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(54) **WATERING PUMP**

(57) A pump **(100)** includes a body **(102)** defining an inlet **(104)** and an outlet **(106)**. A first valve **(300)** selectively opens a backflow opening **(110)**. The first valve **(300)** includes a first valve housing **(306)**, such that a first valve body **(308)** is biasingly coupled by a first spring **(310)** within the first valve housing **(306)**. The first valve body **(308)** moves the first spring **(310)** to a first compressed state, and to a first uncompressed state. A second valve **(312)** provided within the first valve **(300)** includes a second valve body **(314)**. The second valve body **(314)** is biasingly coupled by a second spring **(316)** within the first valve body **(308)**. The second valve body **(314)** moves the second spring **(316)** to a second compressed state to allow flow of the liquid, and to a second uncompressed state to disallow flow of the liquid through the second valve **(312)**.

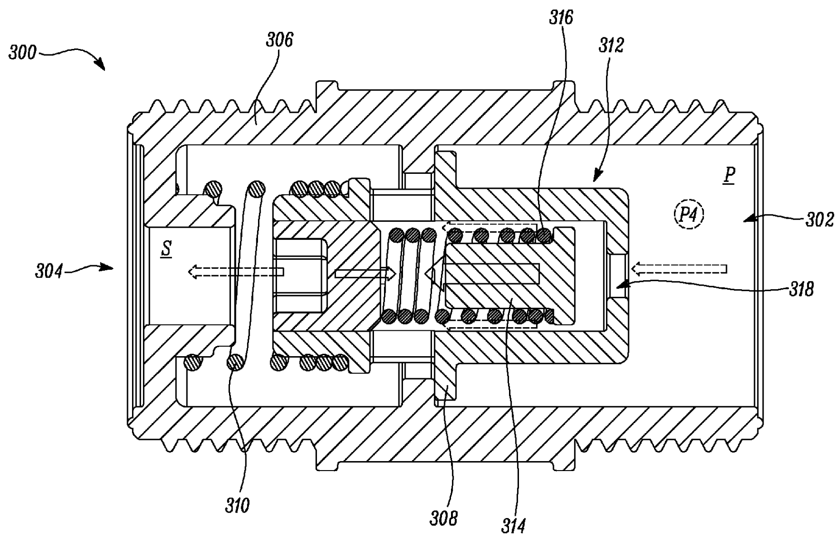


FIG. 6

Processed by Luminess, 75001 PARIS (FR)

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a watering pump, and more specifically to a valve assembly for the watering pump.

BACKGROUND

[0002] Self-priming centrifugal pumps are widely used for enabling water supply in applications such as gardening among others. One of the important functions of such a pump is suction of water. Such pumps are designed to work with water as a medium and not air. Therefore, the pump requires to be filled with water before the start of the pump. The pump defines a suction side towards the inlet and a pressure side towards the outlet. Through the pumping process, water from the suction side is transported to the pressure side, which creates a negative pressure on the suction side. This process may also induce air from the suction side to the pressure side. However, it is imperative that majority of flow medium should be water, as the pump is designed for flow of water.

[0003] One of the ways to ensure this is to provide a backflow opening around the suction side. However, this allows for presence of backflow at all times which results in significant loss of power of the pump, which is partially compensated by higher flow provided by a higher power motor. Similar techniques are also used for multi-stage hydraulic pumps. However, such pumps have better self-priming abilities and require backflow only during special cases of operation.

[0004] To provide for such an arrangement, such pumps are equipped with a suction valve. The suction valve has a backflow opening and a valve body with a compression spring. When unloaded, the suction valve is open. During the suction process, the pumped water flows around the valve body, re-enters the suction side of the pump and can be pumped again by the pump and moved to the pressure side. The suction side builds up a negative pressure by the pumping of a water-air mixture and a separation of the air on the pressure side. After the suction process has been completed, there is a flow that passes the suction valve. This creates a flow pressure gradient between the areas before and after the valve body. Since the pressure in front of the valve body is bigger than the pressure after the valve body, a resulting force is created, which counteracts a force applied by the compression spring of the suction valve. A high flow rate in this area may occur when the pressure side of the pump is almost closed. If the flow rate is sufficiently large, the suction valve is closed by the pressure gradient. The present high static pressure keeps the suction valve closed. If the pressure side is opened, the internal pressure of the pump drops. If a certain pressure is exceeded, the force applied by the compression spring leads to a re-opening of the suction valve.

[0005] A special case is an operating point with a very low flow rate in combination with a closed valve. Due to air separation of the pumped medium, air accumulates on the suction side of the pump. The low flow rate and the resulting low flow velocity cannot transport this air to the pressure side. Further, too much air on the suction side may leads to collapse of the hydraulics of the pump. This phenomenon may be counteracted by an additional back flow opening. The additional backflow opening provides a permanent back flow between the pressure side and the suction side and removes the separated air. However, the additional backflow opening leads to a permanent loss of hydraulic power which is highly undesirable.

[0006] An example is provided by Chinese utility model CN206144850 (hereinafter referred to as ’850 reference). The ’850 reference discloses a runner body structure of a garden pump. The garden pump includes a backward flow hole that further includes a valve member. The valve member includes a spring that operates based on the pressure on the pump. The valve member maintains the flow rate of water inside the pump by actuation of the spring. However, the ’ 850 reference seems short of addressing the issues faced during low flow rate, and low flow velocity which are discussed previously.

[0007] Thus, there is a need to provide an improved valve assembly arrangement for pumps.

SUMMARY

[0008] In view of the above, it is an objective of the present disclosure to solve or at least reduce the drawbacks discussed above. The objective is at least partially achieved by a pump. The pump has a body which defines an inlet and an outlet to allow flow of a liquid. The pump has a suction side around the inlet and a pressure side around the outlet. The pump has an impeller positioned downstream of the inlet. The pump defines a backflow opening. The backflow opening is in fluid communication with the inlet and the outlet. The pump includes a first valve. The first valve is operatively coupled with the backflow opening such that the first valve selectively opens the backflow opening. The first valve has a first end and a second end. The first valve further includes a first valve housing. A first valve body is biasingly coupled by a first spring within the first valve housing around the second end. Based on the operating conditions, the first valve body moves the first spring between a first compressed state and a first uncompressed state. The first valve body moves the first spring to the first compressed state to disallow flow of the liquid through the first valve, and the first valve body moves the first spring to a first uncompressed state to allow flow of the liquid through the first valve.

