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(54) **Cooling structure for fuel injection valve**

Kühlanordnung für Brennstoffeinspritzventil

Structure de refroidissement pour injecteur de carburant

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- **PATENT ABSTRACTS OF JAPAN vol. 2000, no. 25, 12 April 2001 (2001-04-12) & JP 2001 221123 A (NISSAN DIESEL MOTOR CO LTD; TOKYO GAS CO LTD), 17 August 2001 (2001-08-17)**

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Description

[0001] The present invention relates to a cylinder head having a cooling structure for a fuel injection valve according to the preamble part of independent claim 1.

[0002] From JP 2001 221123A a cooling structure as indicated above is known.

[0003] Conventionally, a fuel injection valve for injecting fuel directly into a combustion chamber is installed through insertion into a valve installation hole in a cylinder head, and is sealed by a sealing member provided on the outer peripheral portion thereof such that combustion gas from the combustion chamber does not leak outside.

[0004] Meanwhile, heat from the combustion chamber causes the temperature of a nozzle portion positioned on the tip end side of the fuel injection valve and facing the combustion chamber to rise, whereby the small amount of residual fuel attached to an injection hole at the tip end of the nozzle portion is carbonized to produce a carbon deposit. Accumulation of this carbon deposit in the vicinity of the injection hole has an adverse effect on the injection characteristic and the injection amount.

[0005] However, the aforementioned sealing member typically has a low thermal conductivity, and since the sealing member is installed in the valve installation hole between the fuel injection valve and cylinder head with a predetermined pressing force, a problem arises in that the heat of the nozzle portion on the fuel injection valve cannot easily be conducted outside of the cylinder head through the sealing member.

[0006] In other words, to prevent the generation of carbon deposits on the injection hole, the heat of the nozzle portion of the fuel injection valve, which is caused to increase in temperature by combustion heat from the combustion chamber, must be discharged outside efficiently, but at present, a cooling structure with an adequate heat-discharging function has not yet been developed.

[0007] JP 2001-132582 and JP-2002-138924 disclose conventional fuel injection valve structures.

[0008] The present invention has been designed in consideration of the problems described above, and it is an objective thereof to improve a cylinder head having a cooling structure according to the preamble portion of independent claim 1 so as to enable an exact positioning of the fuel injection valve within the valve installation hole and a secure and exact heat conduction from the fuel injection valve to the cylinder head.

[0009] The objective is solved according to the present invention by a cylinder head comprising a cooling structure for a fuel injection valve being installed in a valve installation hole via a sealing member and injecting fuel into a combustion chamber, wherein a heat conducting member is provided on an outer peripheral portion of said fuel injection valve for performing thermal conduction between a nozzle portion of said fuel injection valve and said cylinder head, and said heat conducting member and a cooling water passage provided in said cylinder head are arranged adjacent to each other and separated from each other by a low temperature portion of said cylinder head, wherein said heat conducting member is a substantially cylindrical member having a larger diameter on one end side than on the other end side, whereby an outer peripheral surface of said larger diameter part contacts an inner wall surface of said valve installation hole, and an inner peripheral surface of said small diameter part contacts said outer peripheral surface of said nozzle portion, wherein an inner peripheral surface of said larger diameter part is contactless to said outer peripheral surface of said nozzle portion and an outer peripheral surface of said small diameter part is contactless to said inner wall surface of said valve installation hole.

[0010] It is an advantage that an actively releasing the heat of the nozzle portion of the fuel injection valve to a low temperature portion of the cylinder head could be obtained.

[0011] The aforementioned low temperature portion may be a cooling water passage provided in the cylinder head.

[0012] Preferably, said sealing member is provided for sealing a combustion gas from said combustion chamber , said nozzle portion of said fuel injection valve and said valve installation hole of said cylinder head are cylindrical, and said fuel injection valve is fixed in position by inserting said nozzle portion and said sealing member into said valve installation hole to inject fuel into said combustion chamber from an injection hole provided on a tip end of said nozzle portion, wherein said heat conducting member is installed in an annular space formed between said inner wall surface of said valve installation hole and said outer peripheral surface of said nozzle portion so as to contact both said inner wall surface and said outer peripheral surface.

[0013] The heat conducting member may have a greater thermal conductivity than the sealing member.

[0014] The heat conducting member may be constituted by a copper material.

[0015] The heat conducting member is a substantially cylindrical member having a larger diameter on one end side than on the other end side. An outer peripheral surface of the large diameter part is capable of contacting the inner wall surface of the valve installation hole, and an inner peripheral surface of the small diameter part is capable of contacting the outer peripheral surface of the nozzle portion.

[0016] The sealing member is provided between the valve installation hole and nozzle portion, and the heat conducting member may be positioned on the side that is further from the tip end of the nozzle portion than the sealing member.

[0017] The sealing member is provided between the valve installation hole and the nozzle portion, and the heat conducting member may be positioned on the side that is closer to the tip end of the nozzle portion than the sealing member.

[0018] Furthermore, the heat conducting member is provided for performing thermal conduction between a high temperature portion in the vicinity of the injection hole in the nozzle portion, which is the tip end portion of the fuel injection valve, and a low temperature portion in the cylinder head, and hence even when the sealing member is interposed between the fuel injection valve and the cylinder head, the high temperature of the nozzle portion of the fuel injection valve can be actively released to the low temperature portion of the cylinder head. Thus the temperature of the nozzle portion, particularly in the vicinity of the injection hole, decreases such that carbon deposits can be reduced.

