

(19)



Europäisches
Patentamt
European
Patent Office
Office européen
des brevets



(11)

EP 2 607 678 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

26.06.2013 Bulletin 2013/26

(51) Int Cl.:

F02M 55/00 (2006.01)

F02M 55/02 (2006.01)

F02M 69/46 (2006.01)

(21) Application number: 11194590.3

(22) Date of filing: 20.12.2011

(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

(71) Applicant: Continental Automotive GmbH

30165 Hannover (DE)

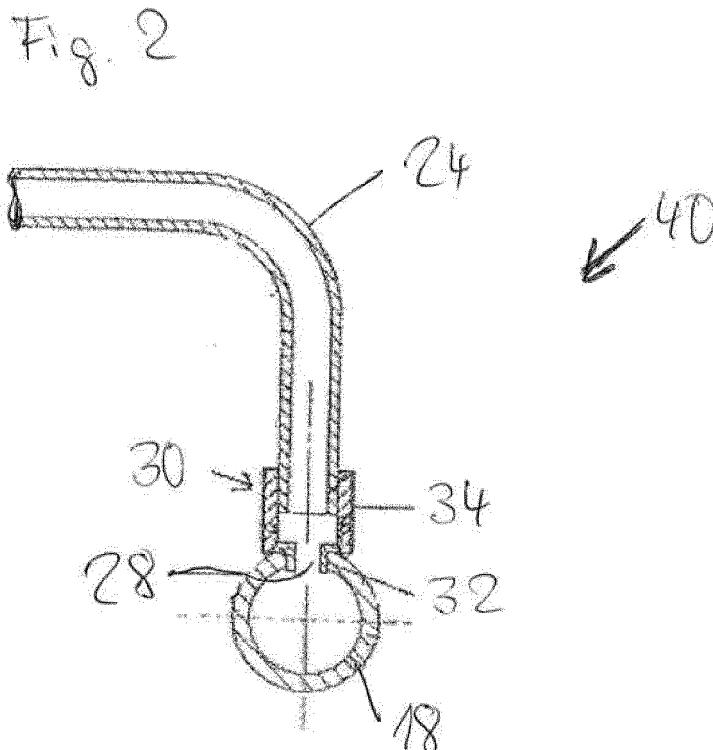
(72) Inventors:

- Giovannetti, Massimo
50018 Scandicci (IT)
- Di Domizio, Gisella
56019 San Giuliano Terme (IT)

(54) Fuel rail device

(57) Fuel rail device (40) of a combustion engine (22), the fuel rail device (40) comprising a fuel rail (18) with a distribution opening (28), a pipe (24) being designed to be in hydraulic communication with a fuel injector (20), and an adapter element (30) being fixedly coupled to the

fuel rail (18) and to the pipe (24) and being in hydraulic communication with the fuel rail (18) and the pipe (24). The adapter element (30) comprises a pipe section (32) being arranged inside the distribution opening (28) of the fuel rail (18) and being designed to sealingly couple the adapter element (30) to the fuel rail (18).



Description

[0001] The invention relates to a fuel rail device.

[0002] Fuel rail devices for hydraulically and mechanically coupling a fuel injector to a fuel rail are in widespread use, in particular for internal combustion engines. Fuel can be supplied to an internal combustion engine by the fuel rail device through the fuel injector.

[0003] In order to keep pressure fluctuations during the operation of the internal combustion engine at a very low level, internal combustion engines are supplied with a fuel accumulator to which the fuel injectors are connected and which has a relatively large volume. Such a fuel accumulator is often referred to as a fuel rail. The fuel injectors can be coupled to the fuel rail in different manners.

[0004] Fuel rail devices may have fuel rails with a hollow body which has recesses in form of fuel injector cups, wherein the fuel injectors are arranged. The coupling of the fuel injectors to the fuel injector cups that supply the fuel from a fuel tank via a low or high-pressure fuel pump needs to be very precise to get a correct injection angle and a sealing of the fuel.

[0005] In alternative embodiments, fuel rail devices may have fuel pipes which enable a hydraulic coupling between the fuel rail and the fuel injectors.

