



(11)

**EP 2 284 385 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**25.06.2014 Bulletin 2014/26**

(51) Int Cl.:  
**F02M 55/00 (2006.01) F02M 55/02 (2006.01)**

(21) Application number: **09008906.1**

(22) Date of filing: **07.07.2009**

**(54) Fuel rail device**

Kraftstoffleistenvorrichtung

Dispositif de rampe de carburant

(84) Designated Contracting States:  
**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 SE SI SK SM TR**

(43) Date of publication of application:  
**16.02.2011 Bulletin 2011/07**

(73) Proprietor: **Continental Automotive GmbH  
30165 Hannover (DE)**

(72) Inventors:  
• **Di Domizio, Gisella  
56019 San Giuliano  
Terme (IT)**

• **Giorgetti, Edoardo  
57013 Rosignano Marittimo (LI) (IT)**  
• **Marc, Daniel  
57125 Livorno (IT)**  
• **Serra, Giandomenico  
56010 Loc. Ghezzano- S. Giuliano Terme (PI) (IT)**

(56) References cited:  
**EP-A1- 1 818 535 EP-A1- 2 058 509  
WO-A1-2009/033304 DE-A1- 19 601 496  
DE-A1- 19 756 102 DE-A1- 19 933 256  
FR-A1- 2 869 367 FR-A1- 2 890 123  
US-B1- 6 830 037 US-B1- 7 406 946**

**EP 2 284 385 B1**

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).

## Description

**[0001]** The invention relates to a fuel rail device of a combustion engine. Furthermore, the invention relates to a fuel rail fuel injector assembly, comprising a coupling assembly for hydraulically and mechanically coupling a fuel injector to a fuel rail of a combustion engine.

**[0002]** Fuel rail devices and coupling assemblies 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 and the coupling assembly 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]** Known fuel rails comprise a hollow body with recesses in form of fuel injector cups, wherein the fuel injectors are arranged. The connection 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]** The object of the invention is to create a fuel rail device and a coupling assembly for hydraulically and mechanically coupling a fuel injector to a fuel rail which are simply to be manufactured and which facilitate a reliable and precise connection between the fuel rail and the fuel injector without a resting of the fuel injector on the cylinder head of the combustion engine.

**[0006]** The objects are achieved by the features of the independent claim. Advantageous embodiments of the invention are given in the sub-claims.

**[0007]** According to a first aspect the invention is distinguished by a fuel rail device of a combustion engine. The fuel rail device comprises a fuel rail and a union having a longitudinal axis. The union is fixedly coupled to the fuel rail and is in hydraulic communication with the fuel rail. Furthermore, the fuel rail device comprises a pipe which is partially engaged by the union and is designed to be in hydraulic communication with a fuel injector. The fuel rail device comprises a sealing ring. The sealing ring is arranged coaxially to the pipe and is arranged radially between the union and the pipe and is designed to sealingly couple the union to the pipe.

**[0008]** 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 pipe connected with the fuel injector can be obtained. Additionally, a compensation of mechanical stress of the coupling between the fuel rail and the pipe is possible.

**[0009]** The pipe has an outer surface comprising a groove. The groove faces the union, and the sealing ring

s partially arranged in the groove. By this a reliable fixing of the sealing ring relative to the pipe in particular in axial direction is possible.

**[0010]** The pipe comprises a tube and a ring holder element which is arranged coaxially to the tube. The ring holder element is fixedly coupled to the tube. The ring holder element comprises the groove. This has the advantage that a very secure fixing of the sealing ring relative to the pipe is possible.

**[0011]** A part of the ring holder element extends in axial direction from an axial end of the tube facing the fuel rail in a manner that the ring holder element covers at least partially the axial end of the tube. This has the advantage that the ring holder element can protect the axial end of the tube facing the fuel rail against mechanical stress or damage.

**[0012]** In an advantageous embodiment the ring holder element is welded or brazed to the tube. This has the advantage that a secure fixing of the ring holder element relative to the tube is possible.

**[0013]** In a further advantageous embodiment the union is welded or brazed to the fuel rail. This has the advantage that a secure fixing of the union relative to the fuel rail is possible.

