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(54) **SYSTEM FOR THE DELIVERY OF A FLUID**

SYSTEM ZUR ABGABE EINER FLÜSSIGKEIT

SYSTÈME POUR LE DÉBIT D'UN FLUIDE

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Description

[0001] The invention relates to a system for the delivery of a fluid.

[0002] In today's automotive engine systems, there is an increased demand for low cost, direct injection. In common rail injection systems, the fuel is delivered by means of a high pressure pump from a fuel tank to a fuel rail which serves as a storage reservoir for the fuel. The fuel is under high pressure in the fuel rail (or common rail) and can be injected directly into the cylinders via injection valves connected to the rail.

[0003] US 2 937 636 A discloses a multi-cylinder internal combustion engine comprising a single injection pump which delivers pressurized fuel to a distributor which distributes the fuel to all of the cylinders of the engine. The injection pump and the distributor are connected via a discharge pipe.

[0004] In GB 818 197 A a multi-cylinder internal combustion engine is described which comprises a single fuel pump cylinder being connected via a delivery conduit with a chamber to collect pressurized fuel.

[0005] US 5 577 892 discloses a fuel supply line for supplying high pressure fuel to fuel injection nozzles, wherein a supply conduit is provided from which a plurality of injection pipes lead to the fuel injection nozzles, the supply conduit being connected to the pump body via a high pressure line pipe.

[0006] EP 2 011 997 A1 discloses a common rail fuel supply system, wherein the common rail is connected with a high pressure pump body via a feed pipe.

[0007] EP 1 079 100 A2 discloses a high pressure fuel pump having a pump housing in which a pump piston is guided, and further comprising an external manifold to distribute a fuel being pressurized by the piston to a plurality of fuel pipes.

[0008] It is desirable to provide a system for the delivery of a fluid which is cost-effective.

[0009] According to an aspect of the invention a system for the delivery of a fluid comprises a high pressure pump. The high pressure pump comprises a pump body. The high pressure pump further comprises a piston. The piston is axially movable within the pump body and comprises a first part and a second part. The first part is arranged within the pump body and the second part is arranged outside the pump body. The pump body is couplable with a combustion engine such that the second part of the piston extends into the combustion engine. The pump body comprises one single fluid outlet.

[0010] The system further comprises a fluid distributor that is directly connected with the pump body. The fluid distributor comprises a fluid inlet that is coupled with the fluid outlet of the pump. The distributor is provided with as many fluid outputs as the combustion engine comprises cylinders. The distributor is designed for coupling each fluid output directly with one cylinder of the combustion engine via a pipe.

[0011] The pump body is couplable with the combustion engine, particularly with an engine block or with a cylinder head of the combustion engine, and when the pump body is coupled with the combustion engine the second part of the piston is arranged such that it is axially movable in an opening of the engine block of the combustion engine. The high pressure pump is a plug-in pump. The high pressure pump is couplable directly in the engine block and mountable with the engine block.

[0012] According to further aspects, the piston is coupled with a roller tappet. The roller tappet is couplable with the cam or crank or balancer shaft of the combustion engine. The cam or crank or balancer shaft is arranged to move the roller tappet and the piston. The roller tappet is in direct contact with the opening of the engine block. The roller tappet slides over the walls of the opening. In the opening in the engine block ensures the axial movement of the roller tappet.

[0013] Since the pump body is provided mainly for the guiding of the fluid and not for the guiding of the piston, the high pressure pump is provided with less weight and is very compact. Further, the pump is cost-effective. With the high pressure pump a direct coupling of the pump with injectors for injecting fluid into the combustion chambers is possible.

[0014] There is no common rail arranged hydraulically between the injectors and the pump. The pump is designed such that each injector comprises its own fluid delivery path from the pump to the injector. Outside the pump the injectors are hydraulically independent from each other.

[0015] According to a further aspect of the invention, the fluid distributor surrounds one single fluid inlet and two or three fluid outlets. The fluid inlet and the fluid outlets each are hydraulically coupled with each other.