[0006] DE 10 2009 051 065 B3 discloses a fuel distributor for supplying fuel to injection valves for internal combustion engines. The fuel distributor includes a hollow manifold having a plurality of branch bores. A plurality of branch lines are operably connected with the manifold at the branch bores by adapters. The adapters have a one-piece deep-drawn construction and include a mounting flange that conforms to the outer contour of the manifold and joins the adapter to the exterior of the manifold, and a neck portion that closely receives and securely mounts therein the end portions of the branch lines.

[0007] The object of the invention is to create a fuel rail device for hydraulically and mechanically coupling a fuel injector to a fuel rail which is simply to be manufactured and which facilitate a reliable and precise connection between the fuel rail and the fuel injector.

[0008] The objects are achieved by the features of the independent claim. Advantageous embodiments of the invention are given in the sub-claims.

[0009] The invention is distinguished by a fuel rail device of a combustion engine, the fuel rail device comprising a fuel rail with a distribution opening, a pipe being designed to be in hydraulic communication with a fuel injector, and an adapter element being fixedly coupled to the fuel rail and to the pipe and being in hydraulic communication with the fuel rail and the pipe. The adapter element comprises a pipe section being arranged inside the distribution opening of the fuel rail and being designed to sealingly couple the adapter element to the fuel rail.

[0010] This has the advantage that a secure and reliable coupling between the fuel rail and the pipe connected with the fuel injector is possible. Furthermore, a good sealing between the fuel rail and the adapter element

connected with the fuel injector can be obtained. Additionally, a compensation of mechanical stress of the coupling between the fuel rail and the adapter element is possible.

5 [0011] In an advantageous embodiment the adapter element comprises a further pipe section. The pipe is engaged by the further pipe section of the adapter element. By this a reliable coupling between the adapter element and the pipe may be achieved.

10 [0012] In a further advantageous embodiment the pipe section of the adapter element being arranged inside the distribution opening has a circular shape with a first outer diameter and the further pipe section of the adapter element has a circular shape with a second outer diameter,

15 the first outer diameter being smaller than the second outer diameter of the further pipe section. This has the advantage that a good adaptation between the pipe and the fuel rail is possible, in particular for pipes with an outer diameter being larger than the diameter of the distribution opening of the fuel rail.

[0013] In a further advantageous embodiment the further pipe section of the adapter element is coupled to the pipe by a brazed joint. This has the advantage that a secure fixing of the adapter element relative to the pipe may be obtained. Furthermore, welding between the pipe and the adapter element may be avoided.

[0014] In a further advantageous embodiment the pipe section of the adapter element being arranged inside the distribution opening is coupled to the fuel rail by a brazed joint. This has the advantage that a secure fixing of the adapter element relative to the fuel rail is possible. Furthermore, welding between the pipe and the fuel rail may be avoided.

[0015] Exemplary embodiments of the invention are explained in the following with the aid of schematic drawings. These are as follows:

40 Figure 1 an internal combustion engine in a schematic view,

45 Figure 2 a longitudinal section through a fuel rail device,

Figure 3 a schematic view of an adapter element of the fuel rail device, and

50 Figure 4 the adapter element in a longitudinal section along line IV-IV' of figure 3.

[0016] Elements of the same design and function that occur in different illustrations are identified by the same reference character.

[0017] A fuel feed device 10 is assigned to an internal combustion engine 22 (figure 1) which can be a diesel engine or a gasoline engine. It includes a fuel tank 12 that is connected via a first fuel line to a fuel pump 14. The output of the fuel pump 14 is connected to a fuel inlet 16 of a fuel rail 18. In the fuel rail 18, the fuel is stored

for example under a pressure of about 200 bar in the case of a gasoline engine or of more than 2,000 bar in the case of a diesel engine. Fuel injectors 20 are connected to the fuel rail 18 and the fuel is fed to the fuel injectors 20 via the fuel rail 18.

[0018] Figure 2 shows an embodiment of a fuel rail device 40 which comprises the fuel rail 18 and a pipe 24. The pipe 24 is designed as a fuel pipe and may be in hydraulic communication with the fuel injector 20.

