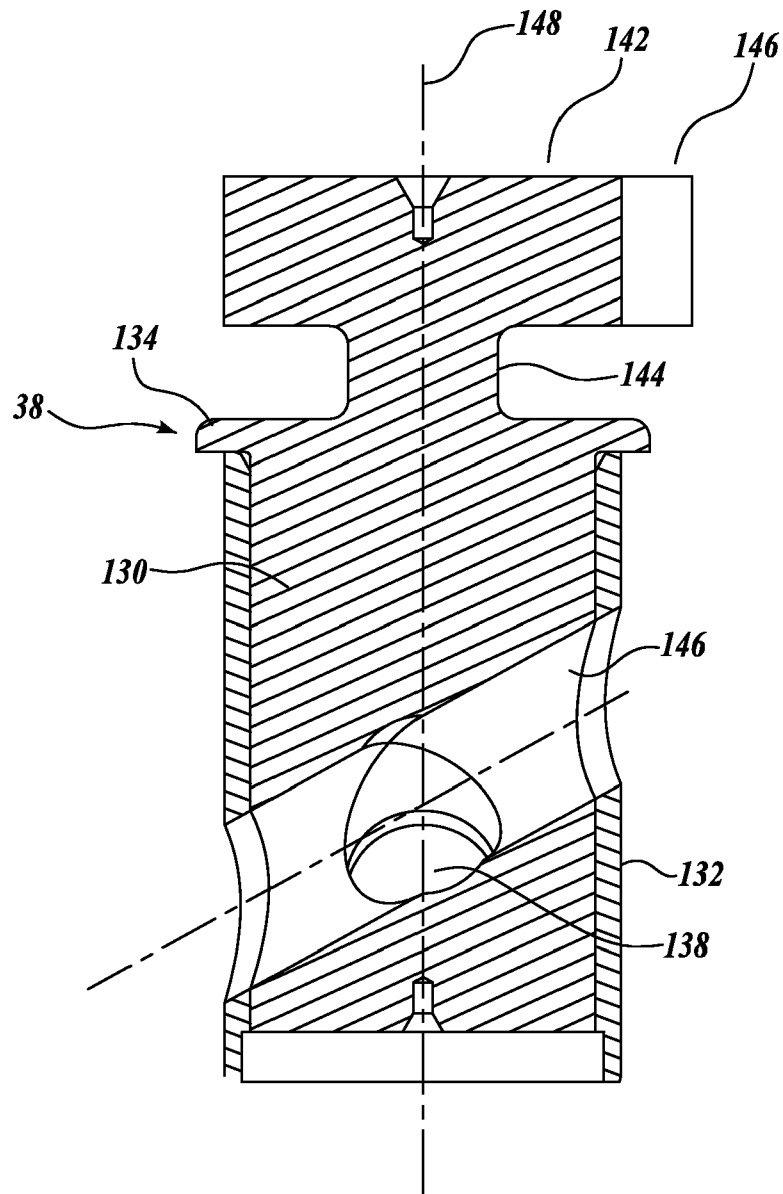


Fig.11.

