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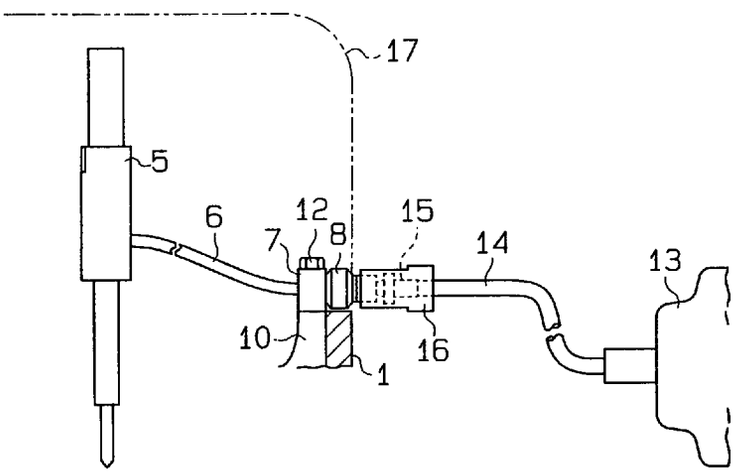
(54) Connecting structure for injection nozzle pipe

(57) A connecting structure for pipes (6, 14) used to convey fluids to an injection nozzle (5) of a diesel engine or the like is disclosed. A block (7) is provided at an end portion of the guide pipe (6), which extends from the injection nozzle (5). The block (7) is secured to a cylinder head (1) by a bolt (12). The guide pipe (6) and the fuel pipe (14) are separably connected to each other by two joint members (8, 15) at the location of the block (7). In this structure, the connecting portion of the two pipes (6, 14) is separated from the nozzle (5) by a distance equal to the length of the guide pipe (6).

Fig.2



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Description

TECHNICAL FIELD

The present invention relates generally to an injection nozzle employed in a diesel engine or the like. More particularly, it pertains to a structure for connecting a pipe, which extends from a pump to an injection nozzle to convey pressurized fluid such as fuel therebetween, to the injection nozzle.

RELATED BACKGROUND ART

Injection nozzles that inject fuel in, for instance, diesel engines, have conventionally been fixed to the engine cylinder head. Typically, a fuel pipe extending from a fuel injection pump is connected to the nozzle to convey pressurized fuel to the nozzle. Since the fuel in the pipe is under high pressure, sealing the connection between the nozzle and the pipe is important.

Japanese Unexamined Utility Model Publication 6-18044 discloses a structure that is used to connect a nozzle and a fuel pipe. In the connecting structure of this publication, an injection nozzle 21 is secured in a hole 23 defined in a cylinder head 22, as shown in Fig. 4. A fuel pipe 25 extending from a fuel injection pump 24 is separably connected to the nozzle 21 by a coupler 26. The fuel pipe 25 is separably secured to a manifold 27, which is fastened to a cylinder head 22, by a clip 28 and a bolt 29.

However, in the above connecting structure, the fuel pipe 25 is connected to the nozzle 21 by the coupler 26 in the proximity of the nozzle 21. In this type of fuel injecting system, the further the distance from the pump is, the higher the fluid pressure becomes. That is, the pressure is highest in the proximity of the injection nozzle. Consequently, since the coupler 26 is provided proximal to the nozzle 21, high fuel pressure acts on the joint of the coupler 26. As a result, there is a possibility that fuel may leak from that joint.

DISCLOSURE OF THE INVENTION

Accordingly, it is a primary objective of the present invention to provide a structure which connects a pipe extending from a pump to convey pressurized fluid, such as fuel, to an injection nozzle fixed to a machine body, such as an engine cylinder head or the like, in which the connecting structure reduces the possibility of fuel leakage.

To achieve the foregoing and other objects and in accordance with the purpose of the present invention, a connecting structure between a pipe member and an injection nozzle which is secured to a body is provided. Fluid is supplied to the injection nozzle from a pump through the pipe member. The structure characterized by that the pipe member includes a first pipe and a second pipe respectively connected to the pump and the injection nozzle. At least one of opposed ends of the first pipe and the second pipe is secured to the body. The first pipe and the second pipe are detachably coupled to each other at a portion secured to the body.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention that are believed to be novel are set forth with particularity in the appended claims. The invention, together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1 is a partial perspective view of a cylinder, a nozzle, etc., according to the present invention;

Fig. 2 is a diagrammatic side view showing a connecting structure of a guide pipe, which leads to the nozzle, and a fuel pipe, which leads to a fuel injection pipe;

Fig. 3 is a graph and diagram indicating the relation between distance from the fuel injection pump and fuel pressure; and

Fig. 4 is a partial cross-sectional view showing a prior art connecting structure.

