(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 789 843 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
13.03.2019 Bulletin 2019/11

(51) Int Cl.:
F02M 59/46 *(2006.01)*

(21) Application number: **14152312.6**

(22) Date of filing: **23.01.2014**

(54) **High-pressure fuel supplying pump and diesel engine having the same**

Hochdruck-Kraftstoffförderpumpe und damit versehener Dieselmotor

Pompe d'alimentation en carburant haute pression et moteur diesel équipé de ce système

(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

(30) Priority: **01.03.2013 CN 201310066169**

(43) Date of publication of application:
15.10.2014 Bulletin 2014/42

(73) Proprietor: **ROBERT BOSCH GMBH**
70442 Stuttgart (DE)

(72) Inventors:
- **Jin, Xin**
214028 Wuxi (CN)
- **Zhang, Jianxin**
214028 Wuxi (CN)
- **Tang, Zhaohui**
214028 Wuxi (CN)

(56) References cited:
EP-A1- 2 522 854
DE-A1- 19 541 507
DE-A1-102008 002 360

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] The present invention relates to a high-pressure fuel supplying pump and a diesel engine having said high-pressure fuel supplying pump.

Background Art

[0002] In a modern diesel engine, fuel pressurized by a high-pressure fuel supplying pump is injected into a common rail and then ejected therefrom in a controllable manner into the engine. The high-pressure fuel supplying pump is usually a plunger-typed fuel pump which mainly comprises a barrel (plunger sleeve) and a plunger, wherein an inlet valve body, an inlet valve core, an outlet valve body, an outlet valve core and a valve holder are arranged successively in the barrel. The plunger is driven, by a cam shaft driven by the engine, to reciprocate in the barrel in such a way that fuel can be sucked in and pressurized in the barrel, and the sucked and pressurized fuel is then injected into the common rail via the valve holder.

[0003] In such high-pressure fuel supplying pump, the outlet valve body and the outlet valve core constitute an outlet valve structure. That is, during manufacturing of the high-pressure fuel supplying pump, it is necessary first to produce the outlet valve body and the outlet valve core separately and then to assemble them into the barrel. Therefore, this will lead to increased manufacturing costs and also an extended error chain possibly occurring in either manufacturing or assembling aspect. DE19541507 gives an example of a known pump arrangement.

[0004] Furthermore, because the plunger reciprocates in the barrel, a contacting area/length between them should be designed as great as possible in order to ensure that sufficient sealing is achieved between them in such a way that fuel is prevented from penetrating into oil of the fuel pump itself or that the oil is prevented from penetrating into the fuel via the plunger.

[0005] Moreover, with respect to the plunger-typed high-pressure supplying pump, it is necessary to provide the outlet valve body between the inlet valve body and the valve holder. Because the outlet valve body must be designed to be small due to space limitation, a fuel suction chamber, which is formed in the outlet valve body to receive the inlet valve core, cannot be further enlarged and the inlet valve core size cannot be further enlarged. Otherwise, if it is possible to enlarge the size of the inlet valve core further, an improved fuel suction flowing area and improved fuel suction efficiency can be obtained.

Summary of the Invention

[0006] In order to overcome the shortcomings in the prior art, the present invention is aimed at proposing an improved high-pressure fuel supplying pump.

[0007] According to the present invention, a high-pressure fuel supplying pump is provided, having the features of claim 1.

[0008] Preferably, the first sealing interface is opened and the second sealing interface is closed when the plunger is moved in the plunger hole in a direction of increasing the accommodating volume of the plunger hole.

[0009] Preferably, the first sealing interface is closed when the plunger is moved in the plunger hole in a direction of decreasing the accommodating volume of the plunger hole, and the second sealing interface is opened after pressure in the pressure chamber reaches a rated value.

[0010] Preferably, a first spring seat is provided in the output fuel passage so as to secure one end of a first spring, and the other end of the first spring is secured on the outlet valve core in such a way that the outlet valve core abuts tightly against the outlet valve body by means of a tensile force of the first spring so as to define the second sealing interface.

[0011] Preferably, a second spring is provided in the pressure chamber, one end of the second spring is secured on the outlet valve core and the other end of the second spring is secured on the inlet valve core in such a way that the inlet valve core abuts tightly against the inlet valve body by means of a tensile force of the second spring so as to define the first sealing interface.

[0012] Preferably, a second spring seat is provided in the pressure chamber so as to secure one end of a second spring, and the other end of the second spring is secured on the inlet valve core in such a way that the inlet valve core abuts tightly against the inlet valve body by means of a tensile force of the second spring so as to define the first sealing interface.

[0013] Preferably, the output fuel passage is embodied as a longitudinal through hole formed in the valve holder, and the outlet valve body extends radially and inwardly from an inner wall of the longitudinal through hole.

[0014] Preferably, the outlet valve core is embodied as a valve rod installed in the longitudinal through hole and passing through the outlet valve body, the diameter of the valve rod is less than the inner diameter of the longitudinal through hole, and a portion of the valve rod passing through the outlet valve body has a diameter less than the inner diameter of the outlet valve body.

[0015] Preferably, the outlet valve core is embodied as a hollow cylinder which is installed movably in the longitudinal through hole and has one closed end, the closed end of the hollow cylinder is formed with a second sealing face for abutting against the outlet valve body, and the hollow cylinder is formed with an aperture which enables an hollow interior of the cylinder to communicate with the pressure chamber.

[0016] Preferably, a segment having an increased inner diameter is formed in the longitudinal through hole directly adjacent the outlet valve body.

[0017] According to the other aspect of the present invention, a diesel engine comprising the high-pressure fuel supplying pump mentioned above is also proposed.

[0018] According to technical solutions of the present invention, it is unnecessary to manufacture the outlet valve body separately. Therefore, the accommodating volume required by the receiving chamber of the barrel is reduced and the length of the plunger hole can be increased correspondingly. Therefore, an increased sealing length can be achieved between the plunger hole and the plunger such that fuel is prevented as much as possible from penetrating into oil of the supplying pump and thus the efficiency of the supplying pump is improved.

[0019] Furthermore, omitting the separately manufactured outlet valve body can also lead to shortening of error chain. At the same time, because the pressure chamber for receiving the inlet valve core is formed directly in the inlet valve core, the pressure chamber and the inlet valve core can be made larger in size such that an improved fuel suction flowing area and improved fuel suction efficiency cannot be obtained.

[0020] According to the technical solutions of the present invention, the spring acting on the outlet valve core and the spring acting on the inlet valve core may be operated independently of each other such that the entire high-pressure fuel supplying pump can be operated more reliably.

Brief Description of the Drawings

[0021] The foregoing and following aspects of the present invention will be well understood by referring to the following detailed explanations accompanied with the drawings, in which:

Fig. 1 schematically shows a partial cross-sectional view of a conventional high-pressure fuel supplying pump which is in a fuel suction state;

Fig. 2 schematically shows a partial cross-sectional view of the conventional high-pressure fuel supplying pump which is in a fuel pressurizing state;

Fig. 3 schematically shows a partial cross-sectional view of a high-pressure fuel supplying pump according to a first embodiment of the present invention which is in the fuel suction state;

Fig. 4 schematically shows a partial cross-sectional view of the high-pressure fuel supplying pump according to the first embodiment of the present invention which is in the fuel pressurizing state;

Fig. 5 schematically shows a partial cross-sectional view of a high-pressure fuel supplying pump according to a second embodiment of the present invention which is in the fuel suction state; and

Fig. 6 schematically shows a partial cross-sectional view of the high-pressure fuel supplying pump according to the second embodiment of the present invention which is in the fuel pressurizing state.

Detailed Description of Preferred Embodiments

[0022] Illustrative embodiments of the present invention are described in view of the attached drawings. It should be noted that the same numeral references represent elements or components having the same function and/or structure in the drawings. It should be further noted that cross-sectional views illustrated in the drawings refer to those obtained by cutting along a central axis of a high-pressure fuel supplying pump.

[0023] In order to understand technical solutions of the present invention well, a conventional high-pressure supplying pump in the form of a plunger-typed fuel pump and its working principle will be explained briefly by referring to Figs. 1 and 2 as below. Figure 1 illustrates that the conventional high-pressure fuel supplying pump is in a fuel suction state, and figure 2 illustrates that the conventional high-pressure fuel supplying pump is in a fuel pressurizing state.

[0024] As shown in Figs. 1 and 2, such high-pressure fuel supplying pump mainly comprises a barrel (a plunger sleeve) 1; a plunger 2 which is able to reciprocate in barrel 1; and an inlet valve 3, an inlet valve core 6, an outlet valve body 4, an outlet valve core 8 and a valve holder (a fuel discharging adapter) 5 which are installed successively in the barrel 1.