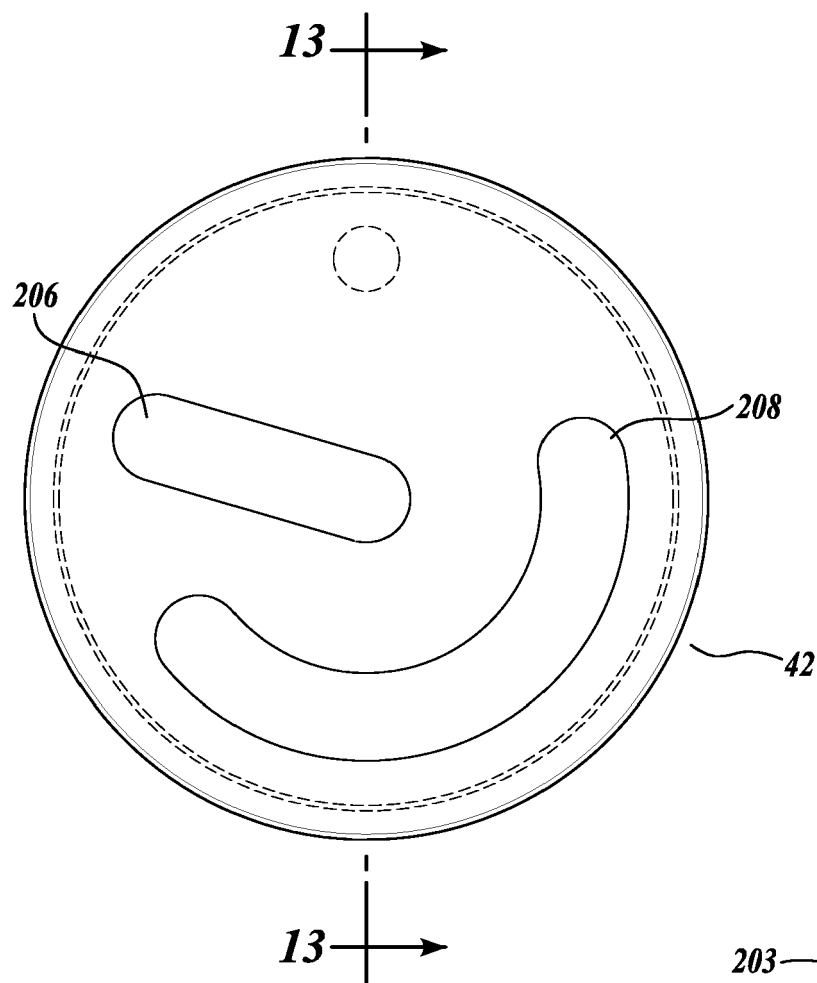


Fig.12.

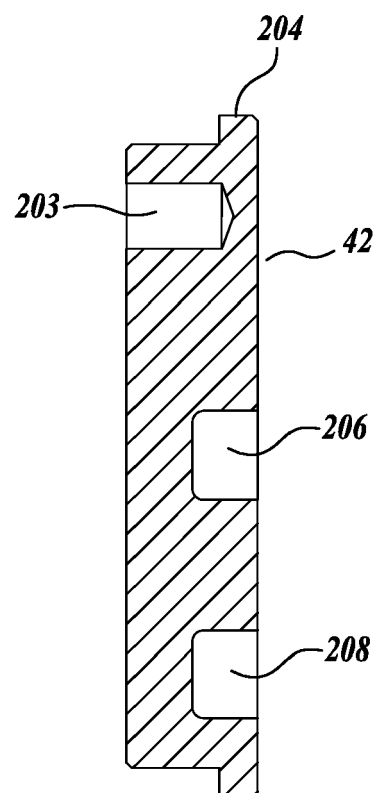


Fig.13.