DESCRIPTION OF SPECIAL EMBODIMENT

An embodiment of a connecting structure for an injection nozzle pipe in a diesel engine according to the present invention will hereinafter be described with reference to the drawings.

As shown in Fig. 1, a cylinder head 1 includes a hole 2 which receives an injection nozzle 5, a hole 3 which receives an intake and exhaust valve (not shown), and a bearing portion 4, which a cam shaft (not shown) is mounted to. The injection nozzle 5, which injects fuel, is made of a metal cylinder with its diameter varying at different positions along its axial direction. A guide pipe 6 extending from the nozzle 5 is made of material having a predetermined flexibility, and is integrally prefixed to the nozzle 5 at one end. The pipe 6 and the nozzle 5 are inseparably fastened to each other. A securing block 7 is connected to the other end of the pipe 6 as shown in Fig. 2. A first joint member 8 is integrally fixed to the block 7. The pipe 6 is fixed to the inside of the block 7. The pipe 6 is inseparably fastened to the joint member 8. The members 5 through 8 constitute an integral assembly.

The nozzle 5 may be of a type that is opened according to alterations in fluid pressure or of a type that is opened by electrically controlled electromagnetic valves. The former type is generally used in diesel engines.

The nozzle 5 is first fit into the hole 2 and then fastened to the cylinder head 1. A hole 9, defined in the block 7, is used to fasten the block 7 to the cylinder head 1. A rib 10 formed on the cylinder head 1 has a bolt hole 11.

As shown in Fig. 2, by inserting a bolt 12 into the hole 9 with the block 7 positioned above the rib 10 and then tightly screwing the bolt 12, the block 7 becomes fastened to the cylinder head 1. In this fixed state, the guide pipe 6 extends above and curves around the cam shaft (not shown).

As shown in Fig. 2, a second joint member 15 is attached to the distal end of the fuel pipe 14 extending from the fuel injection pump 13. The joint member 15 cooperates with the first joint member 8 provided on the block 7. As shown in Fig. 2, the fuel pipe 14 is connected to the guide pipe 6 by coupling the two joint members 8, 15 together and then tightening a nut 16 around the outer side of the connection. Thus, the end of the guide pipe 6 extending from the nozzle 5 is secured to the cylinder head 1 by the block 7. The guide pipe 6 and the fuel pipe 14 are separably linked to each other by the coupling of the joint members 8, 15 at the location of the block 7. Furthermore, the fuel pipe 14 is separably connected to the first joint member 8 at the outer side of the cylinder head 1. A cover 17 surrounding the nozzle 5 is attached to the cylinder head 1.

As shown in Fig. 3, fuel pressure in the fuel pipe 14 increases as the distance from the fuel injection pump 13 increases. As a result, the fuel pressure reaches its highest value in the proximity of the nozzle 5. However, with the connecting structure of the present invention, the connection between the guide pipe 6 and the fuel pipe 14, or the coupling location of the two joint members 8, 15, is upstream from the nozzle 5 by a distance equal to the length of the guide pipe 6. As shown in Fig. 3, the difference in fuel pressure between the coupling location of the present invention and the conventional coupling portion is apparent. In other words, fuel pressure at the coupling location of the two joint members 8, 15 is lower than that in close proximity to the nozzle 5. Accordingly, the relatively low fuel pressure at the coupling location of the two joint members 8, 15 reduces the possibility of fuel leakage.

In this embodiment, the two coupled joint members 8, 15 are fixed to the cylinder head 1. This reduces vibration of the two joint members 8, 15 and suppresses a decline in the sealing performance of the connection due to vibration. This also reduces the possibility of fuel leakage.

Furthermore, in this embodiment, a flexible guide pipe 6 is employed. Therefore, the guide pipe 6 does not transmit forces to the connection between the guide pipe 6 and the nozzle 5. Accordingly, more reliable sealing between the pipe 6 and the nozzle 5 is ensured.

In addition, the fuel pipe 14 may be connected with or disconnected from the guide pipe 6 at the outside of the cylinder head 1 without taking off the cover 17 for conducting maintenance. Hence, workability during maintenance of the diesel engine is improved.