[0019] Cooling efficiency can be raised particularly when the heat conducting member is provided in the vicinity of the cooling water passage in the cylinder head.

[0020] Further, when the heat conducting member is constituted by a material having a greater thermal conductivity than the sealing member, for example a copper material or the like, an even more efficient thermal conduction performance can be ensured.

[0021] Further preferred embodiments are subject of further dependent claims.

[0022] In the following, the present invention is explained in greater detail by means of several embodiments thereof in conjunction with the accompanying drawings, wherein:

Fig. 1 is a sectional view of a fuel injection valve 3 part comprising a cooling structure 4 according to a first embodiment and installed in a valve installation hole 2 of a cylinder head 1;

Fig. 2 is a partially cut-away enlarged sectional view showing the cooling structure 4 in a nozzle portion 3B part of same;

Fig. 3 shows an annular metallic spring 12 which is a heat conducting member not forming part of the present invention,

Fig. 3(1) being a perspective view thereof, and Fig. 3(2) being a sectional view thereof;

Fig. 4 shows a temperature-sensing ring 13 which is a heat conducting member not forming part of the present invention,

Fig. 4(1) being a sectional view thereof in a normal condition (at low temperature), and Fig. 4(2) being a sectional view thereof at high temperature;

Fig. 5 shows an expanding ring 14 which is a heat conducting member not forming part of the present invention,

Fig. 5(1) being a sectional view thereof in a normal condition (at low temperature), and Fig. 5(2) being a sectional view thereof at high temperature; and

Fig. 6 is a partially cut-away enlarged sectional view of a cooling structure 20 for a fuel injection valve according to a second embodiment.

[0023] A cooling structure for a fuel injection valve according to a first embodiment will now be described on the basis of Figs. 1 and 2.

[0024] Fig. 1 is a sectional view of a fuel injection valve 3 part installed in a valve installation hole 2 of a cylinder head 1. The fuel injection valve 3 comprises a main body portion 3A, and a cylindrical nozzle portion 3B which is the tip end portion of the main body portion 3A and has a smaller diameter than the main body portion 3A.

[0025] A cooling structure 4 for the fuel injection valve 3 according to the present teaching is provided on the nozzle portion 3B part.

[0026] Fig. 2 is a partially cut-away enlarged sectional view of the nozzle portion 3B part of the fuel injection valve 3, and shows the cooling structure 4 of the fuel injection valve 3.

[0027] A combustion gas seal 6 (sealing member) of an arbitrary constitution is provided on a combustion chamber 5 side between the valve installation hole 2 and the nozzle portion 3B of the fuel injection valve 3.

[0028] The fuel injection valve 3 injects fuel into the combustion chamber 5 from an injection hole 7 in a tip end 3C of the nozzle portion 3B.

[0029] The cooling structure 4 comprises an annular copper ring 8 (heat conducting member), a cooling water passage 9, and cooling water 10 inside the cooling water passage 9.

[0030] The copper ring 8 is positioned in the cylindrical valve installation hole 2 outside of the combustion gas seal 6 on the opposite side to the combustion chamber 5, and contacts both an outer peripheral surface of the fuel injection valve 3 (nozzle portion 3B) and an inner wall surface of the valve installation hole 2.

[0031] More specifically, the copper ring 8 is a substantially cylindrical member in which the diameter of the end side thereof (large diameter part 8A) that is furthest from the tip end 3C of the nozzle portion 3B is larger than the diameter of the other end side thereof (small diameter part 8B) that is near to the tip end 3C of the nozzle portion 3B. In an annular space 11 formed between the inner wall surface of the valve installation hole 2 and the outer peripheral surface of the nozzle portion 3B, the outer peripheral surface of the large diameter part 8A contacts the inner wall surface of the valve installation hole 2, and the inner peripheral surface of the small diameter part 8B contacts the outer peripheral surface of the nozzle portion 3B.

[0032] In the cooling structure 4 constituted in this manner, the combustion gas seal 6 seals in combustion gas from the combustion chamber 5, and the copper ring 8 conducts high temperatures from the vicinity of the injection hole 7 in the nozzle portion 3B of the fuel injection valve 3 to the cylinder head 1 and the cooling water 10 inside the cooling water passage 9.

[0033] Since the copper ring 8 and cooling water passage 9 are positioned adjacent to each other via the wall surface of the cylinder head 1, heat from the vicinity of the injection hole 7 can be actively conducted to the cylinder head 1 from the fuel injection valve 3 and discharged efficiently even though the combustion gas seal 6 is positioned therebetween. In particular, by cooling the vicinity of the injection valve 7, the generation of carbon deposits can be suppressed.

[0034] In particular, by providing a constitution in which the small diameter part 8B of the copper ring 8 is disposed in the annular space 11 formed between the inner wall surface of the valve installation hole 2 and the outer peripheral surface of the nozzle portion 3B facing the tip end 3C of the nozzle portion 3B, the heat conducting path from the nozzle portion 3B to the cylinder head 1 can be formed in the vicinity of the tip end 3C of the nozzle portion 3B, and thus the heat that is transmitted to the fuel injection valve 3 can be released to the cylinder head 1 efficiently.

[0035] The combustion gas seal 6 also contacts both the inner wall surface of the valve installation hole 2 and the outer peripheral surface of the nozzle portion 3B, and although thermal conduction is also possible through the combustion gas seal 6, the constitution and material of the combustion gas seal 6 should be determined such that a good sealing property can be ensured. As a result, it is difficult to generate a high degree of thermal conductivity in the combustion gas seal 6. On the other hand, the material for the copper ring 8 may be selected with a comparative amount of freedom, and hence the copper ring 8 may be constituted by a material (a copper material, for example) having a higher degree of thermal conductivity than the material constituting the combustion gas seal 6, thereby ensuring a more efficient thermal conduction performance.