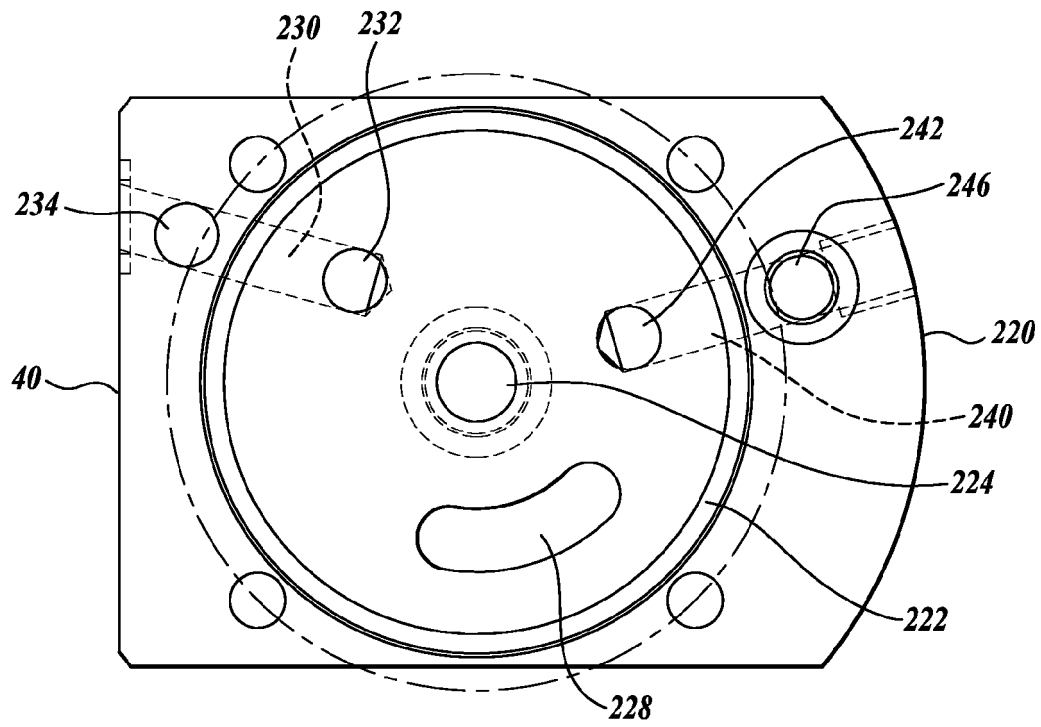


Fig.14.

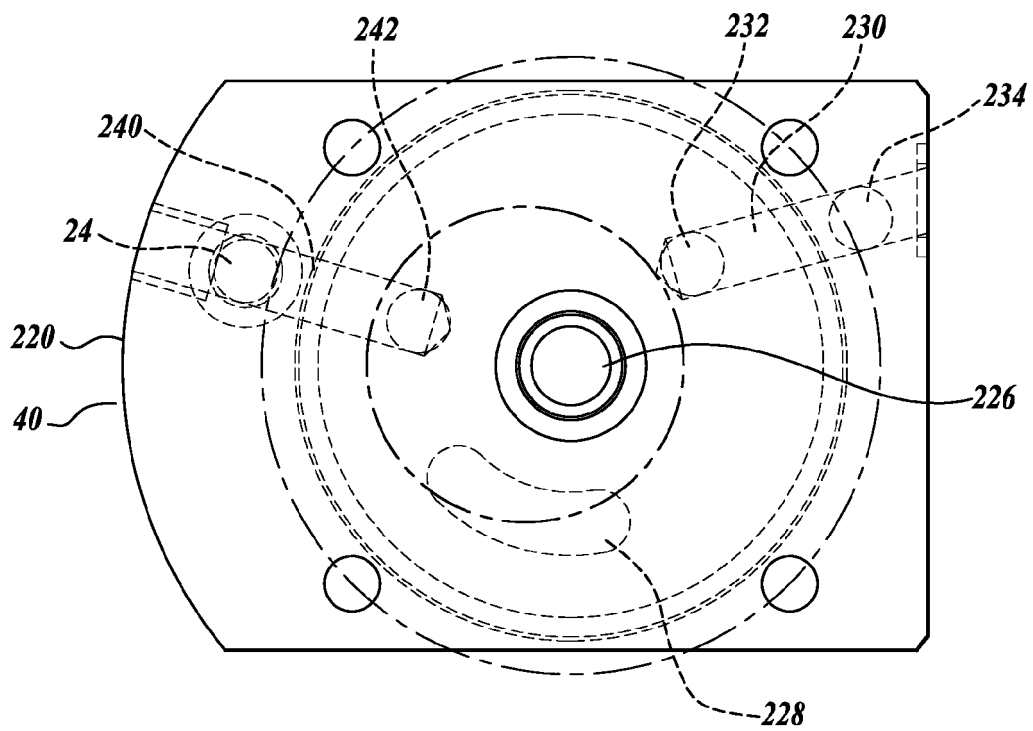


Fig.15.