[0025] The barrel 1 can be machined directly in a body of the high-pressure fuel supplying pump. The barrel 1 is formed with a fuel feeding port 1a for feeding fuel from a fuel passage of a diesel engine into the barrel 1. As shown in Figs. 1 and 2, the barrel 1 is also formed with a plunger hole 1b for receiving the plunger 2 and a receiving chamber 1c for receiving the inlet valve 3, the inlet valve core 6, the outlet valve body 4, the outlet valve core 8 and the valve holder 5. When the fuel supplying pump is not assembled, the fuel feeding port 1a, the plunger hole 1b and the receiving chamber 1c communicate with each other.

[0026] As illustrated, the plunger 2 is driven by a spring and a cam shaft (which are not shown here) in such a way that the plunger is able to reciprocate upwards and downwards in the plunger hole 1b. The receiving chamber 1c is generally cylindrical. The inlet valve body 3 and the outlet valve body 4 are also generally cylindrical.

[0027] A first fuel passage 3a and a second fuel passage 3b are formed in the inlet valve body 3, and the first fuel passage 3a communicates with a central blind hole 3c of the inlet valve body 3. Furthermore, the receiving chamber 1c is formed with threads in its upper wall portion for screwing with outer threads of the valve holder 5.

[0028] During assembling of the high-pressure fuel supplying pump, the inlet valve body 3 and the outlet valve body 4 are firstly pressed in this order into the receiving chamber 1c. Then, the valve holder 5 is screwed into the receiving chamber 1c via the threads mentioned above. In this way, the first fuel passage 3a of the inlet valve body 3 is able to communicate with the fuel feeding port 1a, and the second fuel passage 3b of the inlet valve body 3 is able to communicate with the plunger hole 1b.

[0029] The inlet valve core 6 is located between the inlet valve body 3 and the outlet valve body 4 so as to selectively open or close the first fuel passage 3a. To this end, a central through hole 4a of the outlet valve body 4 is, in its lower portion, formed substantially as a conical shape as illustrated by the Figs. 1 and 2 in such a way that a pressure chamber 4b is formed for receiving the inlet valve core 6. More particularly, the inlet valve core 6 and the inlet valve body 4 are matable with each other so as to form a first sealing interface therebetween, which is openable or closable such that fluid is allowed or prohibited to flow between the first fuel passage 3a and the central blind hole 3c as well as the pressure chamber 4b.

[0030] The outlet valve core 8 is installed in the central through hole 4a of the outlet valve body 4 and is used to selectively open or close a path/passage between the central through hole 4a and the valve holder 5. More particularly, the outlet valve core 8 and the outlet valve body 4 are matable with each other so as to form a second sealing interface therebetween, which is openable or closable such that fluid is allowed or prohibited to flow between the pressure chamber 4b and a central hole 5a of the valve holder 5.

[0031] A spring 7 is installed between the inlet valve core 6 and the outlet valve core 8 so as to constantly exert a tensile force therebetween in such a way that a conical or truncated conical sealing portion of the inlet valve core 6 abuts hermetically against an upper opening of the central blind hole 3c.

[0032] A portion of the outlet valve core 8 in the central through hole 4a is designed to have a size less than the inner diameter of the central through hole 4a such that fuel can be filled into a gap between the portion of the outlet valve core 8 and the central through hole 4a.

[0033] The valve holder 5 is formed with the central hole 5a whose lower portion is formed as being horn mouth-shape illustrated by Figs. 1 and 2 such that the horn mouth-shaped portion of the central hole is able to receive an upper portion of the outlet valve core 8 with appropriate play therein. A spring seat 10 is installed in the horn mouth shaped portion. The spring seat 10 has an upper portion which is formed in such a way that it is complementary to an upper part of the horn mouth shape. As shown in Figs. 1 and 2, a spring 9 is installed between the spring sear 10 and the outlet valve core 8 to constantly exert a tensile force therebetween in such a way that a conical sealing portion of the outlet valve core 8 abuts hermetically against an upper opening of the central through hole 4a.

[0034] As shown in Fig. 1, in the fuel suction state, the outlet valve core 8 closes the central through hole 4a under the action of the spring 9. That is, in the fuel suction state, the first sealing interface is opened and the second sealing interface is closed. At this time, the plunger 2 is driven by means of the spring and the cam shaft of the high-pressure fuel supplying pump to move downwards in the plunger hole 1a in such a way that vacuum negative pressure is generated in the pressure chamber 4b. Therefore, the inlet valve core 6 is moved upwards with resisting the tensile force of the spring 7 such that the first fuel passage 3a is opened. In this way, as indicated by a path I of Fig. 1, fuel is sucked from the fuel feeding port 1a, through the first fuel passage 3a, the central blind hole 3c and the second fuel passage 3b, into a portion of the plunger hole 1b above the plunger 2.

[0035] As shown in Fig. 2, in the fuel pressurizing state, the plunger 2 is moved upwards in the plunger hole 1b and, at the same time, the inlet valve core 6 abuts hermetically against the upper opening of the central blind hole 3c such that the first fuel passage 3a is blocked. That is, in the fuel pressurizing state, the first sealing interface is closed. In this way, the sucked fuel mentioned above is pressurized in the pressure chamber 4b as the plunger 2 is being moved upwards. When the fuel pressure reaches a given value, the outlet valve core 8 overcomes the tensile force of the spring 9 to move upwards (thus the second sealing interface is opened) in such a way that the central through hole 4a communicates with the central hole 5a of the valve holder 5. Therefore, the pressurized fuel may be discharged through the central through hole 4a and the central hole 5a for example into a common rail (not shown) of the diesel engine.

[0036] It can be seen from the above explanation that, in the conventional high-pressure fuel supplying pump, the outlet valve body must be manufactured separately and then assembled into the barrel. Therefore, this will lead to increased manufacturing costs and also an extended error chain possibly occurring in either manufacturing or assembling aspect.

[0037] Moreover, due to construction design limitation, the outlet valve body cannot be produced larger and thus the size of the pressure chamber cannot be further enlarged. Therefore, the size of the inlet valve core cannot be further enlarged and thus an improved fuel suction flowing area and improved fuel suction efficiency cannot be obtained.

[0038] With respect to the shortcomings mentioned above, Figs. 3 and 4 show partial cross-sectional views of a high-pressure fuel supplying pump according to a first embodiment of the present invention, in which the high-pressure fuel supplying pump is in fuel suction and pressurizing states respectively.

[0039] Specifically, the high-pressure fuel supplying pump according to the first embodiment of the present invention mainly comprises a barrel 1; a plunger 2 which is adapted to reciprocating in the barrel 1; an inlet valve body 11, an inlet valve core 12 and a valve holder 13 which are installed successively in the barrel 1; and an outlet valve core 14 installed in the valve holder 13.

[0040] Similarly, the barrel 1 can be machined directly in a body of the high-pressure fuel supplying pump. The barrel 1 is formed with a fuel feeding port 1a for supplying fuel from a fuel passage of a diesel engine into the barrel 1. As shown in Figs, 3 and 4, the barrel 1 is further formed with a plunger hole 1b for receiving the plunger 2 and a receiving chamber 1c for receiving the inlet valve body 11, the inlet valve core 12 and the valve holder 13. When the fuel supplying pump is not assembled, the fuel feeding port 1a, the plunger hole 1b and the receiving chamber 1c communicate with each other.

[0041] The inlet valve body 11 is substantially cylindrical. Optionally, the inlet valve body 11 can be formed on its periphery with a flange for contacting hermetically with an inner wall of the receiving chamber 1c. A first fuel passage 11a is machined in the inlet valve body 11 in such a way that the first fuel passage is perpendicular to a central axis of the inlet valve body. The first fuel passage 11a communicates with a central blind hole 11c of the inlet valve body 11. A second fuel passage 11b is machined in the inlet valve body 11 in such a way that the second fuel passage is parallel to the central blind hole 11c. After the inlet valve body 11 is installed in the receiving chamber 1c of the barrel 1 in place, the first fuel passage 11a communicates with the fuel feeding hole 1a and the second fuel passage 11b communicates with the plunger hole 1b.

[0042] It should be understood that the inlet valve body 11 is not limited by the specific structure explained above. Any other suitable structure can be adopted by the inlet valve body 11 as soon as such structure ensures that the first fuel passage 11a and the second fuel passage 11b of the inlet valve body 11 can achieve the same function mentioned above and/or below.

[0043] As shown in Figs. 3 and 4, the valve holder 13 is provided on its periphery with outer threads for screwing with inner threads of the receiving chamber 1c during assembling such that an end of the valve holder 13 can be pressed against the inlet valve body 11 in the barrel 1 and fixedly secured there.