[0036] A desired structure other than the copper ring 8 may be employed as the heat conducting member of the present invention.

[0037] For example, Fig. 3 shows an annular metallic spring 12 which is a heat conducting member not forming part of the present invention,

[0038] Fig. 3(1) being a perspective view thereof and Fig. 3(2) being a sectional view thereof.

[0039] Due to its resilience, the metallic spring 12 is capable of thermal contact at a predetermined pressing force with both the fuel injection valve 3 and the valve installation hole 2 (cylinder head 1), and is also easy to remove and install.

[0040] Fig. 4 shows a temperature-sensing ring 13 which is a heat conducting member not forming part of the present invention,

[0041] Fig. 4(1) being a sectional view thereof in a normal condition (at low temperature) , and Fig. 4(2) being a sectional view thereof at high temperature.

[0042] The temperature-sensing ring 13 is constituted by a bimetal, a shape memory alloy, or similar. At times such as the installation or removal of the fuel injection valve 3 and temperature-sensing ring 13 to or from the valve installation hole 2, the temperature-sensing ring 13 does not contact either the fuel injection valve 3 (nozzle portion 3B) or the valve installation hole 2, as shown in Fig. 4(1), and thus can be easily installed in and removed from the annular space 11 therebetween.

[0043] Further, only at high temperatures when the temperature of the fuel injection valve 3 must be reduced, the temperature-sensing ring 13 changes shape as shown in Fig. 4(2) , thus enabling thermal conduction and heat discharge.

[0044] As shown in Fig. 4(2) in particular, when the temperature-sensing ring 13 changes shape at high temperatures, thermal conduction efficiency can be further improved by ensuring that the temperature-sensing ring 13 changes shape such that the number of contact points and contact surfaces with the valve installation hole 2 and fuel injection valve 3 increases.

[0045] Fig. 5 shows an expanding ring 14 Which is a heat conducting member not forming part of the present invention,

[0046] Fig. 5(1) being a sectional view thereof in a normal condition (at low temperature), and Fig. 5(2) being a sectional view thereof at high temperature.

[0047] The expanding ring 14 uses a material having a high coefficient of thermal expansion in order to utilize the expansion and contraction of the medium.

[0048] As shown in Fig. 5(1), the expanding ring 14 contracts at times such as the installation or removal of the fuel injection valve 3 and expanding ring 14 to or from the valve installation hole 2, and therefore does not contact either the fuel injection valve 3 or valve installation hole 2. Hence the expanding ring 14^{i} can be easily installed in and removed from the annular space 11 therebetween.

[0049] As shown in Fig. 5(2), at high temperatures, the expanding ring 14 expands so as to contact the valve installation hole 2 and fuel injection valve 3, thus enabling heat transfer.

[0050] Note that in the first embodiment shown in Figs. 1 and 2, the combustion gas seal 6 is provided between the valve installation hole 2 and nozzle portion 3B, and the copper ring 8 is positioned on the side that is further from the tip end 3C (injection hole 7) of the nozzle portion 3B than the combustion gas seal 6. However, the copper ring 8 may be positioned on the side that is closer to the tip end 3C of the nozzle portion 3B than the combustion gas seal 6.

[0051] More specifically, Fig. 6 is a partially cut-away enlarged sectional view of a cooling structure 20 according to a second embodiment. In the cooling structure 20, contrary to the cooling structure 4 (Figs. 1, 2) according to the first embodiment, the copper ring 8 and cooling water passage 9 are positioned further toward the combustion chamber 5 side than the combustion gas seal 6.

[0052] Similarly to the cooling structure 4 in Figs. 1 and 2, in the cooling structure 20 constituted in this manner, the heat of the nozzle portion 3B (injection hole 7) of the fuel injection valve 3 is transmitted efficiently to the cooling water 10 inside the cooling water passage 9 of the cylinder head 1, and thus the generation of carbon deposits in the vicinity of the injection hole 7 can be suppressed.

[0053] According to the present teaching as described above, by providing a heat conducting member between the valve installation hole of a cylinder head and the nozzle portion of a fuel injection valve such that heat is actively discharged to the cylinder head side, the nozzle portion of the fuel injection valve can be cooled efficiently, and the generation of carbon deposits in the vicinity of the injection hole can be suppressed.

Claims

1. A cylinder head (1) comprising a cooling structure (4, 20) and a fuel injection valve (3) installed in a valve installation hole (2) via a sealing member (6) and injecting fuel into a combustion chamber (5), wherein a heat conducting member (8) is provided on an outer peripheral portion of said fuel injection valve (3) for performing thermal conduction between a nozzle portion (38) of said fuel injection valve(3) and said cylinder head (1), and
said heat conducting member (8) and a cooling water passage (9) provided in said cylinder head (1) are arranged adjacent to each other and separated from each other by a low temperature portion of said cylinder head (1), whereby
said heat conducting member (8) is a substantially cylindrical member having a larger diameter on one end side than on the other end side, **characterized in that** an outer peripheral surface of said larger diameter part (8A) contacts an inner wall surface of said valve installation hole (2), and an inner peripheral surface of said small diameter part (8B) contacts said outer peripheral surface of said nozzle portion (3B), wherein an inner peripheral surface of said larger diameter part (8A) is contactless to said outer peripheral surface of said nozzle portion (38) and an outer peripheral surface of said small diameter part (8B) is contactless to said inner wall surface of said valve installation hole (2).