**[0014]** In a further advantageous embodiment the pipe comprises a flange and a clip element is arranged coaxially to the pipe. The clip element is in engagement with the union and the flange to prevent an axial movement of the pipe relative to the union. This has the advantage that a detaching of the pipe from the union can be prevented in particular during the handling of the fuel rail device, for example during a mounting or demounting step.

**[0015]** According to a second aspect the invention is distinguished by a fuel rail fuel injector assembly with a fuel rail device according to the first aspect of the invention and a coupling assembly. The fuel rail device is mechanically and hydraulically coupled to the coupling assembly.

**[0016]** The coupling assembly comprises a fuel injector with a fuel injector body and a central longitudinal axis. The fuel injector body comprises a partially cone-shaped cavity. The coupling assembly comprises a fuel pipe which is hydraulically coupable to the fuel rail and a cup-shaped coupling element. The cup-shaped coupling element is in engagement with the fuel injector body to retain the fuel pipe in the fuel injector in direction of the central longitudinal axis. The fuel pipe has a rounded end section which is at least partially arranged in the partially cone-shaped cavity and is in direct contact with the fuel injector body.

**[0017]** The advantage of this coupling assembly is that the fuel pipe is flexible relative to the injector body. Furthermore, a compensation of mechanical stress is possible. In particular, it is easy possible that the end section is limited pivotable relative to the fuel injector body. Furthermore, the coupling assembly allows an assembly of the fuel injector and the fuel rail without a further metallic

contact between the fuel injector and further parts of the combustion engine. Consequently, a noise transmission between the fuel injector and further parts of the combustion engine can be kept small.

**[0018]** In an advantageous embodiment according to the second aspect of the invention the fuel injector body comprises an outer screw thread and the cup-shaped coupling element comprises an inner screw thread which is in engagement with the outer screw thread of the fuel injector body. This has the advantage that a simple, fast and secure screw coupling between the fuel tube and the fuel injector is possible.

**[0019]** In a further advantageous embodiment according to the second aspect of the invention a clamp element is fixedly coupled to a cylinder head of the combustion engine and comprises an aperture being designed to engage the fuel pipe to enable a mechanical cooperation between the fuel pipe and the cylinder head. This has the advantage that the forces on the fuel pipe can be absorbed at least partially by the clamp element. Furthermore, as the fuel pipe can move in the aperture in axial direction the fuel pipe can limitedly move in axial direction relative to the cylinder head.

**[0020]** Exemplary embodiments of the invention are explained in the following with the aid of schematic drawings. These are as follows:

- Figure 1 an internal combustion engine in a schematic view,
- Figure 2 a longitudinal section through a configuration of a fuel rail device, with a clip element preventing axial movement of the pipe relative to the union,
- Figure 3 a longitudinal section through an embodiment of the fuel rail device,
- Figure 4 a longitudinal section through a configuration of the fuel rail device not falling within the claimed scope of protection,
- Figure 5 a longitudinal section through a configuration of the fuel rail device, with a clip element preventing axial movement of the pipe relative to the union, and
- Figure 6 a longitudinal section through a coupling assembly.

**[0021]** Elements of the same design and function that occur in different illustrations are identified by the same reference character.

**[0022]** 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 about 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.

**[0023]** Figure 2 shows a configuration of a fuel rail device 60 which comprises the fuel rail 18 and a fuel pipe 24. The pipe 24 may be in hydraulic communication with the fuel injector 20. The pipe 24 comprises a tube 26 and a ring holder element 28 which is arranged coaxially to the tube 26 and which is fixedly coupled to the tube 26. Preferably, the ring holder element 28 is welded or brazed to the tube 26.

**[0024]** The pipe 24 has an outer surface 30 which comprises a groove 32. The groove 32 faces a union 34 which is fixedly coupled to the fuel rail 18. Preferably, the union 34 is welded or brazed to the fuel rail 18. The union 34 is shaped as a hollow cylinder with a longitudinal axis L1 and makes a hydraulic communication with the fuel rail 18 possible. The union 34 receives a part of the pipe 24.

**[0025]** The fuel rail device 60 has a sealing ring 38 which is arranged in the groove 32 in radial direction between the fuel pipe 24 and the union 34. The sealing ring 38 has an outer surface 40. The outer surface 40 of the sealing ring 38 is in sealing contact with the outer surface 30 of the fuel pipe 24. By this a good sealing between the fuel pipe 24 and the union 34 can be obtained and mechanical stress on the pipe 24 can be avoided.