[0009] Further, the pump is characterized in that a second valve is provided within the first valve. The second valve has a second valve body such that the second valve body is biasingly coupled by a second spring within the first valve body. Based on the operating conditions, the second valve body moves the second spring between a second compressed state and a second uncompressed state. The second valve body moves the second spring to the second compressed state to allow flow of the liquid through the second valve, and the second valve body moves the second spring to the second uncompressed state to disallow flow of the liquid through the second valve.

[0010] Such an arrangement of multiple valves i.e., the first valve and the second valve allows suction and stable pumping characteristics without permanent losses of pump power due to permanently opened backflow openings. The improved valve system allows for optimal adaptation of the valve to a desired performance curve of the pump through the two springs i.e., the first spring, and the second spring. Additionally, the valve will require lesser space, and lesser number of parts due to placement of the second valve within the first valve as same parts are carrying out more than one functions. For example, the first valve body acts as housing for the second valve. Thus, the present disclosure provides an improved pump which is able to overcome the problems previously discussed.

[0011] According to an embodiment of the present disclosure, the first valve is a suction valve, and the second valve is a pressure valve. Such a combination acts in unison to achieve better performance results for the pump and reduce losses which may happen due to permanent backflow opening.

[0012] According to an embodiment of the present disclosure, the second valve is disposed within the first valve between the first compression spring and the first valve body. This arrangement allows the first valve body to act as a valve housing for the second valve. Such a structural system permits usage of lesser number of parts as existing parts carry out dual functions.

[0013] According to an embodiment of the present disclosure, the second valve reciprocates within the first valve body, based on a pressure acting on the second compression spring. Based on operational conditions, the second valve is actuated through the pressure acting on the second spring through the second valve body. Reciprocation of the second valve within the first valve body provides for actuation of the second valve in case of very high pressure on the second valve. In such a case, the second valve remains open, and the first valve remains closed.

[0014] According to an embodiment of the present disclosure, the first valve body defines a pressure opening around the first end of the first valve. The pressure opening of the first valve body allows fluid flow, such that the second valve body moves the second spring between the second compressed state, and the second uncompressed state. Movement of the second spring between the second compressed state and the second uncompressed state respectively closes and opens the second valve. The pressure opening allows the valve body to take up the pressure and apply adequate forces on the second compression spring for actuation purposes.

[0015] According to an embodiment of the present disclosure, the pump is a centrifugal pump. Centrifugal pumps may utilize the described valve system quite efficiently and reduce the permanent operating power losses due to multiple backflow openings.

[0016] Other features and aspects of this disclosure will be apparent from the following description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The disclosure will be described in more detail with reference to the enclosed drawings, wherein:

FIG. 1 illustrates a centrifugal pump as known in prior art;

FIG. 2A illustrates a valve for the centrifugal pump with a first spring in an uncompressed state, as known in prior art;

FIG. 2B illustrates the valve for the centrifugal pump with the first spring in a compressed state, as known in prior art;

FIG. 3 illustrates a first valve for a centrifugal pump which houses a second valve, according to an embodiment of the present disclosure;

FIG. 4 illustrates the first valve for the centrifugal pump in an intermediate position while the second valve is closed, according to an embodiment of the present disclosure;

FIG. 5 illustrates the first valve for the centrifugal pump and the second valve as closed, according to an embodiment of the present disclosure; and

FIG. 6 illustrates the first valve for the centrifugal pump as closed while the second valve is open, according to an embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0018] The present disclosure will be described more fully hereinafter with reference to the accompanying drawings, in which example embodiments of the disclosure incorporating one or more aspects of the present disclosure are shown. This disclosure may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the disclosure to those skilled in the art. For example, one or more aspects of the present disclosure may be utilized in other embodiments and even other types of structures and/or methods. In the drawings, like numbers refer to like elements.

[0019] Certain terminology is used herein for convenience only and is not to be taken as a limitation on the disclosure. For example, "upper", "lower", "front", "rear", "side", "longitudinal", "lateral", "transverse", "upwards", "downwards", "forward", "backward", "sideward", "left," "right," "horizontal," "vertical," "upward", "inner", "outer", "inward", "outward", "top", "bottom", "higher", "above", "below", "central", "middle", "intermediate", "between", "end", "adjacent", "proximate", "near", "distal", "remote", "radial", "circumferential", or the like, merely describe the configuration shown in the Figures. Indeed, the components may be oriented in any direction and the terminology, therefore, should be understood as encompassing such variations unless specified otherwise.

[0020] **FIG. 1** illustrates a pump **100.** The pump **100** may be any type of a pump. In an embodiment, the pump **100** is a centrifugal pump. The pump **100** may be used to transport a liquid such as water or any other such liquid. For the purpose of describing the present disclosure, the liquid will be considered as water. However, it should be contemplated that the liquid may be any other liquid as well without any limitations. The pump **100** has a body **102** defining an inlet **104** and an outlet **106** to allow flow of the liquid. The fluid enters the pump **100** through the inlet **104** and exits the pump **100** through the outlet **106.** The pump **100** defines a suction side **"S"** and a pressure side **"P".** The suction side **"S"** is defined around the inlet **104** and the pressure side **"P"** is defined around the outlet **106.** The pump **100** further includes an impeller **108.**

[0021] As illustrated, the impeller **108** is positioned downstream of the inlet **104,** however any other position, type, and arrangement of the impeller **108** is well within the scope. The impeller **108,** when in motion, displaces water to augment flow of water from the inlet **104** to the outlet **106.** The pump **100** further includes a backflow opening **110** in fluid communication with the inlet **104** and the outlet **106.** The backflow opening **110** provides a channel for the water to flow back from the pressure side **"P"** to the suction side **"S".** A valve **200** (shown in **FIGS. 2A, B**) is operatively coupled with the backflow opening **110.** The valve **200** operates to selectively open the backflow opening **110.**

[0022] **FIGS. 2A** and **2B** demonstrate structural details of the valve **200** as known conventionally. The valve **200** has a first end **202** and a second end **204.** The valve **200** defines a valve housing **206.** The valve **200** further includes a valve body **208.** The valve body **208** is biasingly coupled by a spring **210** within the valve housing **206.** The valve body **208** is coupled by the spring **210** around the second end **204** of the valve **200.** The spring **210** may move between a compressed state and an uncompressed state. **FIG. 2A** illustrates the spring **210** in the uncompressed state and **FIG. 2B** illustrates the spring in the compressed state. The valve body **208** moves the spring **210** to the compressed state to disallow flow of water through the valve **200.** Further, the valve body **208** moves the spring **210** to the uncompressed state to allow flow of water through the valve **200.**