[0044] The valve holder 13 is formed with a central through hole 13a along its central longitudinal axis. The outlet valve body 18 is formed integrally in the valve holder 13 at an adequate position of the central through hole 13a. As shown, the outlet valve body 18 is a flange which projects radically and inwardly from an inner wall of the center through hole 13a in such a way that the inner diameter of the outlet valve body 18 is less than the inner diameter of the remaining portion of the central through hole 13. In order that fuel can be discharged rapidly after being pressurized, a segment 19 of an increased inner diameter is optionally formed directly adjacent the outlet valve body 18 in the through hole along a downstream direction of the central through hole 13a (i.e. a direction of discharging the fuel).

[0045] An end of the central through hole 13a adjacent the outlet valve body 18 along an upstream direction of the central through hole 13a is machined as a horn mouth shape so as to form a pressure chamber 13b for fuel. End faces of the valve holder 13 and the inlet valve body 11 which contact with each other are provided in such a way that sufficient sealing between the pressure chamber 13b and the receiving chamber 1c is ensured. Furthermore, the pressure chamber 13b communicates with the second fuel passage 11b.

[0046] In a similar manner as shown in Figs. 1 and 2, the inlet valve core 12 and the inlet valve body 11 are matable with each other so as to form a first sealing interface therebetween, which is openable or closable in such a way that fluid is allowed or prohibited to flow between the first fuel passage 11a and the central blind hole 11c as well as the pressure chamber 13b.

[0047] The outlet valve core 14 is installed in the central through hole 13a of the valve holder 13. The outer diameter of the outlet valve core 14 is less than the inner diameter of the central through hole 13a. More particularly, a portion of the outlet valve core 14 passing through the outlet valve body 18 has an outer diameter less than the inner diameter of the outlet valve body 18.

[0048] A spring seat 17 is installed in the central through hole 13a opposite the outlet valve body 18. In order that the spring seat 17 can be fixedly secured, it is installed in the central through hole 13a for example in an interference fitting manner. Alternatively, the central through hole 13a can be formed with inner threads and the spring seat 17 can be formed with outer threads such that the spring seat can be screwed in the central through hole in place.

[0049] The spring seat 17 is of a hollow cylindrical shape in whose interior a step is formed for carrying a coil spring 16. As shown in Figs. 3 and 4, one end of the coil spring 16 is secured in the spring seat 17 and the other end of the coil spring 16 is secured on a projection of the outlet valve core 14. Particularly, a portion of the outlet valve core 14, especially of the projection thereof, extends into the coil spring 16 in such a way that the outlet valve core 14 can be moved upwards or downwards along a central axis of the coil spring 16, especially of the central through hole 13a.

[0050] A conical sealing face is machined for example on the outlet valve core 14 for mating with a correspondingly formed sealing face of the outlet valve body 18. Under the action of a tensile force exerted by the spring 16, the sealing face of the outlet valve core 14 abuts tightly against the sealing face of the outlet valve body 18 such that no fluid passage can be generated between upstream and downstream parts of the central through hole 13a.

[0051] More particularly, the outlet valve core 14 and the outlet valve body 18 are matable with each other so as to form a second sealing interface therebetween, which is openable or closable in such a way that fluid is allowed or prohibited to flow between the pressure chamber 13b and the central through hole 13a of the valve holder 13.

[0052] As shown in Figs. 3 and 4, a flange is formed on the outlet valve core 14 adjacent its bottom end so as to carry a coil spring 15. One end of the coil spring 15 is secured on the flange such that the bottom end of the outlet valve core 14 projects partially into the coil spring 15. The inlet valve core 12 is located in the pressure chamber 13b. The inlet valve core 12 is formed in a similar manner as the inlet valve core 6 illustrated by Figs. 1 and 2. The other end of the spring 15 is secured on the inlet valve core 12 such that a top end of the inlet valve core 12 projects partially into the coil spring 15 and is separated by a distance from the bottom end of the outlet valve core 14. In this way, the inlet valve core 12 can be guided in such a way that the inlet valve core can be moved upwards or downwards along a central axis of the spring 15, that is along the central axis of the central through hole 13a.

[0053] Similarly, the inlet valve core 12 is formed with a conical or truncated conical sealing face which is able to abut hermetically against an upper opening of the central blind hole 11c under the action of a tensile force of the spring 15 such that the first fuel passage 11a is closed.

[0054] Because a separately manufactured outlet valve body is omitted in the technical solution of the present invention, the pressure chamber 13b can be manufactured larger than that illustrated by Figs. 1 and 2 without reducing the strength of the valve holder 13 itself. Therefore, by comparison with the prior art, the inner diameter of the central blind hole 11b of the inlet valve body 11 and the diametral size of the inlet valve core 12 can be designed as being greater such that it facilitates increasing the fuel suction flowing area and improving the fuel suction efficiency.

[0055] As shown in Fig. 3, in the fuel suction state, the outlet valve core 14 abuts tightly against the outlet valve body 18 under the action of the spring 16 in such a way that no fluid passage can be generated between the upstream and downstream parts of the central through hole 13a. That is, in the fuel suction state, the first sealing interface is opened and the second sealing interface is closed. At this time, the plunger 2 is moved downwards in the plunger hole 1b under the action of a spring of the high-pressure fuel supplying pump (not shown) in such a way that vacuum negative pressure is generated in the pressure chamber 13b. In this way, the inlet valve core 12 overcomes the tensile force of the spring 15 to move upwards in such a way that the first fuel passage 11a is opened. Therefore, as indicated by a path I illustrated by Fig. 3, the fuel is sucked, through the first fuel passage 11a, the central blind hole 11c and the second fuel passage 11b, into a portion of the plunger 1b above the plunger 2.

[0056] As shown in Fig. 4, in the fuel pressurizing state, the plunger 2 is moved upwards in the plunger hole 1b and, at the same time, the inlet valve core 12 abuts hermetically the upper opening of the central blind hole 11c under the action of the spring 15 such that the first fuel passage 11a is closed. That is, in the fuel pressurizing state, the first sealing interface is closed. In this way, the sucked fuel is pressurized in the pressure chamber 13b as the plunger 2 is being moved upwards. After the fuel pressure reaches a given value, the outlet valve core 14 can overcome the tensile force of the spring 16 to move upwards (that is, the second sealing interface is opened) such that the pressure chamber 13b communicates with the central through hole 13a of the valve holder 13, especially with the upstream part of the central through hole. Therefore, as indicated by a path II illustrated by Fig. 4, the pressurized fuel can be discharged through the outlet valve body 18 and the central through hole 13a for example into the common rail of the diesel engine (not shown).

[0057] The plunger 2 is driven by the cam shaft of the diesel engine in such a way that the plunger 2 can constantly reciprocate upwards and downwards in the plunger hole 1b of the barrel 1. In this way, the pump is continuously switched between the fuel suction and pressurizing states such that the pressurized fuel can be continuously fed into the common rail.

[0058] After the high-pressure fuel supplying pump have worked for a long period, a small amount of fuel may possibly penetrate into the plunger hole 1b and may enter an oil chamber of the fuel supplying pump such that the oil quality may be reduced. To avoid this, it is always desirable to design the contacting area/length between the plunger hole 1b and the plunger 2 as great as possible. However, due to the limited entire size of the high-pressure fuel supplying pump, increasing the length of the plunger hole 1b will definitely lead to a negative influence on the accommodating volume of the receiving chamber 1c of the barrel 1.

[0059] More particularly, in the conventional high-pressure fuel supplying pump illustrated by Figs. 1 and 2, the valve holder 5 has an outlet which is at a longitudinal distance H from a bottom of the receiving chamber 1c. Because the outlet valve body 4 must be installed in the receiving chamber 1c, the longitudinal length of the receiving chamber 1c cannot be further decreased and thus the contacting area/length of the plunger hole 1b cannot be further increased.

[0060] Contrarily, in the inventive high-pressure fuel supplying pump illustrated by Figs. 3 and 4, the outlet valve holder 13 has an outlet which is at a longitudinal distance H' from a bottom of the receiving chamber 11c. Because the outlet valve body is omitted, the valve holder 13 can be reduced further in size without any negative influence on its strength. That is, H' can be designed as being less than H (H'<H). In this way, the accommodating volume of the receiving chamber 1c illustrated by Figs. 3 and 4 can be reduced such that, under the condition of the entire longitudinal size of the high-pressure fuel supplying pump being unchanged, the plunger hole 1b can be machined in the barrel 1 so as to have an increased length. In this way, the contacting area/length between the plunger hole 1b and the plunger 2 can be increased. Therefore, a possibility that the fuel penetrates into the oil is reduced and the supplying pump may

be operated more efficiently.