**[0026]** The fuel rail device 60 has a supporting ring 42 which is arranged in the groove 32 in radial direction between the fuel pipe 24 and the union 34. The sealing ring 38 is supported by the supporting ring 42 to avoid an axial movement of the sealing ring 38 relative to the pipe 24.

**[0027]** The pipe 24, preferably the ring holder element 28 has a flange 44 extending in radial direction from the tube 26. Coaxially to the pipe 24 a clip element 46 is arranged. The clip element 46 is engaged with the union 34 and the flange 44. By this an axial movement of the pipe 24 relative to the union 34 can be limited in a manner that a sealing contact of the sealing ring 38 with the union 34 and the pipe 24 can be attained. Consequently, the pipe 24 can not detach from the union 34 during a handling of the fuel rail device 60.

**[0028]** Figure 3 shows an embodiment of the fuel rail device 60 in which a part 49 of the ring holder element 28 extends in axial direction from an axial end 48 of the tube 26 which faces the fuel rail 18. In this embodiment the part 49 of the ring holder element 28 is shaped as a collar which covers or overlaps the axial end 48 of the tube 26 in axial direction. This makes it possible that the collar-shaped part 49 protects the axial end 48 of the tube 26 against mechanical damage.

**[0029]** Figure 4 shows a configuration of the fuel rail device 60 wherein the pipe 24 has a corrugated section 50. The corrugated section 50 of the pipe 24 comprises at least the flange 44 and the groove 32 which may re-

ceive the sealing ring 38 and the supporting ring 42. The corrugated section 50 is preferably produced by stamping, cold-forming or hot-forming the pipe 24. In this case, the ring holder element 28 can be left and a low mass and a low weight of the pipe 24 can be obtained. This configuration, however, does not fall within the scope of the appended claims.

**[0030]** Figure 5 shows a configuration of the fuel rail device 60 wherein the union 34 comprises an inner surface 52. In the inner surface 52 a union groove 54 is arranged which faces the tube 26. A circlip 56 is arranged in the union groove 54. The circlip 56 is in mechanical cooperation with the sealing ring 38 and the supporting ring 42. The circlip 56 supports the sealing ring 38 and consequently prevents an axial movement of the sealing ring 38 relative to the union 34. This makes a secure sealing between the tube 26 and the union 34 possible.

**[0031]** Figure 6 shows a coupling assembly 90 with the fuel injector 20 in detail. The coupling assembly 90 may be coupled to the fuel rail 18 of the internal combustion engine 22. The coupling assembly 90 comprises the fuel pipe 24 and the fuel injector 20 with a fuel injector body 62 and a central longitudinal axis L2. The fuel injector body 62 has a cavity 64 which is partially cone-shaped.

**[0032]** The pipe 24 has an outer surface 68 and is hydraulically coupled to the fuel rail 18 at a first end which is for example the axial end 48 in Figures 2 to 5. At a second end the pipe 24 comprises a spherical or rounded end section 66. The end section 66 of the pipe 24 is in partial engagement with the partially cone-shaped cavity 64 of the fuel injector body 62. Therefore, a direct metal-to-metal contact between the pipe 24 and the fuel injector body 62 can be obtained. A sealing element can be avoided. The end section 66 is slightly pivotable relative to the fuel injector body 62. Consequently, the pipe 24 is flexible relative to the injector body 62 and mechanical stress on the pipe 24 can be avoided.

**[0033]** The coupling assembly 90 has a cup-shaped coupling element 70 which is in engagement with the fuel injector body 62 to retain the fuel pipe 24 in the fuel injector 20 in direction of the central longitudinal axis L2. The coupling element 70 is formed as a ring element and has a centrally arranged through hole 72 and a screw thread 74 which is a female screw thread. Thus, the coupling element 70 is formed as a nut.

**[0034]** The fuel injector body 62 has a screw thread 76 which is a male screw thread. The fuel injector body 62 and the coupling element 70 are fixedly coupled with each other by the screw threads 74, 76.

**[0035]** As the fuel injector body 62 is in engagement with the fuel pipe 24, and the coupling element 70 is fixedly coupled to the fuel injector body 62 by the screw threads 74, 76, the fuel pipe 24 is retained in the fuel injector 20 in direction of the central longitudinal axis L2.