Although only one embodiment of the present invention has been described herein, it should be apparent to those skilled in the art that the present invention may be embodied in many other specific forms without departing from the spirit or scope of the invention. Particularly, it should be understood that the present invention may be embodied in the forms described below.

In the illustrated embodiment, only the guide pipe 6 is secured to the cylinder head 1 by the block 7. However, the guide pipe 6 and the fuel pipe 14 may both be secured to the cylinder head 1 by the block 7. Alternatively, only the fuel pipe 14 may be secured to the cylinder head 1 by the block 7.

Although the guide pipe 6 and the nozzle 5 are made of different materials in the illustrated embodiment, they may be made of the same material. In this case, the nozzle and the guide pipe may be integrally diecast.

Furthermore, in the illustrated embodiment, the connecting structure is embodied in a fuel injection system. Alternatively, the connecting structure may be used when connecting an oil pipe, which extends from a hydraulic pump, to an injection nozzle or when connecting other fluid pipes used with other types of fluids that extend from a fluid pump to an injection nozzle.

Therefore, the present examples and embodiments are to be considered as illustrative and not restrictive and the invention is not to be limited to the details given herein, but may be modified within the scope of the appended claims.

A connecting structure for pipes (6, 14) used to convey fluids to an injection nozzle (5) of a diesel engine or the like is disclosed. A block (7) is provided at an end portion of the guide pipe (6), which extends from the injection nozzle (5). The block (7) is secured to a cylinder head (1) by a bolt (12). The guide pipe (6) and the fuel pipe (14) are separably connected to each other by two joint members (8, 15) at the location of the block (7). In this structure, the connecting portion of the two pipes (6, 14) is separated from the nozzle (5) by a distance equal to the length of the guide pipe (6).

Claims

1. A connecting structure between a pipe member (14) and an injection nozzle (5) which is secured to a body (1), wherein fluid is supplied to the injection nozzle (5) from a pump (13) through said pipe member (14), said structure characterized by that:

   said pipe member includes a first pipe (14) and a second pipe (6) respectively connected to the pump (13) and the injection nozzle (5), wherein at least one of opposed ends of the first pipe (14) and the second pipe (6) is secured to the body (1), and wherein said first pipe (14) and the second pipe (6) are detachably coupled to each other at a portion secured to the body (1).

2. The structure as set forth in Claim 1, characterized by that at least one of said opposed ends of the first pipe (14) and the second pipe (6) is secured to the body (1) by a bolt (12) screwed into a bolt hole (11) by way of a block (7).

3. The structure as set forth in Claims 1 or 2, characterized by that said first pipe (14) and said second pipe (6) are detachably coupled to each other via a first joint (8) and a second joint (15).

4. The structure as set forth in Claim 3, characterized by that said first and second joints (8,15) are disposed outside of the body (1).

5. The structure as set forth in Claims 3 or 4, characterized by that said first pipe (14) and said second pipe (6) are fastened by a nut (16) at coupling portions of the pipes (14,6).

6. The structure as set forth in Claim 3, characterized by that the distal end of the second pipe (6) is secured to the body (1) by a bolt (12) screwed into a bolt hole (11) by way of a block (7), wherein said first pipe (14) and said second pipe (6) are coupled to each other by the first joint (8) and the second joint (15) respectively mounted to the block (7) and the distal end of the first pipe (14).

7. The structure as set forth in Claim 6, characterized by that said injection nozzle (5), said second pipe (6), said block (7) and said first joint (8) are attached to one another to form an assembly.

8. The structure as set forth in any one of the preceding claims, characterized by that said second pipe (6) is made of a material having a predetermined flexibility.

9. The structure as set forth in any one of the preceding claims, characterized by that said injection nozzle (5) is arranged to open in accordance with pressure of the fluid.

10. A diesel engine using the connection structure as set forth in any one of the preceding claims, characterized by the cylinder head (1), the fuel injection nozzle (5) and the fuel injection pump (13), wherein fuel is supplied from the fuel injection pump (13) to the fuel injection nozzle (5) to be injected to the engine from the nozzle (5).