[0016] According to further aspects, the pump comprises a pressure sensor coupled with the fluid distributor for determining a value of the fluid pressure at the fluid outlets. Thus, the pump is arranged to provide a given value for the pressure for the injectors precisely.

[0017] According to further aspects of the invention the pump is coupled upstream with an electrically driven pump. For example, the electrically driven pump is an in-tank pump that is arranged inside a fluid tank. For example, the system comprises no further internal transfer pump.

[0018] The system is a low-cost and low-weight compact pump system. There is no need for a common rail between the high pressure pump and the injectors. The injectors are fed directly by the pump. The pump is designed such that each injector comprises its own fluid delivery path from the pump to the injector. Outside the pump the injectors are hydraulically independent from each other. Since the high pressure pump and the fluid distributor are separate parts, one layout of the pump is adaptable to different types of combustion engines due to the fluid distributor.

[0019] Reference will now be made in detail to the preferred embodiments, examples of which are illustrated

in the accompanying drawings. The same elements, elements of the same type and elements having the same effect may be provided with the same reference symbols in the figures.

Figures 1A and 1B: schematically show a system for the delivery of a fluid according to an embodiment, and

Figure 2: schematically shows a system for the delivery of a fluid according to an embodiment.

[0020] Figures 1A and 1B schematically show a system for the delivery of a fluid with a high pressure pump 100 according to an embodiment.

[0021] The high pressure pump 100 comprises a pump body 101 that surrounds openings for the guiding of fluid. The pump body 101 comprises a fluid inlet 112. The fluid inlet is coupleable with an electric pump. The electric pump feeds the fluid to the inlet 112 of the pump body 101. A digital inlet valve 130 is coupled to the pump body 101.

[0022] A piston 102 is axially movable relative to the pump body 101 in a piston chamber 111. Due to the movement of the piston 102 relative to the pump body 101 fluid is sucked in through the inlet 112 into the pump body 101 and ejected through fluid outlet 122.

[0023] The piston comprises a first part 103 that is arranged within the pump body 101. The first part 103 is at least partly in contact with the fluid during operation of the pump 100. The piston 102 comprises a second part 104 that is arranged outside the pump body 101.

[0024] The second part 104 is coupled with a roller tappet 117. The roller tappet 117 is coupled to a drive shaft 127 of a combustion engine. The drive shaft 127 may be a cam or a crank or a balancer shaft for the movement of the roller tappet 117 and the piston 102 axially relative to the pump body 101.

[0025] The pump body 101 is coupled to an engine block 129 of the combustion engine. The engine block 129 surrounds an opening 128. The roller tappet 117 and the second part 104 of the piston 102 are arranged in the opening 128. The roller tappet 117 is in direct contact with the engine block 129. The roller tappet 117 and the drive shaft 127 are lubricated with engine oil.

[0026] The pump 100 comprises one single fluid outlet 122 that is directly connected with a fluid distributor 123. The fluid distributor 123 comprises one fluid inlet 124. The fluid distributor 123 comprises as many fluid outlets 105, 106, 107 as the combustion engine comprises cylinders. For example, the fluid distributor 123 comprises one outlet 105. According to further aspects the fluid distributor 123 comprises two fluid outlets 105, 106. According to further aspects, the fluid distributor 123 comprises three fluid outlets 105, 106, 107. According to further aspects, the fluid distributor 123 comprises more than three fluid outlets 105, 106, 107, for example four or more fluid outlets.

[0027] Each fluid outlet 105, 106, 107 is connectable

to a pipe. Each pipe is coupled with an injector. The pump 100 delivers fluid to the injectors via the fluid distributor 123. The injectors are arranged to inject the fluid into combustion chambers of the combustion engine.