**[0036]** A clamp element 78 is coupled to a cylinder head 84 of the combustion engine 22. The clamp element 78 has a protrusion which extends in radial direction relative to the longitudinal axis L2 of the fuel injector body

62. The protrusion has an orifice which is designed to take in a fixing element 80. The fixing element 80 is designed to rigidly couple the clamp element 78 to the cylinder head 84. The fixing element 80 is preferably a screw but it may also be of another type as a pin or a bolt as long as it enables a fixed coupling of the fuel injector body 62 to the cylinder head 84.

**[0037]** The clamp element 78 has an aperture 82 which may receive the pipe 24 to enable a mechanical cooperation between the pipe 24 and the cylinder head 84. The pipe 24 can limitedly move in the aperture 82 in axial direction relative to the cylinder head 84 to avoid mechanical stress on the pipe 24.

**[0038]** Between the fuel injector body 62 and the cylinder head 84 a distance element 88 is arranged that may give a fixed distance between the fuel injector body 62 and the cylinder head 84 and receive the fixing element 80.

## Claims

1. Fuel rail device (60) of a combustion engine (22), the fuel rail device (60) comprising

- a fuel rail (18),
- a union (34) having a longitudinal axis (L1), being fixedly coupled to the fuel rail (18) and being in hydraulic communication with the fuel rail (18),
- a pipe (24) being partially engaged by the union (34) and being designed to be in hydraulic communication with a fuel injector (20), and
- a sealing ring (38) being arranged coaxially to the pipe (24) and being arranged radially between the union (34) and the pipe (24) and being designed to sealingly couple the union (34) to the pipe (24),

wherein the pipe (24) has an outer surface (30) comprising a groove (32) facing the union (34), and the sealing ring (38) is partially arranged in the groove (32),

wherein the pipe (24) comprises a tube (26) and a ring holder element (28) which is arranged coaxially to the tube (26) and which is fixedly coupled to the tube (26), and the ring holder element (28) comprises the groove (32), and

wherein a part (49) of the ring holder element (28) extends in axial direction from an axial end (48) of the tube (26) facing the fuel rail (18) in a manner that the ring holder element (28) covers at least partially the axial end (48) of the tube (26).

2. Fuel rail device (60) in accordance with claim 1, wherein the ring holder element (28) is welded or brazed to the tube (26).

3. Fuel rail device (60) in accordance with one of the preceding claims, wherein the union (34) is welded or brazed to the fuel rail (18).
4. Fuel rail device (60) in accordance with one of the preceding claims, wherein the pipe (24) comprises a flange (44), and a clip element (46) is arranged coaxially to the pipe (24), and the clip element (46) is in engagement with the union (34) and the flange (44) to prevent an axial movement of the pipe (24) relative to the union (34).
5. Fuel rail-fuel injector assembly with a fuel rail device (60) in accordance with one of the preceding claims and a coupling assembly (90) for hydraulically and mechanically coupling a fuel injector (20) to a fuel rail (18) of a combustion engine (22), the coupling assembly (90) comprising
  - a fuel injector (20) with a fuel injector body (62) and a central longitudinal axis (L2), the fuel injector body (62) comprising a partially cone-shaped cavity (64),
  - a fuel pipe (24) being hydraulically coupable to the fuel rail (18), and
  - a cup-shaped coupling element (70) being in engagement with the fuel injector body (62) to retain the fuel pipe (24) in the fuel injector (20) in direction of the central longitudinal axis (L2), wherein

the fuel pipe (24) has a rounded end section (66) which is at least partially arranged in the partially cone-shaped cavity (64) and is in direct contact with the fuel injector body (62), and wherein the fuel rail device (60) is mechanically and hydraulically coupled to the coupling assembly (90).
6. Fuel rail-fuel injector assembly in accordance with claim 5, wherein the fuel injector body (62) comprises an outer screw thread (76) and the cup-shaped coupling element (70) comprises an inner screw thread (74) which is in engagement with the outer screw thread (76) of the fuel injector body (62).
7. Fuel rail-fuel injector assembly in accordance with claim 5 or 6, wherein a clamp element (78) is fixedly coupled to a cylinder head (84) of the combustion engine (22) and comprises an aperture (82) being designed to engage the fuel pipe (24) to enable a mechanical cooperation between the fuel pipe (24) and the cylinder head (84).