Fig.1

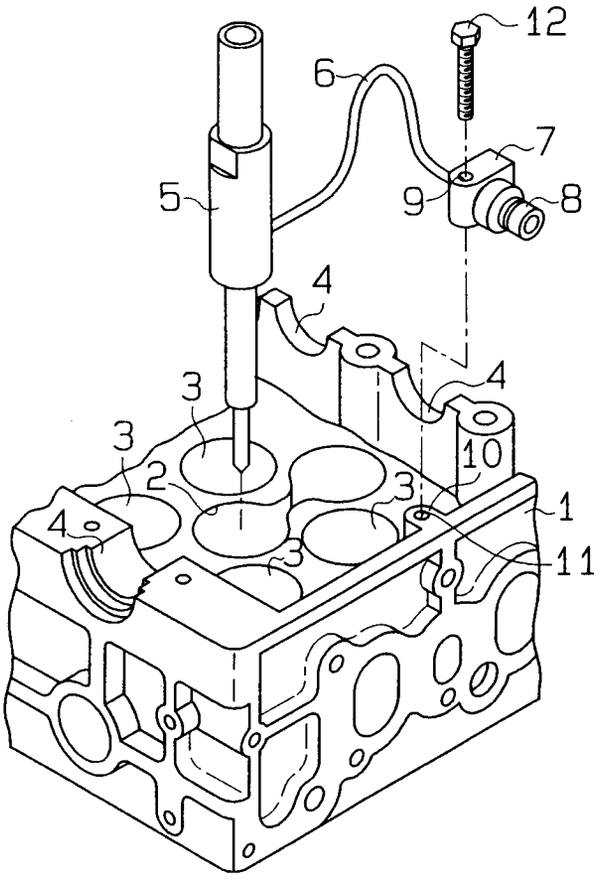


Fig.2

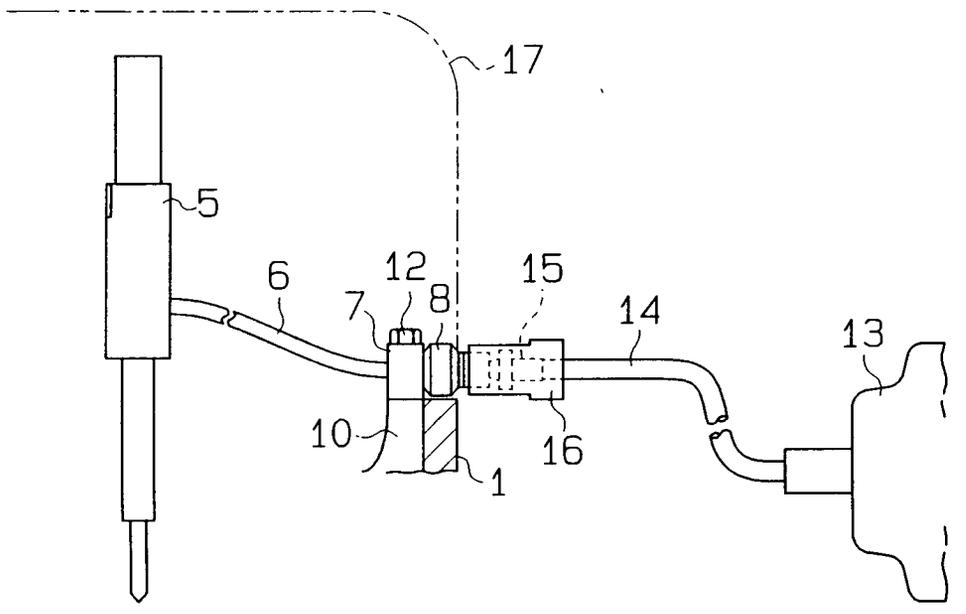


Fig.3

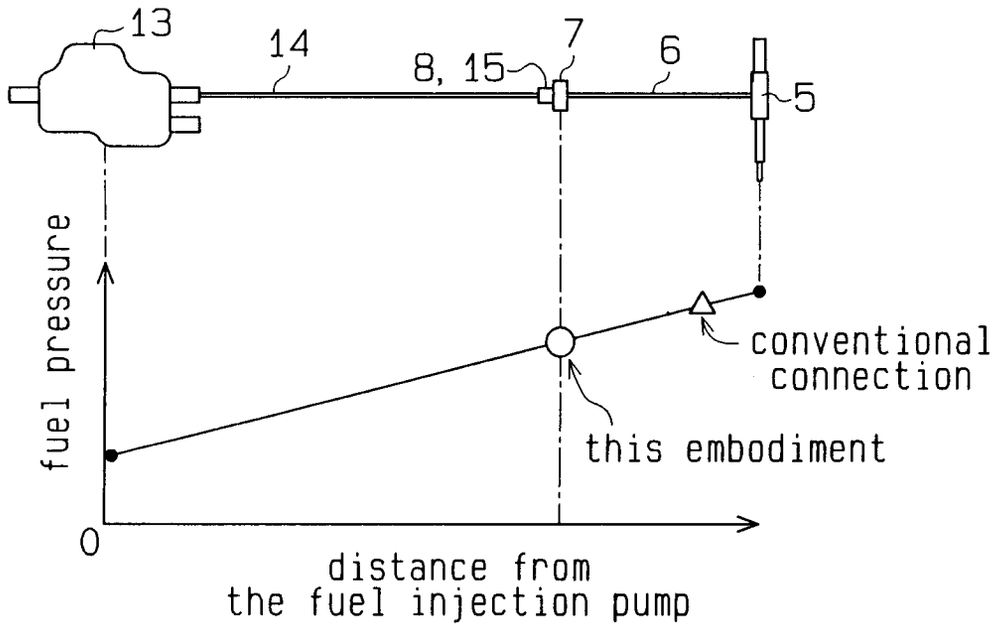
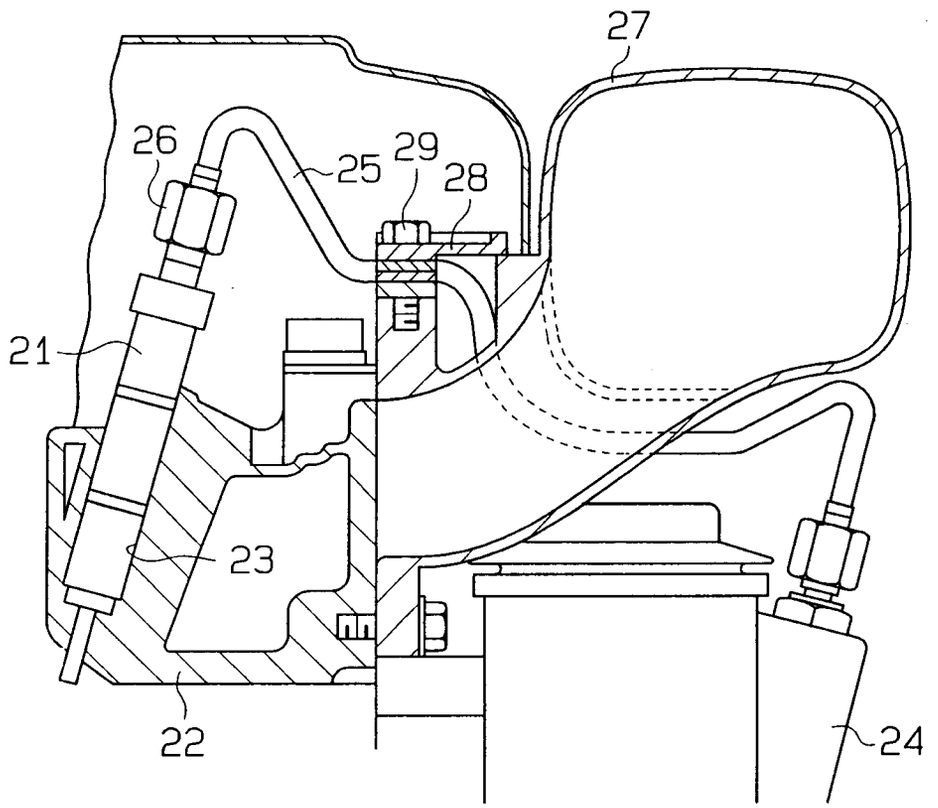

13
14
8, 15
7
6
5
fuel pressure
conventional connection
this embodiment
0
distance from the fuel injection pump

Fig.4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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 7470

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 472 515 (AVL GESELLSCHAFT) * page 3, line 38 - page 4, line 15; figures * ---	1,3-5, 8-10	F02M55/02
X	PATENT ABSTRACTS OF JAPAN vol. 11 no. 318 (M-632) ,16 October 1987 & JP-A-62 101879 (SANSHIN IND CO) 12 May 1987, * abstract * -----	1,3-5,9	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 February 1996	Sideris, M

CATEGORY OF CITED DOCUMENTS

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