[0019] The fuel rail device 40 comprises an adapter element 30. The adapter element 30 enables a hydraulic communication with the fuel rail 18. The adapter element 30 is fixedly coupled to the fuel rail 18. Preferably, the adapter element 30 is brazed to the fuel rail 18. The adapter element 30 comprises a pipe section 32 and a further pipe section 34. The pipe section 32 and the further pipe section 34 are shaped as hollow cylinders with a common longitudinal axis L being coaxially arranged to each other.

[0020] The pipe section 32 of the adapter element 30 is arranged inside a distribution opening 28 of the fuel rail 18. Preferably, the pipe section 32 of the adapter element 30 which is arranged inside the distribution opening 28 is brazed to the fuel rail 18. By this a very good coupling between the adapter element 30 and the fuel rail 18 is possible, and the adapter element 30 may be sealingly coupled to the fuel rail 18. The pipe section 32 of the adapter element 34 which is arranged inside the distribution opening 28 has a circular shape with a first outer diameter D1.

[0021] The further pipe section 34 of the adapter element 30 receives a section of the pipe 24. In particular, the further pipe section 34 of the adapter element 30 may be coupled to the pipe 24 by crimping. Preferably, the further pipe section 34 of the adapter element 30 is brazed to the pipe 24. By this a very good coupling between the adapter element 30 and the pipe 24 is possible.

The further pipe section 34 of the adapter element 30 has a circular shape with a second outer diameter D2.

[0022] Preferably, the first outer diameter D1 is smaller than the second outer diameter D2 of the further pipe section 34 of the adapter element 30. In the case that the diameter of the distribution opening 28 of the fuel rail 18 is smaller than the diameter of the pipe 24 a good adaptation between the pipe 24 and the distribution opening 28 of the fuel rail 18 may be achieved.

[0023] Preferably, the adapter element 30 is a deep drawn component. Deep drawn components may be manufactured with a low usage of material in a simple and cost effective manner.

[0024] The advantage of the shown fuel rail device 40 is that the three components of the fuel rail device 40, the fuel rail 18, the pipe 24 and the adapter element 30, may be aligned and brazed with each other. Therefore, the durability of the fuel rail device 40 may be very high. Furthermore, a welding of the adapter element 30 may be avoided. Consequently, a copper flow due to welding may be avoided. Consequently, a disturbance of the fluid

flow through the fuel rail device 40 may be avoided.

Claims

- 5 1. Fuel rail device (40) of a combustion engine (22),
the fuel rail device (40) comprising
 - a fuel rail (18) with a distribution opening (28),
 - a pipe (24) being designed to be in hydraulic communication with a fuel injector (20), and
 - an adapter element (30) being fixedly coupled to the fuel rail (18) and to the pipe (24) and being in hydraulic communication with the fuel rail (18) and the pipe (24),
wherein the adapter element (30) comprises a pipe section (32) being arranged inside the distribution opening (28) of the fuel rail (18) and being designed to sealingly couple the adapter element (30) to the fuel rail (18).
- 10 2. Fuel rail device (40) in accordance with claim 1,
wherein the adapter element (30) comprises a further pipe section (34), the pipe (24) being engaged by the further pipe section (34) of the adapter element (30).
- 15 3. Fuel rail device (40) in accordance with claim 2,
wherein the pipe section (32) of the adapter element (34) being arranged inside the distribution opening (28) has a circular shape with a first outer diameter (D1) and the further pipe section (34) of the adapter element (30) has a circular shape with a second outer diameter (D2), the first outer diameter (D1) being smaller than the second outer diameter (D2) of the further pipe section (34) .
- 20 4. Fuel rail device (40) in accordance with claim 2 or 3,
wherein the further pipe section (34) of the adapter element (30) is coupled to the pipe (24) by a brazed joint.
- 25 5. Fuel rail device (40) in accordance with one of the preceding claims, wherein the pipe section (32) of the adapter element (30) being arranged inside the distribution opening (28) is coupled to the fuel rail (18) by a brazed joint.