[0023] With combined reference to **FIGS. 2A** and **2B,** during normal operation, the spring **210** is in the uncompressed state and the valve **200** is open. Water enters the pump **100** through the inlet **104** and exits the pump **100** through the outlet **106.** During suction process, water being pumped by the pump **100** flows around the valve body **208.** The pumped water may flow around the valve body **208** and reenter the suction side **"S"** of the pump **100.** This pumped water may be pumped again and moved to the pressure side **"P"** of the pump **100.** Now, it should be considered that a water air mixture is being pumped from the suction side **"S".** The air from the water air mixture gets separated on the pressure side **"P".** Due to this, a negative pressure builds up towards the suction side **"S".** Further, after completion of the suction process, a flow of water starts passing the valve **200.** This creates a flow pressure gradient across the valve body **208.** Thus, the flow pressure gradient creates a resulting force which acts against the spring **210** and biases the valve body **208** to move the spring **210** towards the compressed state, as shown in **FIG. 2B.**

[0024] As used herein, pressures **"P1", "P2", "P3",** and **"P4"** are used to show pressure, and forces inside the valve **200,** and valve **300** based upon flow of the liquid (illustrated with dashed lines), spring forces (illustrated with left solid line arrow in the present figures), related to the spring **210,** a first spring **310,** and a second spring **316,** and resultant force based on the liquid flow and the spring force (illustrated with right solid line arrow in the present figures). In some embodiments, as illustrated in **FIGS. 2A** and **2B,** a higher pressure **"P1"** around the pressure side **"P",** compared to pressure **"P2"** around the suction side **"S"** i.e., **"P1"** > **"P2",** allows actuation of the valve body **208** to moves the spring **210** to the compressed state (shown in **FIG. 2B)** to disallow flow of water through the valve **200.** For clarity considerations, the solid arrow around the valve body **208** is illustrated as having a larger size to indicate movement of the valve body **208** to move the spring **210** to the compressed state as shown in **FIG. 2B.**

[0025] **FIG. 3** illustrates structural details of a valve **300** as per the present disclosure. The valve **300** as per the present disclosure shall be referred to as a first valve **300** henceforth. The first valve **300** has a first end **302** and a second end **304.** The first valve **302** defines a first valve housing **306.** The first valve **300** further includes a first valve body **308.** The first valve body **308** is biasingly coupled by the first spring **310** within the first valve housing **306.** The first valve body **308** is coupled by the first spring **310** around the second end **304** of the first valve **300.** The first spring **310** may move between a first uncompressed state and a first compressed state. The first valve body **308** may move the first spring **310** to the first uncompressed state to allow flow of water through the first valve **300.** Further, the first valve body **308** may move the first spring **310** to the first compressed state to disallow flow of water through the first valve **300.** **FIG. 3**

shows the first spring **310** in the uncompressed state and **FIG. 4** shows the first spring **310** in the compressed state.

[0026] With combined reference to **FIGS. 3** and **4,** the pump **100** further includes a second valve **312** disposed within the first valve **300.** It should be noted here that the first valve body **308** acts as a valve housing for the second valve **312.** The second valve **312** is disposed within the first valve **300** between the first spring **310** and the first valve body **308.** The second valve **312** further includes a second valve body **314** and a second spring **316.** The second valve body **314** is biasingly coupled by the second spring **316** within the first valve body **308.** The second spring **316** may move between a second uncompressed state and a second compressed state. The second valve body **314** may move the second spring **316** to the second uncompressed state to disallow flow of water through the second valve **312.** Further, the second valve body **314** may move the second spring **316** to the second compressed state to allow flow of water through the second valve **300. FIGS. 3** and **4** both show the second spring **316** in the uncompressed state. Further, the first valve **300** is a suction valve, and the second valve **312** is a pressure valve, in some embodiments. Such a combination may allow to achieve better performance results for the pump **100** and reduce losses which may otherwise happen due to a permanent backflow opening.

[0027] Referring back to **FIG. 3,** water starts flowing from the inlet **104** and flows out through the outlet **106.** During normal operation, flow of water creates pressure difference or flow pressure gradient across the first valve body **308.** Due to this, forces act on the first valve body **308** and the first valve body **308** moves towards the second end **304** from the first end **302.** This movement is actuated by overcoming of the force applied on the first valve body **308** by the first spring **310** through the forces acting due to the flow pressure gradient on the first valve body **308.**

[0028] **FIG. 4** shows the first valve **308** body in an intermediate position between the first end **302** and the second end **304.** In this position, the flow rate is reduced compared to when the first valve body **308** is at the first end **302.** The first valve **300** is partially open, and the second valve **312** is fully closed. As the force applied due to the flow pressure gradient increases on the first valve body **308,** the first valve body **308** reaches the first end **302** as shown in **FIG. 5.** Herein, due to the pressure **"P3"** around the first valve body **308,** the first valve **300** is fully closed now and does not allow any flow of water at all. The second valve **312** is still fully closed. Now, if the pressure towards the pressure side **"P"** further increases, and exceeds a particular threshold value, then the second valve **312** gets actuated. The threshold value may depend upon various factors such as compression coefficient of the second spring **316,** material composition of the second valve body **314** among others.

[0029] Referring to **FIG. 6,** actuation of the second valve **312** depends upon forces, herein the pressure **"P4"** around the first valve body **308,** being applied on the second valve body **314.** The second valve body **314** experiences two opposing forces. One of the forces is the compression force applied by the second spring **316** (illustrated by left solid arrow) on the second valve body **314.** The first valve body **308** defines a pressure opening **318** towards the first end **302** of the first valve **300.** Other force i.e., the pressure **"P4"** is being applied due to the pressure on the pressure side **"P"** through the pressure opening **318.** Referring to **FIGS. 5, 6,** the pressure **"P4"** > the pressure **"P3"** leading to movement or actuation of the second valve body **314** of the second valve **312.** This movement of the second valve body **314** allows flow of the liquid, as illustrated by dashed arrow from the pressure opening **318** through around the second valve body **314** of the second valve **312** towards the backflow opening **110** (shown in **FIG. 1**) of the valve **300.** The present disclosure refers to the backflow opening **110** which for the reference of the valve **300** of the present disclosure may be provided around the second end **304** of the valve **300.**

[0030] The pressure opening **318** of the first valve body **308** allows fluid flow, such that the second valve body **314** moves the second spring **316** between the second compressed state (refer **FIG. 6),** and the second uncompressed state (refer **FIG. 5).** Movement of the second spring **316** between the second compressed state and the second uncompressed state respectively opens and closes the second valve **312.** The pressure opening **318** allows the second valve body **314** to take up the pressure and apply adequate forces on the second spring **316** for actuation purposes.