[0028] One injector of the injectors is arranged in one combustion chamber respectively. There is no common rail between the fluid distributor 123 and the injectors. The injectors each are directly coupled with the fluid distributor 123 via the pipes. The fluid distributor 123 is screwed directly on the pump housing 101 by a coupling nut 126. A coupling connector 125 connects the fluid distributor 123 and the pump housing 101 hydraulically. A pressure sensor 116 is arranged at the fluid distributor 123 for determining the value of the fluid pressure at the fluid outlets 105, 106, 107.

[0029] Each fluid outlet 105, 106, 107 is connected to a pipe as exemplarily shown for three outputs in Figure 2. Each pipe 108, 109, 110 is coupled with an injector 113, 114, 115. The pump 100 delivers fluid to the injectors 113, 114, 115. The injectors are arranged to inject the fluid into combustion chambers of the combustion engine. In the example of Figure 2 the combustion engine comprises three combustion chambers.

[0030] One injector of the injectors 113, 114, 115 is arranged in one combustion chamber respectively. There is no common rail between the pump 100 and the injectors 113, 114 and 115. The injectors 113, 114, 115 each are directly coupled with the pump 100 via the pipes 108, 109, 110.

[0031] According to further aspects, the pump 100 comprises a volume control valve for controlling the volume of fluid delivered to the combustion engine.

[0032] The pump 100 is installed directly in the engine block 129. The roller tappet 117 slides over the walls of the engine block 129 in the opening 128. The opening 128 ensures the axial movement of the roller tappet 117. Thus, a lighter and compact system for the delivery of the fluid is provided. Since there is no need for a common rail, the system is cost-effective. An internal transfer pump may be replaced by the electric in-tank pump that is hydraulically coupled to the inlet 112 of the pump body 101.

[0033] According to further aspects, the pump 100 comprises a volume control valve for controlling the volume of fluid delivered to the combustion engine.

[0034] The pump 100 is installed directly in the engine block 129. The roller tappet 117 slides over the walls of the engine block 129 in the opening 128. The opening 128 ensures the axial movement of the roller tappet 117. Thus, a lighter and compact system for the delivery of the fluid is provided. Since there is no need for a common rail, the system is cost-effective. An internal transfer pump may be replaced by the electric in-tank pump that is hydraulically coupled to the inlet 112 of the pump body 101. The high pressure pump 100 and the distributor 123 form an inseparable assembly in a ready for use state. The high pressure pump 100 is directly integrated with the fluid distributor 123 and thus, a high pressure pipe

line connecting between the pump and the distributor can be omitted.

Claims

1. System for the delivery of a fluid, comprising:

- a high pressure pump (100) being formed as a plug-in pump, comprising
- a pump body (101),
- a piston (102), the piston being axially movable within the pump body (101) and comprising a first part (103) arranged within the pump body (101) and a second part (104) arranged outside the pump body (101), the pump body (101) not being provided for guiding of the piston (102),
- wherein the pump body (101) is couplable with a combustion engine, such that the second part (104) of the piston (102) extends into the combustion engine, and wherein
- the pump body (101) comprises one single fluid outlet (122), the system further comprising
- a fluid distributor (123) directly connected with the pump body (102), the distributor comprising a fluid inlet (124), the fluid inlet (124) being screwed on the fluid outlet (122) of the pump (100) via a coupling connector (125) and a coupling nut (126), the distributor (123) further being provided with as many fluid outputs (105, 106, 107) as the combustion engine comprises cylinders, wherein
- the distributor (123) is designed for coupling each fluid output (105, 106, 107) directly with an injector for the respective cylinder of the combustion engine via an own pipe (108, 109, 110) of each injector without a common rail being hydraulically arranged between the injectors and the high pressure pump (100).

2. System according to claim 1, wherein the pump body (101) and the distributor (123) are separate parts.

3. System according to one of claims 1 or 2, comprising:

- a pressure sensor (116) coupled with the distributor (123) for determining a value of the fluid pressure at the fluid outputs (105, 106, 107).