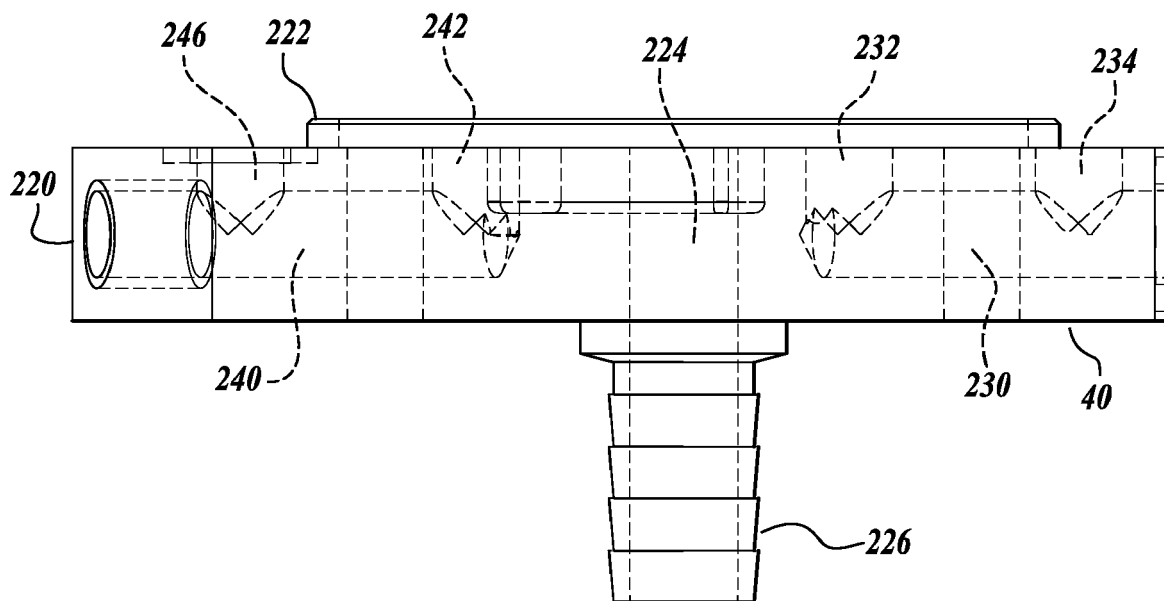


Fig.16.