#### Patentansprüche

1. Kraftstoffleistenvorrichtung (60) eines Verbrennungsmotors (22), wobei die Kraftstoffleistenvor-

richtung (60) umfasst

- eine Kraftstoffleiste (18),
- eine Verbindung (34) mit einer Längsachse (L1), die fest an die Kraftstoffleiste (18) gekuppelt ist und in hydraulischer Kommunikation mit der Kraftstoffleiste (18) ist,
- ein Rohr (24), das teilweise von der Verbindung (34) umgriffen wird und dazu ausgestaltet ist, in hydraulischer Kommunikation mit einem Kraftstoffinjektor (20) zu sein, und
- einen Dichtungsring (38), der koaxial zu dem Rohr (24) angeordnet ist und radial zwischen der Verbindung (34) und dem Rohr (24) angeordnet ist und dazu ausgestaltet ist, die Verbindung (34) dichtend an das Rohr (24) zu kuppeln,

wobei das Rohr (24) eine äußere Oberfläche (30) umfassend eine der Verbindung (34) zugewandte Nut (32) hat und der Dichtungsring (18) teilweise in der Nut (32) angeordnet ist,

wobei das Rohr (24) eine Röhre (26) und ein Ringhalterelement (28) umfasst, welches koaxial zu der Röhre (26) angeordnet ist und welches fest an die Röhre (26) gekoppelt ist und das Ringhalterelement (28) die Nut (32) umfasst und

wobei ein Teil (49) des Ringhalterelements (28) sich in Axialrichtung von einem der Kraftstoffleiste zugewandten axialen Ende (48) der Röhre (26) in einer Weise erstreckt, dass das Ringhalterelement (28) mindestens teilweise das axiale Ende (48) der Röhre (26) überdeckt.

2. Kraftstoffleistenvorrichtung (60) gemäß Anspruch 1, wobei das Ringhalterelement (28) an die Röhre (26) geschweißt oder hartgelötet ist.
3. Kraftstoffleistenvorrichtung (60) gemäß einem der vorhergehenden Ansprüche, wobei die Verbindung (34) an die Kraftstoffleiste (18) geschweißt oder hartgelötet ist.
4. Kraftstoffleistenvorrichtung (60) gemäß einem der vorhergehenden Ansprüche, wobei das Rohr (24) einen Flansch (44) aufweist und ein Schellenelement (46) koaxial zu dem Rohr (24) angeordnet ist und das Schellenelement (46) in Eingriff mit der Verbindung (34) und dem Flansch (44) ist, um eine axiale Bewegung des Rohrs (24) relativ zu der Verbindung (34) zu verhindern.
5. Kraftstoffleiste-Kraftstoffinjektor-Baugruppe mit einer Kraftstoffleistenvorrichtung (60) gemäß einem der vorhergehenden Ansprüche und einer Kuppelungsbaugruppe (90) zum hydraulischen und mechanischen Kuppeln eines Kraftstoffinjektors (20) an eine Kraftstoffleiste (18) eines Verbrennungsmotors (22), wobei die Kuppelungsbaugruppe (90) umfasst

- einen Kraftstoffinjektor (20) mit einem Kraftstoffinjektorkörper (62) und einer mittigen Längsachse (L2), wobei der Kraftstoffinjektorkörper (62) einen teilweise kegelstumpfförmigen Hohlraum (64) aufweist,
- ein Kraftstoffrohr (24), das hydraulisch an die Kraftstoffleiste (18) kuppelbar ist, und
- ein kelchförmiges Kupplungselement (70), das in Eingriff mit dem Kraftstoffinjektorkörper (62) ist, um das Kraftstoffrohr (24) in dem Kraftstoffinjektor (20) in Richtung der mittigen Längsachse (L2) zu halten, wobei das Kraftstoffrohr (24) einen abgerundeten Endabschnitt (66) hat, welcher mindestens teilweise in dem teilweise kegelstumpfförmigen Hohlraum (64) angeordnet ist und in direktem Kontakt mit dem Kraftstoffinjektorkörper (62) ist, und

wobei die Kraftstoffleistenvorrichtung (60) mechanisch und hydraulisch an die Kupplungsbaugruppe (90) gekuppelt ist.