FIG 1

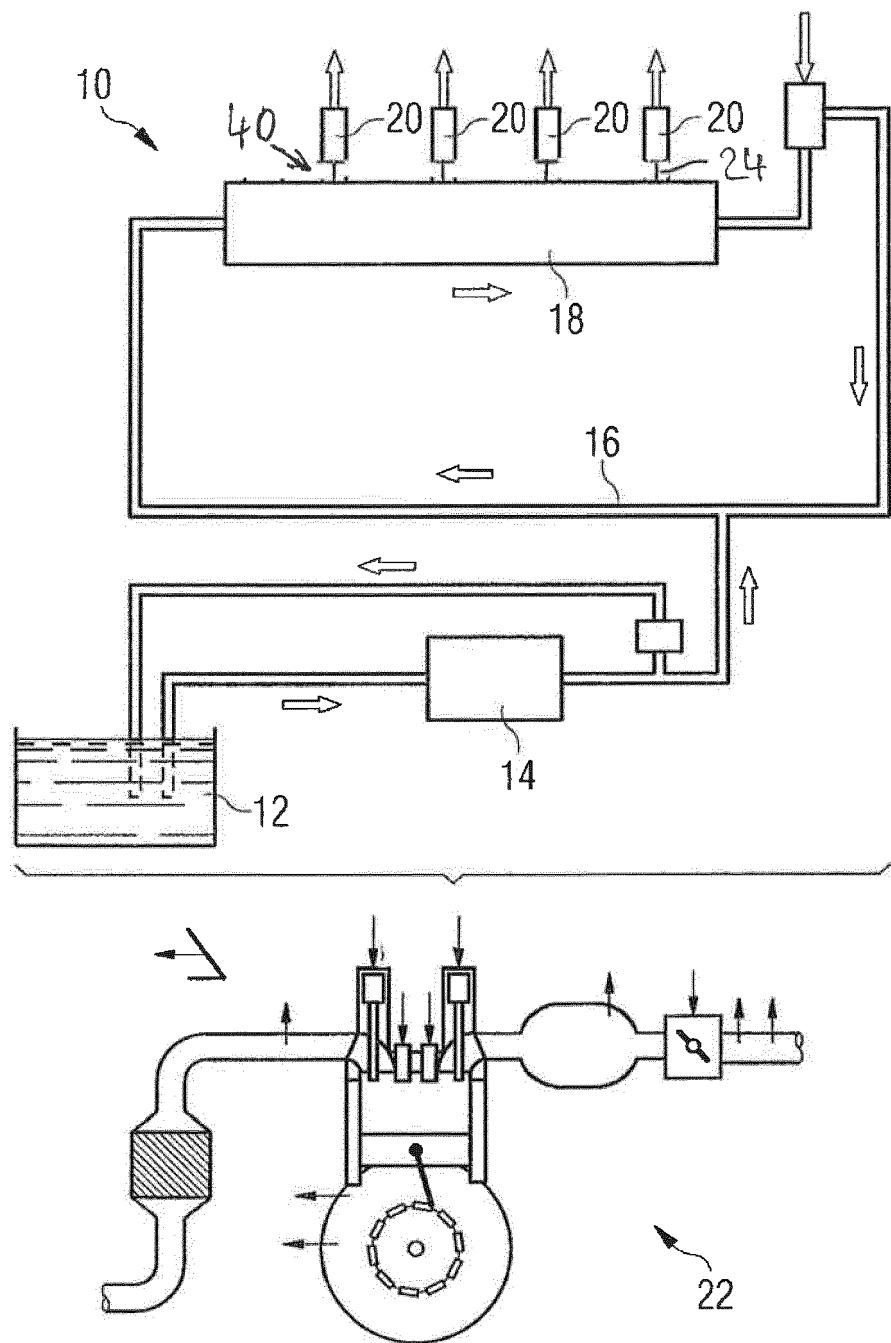


Fig. 2

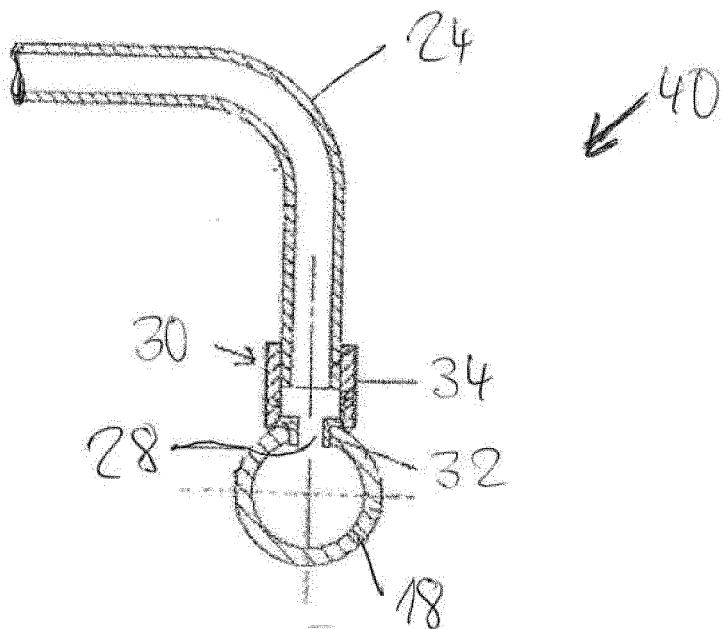


Fig. 3

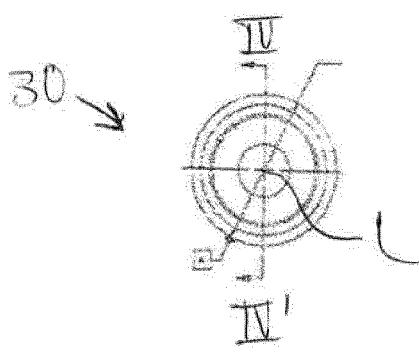
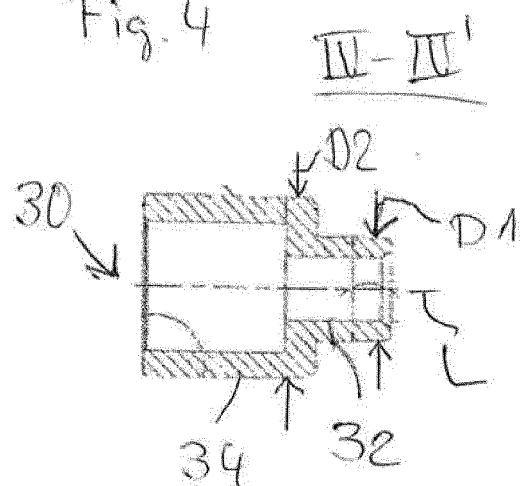


Fig. 4





Europäisches
Patentamt
European
Patent Office
Office européen
des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 19 4590

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US 2003/127852 A1 (USUI MASAYOSHI [JP]) 10 July 2003 (2003-07-10) * paragraph [0005]; figure 24 * * abstract * -----	1-5	INV. F02M55/00 F02M55/02 F02M69/46
X	US 6 901 913 B1 (TSUCHIYA HIKARI [JP] ET AL) 7 June 2005 (2005-06-07) * paragraphs [0037], [0051]; figures 2b,5,10a * * abstract *	1-5	
X	JP 2007 021508 A (USUI KOKUSAI SANGYO KK; KOBAYASHI IND) 1 February 2007 (2007-02-01) * abstract; figure 2 *	1-3,5 -----	
			TECHNICAL FIELDS SEARCHED (IPC)
			F02M
The present search report has been drawn up for all claims			
1	Place of search	Date of completion of the search	Examiner
EPO FORM 1503/03.82 (P04C01)	The Hague	10 May 2012	Hermens, Sjoerd
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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

EP 11 19 4590

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-05-2012

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 2003127852	A1	10-07-2003	CN DE FR KR US	1432759 A 10259138 A1 2834046 A1 20030053446 A 2003127852 A1		30-07-2003 07-08-2003 27-06-2003 28-06-2003 10-07-2003
US 6901913	B1	07-06-2005	US WO	6901913 B1 03008796 A1		07-06-2005 30-01-2003
JP 2007021508	A	01-02-2007	JP JP	4752035 B2 2007021508 A		17-08-2011 01-02-2007

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 102009051065 B3 **[0006]**