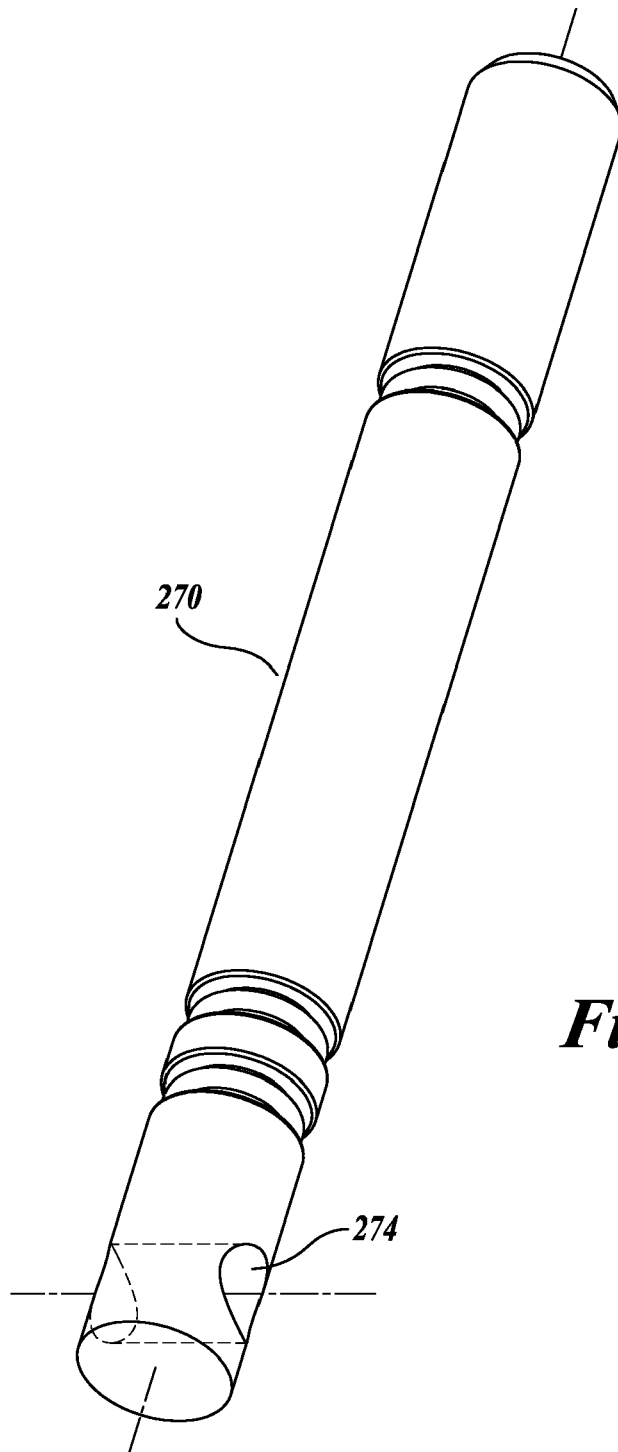


Fig.17.

