(19) Europäisches Patentamt
European Patent Office
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(11) EP 3 306 071 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.04.2018 Bulletin 2018/15

(21) Application number: **17195118.9**

(22) Date of filing: **06.10.2017**

(51) Int Cl.:
F02M 55/00 *(2006.01)* ***F02M 59/10*** *(2006.01)*
F02M 59/44 *(2006.01)* ***F04B 53/16*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **10.10.2016 CN 201610884335**

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(54) PLUNGER-TYPE HIGH-PRESSURE PUMP, AND HIGH-PRESSURE ASSEMBLY AND PLUNGER SLEEVE THEREOF

(57) The present invention provides a plunger-type high-pressure pump (100), comprising a pump housing (20), with a high-pressure assembly accommodating cavity (201) and a camshaft cavity (202) being provided in the pump housing (20), a high-pressure assembly (30) being disposed in the high-pressure assembly accommodating cavity (201), a camshaft (40) being disposed in the camshaft cavity (202), and the camshaft (40) being able to drive the high-pressure assembly (30), by means of a cam driven apparatus (50), to perform pressurization, characterized in that the high-pressure assembly (30) comprises a plunger sleeve (31) fixed in the high-pressure assembly accommodating cavity (201), a plunger (32) that is disposed in a plunger chamber (311) in the plunger sleeve (31) and is capable of reciprocating in the plunger chamber (311), and a valve assembly (33) disposed in a valve cavity (312) in the plunger sleeve (31); the plunger chamber (311) is in communication with the valve cavity (312), a seal accommodating chamber (314) is disposed on the plunger sleeve (31), a plunger seal (34) is disposed in the seal accommodating chamber (314), to provide sealing between the plunger (32) and the plunger sleeve (31), and an oil drainage channel (315) is further disposed on the plunger sleeve, the oil drainage channel (315) having one end in communication with the seal accommodating chamber (314) and another end in communication with the outside of the plunger-type high-pressure pump (100).

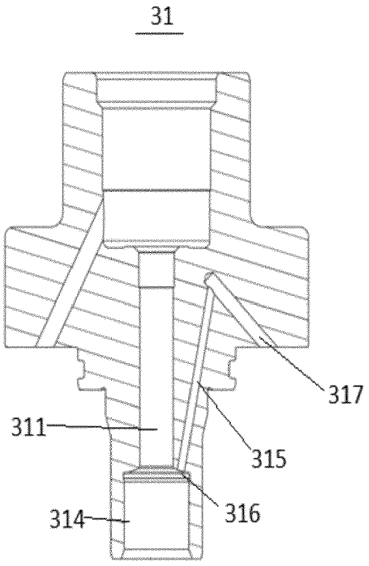

Fig. 5

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Description

TECHNICAL FIELD

[0001] The present invention relates to a high-pressure pump, in particular to a plunger-type high-pressure pump, and a high-pressure assembly and a plunger sleeve thereof.

Background art

[0002] Plunger-type high-pressure pumps are widely used in the field of high-pressure fuel pumps. In a plunger-type high-pressure pump, a camshaft pushes a plunger so as to pressurize fuel in a plunger cavity, and a control valve controls the supply of high-pressure fuel to the outside. Reference is made to figs. 1 and 2, which schematically show the basic structure of a plunger-type high-pressure pump in the prior art. The plunger-type high-pressure pump 900 comprises a housing 90; a high-pressure assembly accommodating cavity 901 and a camshaft cavity 902 are provided in the housing 90, wherein the high-pressure assembly accommodating cavity 901 and the camshaft cavity 902 are in communication with each other. A camshaft 92 is disposed in the camshaft cavity 902; a high-pressure assembly 91 is disposed in the high-pressure assembly accommodating cavity 901. The high-pressure assembly 91 comprises a plunger sleeve 910, and a plunger 911 that is disposed in a plunger cavity 915 of the plunger sleeve 910 and is capable of reciprocating in the plunger cavity 915. A driven element 93 is further disposed between the high-pressure assembly 91 and the camshaft 92; the driven element 93 is pushed by a cam on the camshaft 92, and thereby pushes the abovementioned plunger 911 to reciprocate in the plunger cavity 915.