6. Kraftstoffleiste-Kraftstoffinjektor-Baugruppe gemäß Anspruch 5, wobei der Kraftstoffinjektorkörper (62) ein äußeres Schraubgewinde (76) aufweist und das kelchförmige Kupplungselement (70) ein inneres Schraubgewinde (74) aufweist, welches in Eingriff mit dem äußeren Schraubgewinde (76) des Kraftstoffinjektorkörpers (62) ist.
7. Kraftstoffleiste-Kraftstoffinjektor-Baugruppe gemäß Anspruch 5 oder 6, wobei ein Klemmelement (78) fest an einen Zylinderkopf (84) des Verbrennungsmotors (22) gekuppelt ist und eine Öffnung (82) aufweist, die dazu konstruiert ist, das Kraftstoffrohr (24) in Eingriff zu nehmen, um mechanische Zusammenarbeit zwischen dem Kraftstoffrohr (24) und dem Zylinderkopf (84) zu ermöglichen.

## Revendications

1. Dispositif à rampe à carburant (60) d'un moteur à combustion (22), le dispositif à rampe à carburant (60) comprenant :
  - une rampe à carburant (18),
  - une union (34) possédant un axe longitudinal (L1), accouplée de façon fixe à la rampe à carburant (18) et en communication hydraulique avec la rampe à carburant (18),
  - un tuyau (24), avec lequel l'union (34) entre partiellement en prise, et conçu pour être en communication hydraulique avec un injecteur de carburant (20), et
  - une bague d'étanchéité (38) agencée de façon coaxiale sur le tuyau (24) et agencée radialement entre l'union (34) et le tuyau (24) et conçue

pour accoupler de façon étanche l'union (34) au tuyau (24),

dans lequel le tuyau (24) comporte une surface extérieure (30) comprenant une rainure (32) faisant face à l'union (34), et la bague d'étanchéité (38) est partiellement agencée dans la rainure (32), dans lequel le tuyau (24) comprend un tube (26) et un élément de retenue de bague (28) qui est agencé de façon coaxiale par rapport au tube (26) et qui est accouplé de façon fixe au tube (26), et l'élément de retenue de bague (28) comprend la rainure (32), et dans lequel une partie (49) de l'élément de retenue de bague (28) s'étend dans une direction axiale à partir d'une extrémité axiale (48) du tube (26) faisant face à la rampe à carburant (18) de manière telle que l'élément de retenue de bague (28) couvre au moins partiellement l'extrémité axiale (48) du tube (26).