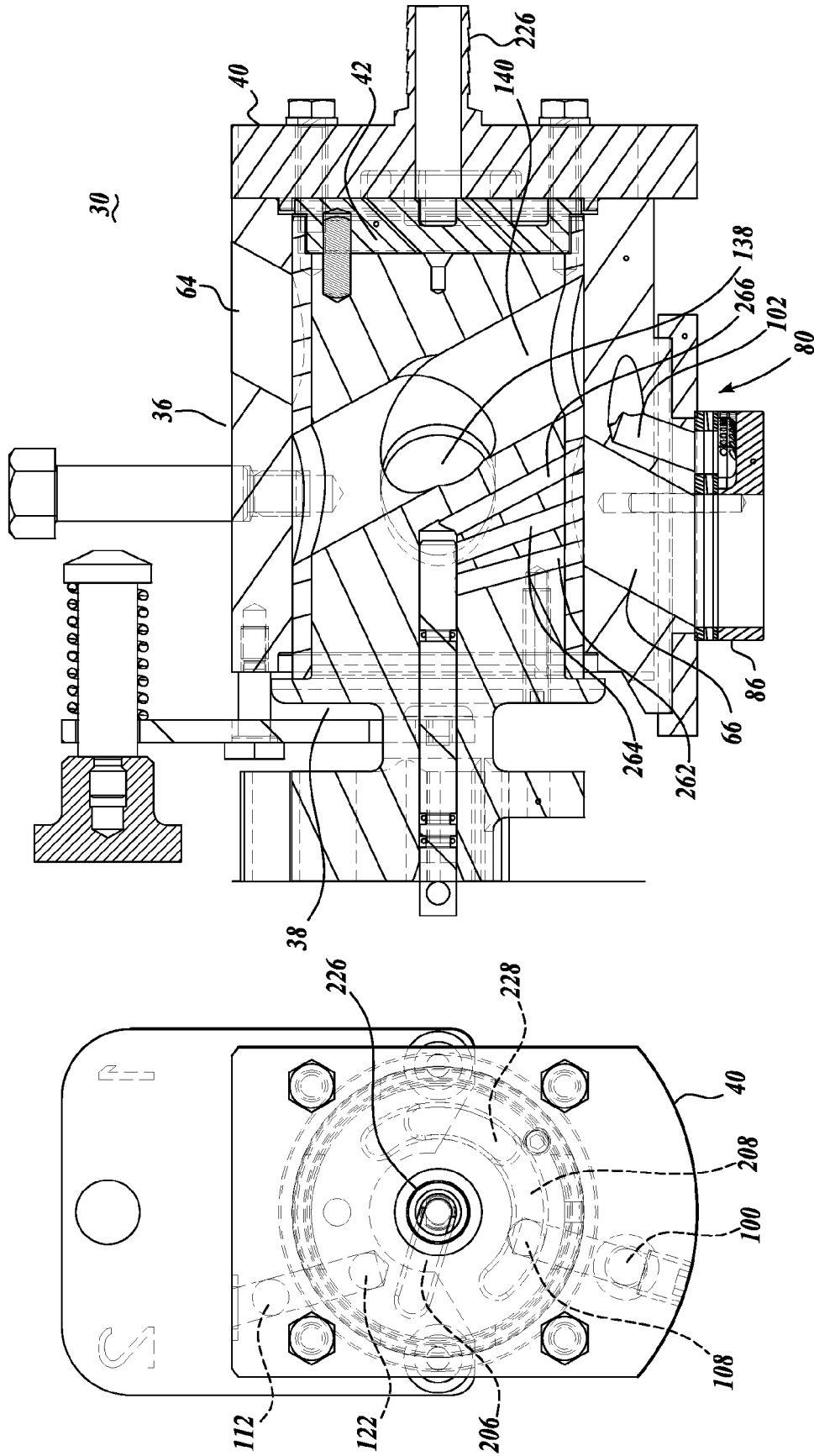
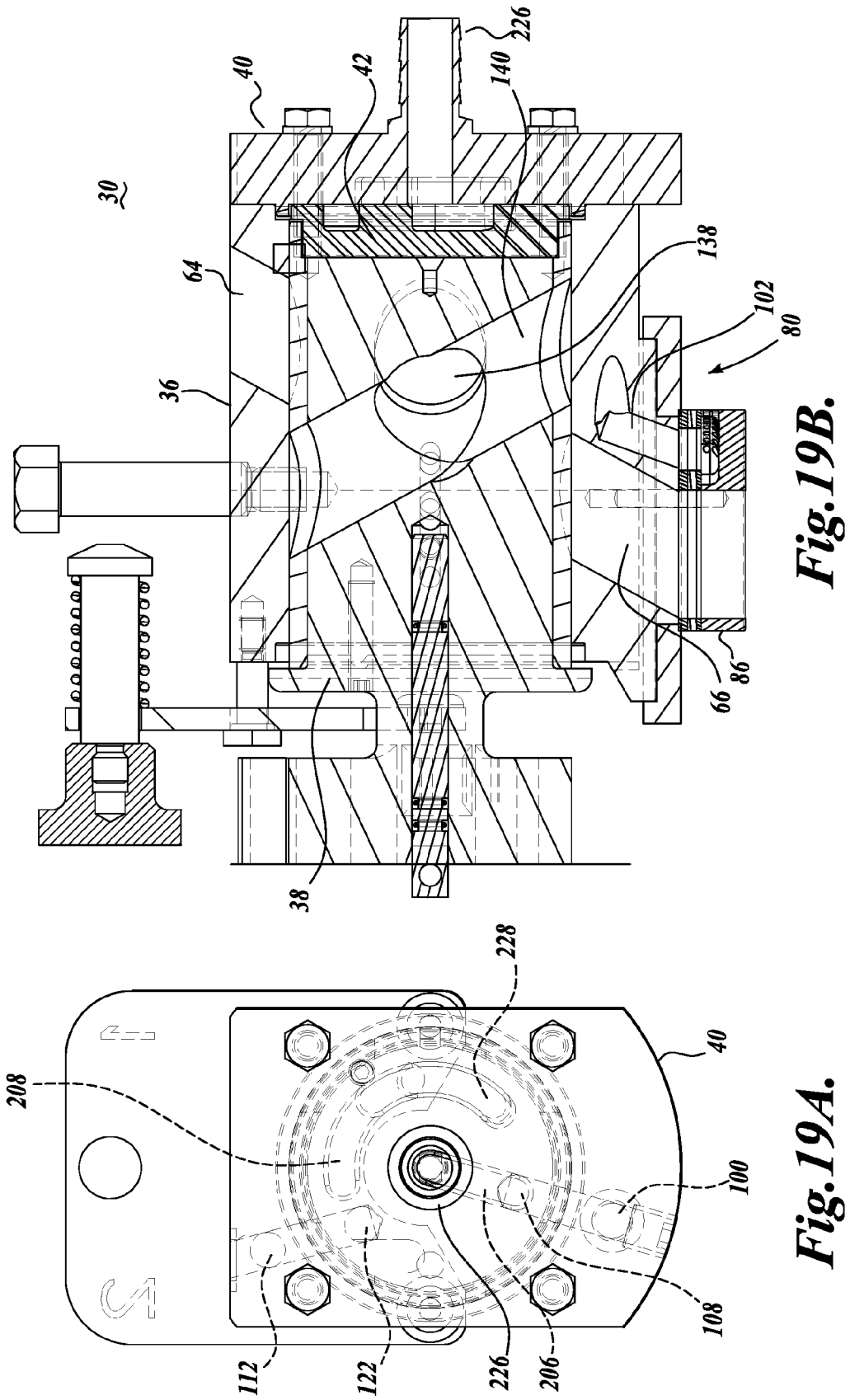


Fig. 18B.