[0061] Figs. 3 and 4 illustrate only one of possible embodiments of the outlet valve core 14. It is understood by a person skilled in the art, after reading the description, that any kind of outlet valve core having the same function can be adopted in the technical solution of the present invention. For instance, it is conceived that each flange can be formed integrally on the outlet valve core 14 or the flange can alternatively be a separate part, for example a nut, which is assembled onto the outlet valve core.

[0062] In the embodiment illustrated by Figs. 3 and 4, both the springs 15 and 16 act on the outlet valve core 14. Although fuel suction and pressurizing processes can be carried out by adjusting parameters, such as stiffness or the like, of the springs 15 and 16, the two springs both acting on a single part may lead to an increasing risk of failure.

[0063] A high-pressure fuel supplying pump according to a second embodiment of the present invention will be explained below with respect to Figs. 5 and 6, in which the fuel suction and pressurizing processes are carried out more reliably.

[0064] Figs. 5 and 6 shows partial cross-sectional views of the high-pressure fuel supplying pump according to the second embodiment of the present invention, in which the high-pressure fuel supplying pump is in a fuel suction state and in a fuel pressurizing state respectively.

[0065] As shown, the high-pressure fuel supplying pump according to the second embodiment differs from that according to the first embodiment mainly in that the spring exerting the tensile force on the outlet valve core is able to be operated independently of the spring exerting the tensile force on the inlet valve core.

[0066] For simplicity, only the difference between the second embodiment and the first embodiment illustrated by Figs. 3 and 4 is explained below.

[0067] In the second embodiment, an outlet valve core 20 is installed in the central through hole 13a above the outlet valve body 18 such that the outlet valve core is movable upwards or downwards. The outlet valve core 20 is in the form of a hollow cylinder one end of which is closed. The closed end has an outer diameter slightly less than the inner diameter of the central through hole 13a and is formed with a conical sealing face in a similar manner as illustrated by Figs. 3 and 4. The conical sealing face of the closed end is used to abut hermetically against the corresponding sealing face of the outlet valve body 18. One or more apertures 20 are formed circumferentially in the outlet valve core 20 at a position separated by a longitudinal distance from the sealing face such that an hollow interior of the outlet valve core 20 is able to communicate with the central through hole 13a, especially the segment 19 thereof, via the aperture 20.

[0068] One end of the spring 16 is secured in the spring seat 17 in a similar manner as illustrated by Figs. 3 and 4. A step extends radially and inwardly from a cylindrical inner wall of the outlet valve core 20 so as to secure the other end of the spring 16 thereon. Under the action of the spring 16, the sealing face of the outlet valve core 20 is pressed tightly against the outlet valve body 18 in such a way that no fluid passage can be generated between the upstream and downstream parts of the central through hole 13a.

[0069] In this case, the outlet valve core 20 and the outlet valve body 18 are matable with each other so as to form a second sealing interface therebetween, which is openable or closable in such a way that fluid is allowed or prohibited to flow between the pressure chamber 13b and the central through hole 13a of the valve holder 13.

[0070] A spring seat 21 is additionally provided in the pressure chamber 13b. The spring seat 21 is of a hollow cap shape. Because the pressure chamber 13b is in the form of a horn mouth shape opening downwards, the upper end of the spring seat 21 and the upper portion of the pressure chamber 13b are formed such that they are complementary to each other. Therefore, after being assembled, the spring seat 21 can be received in the upper portion of the pressure chamber 13b in an adaptably fixed manner. Alternatively, the spring seat 21 can be formed with outer threads and the pressure chamber 13b can be formed with inner threads such that the spring seat 21 can be screwed in the pressure chamber 13b in place.

[0071] A step extends inwardly from a top end of a cylindrical inner wall of the spring seat 21 to secure one end of the spring 15 thereon. The other end of the spring 15 is secured on the inlet valve core 12 in the same manner as illustrated by Figs. 3 and 4. Under the action of the spring 15, the inlet valve core 12 abuts tightly against the upper opening of the central blind hole 11c of the inlet valve body 11 in such a way that the first fuel passage 11a is closed.

[0072] In this case, the inlet valve 12 and the inlet valve body 11 are matable with each other so as to form the first sealing interface, which is openable or closable such that fluid is allowed or prohibited to flow between the first fuel passage 11a and the center blind hole 11c as well as the pressure chamber 13b.

[0073] As shown in Fig. 5, in the fuel suction state, the outlet valve core 20 abuts tightly against the outlet valve body 18 under the action of the spring 16 in such a way that no liquid passage can be generated between the upstream and downstream parts of the central through hole 13a. That is, in the fuel suction state, the first sealing interface is opened and the second sealing interface is closed. At this time, the plunger 2 is moved downwardly in the plunger hole 1b under the action of the spring (not shown) and the cam shaft (not shown) of the high-pressure fuel supplying pump such that vacuum negative pressure is generated in the pressure chamber 13b. Therefore, the inlet valve core 12 is moved upwardly with resisting the tensile force of the spring 15 such that the first fuel passage 11a is opened. In this way, as indicated by the path I illustrated by Fig. 5, fuel is sucked, through the first fuel passage 11a, the central blind hole 11c and the second fuel passage 11b, in the portion of the plunger hole 1b above the plunger 2.

[0074] As shown in Fig. 6, in the fuel pressurizing state, the plunger 2 is moved upwardly in the plunger hole 1b and, at the same time, the inlet valve core 12 is pressed hermetically against the upper opening of the central blind hole 11c under the action of the spring 15 such that the first fuel passage 11a is closed. That is, in the fuel pressuring state, the first sealing interface is closed. In this way, the sucked fuel can be pressurized in the pressure chamber 13b as the plunger 2 is being moved upwardly. After the fuel pressure reaches a given value, the outlet valve core 20 overcomes the tensile force of the spring 16 to move upwardly such that the pressure chamber 13b communicates fluidly with the upstream part of the central through hole 13a of the valve holder 13 (that is, the second sealing interface is opened). Therefore, as indicated by a path II illustrated by Fig. 6, the pressurized fuel can be discharged through the outlet valve body 18, the aperture 20a and the central through hole 13a for example into the common rail of the diesel engine (not shown).

[0075] Although, in the above embedment of the present invention, the outlet valve body 18 is formed integrally in the central through hole 13a of the valve holder 13 in such a way that the outlet valve body extends inwardly from the inner wall of the central through hole, the outlet valve body 18 can be produced as a ring-shaped part having a small central through hole in an alternative embodiment. In this alternative embodiment, the ring-shaped part is provided with outer threads on its periphery and the inner wall of the central through hole 13a is provided with threads such that, during assembling, the ring-shaped part can be screwed in the central through hole 13a at locations illustrated by Figs. 3 and 5.

[0076] In the second embodiment of the present invention, the springs 15 and 16 can be operated independently of each other. Therefore, besides the advantages of the first embodiment, the second embodiment offers advantages that the fuel suction and pressurizing processes can be reliably carried out and the risk of failure is reduced.

[0077] It should be understood that various technical features of the embodiments of the present invention can be combined with each other arbitrarily. For instance, the spring seat 21 illustrated by Figs. 5 and 6 can be applied in the embodiment illustrated by Figs. 3 and 4. In this case, the bottom end of the outlet valve core 14 can be shortened correspondingly such that it will not contact the upper end of the spring seat 21.

[0078] For instance, Figs. 7 and 8 show schematic views of another embodiment according to the present invention. A high-pressure fuel supplying pump according to this another embodiment is mainly characterized in that: the outlet valve core 14 illustrated by Figs. 3 and 4 is replaced with the outlet valve core 20 illustrated by Figs. 5 and 6 so as to form an outlet valve core 22. In this case, the outlet valve core 22 can similarly be formed with a part extending from its lower end. This part of the outlet valve core 22 has an outer diameter less than the outer diameter of the outlet valve body 18, and has a projection which is used to secure the spring 15 and extends partially into the spring 15. Besides, a fuel suction process according to this embodiment is carried out in the same manner as illustrated by Fig. 3. However, in a fuel pressurizing process according to this embodiment, fuel, after being pressurized, must pass through a gap between the outlet valve core 22 and the outlet valve body 18 so as to be discharged along a path II as illustrated out of the high-pressure fuel supplying pump.

[0079] Although those specific embodiments of the present invention are explained here, they are only for illustrative purposes and cannot be considered to limit the scope of the present invention in any manner. Various modifications of the present invention are possible within the scope of attached claims.