Patentansprüche

1. System zur Abgabe einer Flüssigkeit, umfassend:

- eine Hochdruckpumpe (100) die als Steckpumpe geformt ist, umfassend
- einen Pumpenkörper (101),
- einen Kolben (102), wobei der Kolben axial im

Pumpenkörper (101) beweglich ist und einen ersten Teil (103), der innerhalb des Pumpenkörpers (101) angeordnet ist, und einen zweiten Teil (104), der außerhalb des Pumpenkörpers (101) angeordnet ist, umfasst, wobei der Pumpenkörper (101) nicht zum Führen des Kolbens (102) bereitgestellt ist,

- wobei der Pumpenkörper (101) mit einem Verbrennungsmotor koppelbar ist, so dass sich der zweite Teil (104) des Kolbens (102) in den Verbrennungsmotor erstreckt, und wobei
- der Pumpenkörper (101) einen einzelnen Fluidauslass (122) umfasst,

wobei das System ferner das Folgende umfasst

- einen Fluidverteiler (123), der direkt mit dem Pumpenkörper (101) verbunden ist, wobei der Verteiler einen Fluideinlass (124) umfasst, wobei der Fluideinlass (124) auf den Fluidauslass (122) der Pumpe (100) über einen Kupplungsverbinder (125) und eine Kupplungsmutter (126) aufgeschraubt ist, wobei der Verteiler (123) ferner mit so vielen Fluidauslässen (105, 106, 107) ausgestattet ist, wie der Verbrennungsmotor Zylinder umfasst, wobei
- der Verteiler (123) zur direkten Verbindung jedes Fluidauslasses (105, 106, 107) mit einer Einspritzdüse für den jeweiligen Zylinder des Verbrennungsmotors über ein eigenes Rohr (108, 109, 110) jeder Einspritzdüse ausgelegt ist, ohne dass eine gemeinsame Leiste hydraulisch zwischen den Einspritzdüsen und der Hochdruckpumpe (100) angeordnet ist.

2. System nach Anspruch 1, wobei der Pumpenkörper (101) und der Verteiler (123) separate Teile sind.

3. System nach einem der Ansprüche 1 oder 2, umfassend:

- einen Drucksensor (116), der mit dem Verteiler (123) verbunden ist, um einen Wert des Fluiddrucks an den Fluidauslässen (105, 106, 107) zu bestimmen.

Revendications

1. Système de distribution d'un fluide, comprenant :

- une pompe haute pression (100) réalisée sous la forme d'une pompe enfichable, comprenant
- un corps de pompe (101),
- un piston (102), le piston étant mobile axialement à l'intérieur du corps de pompe (101) et comprenant une première partie (103) disposée à l'intérieur du corps de pompe (101) et une se-

conde partie (104) disposée à l'extérieur du corps de pompe (101), le corps de pompe (101) n'étant pas prévu pour le guidage du piston (102),

- dans lequel le corps de pompe (101) peut être accouplé avec un moteur à combustion, de telle sorte que la seconde partie (104) du piston (102) s'étende dans le moteur à combustion, et dans lequel 5
- le corps de pompe (101) comprend une sortie de fluide (122) unique, 10

le système comprenant en outre

- un distributeur de fluide (123) raccordé directement au corps de pompe (102), le distributeur comprenant une entrée de fluide (124), l'entrée de fluide (124) étant vissée sur la sortie de fluide (122) de la pompe (100) par le biais d'un élément de raccordement d'accouplement (125) et d'un écrou d'accouplement (126), 15
 - le distributeur (123) étant en outre pourvu d'autant de sorties de fluide (105, 106, 107) qu'il y a de cylindres dans le moteur à combustion, dans lequel 20
 - le distributeur (123) est conçu pour accoupler chaque sortie de fluide (105, 106, 107) directement avec un injecteur pour le cylindre respectif du moteur à combustion par le biais d'un conduit propre (108, 109, 110) de chaque injecteur sans rampe commune disposée hydrauliquement entre les injecteurs et la pompe haute pression (100). 25
2. Système selon la revendication 1, dans lequel le corps de pompe (101) et le distributeur (123) sont des parties distinctes. 30
3. Système selon l'une des revendications 1 et 2, comprenant : 35
- un capteur de pression (116) accouplé avec le distributeur (123) afin de déterminer une valeur de la pression de fluide au niveau des sorties de fluide (105, 106, 107). 40