Fig. 18A.



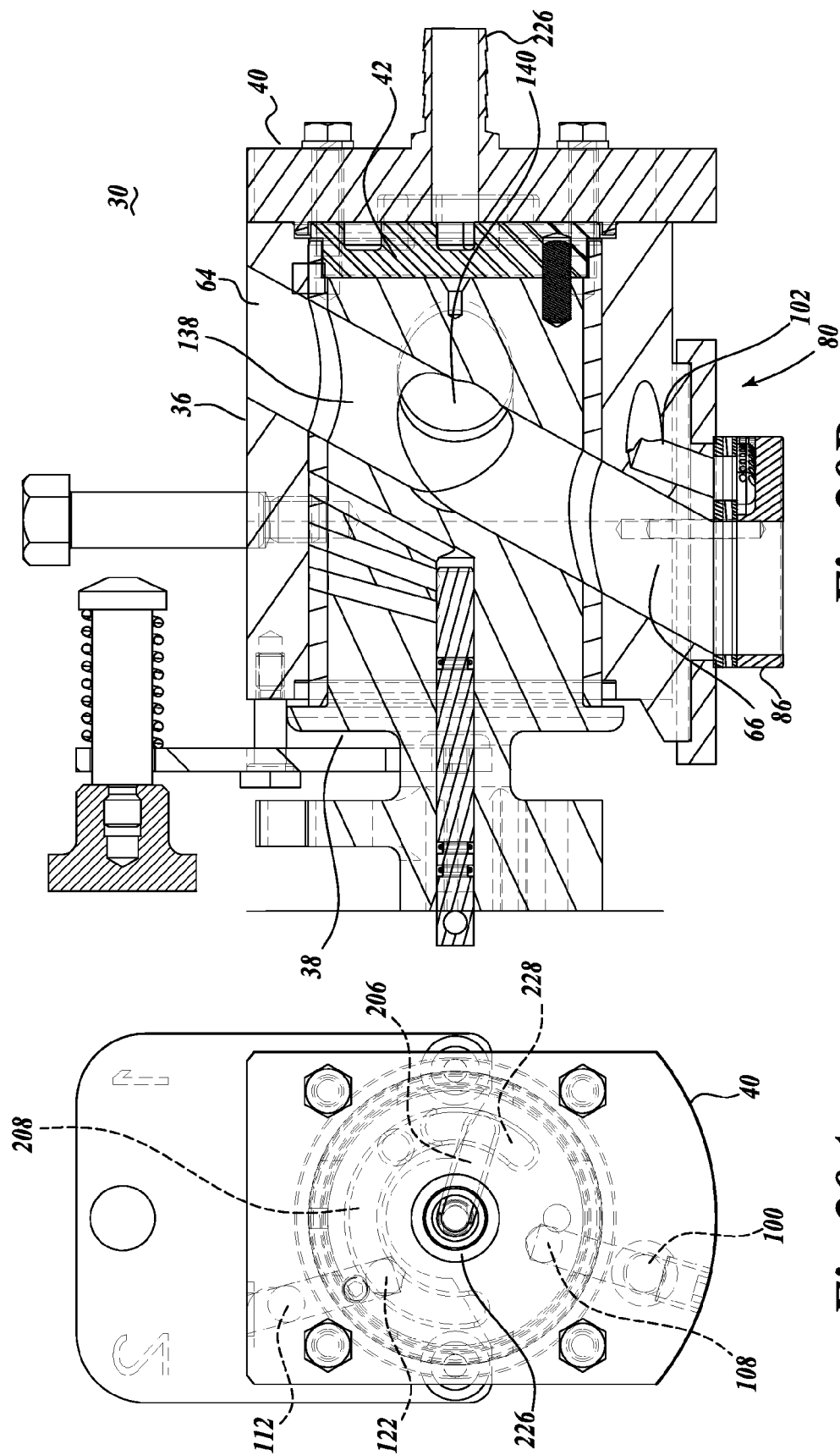


Fig. 20B.