[0031] Based on operating conditions, when the force applied on the second valve body **314** through the pressure opening **318** exceeds the force applied on the second valve body **314** due to the second spring **316,** the second valve body **314** moves against the biasing force of the second spring **316** and the second valve **312** opens, as shown in **FIG. 6.** The second valve **312** reciprocates within the first valve body **308,** based on the pressure acting on the second spring **316.**

[0032] Reciprocation of the second valve **312** within the first valve body **308** provides for actuation of the second valve **312** in case of very high pressure on the second valve **312.** In such a case, the second valve **312** remains open, and the first valve **300** remains closed. When the second valve **312** is open, water flows through the pressure opening **318,** and around the second valve body **314** to enter the suction side **"S".** Thus, backflow of water is achieved in closed state of the first valve **300** as well. Such an arrangement allows suction and stable pumping characteristics without permanent losses of pump power due to permanently opened backflow openings. The first valve **300** and the second valve **312** together allow for optimal adaptation of operation of the pump **100** to a desired performance curve of the pump **100** through adjustments made via the first spring **310** and the second spring **312.**

[0033] In some embodiments, the present disclosure allows fine tuning of performance of the pump **100** which may be easily achieved through adjustments in compression coefficients of the first spring **310** and the second spring **316.** Factors such as different operating conditions, different stages of wear and tear of the pump **100,** and different water quality may also be taken care of by adjusting the first spring **310** and the second spring **316** without incurring heavy cost and efforts.

[0034] Additionally, the pump **100** will require lesser space, and lesser number of parts due to placement of the second valve **312** within the first valve **300** as same parts are carrying out more than one functions. For example, the first valve body **308** acts as a valve housing for the second valve **312.** Thus, the present disclosure provides an improved pump **100** which is able to overcome the problems discussed regarding conventional pumps.

[0035] In the drawings and specification, there have been disclosed preferred embodiments and examples of the disclosure and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation of the scope of the disclosure being set forth in the following claims.

<u>LIST OF ELEMENTS</u>

[0036]

100	Pump
102	Body
104	Inlet
106	Outlet
108	Impeller
110	Backflow opening
200	Valve
202	First end
204	Second end
206	Valve housing
208	Valve body
210	Spring
300	Valve/First valve
302	First end of first valve
304	Second end of first valve
306	First valve housing
308	First valve body
310	First spring
312	Second valve
314	Second valve body
316	Second spring
318	Pressure opening
320	Backflow Opening
S	Suction side
P	Pressure side
P1	Pressure
P2	Pressure
P3	Pressure
P4	Pressure

Claims

1. A pump **(100)** comprising:

    a body **(102)** which defines an inlet **(104)** and an outlet **(106)** to allow flow of a liquid, wherein the pump **(100)** has a suction side (S) around the inlet **(104)** and a pressure side (P) around the outlet **(106);**
    an impeller **(108)** positioned downstream of the inlet **(104);**
    a backflow opening **(110)** in fluid communication with the inlet **(104)** and the outlet **(106);** and
    a first valve **(300)** operatively coupled with the backflow opening **(110)** to selectively open the backflow opening **(110),** wherein the first valve **(300)** defines a first end **(302)** and a second end **(304),** and
    wherein the first valve **(300)** includes a first valve housing **(306),** wherein a first valve body **(308)** is biasingly coupled by a first spring **(310)** within the first valve housing **(306)** around the second end **(304),** and
    wherein the first valve body **(308)** is adapted to move the first spring **(310)** to a first compressed state to disallow flow of the liquid through the first valve **(300),** and the first valve body **(308)** is adapted to move the first spring **(310)** to a first uncompressed state to allow flow of the liquid through the first valve **(300);**
    <u>**characterized in that:**</u>

        a second valve **(312)** disposed within the first valve **(300),** wherein the second valve **(312)** has a second valve body **(314),** wherein the second valve body **(314)** is biasingly coupled by a second spring **(316)** within the first valve body **(308),**
        wherein the second valve body **(314)** is adapted to move the second spring **(316)** to a second compressed state to allow flow of the liquid through the second valve **(312),** and the second valve body **(314)** is adapted to move the second spring **(316)** to a second uncompressed state to disallow flow of the liquid through the second valve **(312).**

2. The pump **(100)** of claim **1,** wherein the first valve **(300)** is a suction valve, and the second valve **(312)** is a pressure valve.

3. The pump **(100)** of claims **1** or **2,** wherein the second valve **(312)** is disposed within the first valve **(300)** between the first spring **(310)** and the first valve body **(308).**

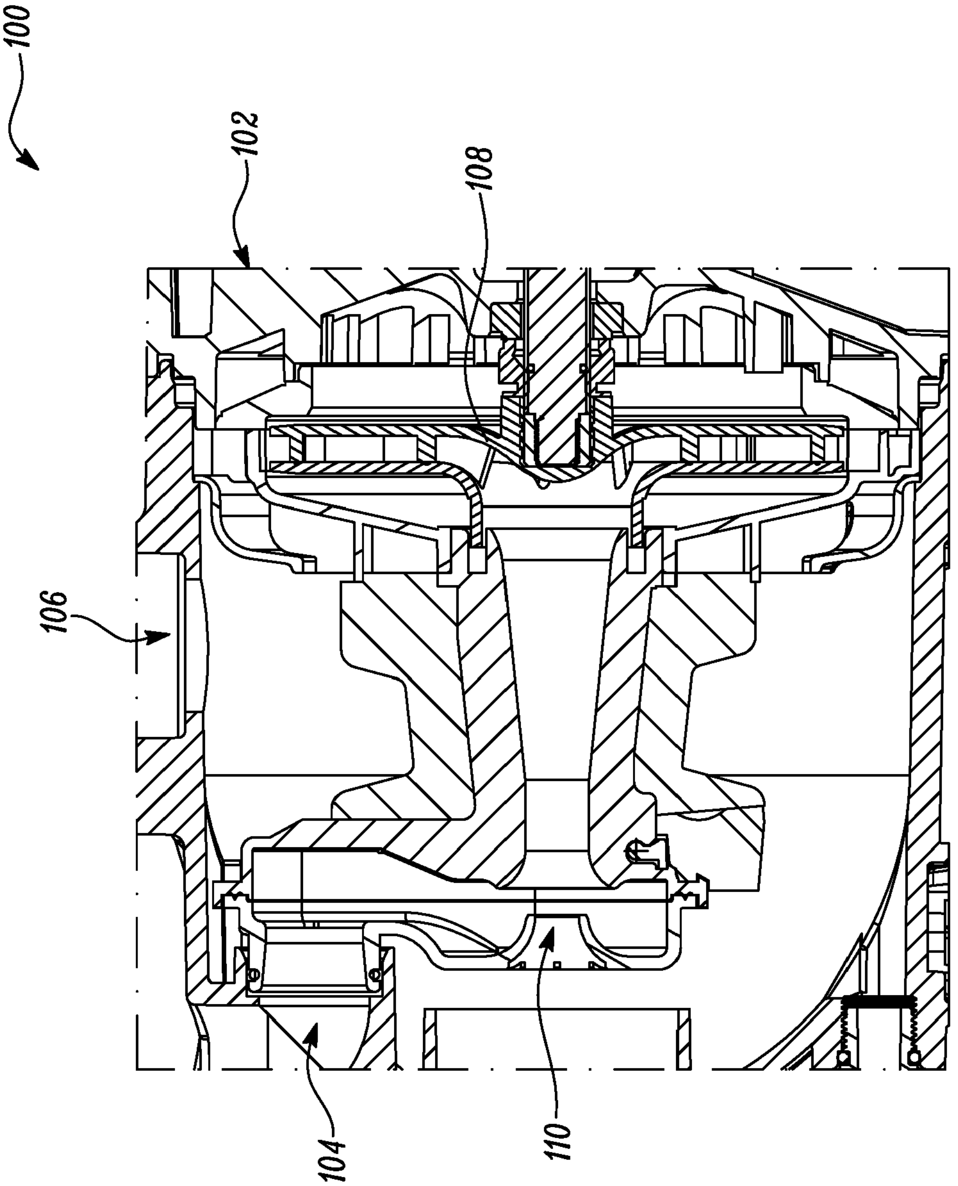
4. The pump **(100)** of any of the claims **1** to **3,** wherein the second valve **(312)** reciprocates within the first