[0003] To prevent lubricating oil in the camshaft cavity 902 from entering fuel under the driving action of the plunger 911 and lowering the quality of the fuel, a seal accommodating chamber 912 is provided on a lower side of the plunger sleeve 910; a plunger seal 913 is disposed in the seal accommodating chamber 912, and provides sealing between the plunger 911 and the plunger sleeve 910. An oil storage groove 916 is disposed at the plunger sleeve 910, above the abovementioned seal accommodating chamber 912; the oil storage groove 916 is used for holding a portion of fuel located between the plunger 913 and the plunger sleeve 910, and guiding same to a fuel tank (not shown in the figures) through an oil drainage channel 917. The oil drainage channel 917 is a channel drilled from outside the plunger sleeve 910 to the plunger cavity 915; a stopper 918 is needed to close the oil drainage channel 917 at one end thereof.

[0004] However, since the plunger seal 913 is generally made of a plastics material, there is a possibility that fragments will form when the plunger 911 rubs against it at high speed, and there is a possibility that fragments will form if the temperature is too high when the oil storage groove 916 rubs against it at high speed; the oil storage groove 916 and the plunger seal 913 are relatively far apart, therefore the cooling effect of fuel on the plunger seal 913 is limited. Furthermore, the presence of the stopper will also result in complex processing steps and components.

SUMMARY OF THE INVENTION

[0005] The object of the present invention is to provide a plunger-type high-pressure pump, and a high-pressure assembly and plunger sleeve thereof, which are structurally simple and convenient to form by processing.

[0006] The present invention provides a plunger-type high-pressure pump, comprising a pump housing, with a high-pressure assembly accommodating cavity and a camshaft cavity being provided in the pump housing, a high-pressure assembly being disposed in the high-pressure assembly accommodating cavity, a camshaft being disposed in the camshaft cavity, and the camshaft being able to drive the high-pressure assembly, by means of a cam driven apparatus, to perform pressurization, characterized in that the high-pressure assembly comprises a plunger sleeve fixed in the high-pressure assembly accommodating cavity, a plunger that is disposed in a plunger chamber in the plunger sleeve and is capable of reciprocating in the plunger chamber, and a valve assembly disposed in a valve cavity in the plunger sleeve; the plunger chamber is in communication with the valve cavity, a seal accommodating chamber is disposed on the plunger sleeve, a plunger seal is disposed in the seal accommodating chamber, to provide sealing between the plunger and the plunger sleeve, and an oil drainage channel is further disposed on the plunger sleeve, the oil drainage channel having one end in communication with the seal accommodating chamber and another end in communication with the outside of the plunger-type high-pressure pump.

[0007] Preferably, the seal accommodating chamber is in communication with the oil drainage channel via an annular groove or directly.

[0008] Preferably, the other end of the oil drainage channel is in communication with the outside of the plunger-type high-pressure pump via an oil outlet.

[0009] The present invention additionally provides a type of the high-pressure assembly, characterized by comprising a plunger sleeve, a plunger that is disposed in a plunger chamber in the plunger sleeve and is capable of reciprocating in the plunger chamber, and a valve assembly disposed in a valve cavity in the plunger sleeve; the plunger chamber is in communication with the valve cavity, a seal accommodating chamber is disposed on the plunger sleeve, a plunger seal is disposed in the seal accommodating chamber, to provide sealing between the plunger and the plunger sleeve, and an oil drainage channel is further disposed on the plunger sleeve, the oil drainage channel having one end in communication with the seal accommodating chamber and another end in

communication with the outside of the high-pressure assembly.

[0010] Preferably, the seal accommodating chamber is in communication with the oil drainage channel via an annular groove or directly.

[0011] Preferably, the other end of the oil drainage channel is in communication with the outside of the high-pressure assembly via an oil outlet.