Claims

1. A high-pressure fuel supplying pump comprising:

a barrel (1) formed with a fuel feeding port (1a), a plunger hole (1b) and a receiving chamber (1c) which communicate with each other; and

a plunger (2) which is able to reciprocate in the plunger hole (1b),

wherein installed in the receiving chamber (1c) are an inlet valve body (11) and an valve holder (13) with a central through hole (13a) which abut hermetically against each other,

an input fuel passage (11a) is formed in the inlet valve body (11) so as to communicate the fuel feeding port (1a) with the plunger hole (1b),

a pressure chamber (13b) communicating with the plunger hole (1b) is formed in the central through hole (13a) at an end of the valve holder (13) contacting with the inlet valve body (11),

an inlet valve core (12) is disposed in the pressure chamber (13b), the inlet valve core (12) is matable with the inlet valve body (11) so as to define a first sealing interface therebetween, and the first sealing interface is openable or closable such that it allows the input fuel passage (11a) selectively to communicate with the pressure chamber (13b) or to isolate from the pressure chamber (13b), and

wherein an output fuel passage is formed in the valve holder (13) to communicate with the pressure chamber (13b), and the valve holder (13) is provided in such a way that it allows the output fuel passage selectively to communicate with the pressure chamber (13b) or to isolate from the pressure chamber (13b),

wherein a second sealing interface is provided in the valve holder (13) between the pressure chamber (13b) and the output fuel passage, which second interface is selectively openable or closable, and

wherein an outlet valve is disposed in the valve holder (13) and comprises an outlet valve core (14, 20) and an outlet valve body (18) which are matable with each other so as to define the second sealing interface,

characterized in that

the outlet valve body (18) is formed integrally in the valve holder (13).

2. The high-pressure fuel supplying pump as claimed in claim 1, wherein the first sealing interface is opened and the second sealing interface is closed when the plunger (2) is moved in the plunger hole (1b) in a direction of increasing the accommodating volume of the plunger hole (1b).

3. The high-pressure fuel supplying pump as claimed in claim 1 or 2, wherein the first sealing interface is closed when the plunger (2) is moved in the plunger hole (1b) in a direction of decreasing the accommodating volume of the plunger hole (1b), and the second sealing interface is opened after pressure in the pressure chamber (13b) reaches a rated value.

4. The high-pressure fuel supplying pump as claimed in claim 1, wherein a first spring seat (17) is provided in the output fuel passage so as to secure one end of a first spring (16), and the other end of the first spring (16) is secured on the outlet valve core (14, 20) in such a way that the outlet valve core (14, 20) abuts tightly against the outlet valve body (18) by means of a tensile force of the first spring (16) so as to define the second sealing interface.

5. The high-pressure fuel supplying pump as claimed in claim 4, wherein a second spring (15) is provided in the pressure chamber (13b), one end of the second spring (15) is secured on the outlet valve core (14, 20) and the other end of the second spring (15) is secured on the inlet valve core (12) in such a way that the inlet valve core (12) abuts tightly against the inlet valve body (11) by means of a tensile force of the second spring (15) so as to define the first sealing interface.

6. The high-pressure fuel supplying pump as claimed in claim 4, wherein a second spring seat (21) is provided in the pressure chamber (13b) so as to secure one end of a second spring (15), and the other end of the second spring (15) is secured on the inlet valve core (12) in such a way that the inlet valve core (129 abuts tightly against the inlet valve body (11) by means of a tensile force of the second spring (15) so as to define the first sealing interface.

7. The high-pressure fuel supplying pump as claimed in claim 1, wherein the output fuel passage is embodied as the longitudinal through hole (13a) formed in the valve holder (13), and the outlet valve body (14, 20) extends radially and inwardly from an inner wall of the longitudinal through hole (13a).

8. The high-pressure fuel supplying pump as claimed in claim 1, wherein the outlet valve core (14) is embodied as a valve rod installed in the longitudinal through hole (13a) and passing through the outlet valve body (13), the diameter of the valve rod is less than the inner diameter of the longitudinal through hole (13a), and a portion of the valve rod passing through the outlet valve body (13) has a diameter less than the inner diameter of the outlet valve body (13).

9. The high-pressure fuel supplying pump as claimed in claim 6, wherein the outlet valve core (20) is embodied as a hollow cylinder which is installed movably in the longitudinal through hole (13a) and has one closed end, the closed end of the hollow cylinder is formed with a second sealing face for abutting against the outlet valve body (13), and the hollow cylinder is formed with an aperture (20a) which enables an hollow interior of the cylinder to communicate with the pressure chamber (13b).

10. The high-pressure fuel supplying pump as claimed in any one of claims 7 to 9, wherein a segment (19) having an increased inner diameter is formed in the longitudinal through hole (13a) directly adjacent the outlet valve body (14, 20).

11. A diesel engine comprising a high-pressure fuel supplying pump as claimed in any one of the preceding claims.

Patentansprüche

1. Hochdruck-Kraftstoffförderpumpe, die Folgendes umfasst:

einen Zylinder (1), der mit einem Kraftstoffeinspeiseanschluss (1a), einem Kolbenloch (1b) und einer Empfängerkammer (1c), die sich miteinander im Austausch befinden, ausgebildet ist;

einen Kolben (2), der in der Lage ist, sich in dem Kolbenloch (1b) hin- und herzubewegen,

wobei in der Empfängerkammer (1c) ein Einlassventilkörper (11) und ein Ventilhalter (13) mit einem zentralen Durchgangsloch (13a) installiert sind, die hermetisch aneinander anliegen,

eine Kraftstoffeingangspassage (11a) in dem Einlassventilkörper (11) ausgebildet ist, sodass sich der Kraftstoffeinspeiseanschluss (1a) und das Kolbenloch (1b) im Austausch miteinander befinden,

eine Druckkammer (13b), die sich im Austausch mit dem Kolbenloch (1b) befindet, in dem zentralen Durchgangsloch (13a) an einem Ende des Ventilhalters (13) ausgebildet ist, und den Einlassventilkörper (11) kontaktiert,

ein Einlassventilkern (12) in der Druckkammer (13b) angeordnet ist, wobei der Einlassventilkern (12) mit dem Einlassventilkörper (11) zusammenfügbar ist, um dazwischen eine erste Dichtungsgrenzfläche zu definieren, und die erste Dichtungsgrenzfläche geöffnet oder geschlossen werden kann, sodass sie der Kraftstoffeingangspassage (11a) gestattet, wahlweise mit der Druckkammer (13b) zu kommunizieren oder sich von der Druckkammer (13b) zu isolieren, und

wobei in dem Ventilhalter (13) eine Kraftstoffausgangspassage ausgebildet ist, die sich mit der Druckkammer (13b) im Austausch befindet, und der Ventilhalter (13) so bereitgestellt ist, dass er der Kraftstoffausgangspassage gestattet, sich wahlweise mit der Druckkammer (13b) auszutauschen oder sich von der Druckkammer (13b) zu isolieren,

wobei eine zweite Dichtungsgrenzfläche in dem Ventilhalter (13) zwischen der Druckkammer (13b) und der Kraftstoffausgangspassage bereitgestellt ist, wobei die zweite Grenzfläche wahlweise geöffnet oder geschlossen werden kann, und

wobei ein Auslassventil in dem Ventilhalter (13) angeordnet ist und einen Auslassventilkern (14, 20) und einen Auslassventilkörper (18) umfasst, die miteinander zusammenfügbar sind, um die zweite Dichtungsgrenzfläche zu definieren,

dadurch gekennzeichnet, dass

der Auslassventilkörper (18) integral in dem Ventilhalter (13) ausgebildet ist.

2. Hochdruck-Kraftstoffförderpumpe nach Anspruch 1, wobei die erste Dichtungsgrenzfläche geöffnet wird und die zweite Dichtungsgrenzfläche geschlossen wird, wenn der Kolben (2) in dem Kolbenloch (1b) in einer Richtung der Erhöhung des Aufnahmevolumens des Kolbenlochs (1b) bewegt wird.

3. Hochdruck-Kraftstoffförderpumpe nach Anspruch 1 oder 2, wobei die erste Dichtungsgrenzfläche geschlossen wird, wenn der Kolben (2) in dem Kolbenloch (1b) in einer Richtung der Verringerung des Aufnahmevolumens des Kolbenlochs (1b) bewegt wird, und die zweite Dichtungsgrenzfläche geöffnet wird, nachdem der Druck in der Druckkammer (13b) einen Auslegungswert erreicht.

4. Hochdruck-Kraftstoffförderpumpe nach Anspruch 1, wobei ein erster Federsitz (17) in der Ausgangskraftstoffpassage bereitgestellt ist, um ein Ende einer ersten Feder (16) zu sichern, und das andere Ende der ersten Feder (16) so an dem Auslassventilkern (14, 20) gesichert ist, dass der Auslassventilkern (14, 20) aufgrund einer Zugkraft der ersten Feder (16) eng an dem Auslassventilkörper (18) anliegt, um die zweite Dichtungsgrenzfläche zu definieren.