valve body **(308),** based on a pressure acting on the second spring **(316).**

5. The pump **(100)** of any of the claims **1** to **4,** wherein the first valve body **(308)** defines a pressure opening **(318)** around the first end **(302)** of the first valve **(300).**

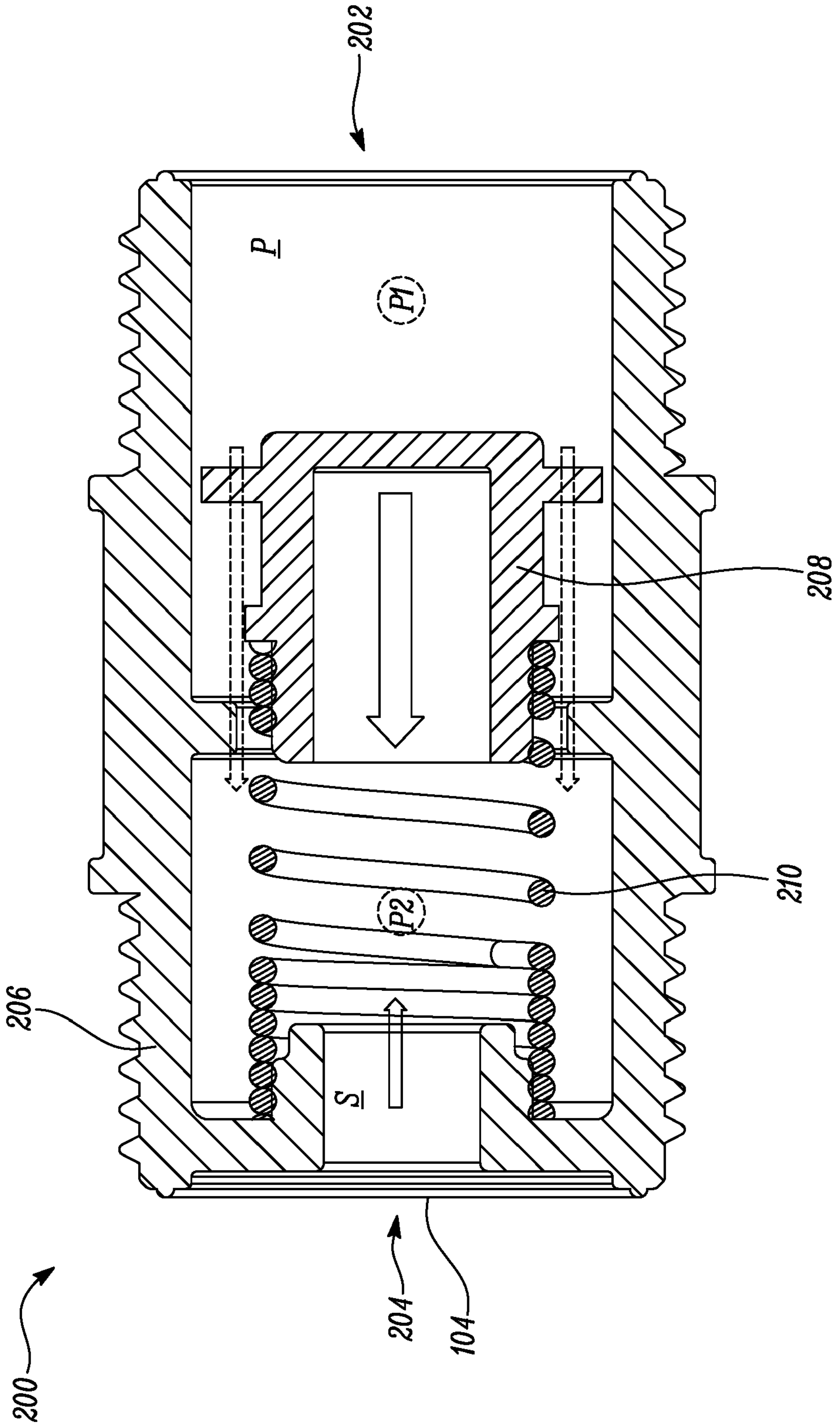
6. The pump **(100)** of claim **5,** wherein the pressure opening **(318)** of the first valve body **(308)** allows fluid flow, such as to allow the second valve body **(314)** to move the second spring **(316)** between the second compressed state, and the second uncompressed state.