[0012] The present invention also provides a plunger sleeve of a high-pressure assembly; a seal accommodating chamber housing a plunger seal, and an oil drainage channel, are disposed on the plunger sleeve, the oil drainage channel having one end in communication with the seal accommodating chamber and another end in communication with the outside of the plunger sleeve via an oil outlet.

[0013] Preferably, an extended line of the central axis of the oil drainage channel does not intersect with a bottom end of the plunger sleeve, and the oil drainage channel is in communication with the seal accommodating chamber via an annular groove.

[0014] In the plunger-type high-pressure pump, and high-pressure assembly and plunger sleeve thereof, of the present invention, the oil drainage channel is in communication with a sealing ring accommodating chamber, and is therefore structurally simple and convenient to form by processing.

Description of the accompanying drawings

[0015] Demonstrative embodiments of the present invention will be explained in detail below with reference to the accompanying drawings. It should be understood that the embodiments described below are merely intended to explain the present invention, without limiting the scope thereof. In the accompanying drawings:

Fig. 1 is a sectional view of a plunger-type high-pressure pump in the prior art, intended to show the structure and positions of a camshaft and a high-pressure assembly in the high-pressure pump;

Fig. 2 is a sectional view of a high-pressure assembly of a plunger-type high-pressure pump of the prior art, intended to show the structural design inside the high-pressure assembly, in particular inside a plunger cavity;

Fig. 3 is a sectional view of an embodiment of the plunger-type high-pressure pump of the present invention, intended to show the positions of the camshaft and high-pressure assembly in the high-pressure pump;

Fig. 4 is a sectional view of an embodiment of the high-pressure assembly of the plunger-type high-pressure pump of the present invention, intended to show the structural design inside the high-pressure assembly;

Fig. 5 is a sectional view of an embodiment of the plunger sleeve in the high-pressure assembly of the plunger-type high-pressure pump of the present invention, intended to show the structural design inside the plunger sleeve, in particular inside the plunger cavity.

Particular embodiments

[0016] Identical or similar components in different accompanying drawings are indicated by identical reference labels.

[0017] It should be understood that the accompanying drawings are merely intended to explain the present invention, wherein component sizes, proportional relations and component quantities are not restrictions on the present invention.

[0018] Reference is made to fig. 3, which is a schematic structural diagram of an embodiment of a plunger-type high-pressure pump of the present invention. The plunger-type high-pressure pump 100 comprises a pump housing 20; a high-pressure assembly 30 and a camshaft 40 disposed in the pump housing 20; and a cam driven apparatus 50 located between the high-pressure assembly 30 and the camshaft 40. A high-pressure assembly accommodating cavity 201 and a camshaft cavity 202 are provided in the pump housing 20; the high-pressure assembly accommodating cavity 201 and camshaft cavity 202 are in communication with each other, and arranged perpendicular to each other. Two high-pressure assembly accommodating cavities are shown in fig. 1; in other embodiments, other numbers of the high-pressure assembly accommodating cavity 201 are possible. The high-pressure assembly 30 is disposed in the high-pressure assembly accommodating cavity 201, the camshaft 40 is disposed in the camshaft cavity 202, and the camshaft 40 can drive the high-pressure assembly 30, by means of the cam driven apparatus 50, to perform pressurization.

[0019] Referring to fig. 4 in a coordinated manner, the high-pressure assembly 30 comprises a plunger sleeve 31 fixed in the high-pressure assembly accommodating cavity 201; a plunger cavity 311 and a valve cavity 312 in communication with each other are provided in the plunger sleeve 31. A plunger 32 is installed in the plunger cavity 311, a valve assembly 33 is disposed in the valve cavity 312, and a high-pressure cavity is formed between the plunger 32 and the valve assembly 33, at the top of the plunger cavity 311. The plunger 32 can reciprocate in the plunger cavity 311 under the driving action of the cam driven apparatus 50, so as to perform oil suction and oil pressurizing operations.