2. A cylinder head (1) according claim 1, **characterized in that** said low temperature portion of said cylinder head (1) is a wall portion thereof being direct in contact with said cooling water passage (9).

3. A cylinder head (1) according claim 1 or 2, **characterized in that** said heat conducting member (8) is spaced from said outer peripheral portion of said fuel injection valve (3) and said inner wall surface of said valve installation hole(2) at low temperatures, and configured to contact said outer peripheral portion and said inner wall surface at high temperatures.

4. A cylinder head (1) according to claim 1 or 2, **characterized in that** said sealing member (6) is provided for sealing a combustion gas from said combustion chamber (5),
said nozzle portion (3B) of said fuel injection valve (3) and said valve installation hole (2) of said cylinder head (1) are cylindrical, and
said fuel injection valve (3) is fixed in position by inserting said nozzle portion (3B) and
said sealing member (6) into said valve installation hole (2) to inject fuel into said combustion chamber (5) from an injection hole (7) provided on a tip end (3C) of said nozzle portion (3B),
wherein said heat conducting member (8) is installed in an annular space (11) formed between said inner wall surface of said valve installation hole (2) and said outer peripheral surface of said nozzle portion (3B) so as to contact both said inner wall surface and said outer peripheral surface.

5. A cylinder head (1) according to claim 4, **characterized in that** said heat conducting member (8) comprises a greater thermal conductivity than said sealing member (6).

6. A cylinder head (1) according to claim 5, **characterized in that** said heat conducting member (8) is constituted by a copper material.

7. A cylinder head (1) according to claims 4 to 6, **characterized in that** said sealing member (6) is provided between said valve installation hole (2) and said nozzle portion (3B), and said heat conducting member (8) is positioned on the side that is farther from a tip end of said nozzle portion (3B) than said sealing member (6).

8. A cylinder head (1) according to claims 4 to 6, **characterized in that** said sealing member (6) is provided between said valve installation hole (2) and said nozzle portion (38), and said heat conducting member (8) is positioned on the side that is closer to a tip end of said nozzle portion (3B) than said sealing member (6).

Patentansprüche

1. Zylinderkopf (1), der aufweist eine Kühlstruktur (4, 20) und ein Kraftstoffeinspritzventil (3), installiert in einer Ventilinstallationsbohrung (2) über ein Dichtungsteil (6) und das Kraftstoff in die Verbrennungskammer (5) einspritzt, wobei ein wärmeleitendes Teil (8) an einem äußeren Umfangsabschnitt des Kraftstoffeinspritzventils (3) zum Ausführen einer thermischen Leitung zwischen einem Düsenabschnitt (3B) des Kraftstoffeinspritzventiles (3) und dem Zylinderkopf (1) vorgesehen ist, und
das wärmeleitende Teil (8) und ein Kühlwasserkanal (9), vorgesehen in dem Zylinderkopf (1), benachbart zueinander vorgesehen und voneinander durch einen Niedrigtemperaturabschnitt des Zylinderkopfes (1) getrennt sind, wodurch
das wärmeleitende Teil (8) ein im Wesentlichen zylindrisches Teil mit einem größeren Durchmesser an

einer Endseite als an einer anderen Endseite ist, **dadurch gekennzeichnet, dass** eine äußere Umfangsoberfläche des Teils (8A) mit größerem Durchmesser eine innere Wandoberfläche der Ventilinstallationsbohrung (2) berührt, und eine innere Umfangsoberfläche des Teils (8B) mit kleinem Durchmesser die äußere Umfangsoberfläche des Düsenabschnitts (3B) berührt, wobei eine innere Umfangsoberfläche des Teils (8A) mit größerem Durchmesser zu der äußeren Umfangsoberfläche des Düsenabschnitts (3B) und die äußere Umfangsoberfläche des Teils (8B) mit kleinem Durchmesser zu der inneren Wandoberfläche der Ventilinstallationsbohrung (2) berührungsfrei ist.

2. Zylinderkopf (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Niedrigtemperaturabschnitt des Zylinderkopfes (1) ein Wandabschnitt desselben ist, der in direktem Kontakt mit dem Kühlwasserkanal (9) ist.

3. Zylinderkopf (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der wärmeleitende Teil (8) von dem äußeren Umfangsabschnitt des Kraftstoffeinspritzventils (3) und der inneren Wandoberfläche der Ventilinstallationsbohrung (2) bei niedrigen Temperaturen beabstandet und konfiguriert ist, den äußeren Umfangsabschnitt und die innere Wandoberfläche bei hohen Temperaturen zu berühren.

4. Zylinderkopf (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das Dichtungsteil (6) vorgesehen ist zum Abdichten eines Verbrennungsgases aus der Verbrennungskammer (5),
der Düsenabschnitt (3B) des Kraftstoffeinspritzventils (3) und die Ventilinstallationsbohrung (2) des Zylinderkopfes (1) zylindrisch sind, und
das Kraftstoffeinspritzventil (3) an Ort und Stelle durch Einsetzen des Düsenabschnittes (3B) und des Dichtungsteils (6) in die Ventilinstallationsbohrung (2) befestigt ist, um Kraftstoff in die Verbrennungskammer (5) aus der Einspritzerbohrung (7), vorgesehen an einem Spitzenende (3C) des Düsenabschnitts (3B), einzuspritzen,
wobei das wärmeleitende Teil (8) installiert ist in einem ringförmigen Raum (11), gebildet zwischen der inneren Wandoberfläche der Ventilinstallationsbohrung (2) und der äußeren Umfangsoberfläche des Düsenabschnitts (3B), um sowohl die innere Wandoberfläche, als auch die äußere Umfangsoberfläche zu berühren.