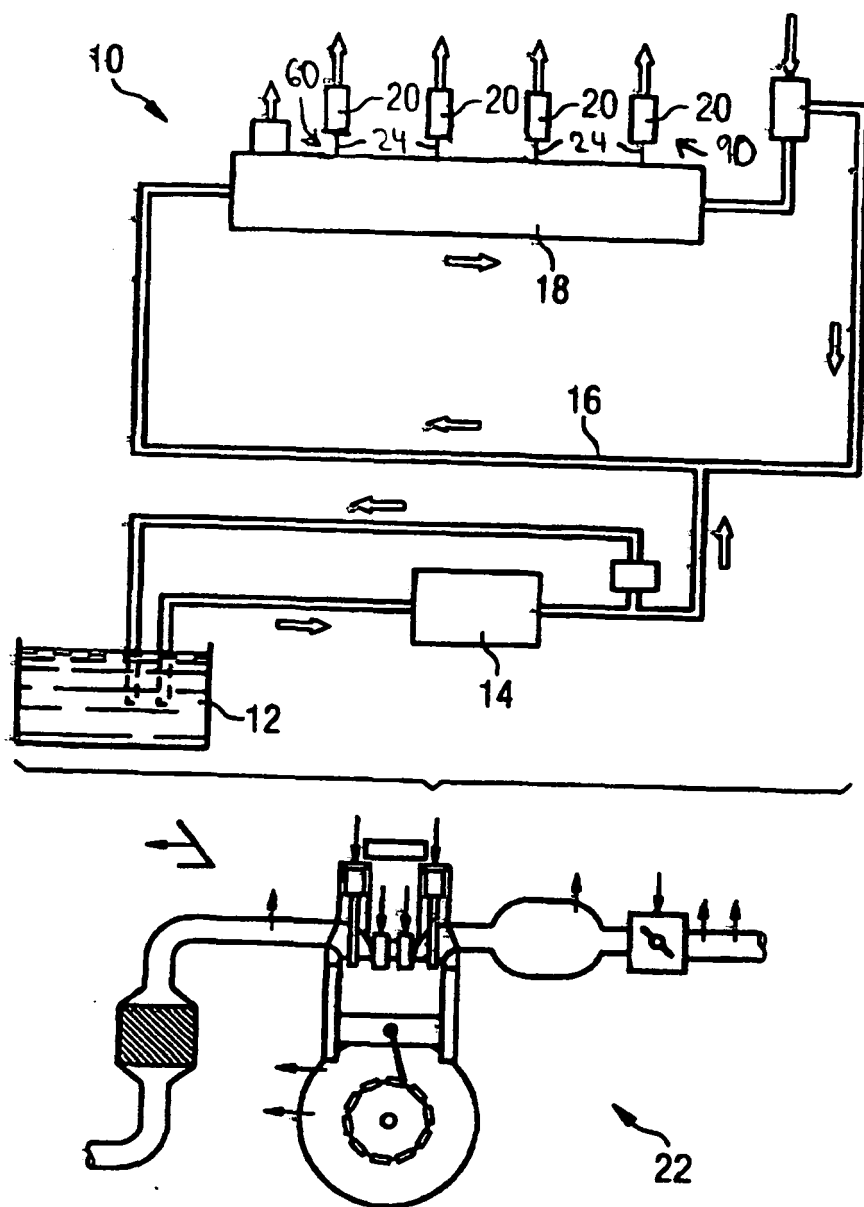
2. Dispositif à rampe à carburant (60) selon la revendication 1, dans lequel l'élément de retenue de bague (28) est soudé ou brasé sur le tube (26).
3. Dispositif à rampe à carburant (60) selon une des revendications précédentes, dans lequel l'union (34) est soudée ou brasée sur la rampe à carburant (18).
4. Dispositif à rampe à carburant (60) selon une des revendications précédentes, dans lequel le tuyau (24) comprend une bride (44), et un élément à attache (46) est agencé de façon coaxiale sur le tuyau (24), et l'élément à attache (46) est en prise avec l'union (34) et la bride (44) pour empêcher un mouvement axial du tuyau (24) par rapport à l'union (34).
5. Ensemble à rampe à carburant et à injecteur de carburant avec un dispositif à rampe à carburant (60) selon une des revendications précédentes et un ensemble à accouplement (90) pour accoupler hydrauliquement et mécaniquement un injecteur de carburant (20) à une rampe à carburant (18) d'un moteur à combustion (22), l'ensemble à accouplement (90) comprenant :
  - un injecteur de carburant (20) avec un corps d'injecteur de carburant (62) et un axe longitudinal central (L2), le corps d'injecteur de carburant (62) comprenant une cavité partiellement en forme de cône (64),
  - un tuyau à carburant (24) pouvant être hydrauliquement accouplé à la rampe à carburant (18), et
  - un élément à accouplement en forme de coupelle (70) en prise avec le corps d'injecteur de carburant (62) pour retenir le tuyau à carburant (24) dans l'injecteur de carburant (20) dans une direction de l'axe longitudinal central (L2), dans

lequel

le tuyau à carburant (24) comporte une section d'extrémité arrondie (66) qui est au moins partiellement agencée dans la cavité partiellement en forme de cône (64) et est en contact direct avec le corps d'injecteur de carburant (62), et dans lequel le dispositif à rampe à carburant (60) est accouplé mécaniquement et hydrauliquement à l'ensemble à accouplement (90).

6. Ensemble à rampe à carburant et à injecteur de carburant selon la revendication 5, dans lequel le corps d'injecteur de carburant (62) comprend un filet de vis extérieur (76) et l'élément à accouplement en forme de coupelle (70) comprend un filet de vis intérieur (74) qui est en prise avec le filet de vis extérieur (76) du corps d'injecteur de carburant (62).
7. Ensemble à rampe à carburant et à injecteur de carburant selon la revendication 5 ou 6, dans lequel un élément de serrage (78) est accouplé de façon fixe à une culasse de cylindre (84) du moteur à combustion (22) et comprend une ouverture (82) conçue pour venir en prise avec le tuyau à carburant (24) pour permettre une coopération mécanique entre le tuyau à carburant (24) et la culasse de cylindre (84).