[0020] Referring to fig. 5 in a coordinated manner, a seal accommodating chamber 314 is formed by processing at the bottom of the plunger seal 31, i.e. in a part close to the cam driven apparatus 50. An annular groove 316 is formed at an upper part of the seal accommodating chamber 314, and an oil drainage channel 315 is formed by processing so as to run from the annular groove 316 obliquely upwards into the plunger sleeve 31, such that

an extended line of the central axis of the oil drainage channel 315 does not intersect with the bottom end of the plunger sleeve 31. The oil drainage channel 315 is further connected to an oil outlet 317, so as to discharge drained oil from the annular groove 316. In this embodiment, it will be discharged to a fuel tank, but in other embodiments, it may be discharged to any other place outside the plunger sleeve 31. In this embodiment, the seal accommodating chamber 314 is connected to the oil drainage channel 315 via the annular groove 316, but in other embodiments, the annular groove 316 could also be omitted, such that the seal accommodating chamber 314 is in direct communication with the oil drainage channel 315.

[0021] Referring to figs. 4 and 5 in combination, the plunger 32 is installed in the plunger cavity 311, and a plunger seal 34 is disposed in the seal accommodating chamber 314. When the plunger 32 reciprocates in the plunger cavity 311, high-pressure fuel in the high-pressure cavity will partially drain into a gap between the plunger 32 and the plunger sleeve 31, thereby providing lubrication at this site. Furthermore, fuel that has drained to the seal accommodating chamber 314 can also carry away some of the heat generated by friction between the plunger seal 34 and the plunger 32, and be discharged out of the plunger sleeve 31 through the oil outlet 317.

[0022] In the plunger-type high-pressure pump, and high-pressure assembly and plunger sleeve thereof, of the present invention, the oil drainage channel is in communication with a sealing ring accommodating chamber, and is therefore structurally simple and convenient to form by processing. The robustness of the product is improved in two ways at the same time: the distance between the annular groove 316 and the plunger seal 34 is shortened, enhancing the cooling of the plunger seal 34 by fuel, lowering the operating temperature thereof and thereby reducing the speed of ageing thereof, to increase the lifespan; and enhancing lubrication between the plunger sleeve 31 and the plunger 32 at an upper part of the plunger seal 34, to reduce the risk of seizing.

[0023] The present invention is described above merely with reference to the most practical preferred embodiments considered at the present time. It must be understood that the explanation above is not a limitation of the present invention, and the present invention is not limited to the examples given above. Changes, alterations in form, additions or substitutions made by those skilled in the art within the substantive scope of the present invention should also be included in the scope of protection of the present invention.

Claims

1. A plunger-type high-pressure pump (100), comprising a pump housing (20), with a high-pressure assembly accommodating cavity (201) and a camshaft cavity (202) being provided in the pump housing (20), a high-pressure assembly (30) being disposed in the high-pressure assembly accommodating cavity (201), a camshaft (40) being disposed in the camshaft cavity (202), and the camshaft (40) being able to drive the high-pressure assembly (30), by means of a cam driven apparatus (50), to perform pressurization, **characterized in that** the high-pressure assembly (30) comprises a plunger sleeve (31) fixed in the high-pressure assembly accommodating cavity (201), a plunger (32) that is disposed in a plunger chamber (311) in the plunger sleeve (31) and is capable of reciprocating in the plunger chamber (311), and a valve assembly (33) disposed in a valve cavity (312) in the plunger sleeve (31); the plunger chamber (311) is in communication with the valve cavity (312), a seal accommodating chamber (314) is disposed on the plunger sleeve (31), a plunger seal (34) is disposed in the seal accommodating chamber (314), to provide sealing between the plunger (32) and the plunger sleeve (31), and an oil drainage channel (315) is further disposed on the plunger sleeve, the oil drainage channel (315) having one end in communication with the seal accommodating chamber (314) and another end in communication with the outside of the plunger-type high-pressure pump (100).