7. The pump **(100)** of any of the preceding claims, wherein the pump **(100)** is a centrifugal pump.



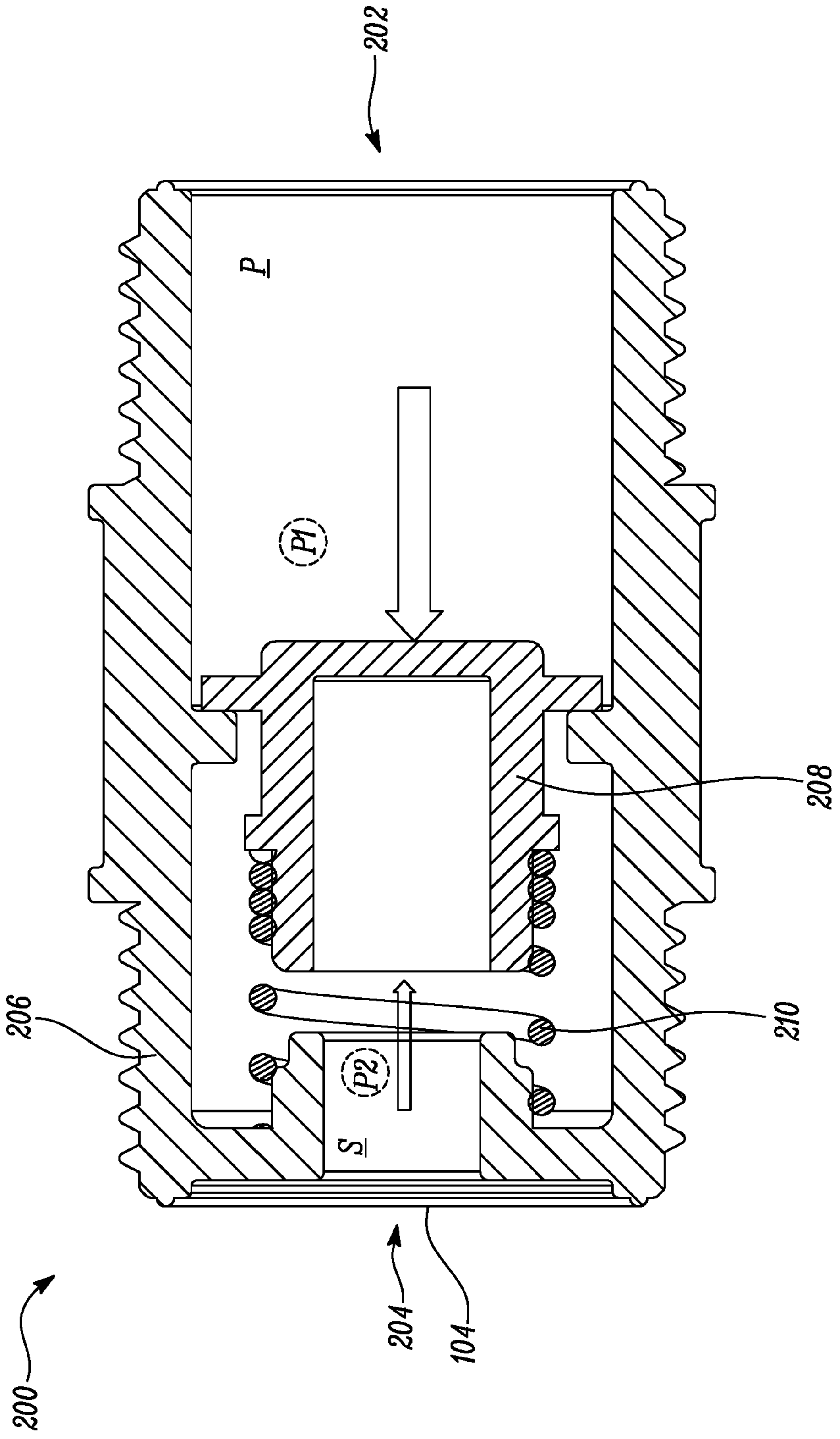
PRIOR ART

FIG. 1



PRIOR ART

FIG. 2A



PRIOR ART

FIG. 2B

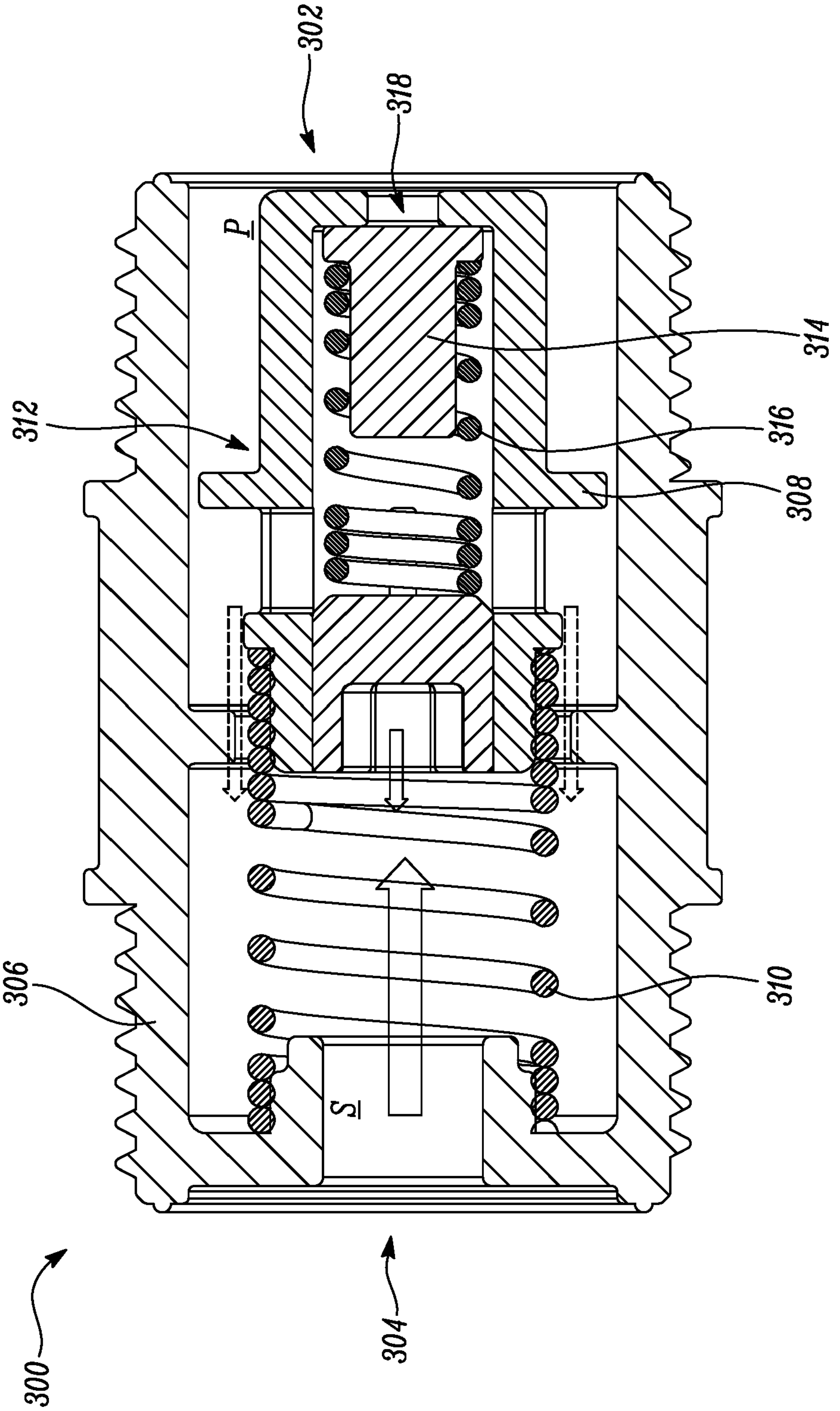


FIG. 3

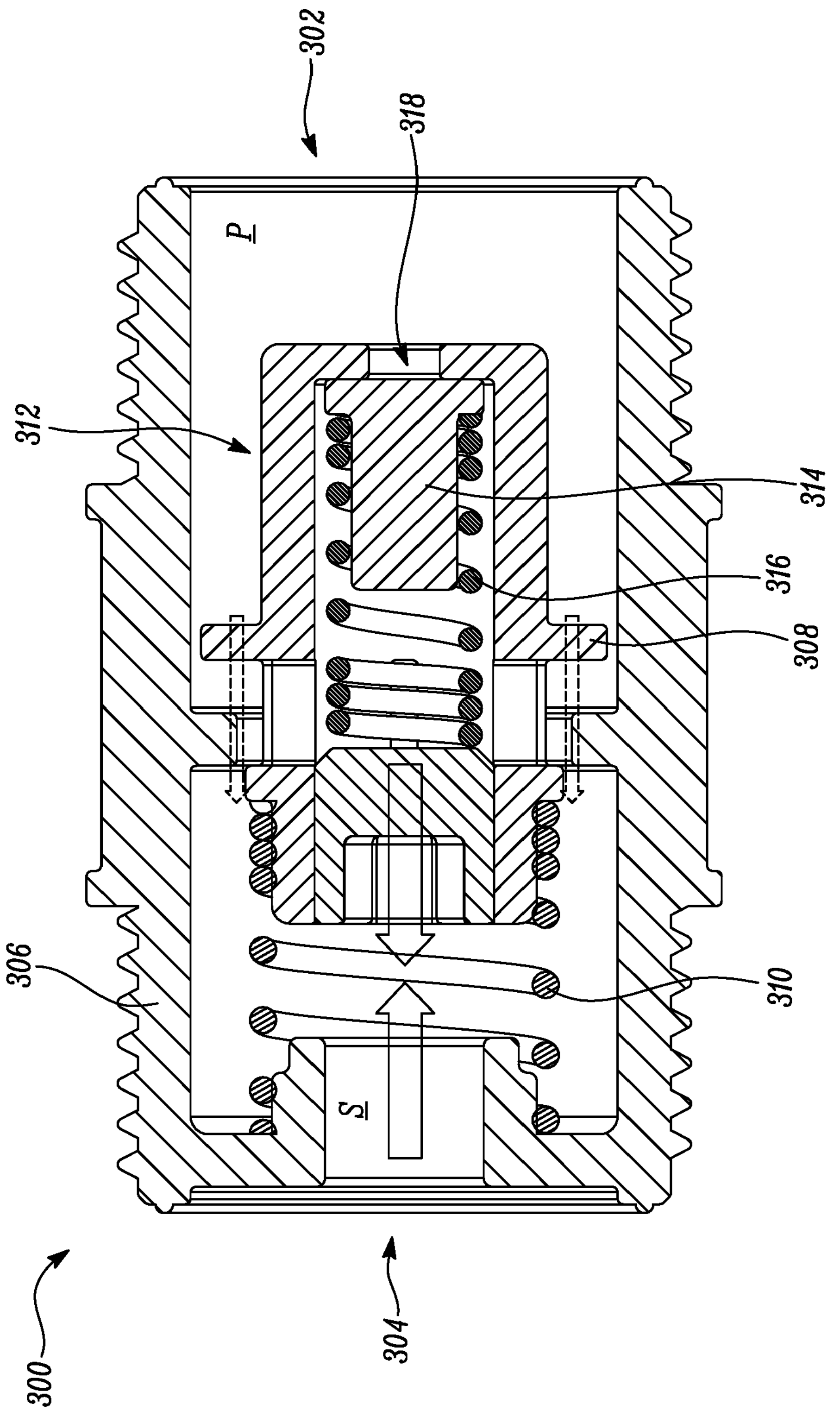


FIG. 4

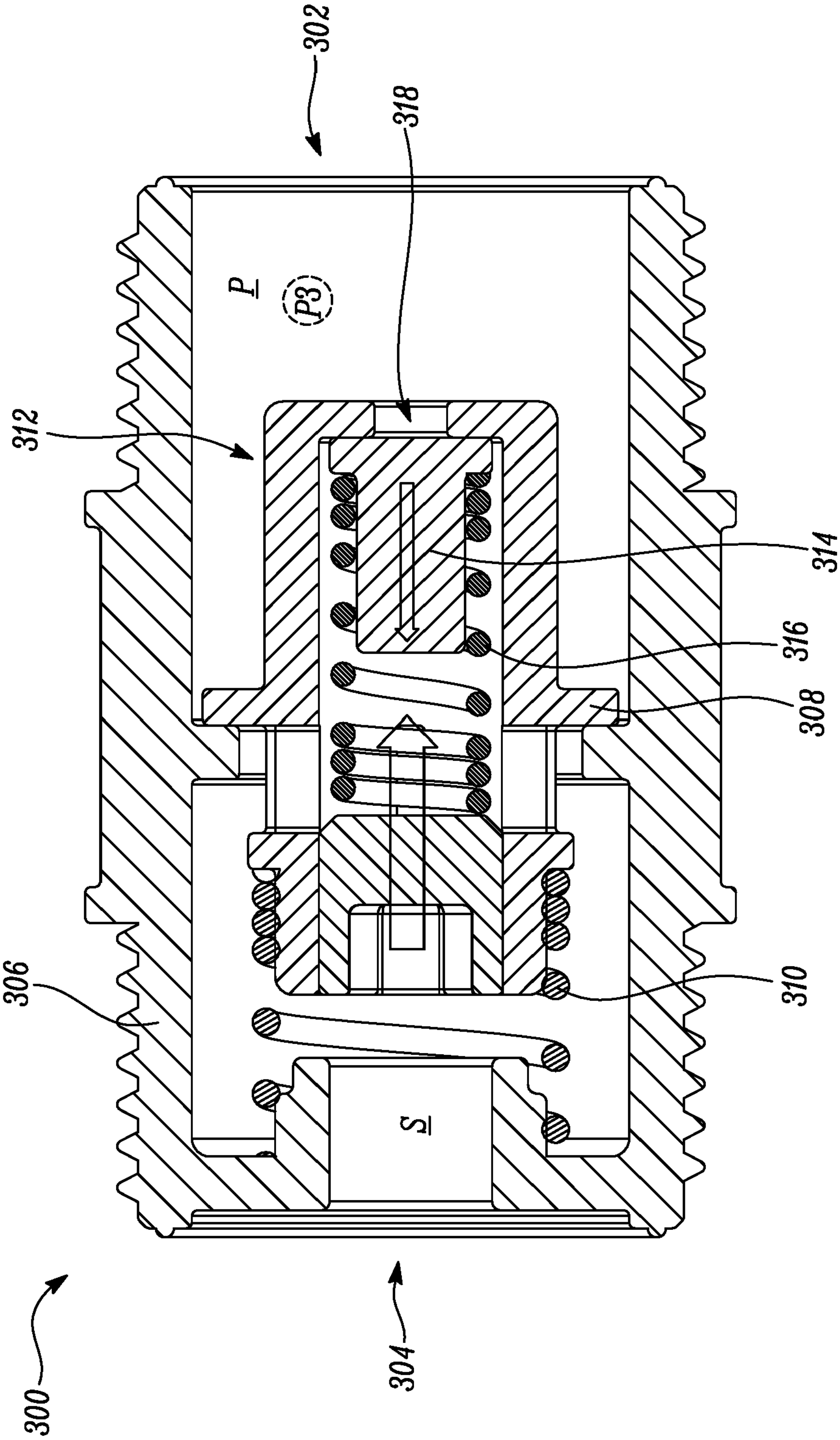


FIG. 5

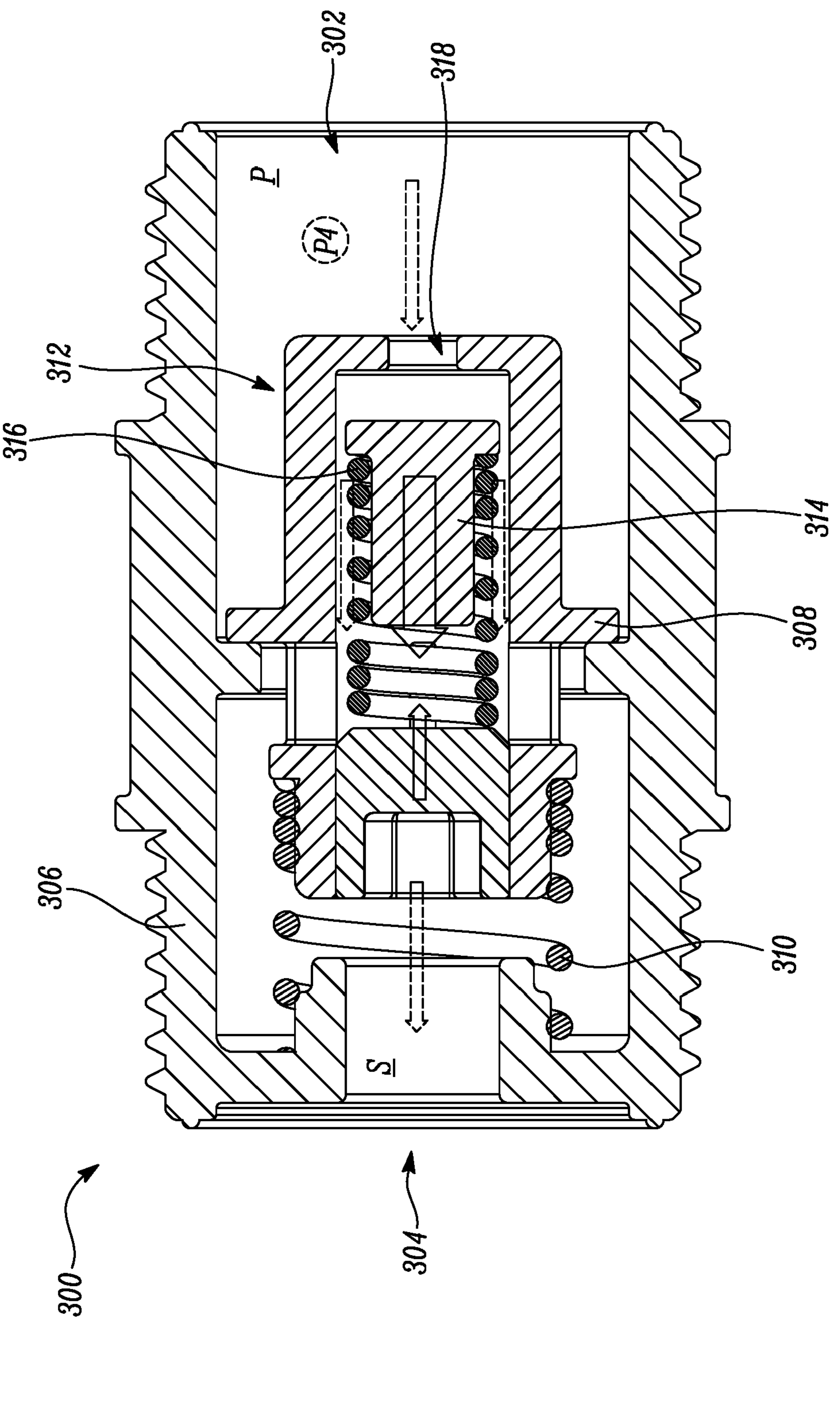


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 2039

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 729 009 A1 (PEDROLLO SPA [IT]) 6 December 2006 (2006-12-06) * paragraphs [0001], [0032] - [0038], [0049] - [0056] * * figures 1-4 * -----	1-7	INV. F04D1/00 F04D9/00 F04D15/00 F16K1/00
A	JP S51 51003 A (HITACHI LTD) 6 May 1976 (1976-05-06) * the whole document * * figures 1-4 * -----	1-7	

TECHNICAL FIELDS SEARCHED (IPC)
F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 May 2022	De Tobel, David

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CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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12-05-2022

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 1729009	A1	06-12-2006	AT	366878 T	15-08-2007
			EP	1729009 A1	06-12-2006
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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