5. Zylinderkopf (1) nach Anspruch 4, **dadurch gekennzeichnet, dass** das wärmeleitende Teil (8) eine größere thermische Leitfähigkeit als das Dichtungsteil (6) aufweist.

6. Zylinderkopf (1) nach Anspruch 5, **dadurch gekennzeichnet, dass** das wärmeleitende Teil (8) durch ein Kupfermaterial gebildet ist.

7. Zylinderkopf (1) nach den Ansprüchen 4 bis 6, **dadurch gekennzeichnet, dass** das Dichtungsteil (6) zwischen der Ventilinstallationsbohrung (2) und dem Düsenabschnitt (3B) vorgesehen ist, und das Wärmeleitende Teil (8) auf der Seite positioniert ist, die weiter entfernt von einem Spitzenende des Düsenabschnitts (3B) als das Dichtungsteil (6) ist.

8. Zylinderkopf (1) nach den Ansprüchen 4 bis 6, **dadurch gekennzeichnet, dass** das Dichtungsteil (6) zwischen der Ventilinstallationsbohrung (2) und dem Düsenabschnitt (3B) vorgesehen ist, und das wärmeleitende Teil (8) auf der Seite positioniert ist, die näher zu einem Spitzenende des Düsenabschnitts (3B) als das Dichtungsteil (6) ist.

Revendications

1. Culasse de cylindre (1) comprenant une structure de refroidissement (4, 20) et une soupape d'injection de carburant (3) installée dans un orifice d'installation de soupape (2) par l'intermédiaire d'un élément d'étanchéité (6) et injectant du carburant dans une chambre de combustion (5), dans laquelle un élément de conduction thermique (8) est prévu sur une partie périphérique extérieure de ladite soupape d'injection de carburant (3) pour réaliser une conduction thermique entre une partie d'injecteur (3B) de ladite soupape d'injection de carburant (3) et ladite culasse de cylindre (1), et
ledit élément de conduction thermique (8) et un passage d'eau de refroidissement (9) prévus dans ladite culasse de cylindre (1) sont agencés l'un à côté de l'autre et séparés l'un de l'autre par une partie à basse température de ladite culasse de cylindre (1), moyennant quoi
ledit élément de conduction thermique (8) est un élément sensiblement cylindrique possédant un diamètre plus important sur un côté d'extrémité que sur l'autre côté d'extrémité, **caractérisée en ce qu'**une surface périphérique extérieure de ladite partie de diamètre plus important (8A) entre en contact avec une surface de paroi intérieure dudit orifice d'installation de soupape (2), et une surface périphérique intérieure de ladite partie de faible diamètre (8B) entre en contact avec ladite surface périphérique extérieure de ladite partie d'injecteur (3B), dans laquelle une surface périphérique intérieure de ladite partie de diamètre plus important (8A) est sans contact par rapport à ladite surface périphérique extérieure de ladite partie d'injecteur (3B) et une surface périphérique extérieure de ladite partie de faible diamètre (8B) est sans contact par rapport à ladite surface de paroi intérieure dudit orifice d'installation de soupape

(2).

2. Culasse de cylindre (1) selon la revendication 1, **caractérisée en ce que** ladite partie à basse température de ladite culasse de cylindre (1) est une partie de paroi de celle-ci étant en contact direct avec ledit passage d'eau de refroidissement (9).

3. Culasse de cylindre (1) selon la revendication 1 ou 2, **caractérisée en ce que** ledit élément de conduction thermique (8) est espacé de ladite partie périphérique extérieure de ladite soupape d'injection de carburant (3) et ladite surface de paroi intérieure dudit orifice d'installation de soupape (2) à basses températures, et configuré pour entrer en contact avec ladite partie périphérique extérieure et ladite surface de paroi intérieure à hautes températures.

4. Culasse de cylindre (1) selon la revendication 1 ou 2, **caractérisée en ce que** ledit élément d'étanchéité (6) est prévu pour étanchéifier un gaz de combustion par rapport à ladite chambre de combustion (5), ladite partie d'injecteur (38) de ladite soupape d'injection de carburant (3) et ledit orifice d'installation de soupape (2) de ladite culasse de cylindre (1) sont cylindriques, et
ladite soupape d'injection de carburant (3) est fixée en position en insérant ladite partie d'injecteur (3B) et ledit élément d'étanchéité (6) dans ledit orifice d'installation de soupape (2) pour injecter du carburant dans ladite chambre de combustion (5) à partir d'un orifice d'injection (7) prévu sur une extrémité de pointe (3C) de ladite partie d'injecteur (3B),
dans laquelle ledit élément de conduction thermique (8) est installé dans un espace annulaire (11) formé entre ladite surface de paroi intérieure dudit orifice d'installation de soupape (2) et ladite surface périphérique extérieure de ladite partie d'injecteur (3B) afin d'entrer en contact avec ladite surface de paroi intérieure et ladite surface périphérique extérieure.

5. Culasse de cylindre (1) selon la revendication 4, **caractérisée en ce que** ledit élément de conduction thermique (8) comprend une conductivité thermique supérieure à celle dudit élément d'étanchéité (6).