2. The plunger-type high-pressure pump (100) as claimed in Claim 1, **characterized in that** the seal accommodating chamber (314) is in communication with the oil drainage channel (315) via an annular groove (316).

3. The plunger-type high-pressure pump (100) as claimed in Claim 1, **characterized in that** the seal accommodating chamber (314) is in direct communication with the oil drainage channel (315).

4. The plunger-type high-pressure pump (100) as claimed in Claim 2 or 3, **characterized in that** the other end of the oil drainage channel (315) is in communication with the outside of the plunger-type high-pressure pump (100) via an oil outlet (317).

5. A type of the high-pressure assembly (30), **characterized by** comprising a plunger sleeve (31), a plunger (32) that is disposed in a plunger chamber (311) in the plunger sleeve (31) and is capable of reciprocating in the plunger chamber (311), and a valve assembly (33) disposed in a valve cavity (312) in the plunger sleeve (31); the plunger chamber (311) is in communication with the valve cavity (312), a seal accommodating chamber (314) is disposed on the plunger sleeve (31), a plunger seal (34) is disposed in the seal accommodating chamber (314), to provide sealing between the plunger (32) and the plunger sleeve (31), and an oil drainage channel (315) is further disposed on the plunger sleeve (31), the oil

drainage channel (315) having one end in communication with the seal accommodating chamber (314) and another end in communication with the outside of the high-pressure assembly (30).

6. The high-pressure assembly (30) as claimed in Claim 5, **characterized in that** the seal accommodating chamber (314) is in communication with the oil drainage channel (315) via an annular groove (316).

7. The high-pressure assembly (30) as claimed in Claim 5, **characterized in that** the seal accommodating chamber (314) is in direct communication with the oil drainage channel (315).

8. The high-pressure assembly (30) as claimed in Claim 6 or 7, **characterized in that** the other end of the oil drainage channel (315) is in communication with the outside of the high-pressure assembly (30) via an oil outlet (317).

9. A plunger sleeve (31) of a high-pressure assembly, **characterized in that** a seal accommodating chamber (314) housing a plunger seal (34), and an oil drainage channel (315), are disposed on the plunger sleeve (31), the oil drainage channel (315) having one end in communication with the seal accommodating chamber (314) and another end in communication with the outside of the plunger sleeve (31) via an oil outlet (317).

10. The plunger sleeve (31) as claimed in Claim 9, **characterized in that** an extended line of the central axis of the oil drainage channel (315) does not intersect with a bottom end of the plunger sleeve (31).

11. The plunger sleeve (31) as claimed in Claim 9, **characterized in that** the oil drainage channel (315) is in communication with the seal accommodating chamber (314) via an annular groove (316).