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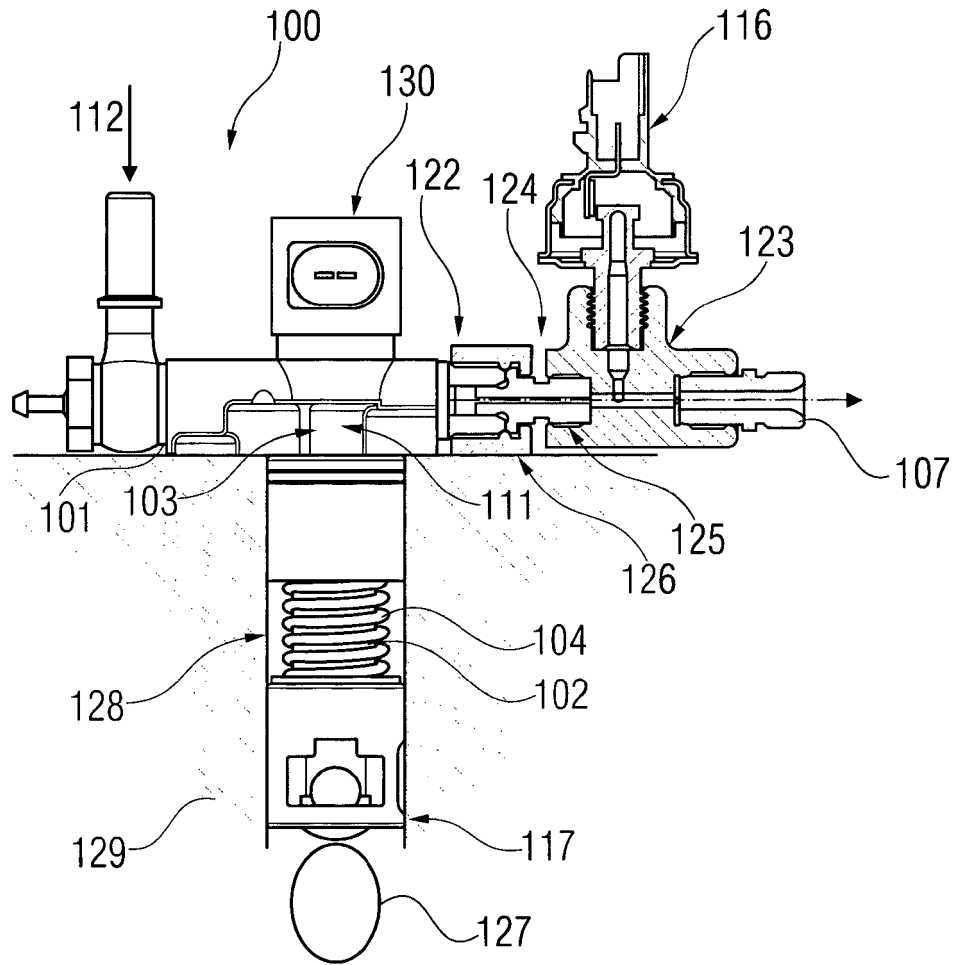