5. Hochdruck-Kraftstoffförderpumpe nach Anspruch 4, wobei eine zweite Feder (15) in der Druckkammer (13b) bereitgestellt ist, ein Ende der zweiten Feder (15) an dem Auslassventilkern (14, 20) gesichert ist, und das andere Ende der zweiten Feder (15) so an dem Einlassventilkern (12) gesichert ist, dass der Einlassventilkern (12) aufgrund einer Zugkraft der zweiten Feder (15) eng an dem Einlassventilkörper (11) anliegt, um die erste Dichtungsgrenzfläche zu definieren.

6. Hochdruck-Kraftstoffförderpumpe nach Anspruch 4, wobei ein zweiter Federsitz (21) so in der Druckkammer (13b) bereitgestellt ist, dass ein Ende einer zweiten Feder (15) gesichert wird, und das andere Ende der zweiten Feder (15) so an dem Einlassventilkern (12) gesichert ist, dass der Einlassventilkern (129 aufgrund einer Zugkraft der zweiten Feder (15) eng an dem Einlassventilkörper (11) anliegt, um die erste Dichtungsgrenzfläche zu definieren.

7. Hochdruck-Kraftstoffförderpumpe nach Anspruch 1, wobei die Kraftstoffausgangspassage als das längliche Durchgangsloch (13a) verkörpert ist, das in dem Ventilhalter (13) ausgebildet ist, und der Auslassventilkörper (14, 20) sich radial und von einer inneren Wand des länglichen Durchgangslochs (13a) nach innen erstreckt.

8. Hochdruck-Kraftstoffförderpumpe nach Anspruch 1, wobei der Auslassventilkern (14) als eine Ventilstange verkörpert ist, die in dem länglichen Durchgangsloch (13a) installiert ist und den Auslassventilkörper (13) durchläuft, wobei der Durchmesser der Ventilstange kleiner als der Innendurchmesser des länglichen Durchgangslochs (13a) ist, und ein Abschnitt der Ventilstange, die den Auslassventilkörper (13) durchläuft, einen Durchmesser aufweist, der kleiner als der Innendurchmesser des Auslassventilkörpers (13) ist.

9. Hochdruck-Kraftstoffförderpumpe nach Anspruch 6, wobei der Auslassventilkern (20) als ein hohler Zylinder verkörpert ist, der bewegbar in dem länglichen Durchgangsloch (13a) installiert ist und ein geschlossenes Ende aufweist, wobei das geschlossene Ende des hohlen Zylinders mit einer zweiten Dichtungsfläche für ein Angrenzen an den Auslassven-

tilkörper (13) ausgebildet ist, und der hohle Zylinder mit einer Öffnung (20a) ausgebildet ist, die einem hohlen Inneren des Zylinders einen Austausch mit der Druckkammer (13b) gestattet.

10. Hochdruck-Kraftstofffförderpumpe nach einem der Ansprüche 7 bis 9, wobei ein Segment (19), das einen vergrößerten inneren Durchmesser aufweist, in dem länglichen Durchgangsloch (13a), direkt angrenzend an den Auslassventilkörper (14, 20), ausgebildet ist.

11. Dieselmotor, der eine Hochdruck-Kraftstofffförderpumpe nach einem der vorangehenden Ansprüche umfasst.

Revendications

1. Pompe d'alimentation en carburant haute pression comprenant :

un corps (1) pourvu d'un orifice d'alimentation en carburant (1a), d'un trou à plongeur (1b) et d'une chambre de réception (1c) qui communiquent entre eux ; et

un plongeur (2) qui peut effectuer un mouvement de va-et-vient dans le trou à plongeur (1b),

un corps de soupape d'entrée (11) et un support de soupape (13) ayant un trou traversant central (13a) étant installés dans la chambre de réception (1c) et venant en butée hermétique l'un contre l'autre,

un passage de carburant d'entrée (11a) étant formé dans le corps de soupape d'entrée (11) de sorte à faire communiquer l'orifice d'alimentation en carburant (1a) avec le trou à plongeur (1b),

une chambre de pression (13b) en communication avec le trou à plongeur (1b) étant formée dans le trou traversant central (13a) à une extrémité du support de soupape (13) en contact avec le corps de soupape d'entrée (11),

un noyau de soupape d'entrée (12) étant disposé dans la chambre de pression (13b), le noyau de soupape d'entrée (12) pouvant être accouplé avec le corps de soupape d'entrée (11) de sorte à définir une première interface d'étanchéité entre eux, et la première interface d'étanchéité pouvant être ouverte ou fermée de sorte à permettre au passage de carburant d'entrée (11a) de sélectivement communiquer avec la chambre de pression (13b) ou de s'isoler de la chambre de pression (13b), et

un passage de carburant de sortie étant formé dans le support de soupape (13) pour communiquer avec la chambre de pression (13b), et le support de soupape (13) étant conçu de sorte à permettre au passage de carburant de sortie de sélectivement communiquer avec la chambre de pression (13b) ou de s'isoler de la chambre de pression (13b),

une seconde interface d'étanchéité étant disposée dans le support de soupape (13) entre la chambre de pression (13b) et le passage de carburant de sortie, ladite seconde interface pouvant être ouverte ou fermée de manière sélective, et

une soupape de sortie étant disposée dans le support de soupape (13) et comprenant un noyau de soupape de sortie (14, 20) et un corps de soupape de sortie (18) qui peuvent être accouplés l'un avec l'autre de sorte à définir la seconde interface d'étanchéité,

caractérisée en ce que

le corps de soupape de sortie (18) est formé d'un seul tenant dans le support de soupape (13).

2. Pompe d'alimentation en carburant haute pression selon la revendication 1, la première interface d'étanchéité étant ouverte et la seconde interface d'étanchéité étant fermée lorsque le plongeur (2) est déplacé dans le trou à plongeur (1b) dans une direction d'augmentation du volume de réception du trou à plongeur (1b).

3. Pompe d'alimentation en carburant haute pression selon la revendication 1 ou 2, la première interface d'étanchéité étant fermée lorsque le plongeur (2) est déplacé dans le trou à plongeur (1b) dans une direction diminuant le volume de réception du trou à plongeur (1b), et la seconde interface d'étanchéité étant ouverte après que la pression dans la chambre de pression (13b) atteint une valeur nominale.

4. Pompe d'alimentation en carburant haute pression selon la revendication 1, un premier siège de ressort (17) étant disposé dans le passage de carburant de sortie de sorte à fixer une extrémité d'un premier ressort (16), et l'autre extrémité du premier ressort (16) étant fixée sur le noyau de soupape de sortie (14, 20) de sorte que le noyau de soupape de sortie (14, 20) vienne étroitement en butée contre le corps de soupape de sortie (18) à l'aide d'une force de traction du premier ressort (16) de sorte à définir la seconde interface d'étanchéité.

5. Pompe d'alimentation en carburant haute pression selon la revendication 4, un second ressort (15) étant disposé dans la chambre de pression (13b), une extrémité du second ressort (15) étant fixée sur le noyau de soupape de sortie (14, 20) et l'autre extrémité du second ressort (15) étant fixée sur le noyau de soupape d'entrée (12), de sorte que le noyau de soupape d'entrée (12) vienne étroitement en butée contre le corps de soupape d'entrée (11) à l'aide d'une force de traction du second ressort (15) de sorte à définir la première interface d'étanchéité.

6. Pompe d'alimentation en carburant haute pression selon la revendication 4, un second siège de ressort (21) étant disposé dans la chambre de pression (13b) pour fixer une extrémité d'un second ressort (15), et l'autre extrémité du second ressort (15) étant fixée sur le noyau de soupape d'entrée (12) de sorte que le noyau de soupape d'entrée (129 vienne étroitement en butée contre le corps de soupape d'entrée (11) à l'aide d'une force de traction du second ressort (15) de sorte à définir la première interface d'étanchéité.

7. Pompe d'alimentation en carburant haute pression selon la revendication 1, le passage de carburant de sortie étant réalisé sous la forme du trou traversant longitudinal (13a) formé dans le support de soupape (13), et le corps de soupape de sortie (14, 20) s'étendant radialement et vers l'intérieur depuis une paroi interne du trou traversant longitudinal (13a).

8. Pompe d'alimentation en carburant haute pression selon la revendication 1, le noyau de soupape de sortie (14) étant réalisé sous la forme d'une tige de soupape installée dans le trou traversant longitudinal (13a) et traversant le corps de soupape de sortie (13), le diamètre de la tige de soupape étant inférieur au diamètre intérieur du trou traversant longitudinal (13a), et une partie de la tige de soupape traversant le corps de soupape de sortie (13) ayant un diamètre inférieur au diamètre intérieur du corps de soupape de sortie (13).