Fig. 20A.

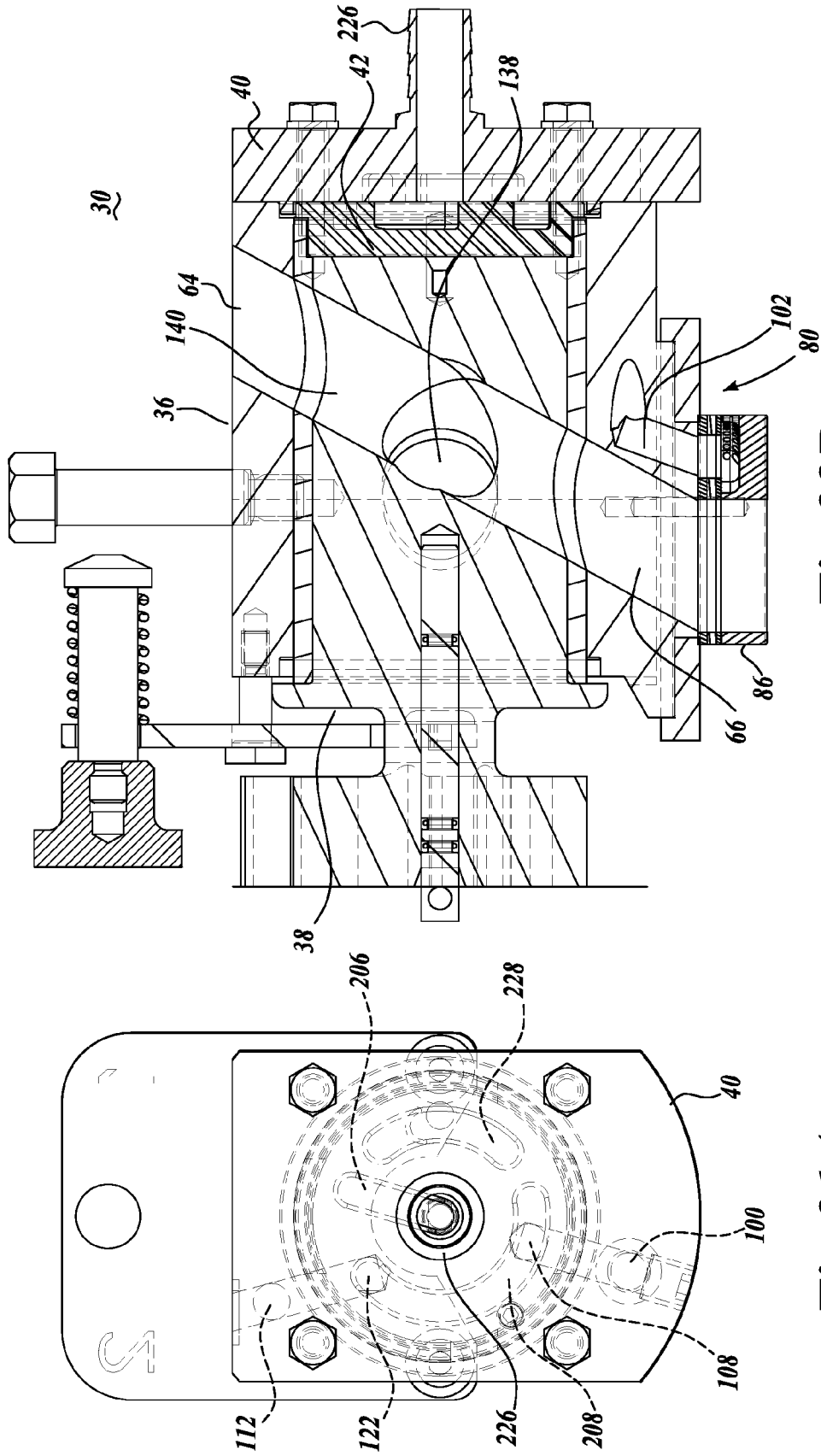


Fig. 22B.

Fig. 21A.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 6195

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 September 2006	Examiner Vigilante, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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