6. Culasse de cylindre (1) selon la revendication 5, **caractérisée en ce que** ledit élément de conduction thermique (8) est constitué par un matériau de cuivre.

7. Culasse de cylindre (1) selon les revendications 4 à 6, **caractérisée en ce que** ledit élément d'étanchéité (6) est prévu entre ledit orifice d'installation de soupape (2) et ladite partie d'injecteur (3B), et ledit élément de conduction thermique (8) est positionné sur le côté qui est plus éloigné d'une extrémité de pointe de ladite partie d'injecteur (3B) que ledit élément d'étanchéité (6).

8. Culasse de cylindre (1) selon les revendications 4 à 6, **caractérisée en ce que** ledit élément d'étanchéité (6) est prévu entre ledit orifice d'installation de soupape (2) et ladite partie d'injecteur (38), et ledit élément de conduction thermique (8) est positionné sur le côté qui est plus près d'une extrémité de pointe de ladite partie d'injecteur (3B) que ledit élément d'étanchéité (6).

FIG. 1

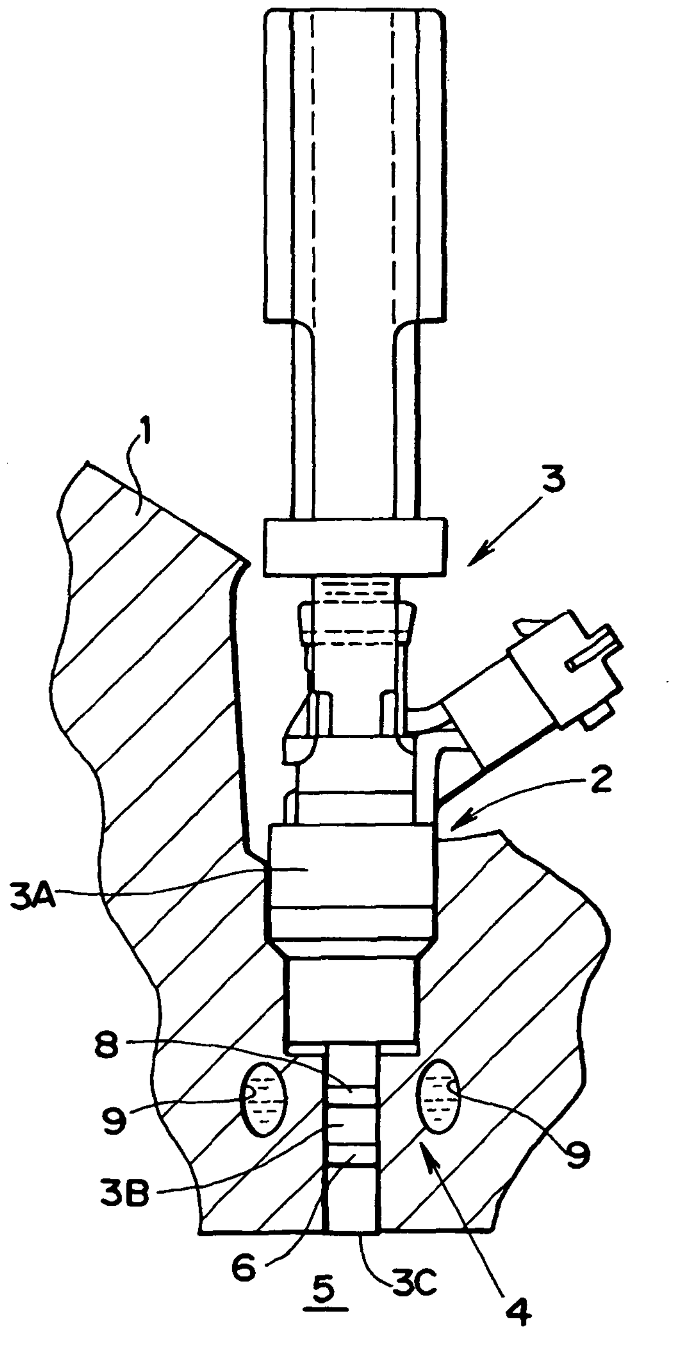


FIG. 2

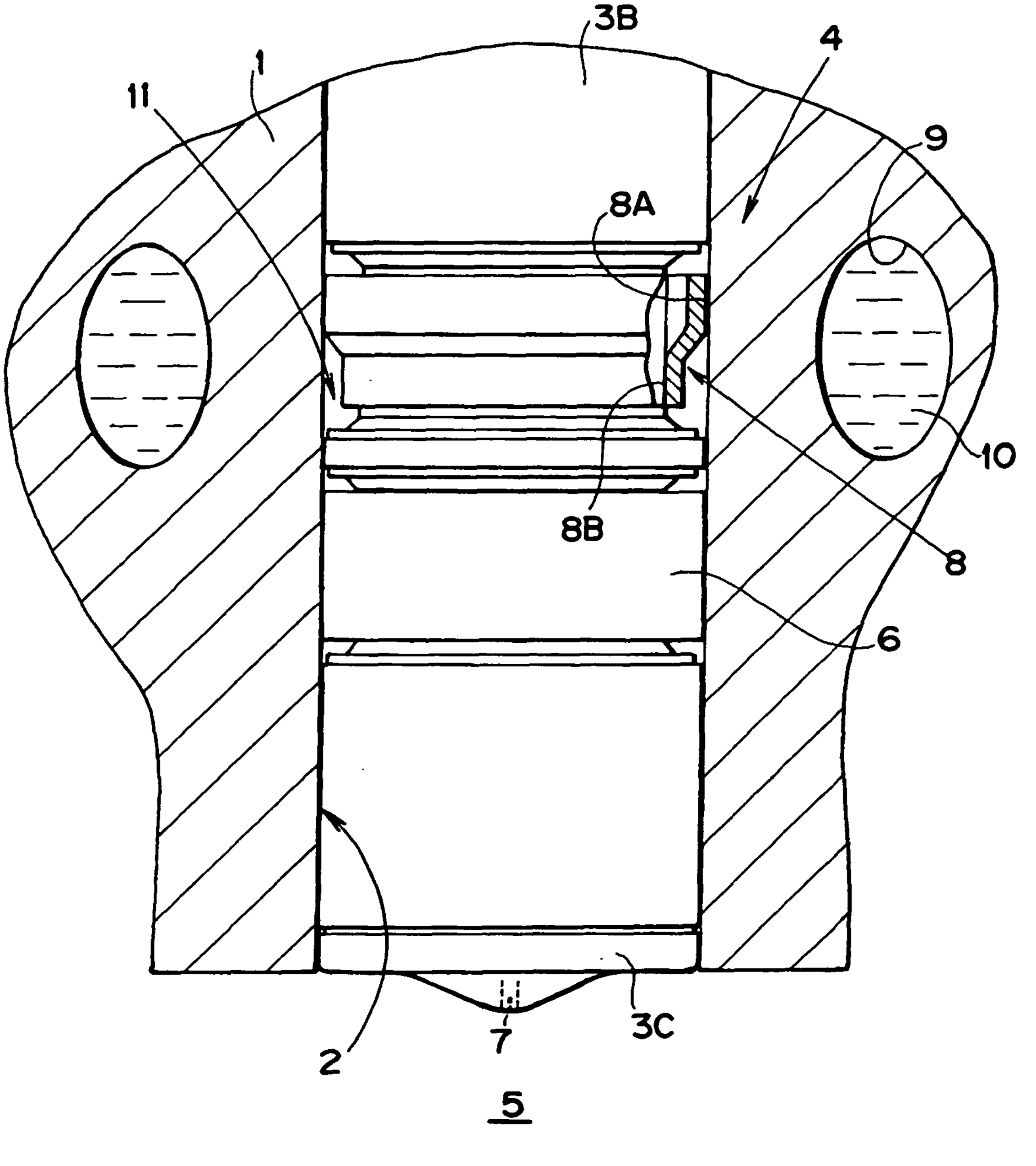


FIG.3

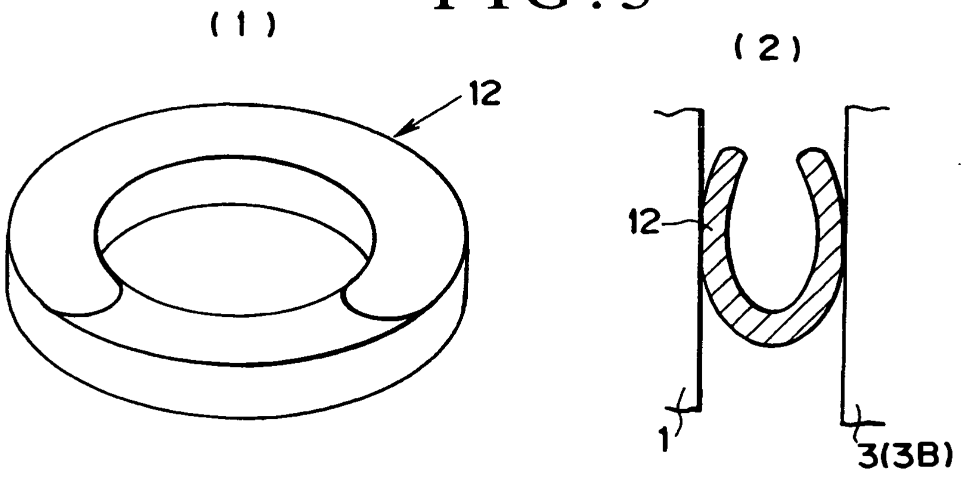


FIG.4

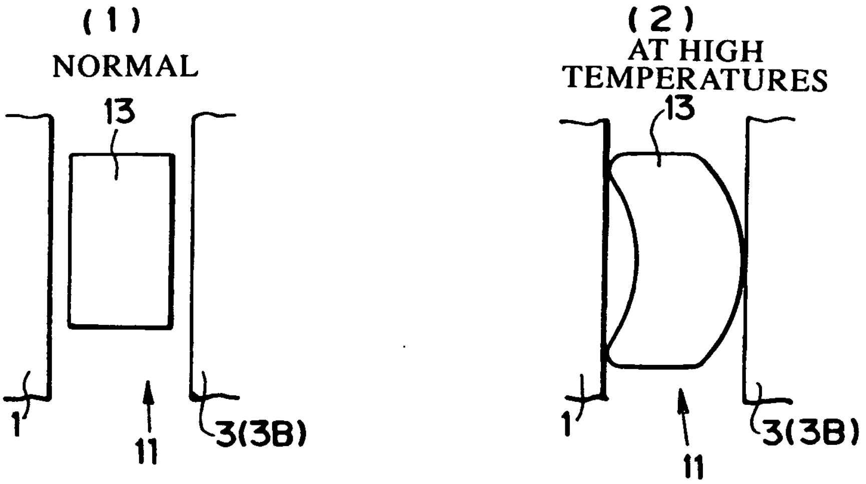


FIG.5

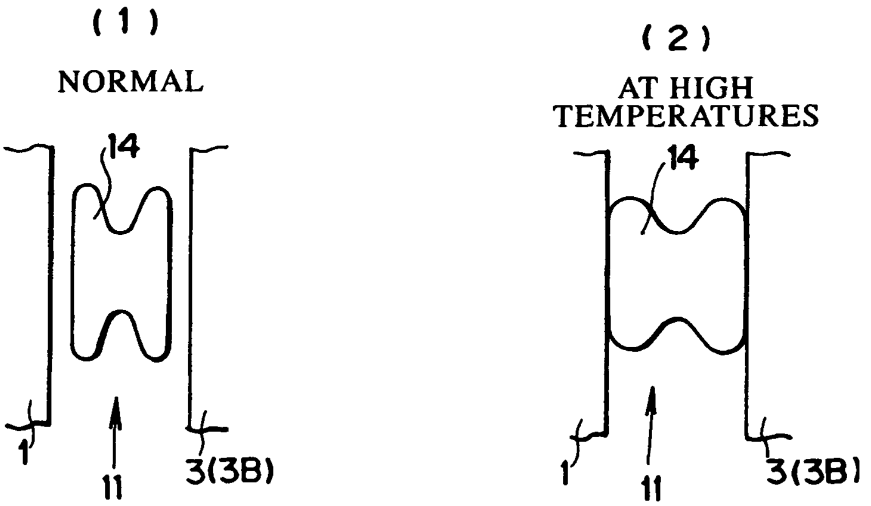
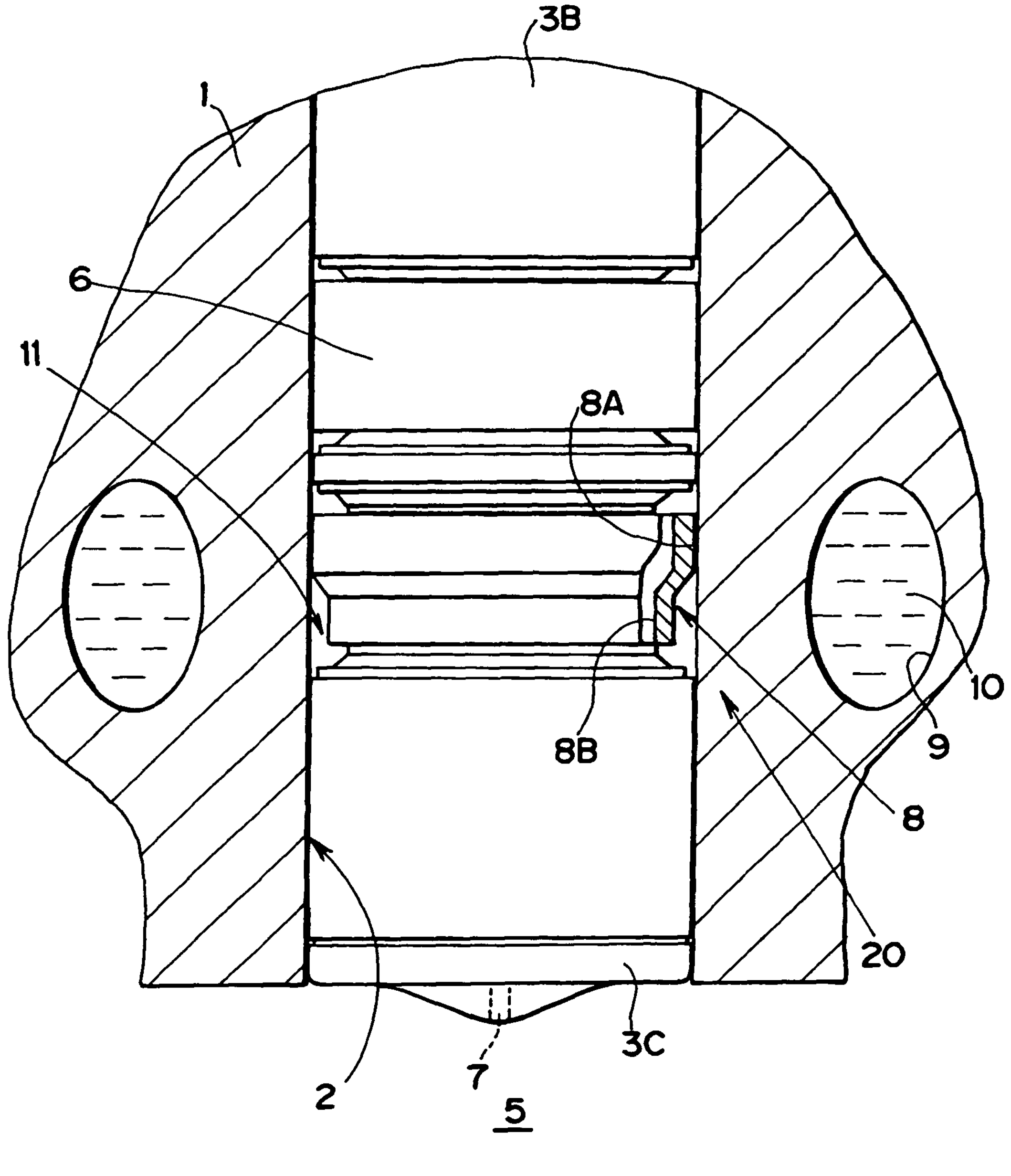


FIG.6



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