FIG 1





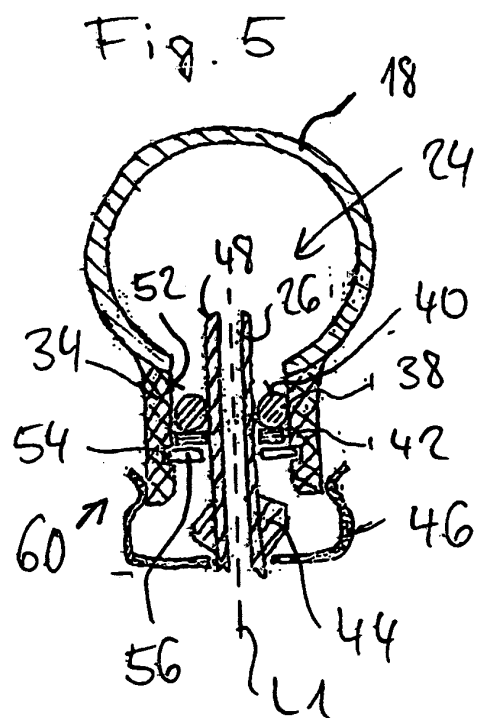
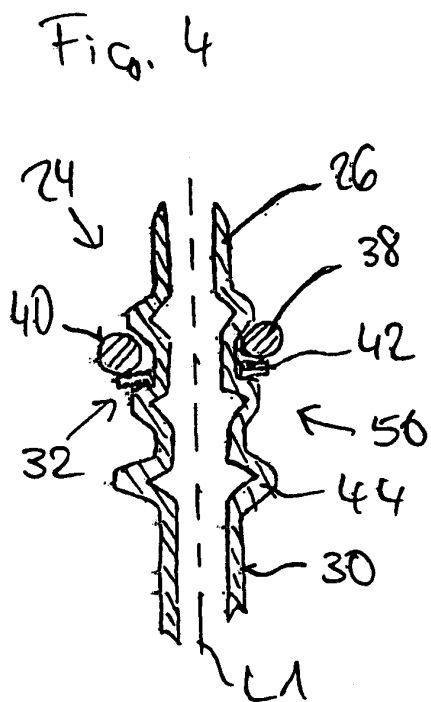
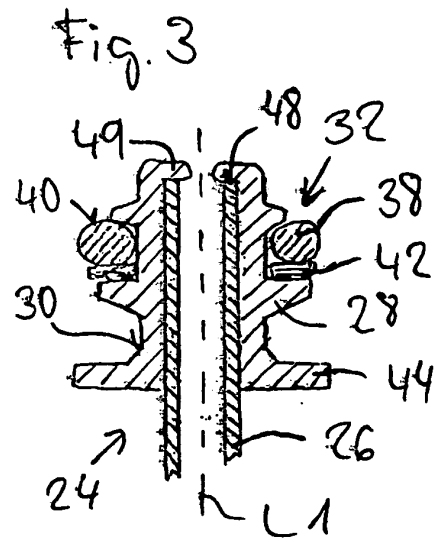
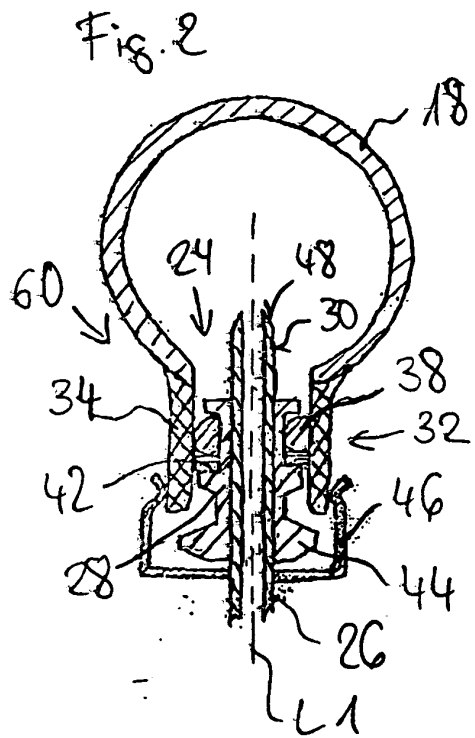


Fig. 6