9. Pompe d'alimentation en carburant haute pression selon la revendication 6, le noyau de soupape de sortie (20) étant réalisé sous la forme d'un cylindre creux qui est monté de manière mobile dans le trou traversant longitudinal (13a) et a une extrémité fermée, l'extrémité fermée du cylindre creux étant formée avec une seconde face d'étanchéité pour venir en butée contre le corps de soupape de sortie (13), et le cylindre creux étant formé avec une ouverture (20a) qui permet à l'intérieur creux du cylindre de communiquer avec la chambre de pression (13b).

10. Pompe d'alimentation en carburant haute pression selon l'une quelconque des revendications 7 à 9, un segment (19) ayant un diamètre intérieur accru étant formé dans le trou traversant longitudinal (13a) directement adjacent au corps de soupape de sortie (14, 20).

11. Moteur diesel comprenant une pompe d'alimentation en carburant haute pression selon l'une quelconque des revendications précédentes.

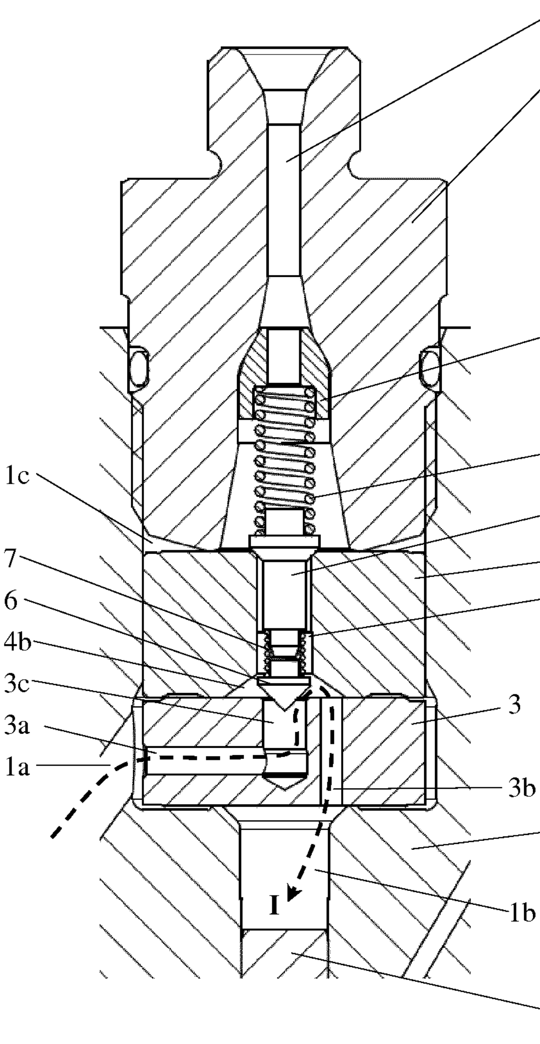
5a
5
10
9
8
1c
7
6
4b
3c
3a
1a
4
4a
3
3b
1
1b
I
2