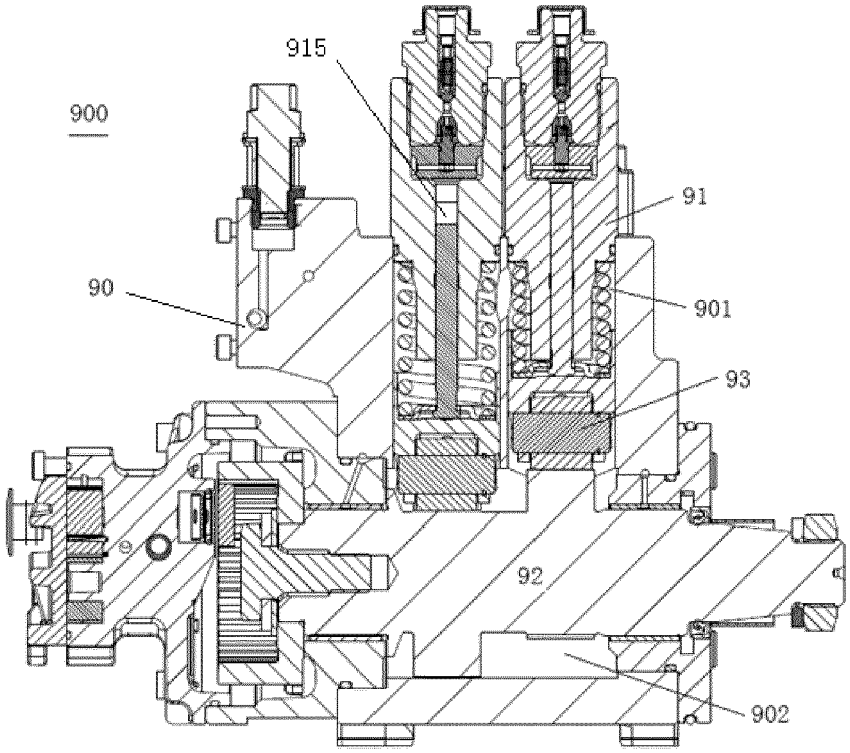

Fig. 1

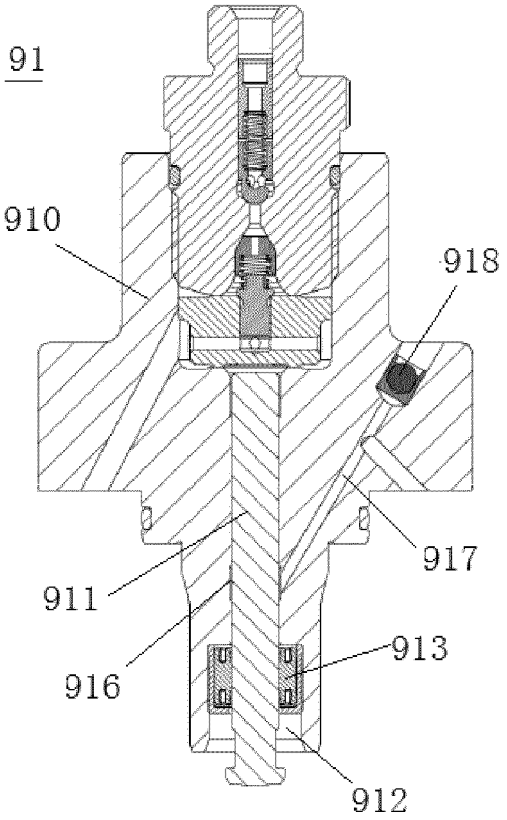

Fig. 2

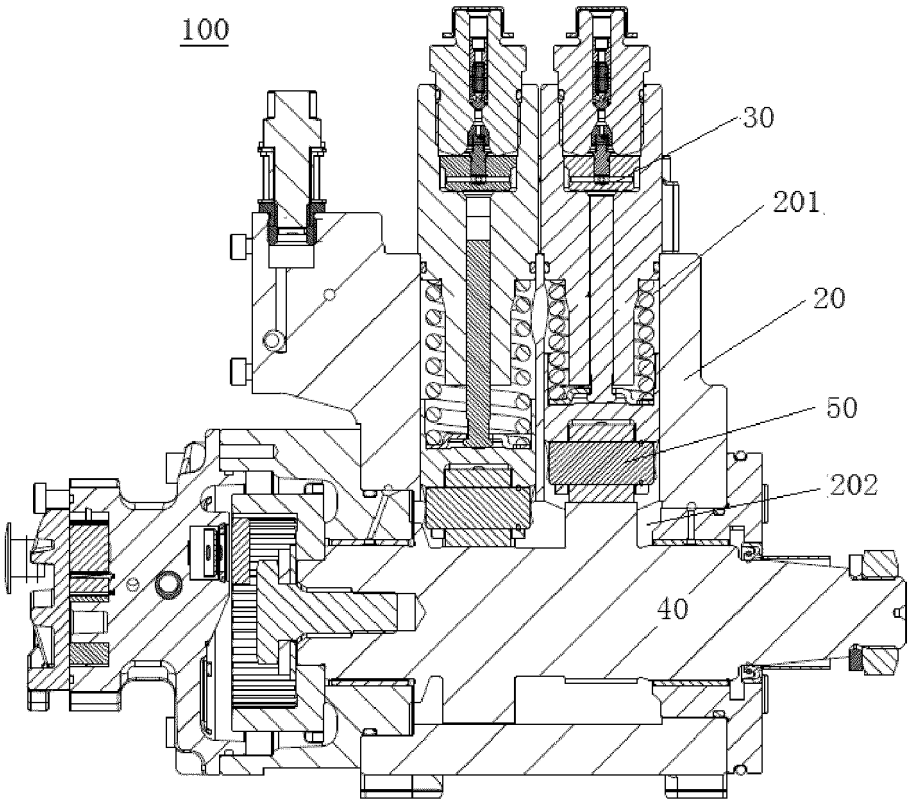

Fig. 3

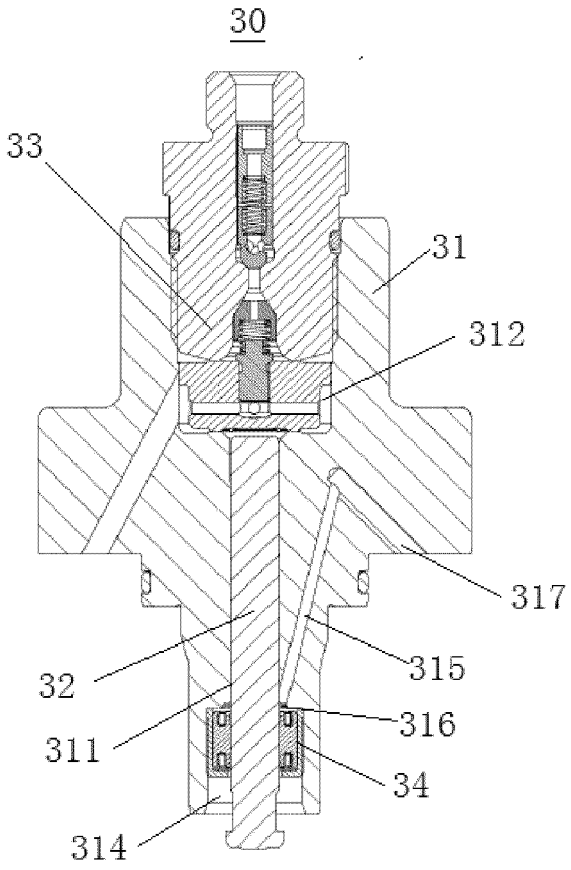

Fig. 4

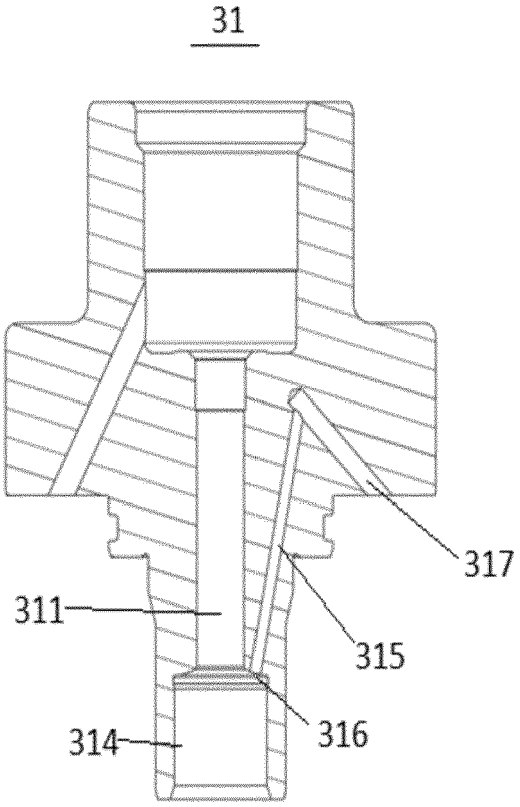

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 5118

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 January 2018	Boye, Michael

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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