FIG 1A

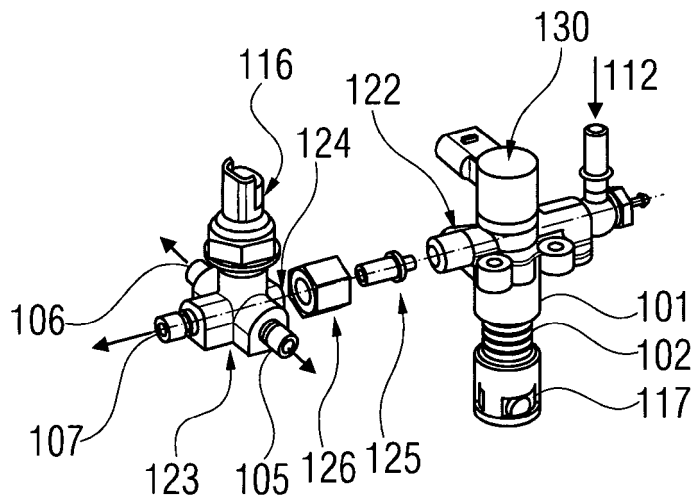


FIG 1B

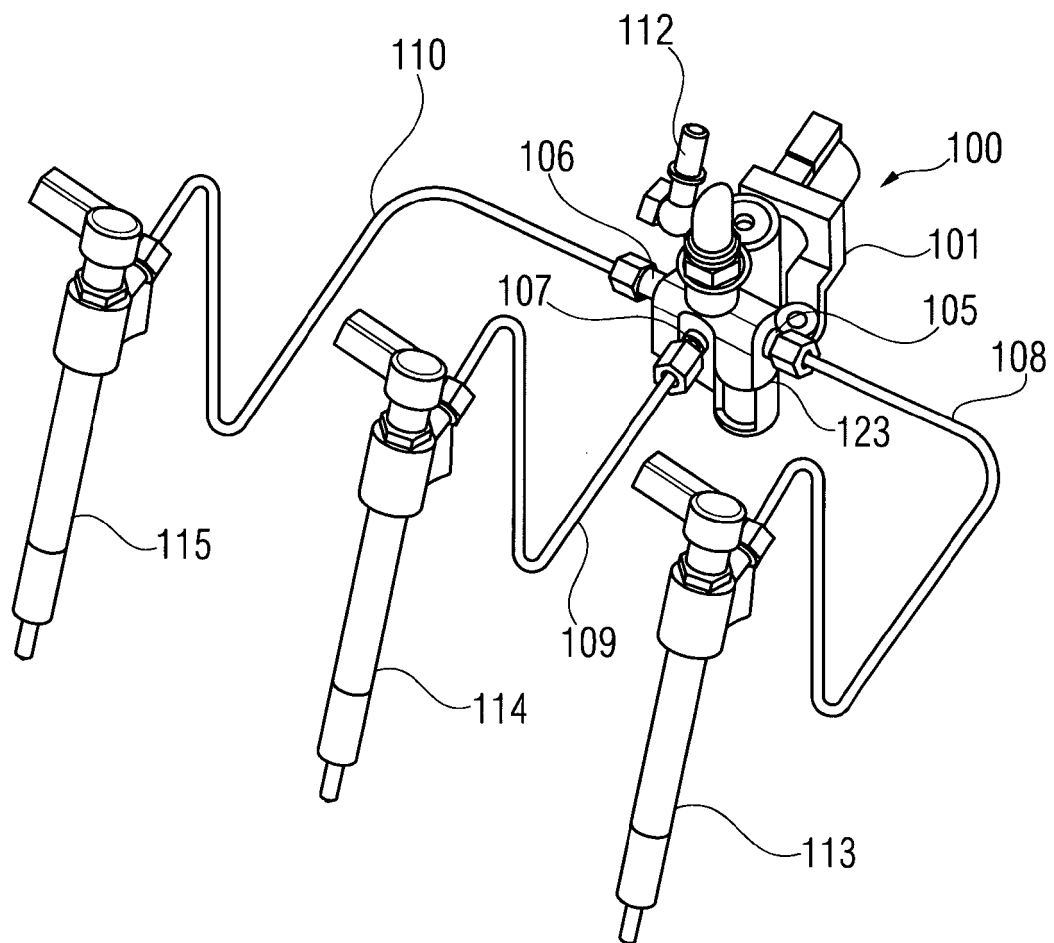


FIG 2

REFERENCES CITED IN THE DESCRIPTION

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