Fig. 1

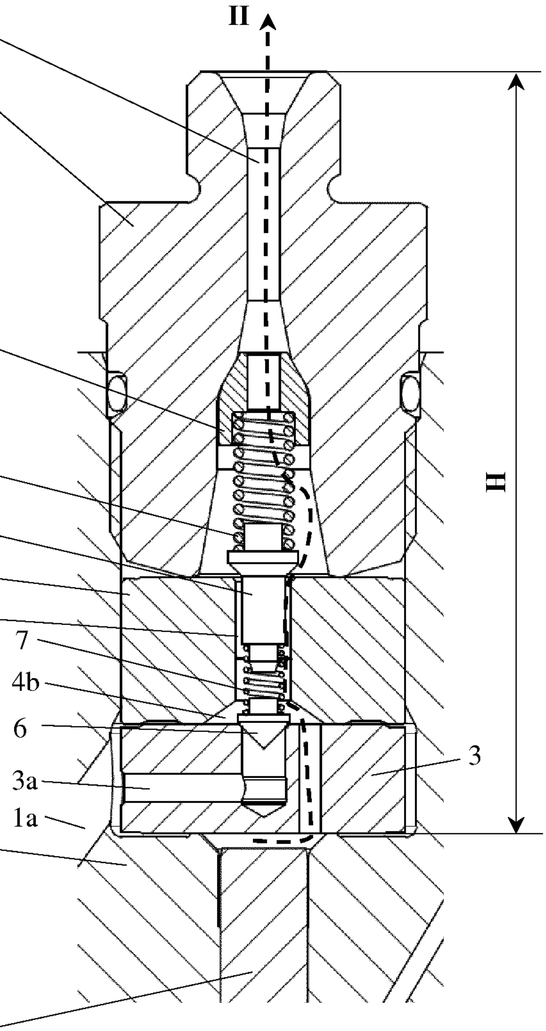
II
5a
5
10
9
8
4
4a
7
4b
6
3a
1a
3
1
H

Fig. 2

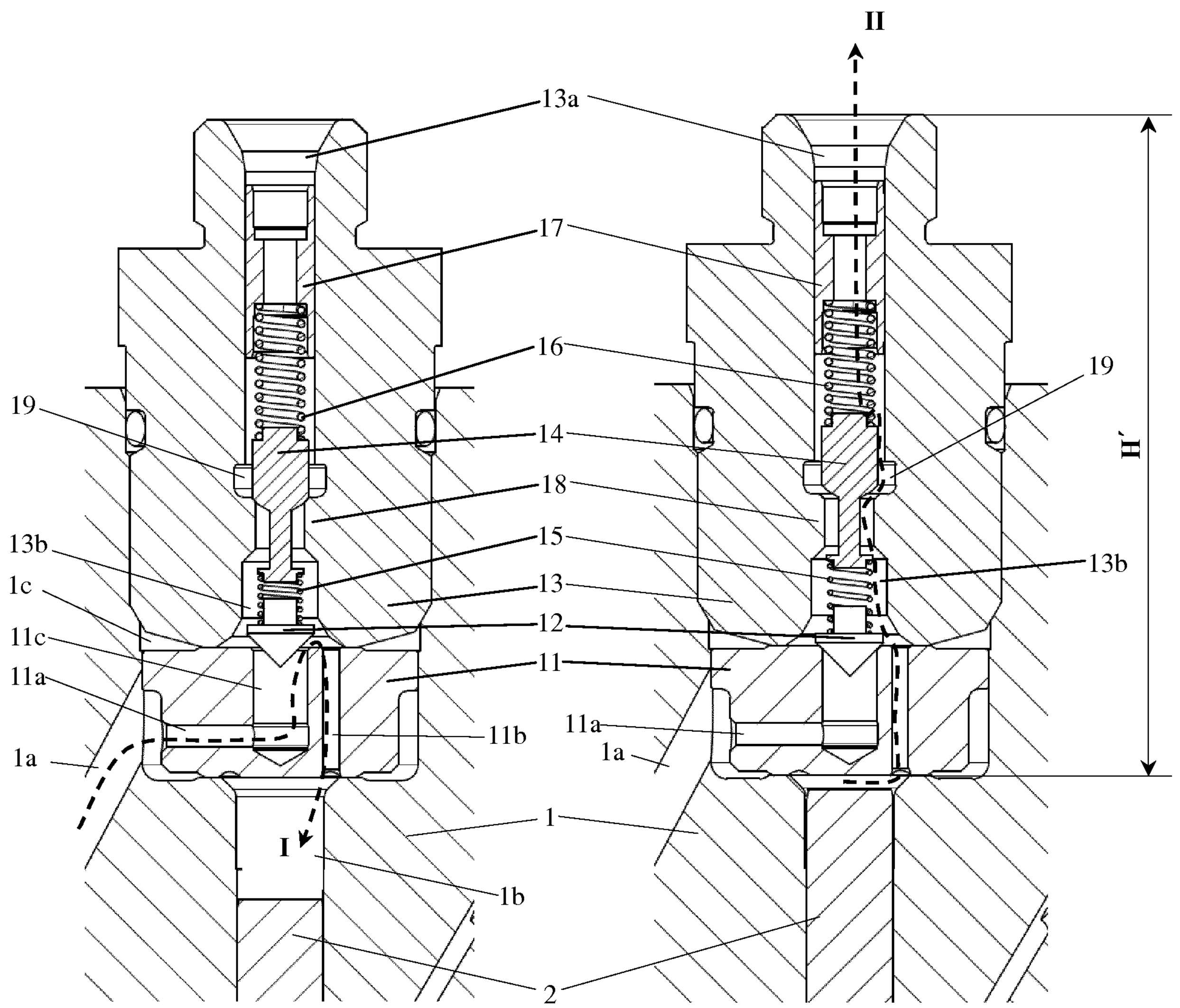

Fig. 3

Fig. 4

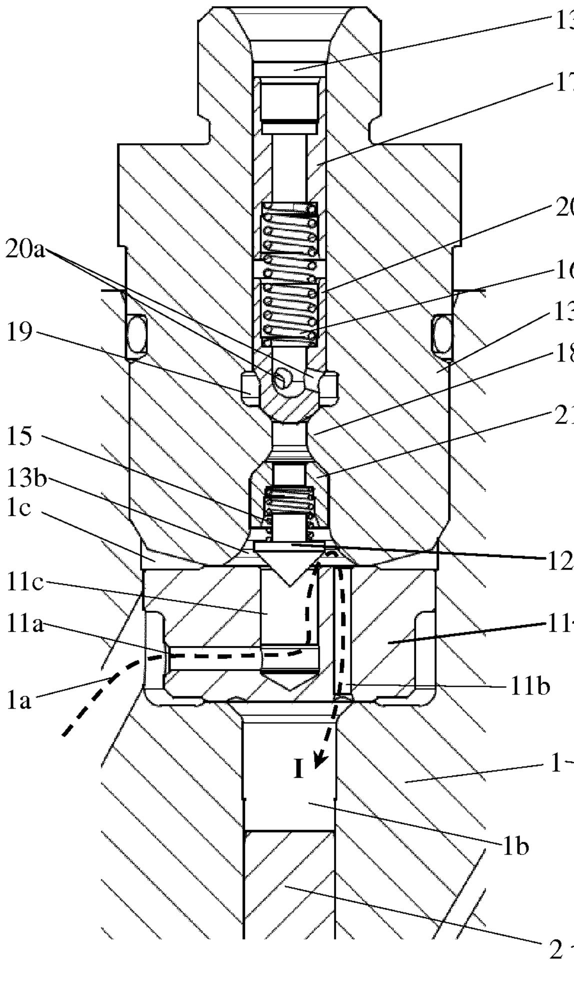
13a
17
20a
20
16
19
13
18
15
21
13b
1c
12
11c
11
11a
1a
11b
I
1
1b
2

Fig. 5

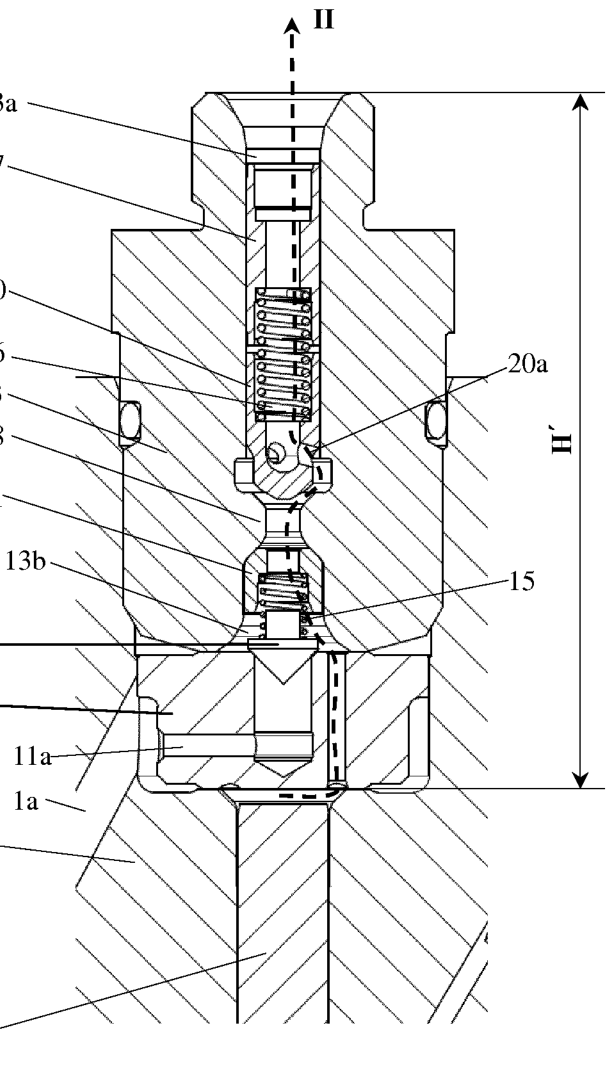
II
13a
17
20
16
20a
13
18
21
13b
15
12
11
11a
1a
1
2
H´

Fig. 6

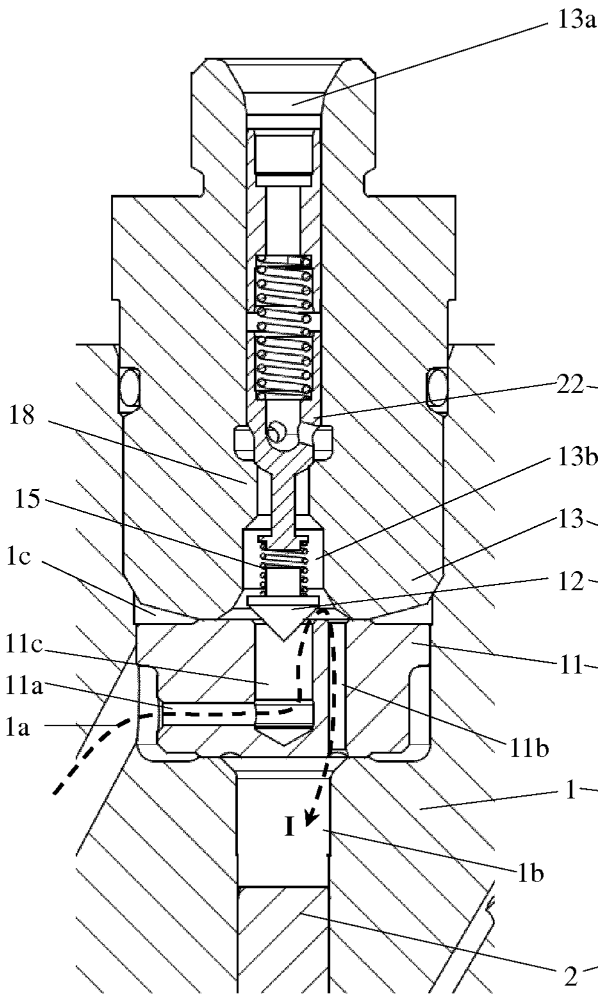
13a
22
18
13b
15
13
1c
12
11c
11
11a
1a
11b
1
I
1b
2

Fig. 7

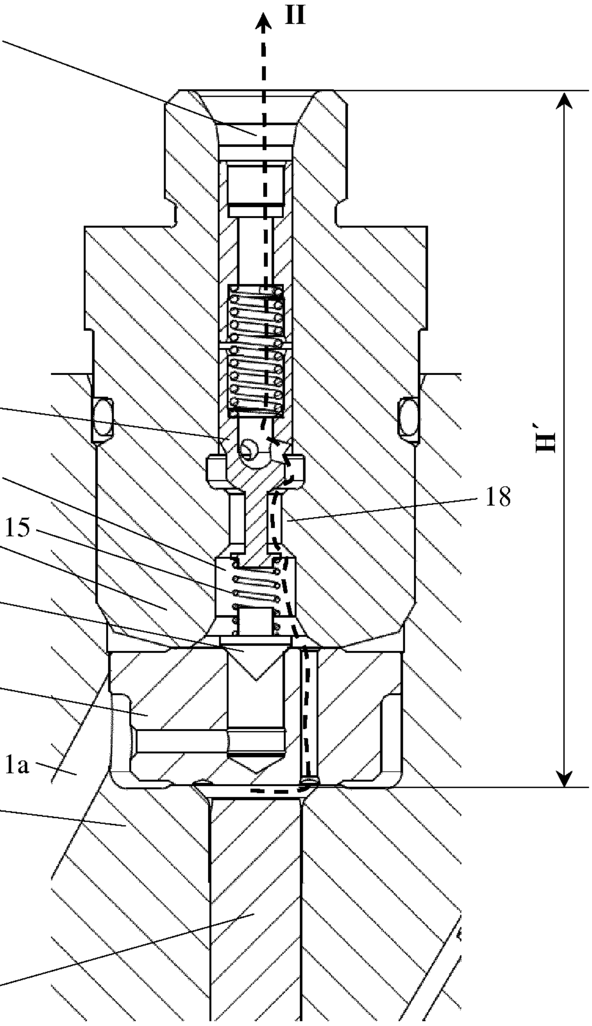
II
13a
H´
22
18
15
13
12
11
1a
1
2

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 19541507 **[0003]**