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(54) WATER COOLED ENGINE

WASSERGEKÜHLTER MOTOR

MOTEUR REFROIDI À L'EAU

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Description

BACKGROUND OF THE INVENTION

(1) Field of the Invention

[0001] The present invention relates to a water cooled engine, specifically, a water cooled engine including a cylinder head with minimized thermal strain.

(2) Description of Related Art

[0002] Conventionally, there exists a water cooled engine including a cylinder head, which cylinder head includes an air intake port, an exhaust port, and a head water jacket allowing an engine cooling water to pass around the ports (for example, see Japanese Patent Application No. H8-261059, (Figs. 1, 4, and 5)).

[0003] The water cooled engine of this type is advantageous in being capable of strongly cooling the cylinder head with the engine cooling water.

[0004] Further prior art arrangements are known from US 3769948, which discloses a water cooler engine according to the preamble of claim 1, and US 4889080.

SUMMARY OF THE INVENTION

[0005] «Problem» An increase in thermal strain of the cylinder head may be invited.

[0006] When output is increased with the water cooled engine, the temperature of the exhaust gas may rise and cooling may become insufficient at the exhaust side, inviting an increase in thermal strain of the cylinder head.

[0007] An object of the present invention is to provide a water cooled engine including a cylinder head with minimized thermal strain.

[0008] According to the present invention, there is provided a water cooled engine as recited by claim 1. Further, preferred features are presented in the dependent claims.

[0009] The present invention exhibits the following effects.

«Effect» Thermal strain of the cylinder head (6) is minimized.

[0010] As shown in Fig. 1A, the bottom wall (6c) of the cylinder head (6) on the exhaust end (6a) side with great heat load is strongly cooled by the engine cooling water (36) passing through the cooling water injection passage (27). Further, the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e) with great heat load are strongly cooled by the engine cooling water (36) injected from the cooling water injection passage (27). These factors improve cooling on the exhaust side, and minimize thermal strain of the cylinder head (6).

[0011] «Effect» High cooling performance is achieved at the first exhaust entrance port wall (3d).

[0012] By virtue of heat dissipation of the heat dissipation fin (28), high heat dissipation performance is achieved at the first exhaust entrance port wall (3d).

«Effect» High cooling performance is achieved at the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e).

[0013] As shown in Fig. 1A, by virtue of the heat dissipation fin (28), the engine cooling water (36) is prevented from diffusing into the direction distancing from the inter-exhaust-port-wall water channel (29), and instead smoothly flows into the inter-exhaust-port-wall water channel (29). Thus, high cooling performance is achieved at the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e).

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1A is a schematic plan view describing a cylinder head of a water cooled engine according to an embodiment of the present invention;
Fig. 1B is a cross-sectional view taken along line B-B in Fig. 1A;
Fig. 1C is a cross-sectional view taken along line C-C in Fig. 1A;
Fig. 2 is a vertical cross-sectional view of a combustion chamber of a water cooled engine according to the embodiment of the present invention;
Fig. 3 is a vertical cross-sectional front view of the engine of the embodiment of the present invention;
Fig. 4 is a vertical cross-sectional side view of the engine shown in Fig. 3;
Fig. 5 is a front view of the engine shown in Fig. 3;
Fig. 6 is a side view of the engine shown in Fig. 3; and
Fig. 7 is a plan view of the engine shown in Fig. 3.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0015] Figs. 1A to 1C are illustrations describing a water cooled engine according to an embodiment of the present invention. In the present embodiment, a description will be given of a water-cooled common-rail inline four-cylinder diesel engine.

[0016] The overview of the engine is as follows.

[0017] As shown in Fig. 3, the engine includes: a cylinder block (5); a cylinder head (6) mounted on an upper part of the cylinder block (5); a cylinder head cover (7) mounted on an upper part of the cylinder head (6); an oil pan (4) mounted on a lower part of the cylinder block (5); a belt transmission mechanism (9) disposed at a front part of the cylinder block (5) as shown in Fig. 4 where an extending direction of the crankshaft (8) is a front-rear direction; a flywheel housing (10) disposed at a rear part of the cylinder block (5); an intake manifold (11) provided on laterally one side of the cylinder head (6) as shown in Fig. 3 where a width direction of the engine being perpendicular to the front-rear direction is a lateral direction; and an exhaust manifold (12) provided on laterally other

side of the cylinder head (6).

[0018] The engine includes a fuel injection apparatus, a vibration damper apparatus, a water-cooling apparatus, a lubricating apparatus, and an oil-cooling apparatus.

[0019] The fuel injection apparatus is of the common rail type, and includes, as shown in Fig. 6, a fuel supply pump (13), a common rail (14), and a fuel injector (15) as shown in Fig. 4, to inject fuel into a combustion chamber.

[0020] As shown in Fig. 3, the vibration damper apparatus includes rotary balancers (1), to cancel out the secondary vibrations of the engine thereby reducing the vibrations of the engine.

[0021] The water-cooling apparatus includes: a radiator (not shown); a water entrance chamber (16) provided on the air intake side of the cylinder block (5) as shown in Fig. 3; a water pump (17) provided at a front part of the water entrance chamber (16) as shown in Fig. 6; and as shown in Fig. 3, a water relay chamber (18) provided on the rear side of the water pump (17) and at a lower part of the water entrance chamber (16); a block water jacket (19) provided inside the cylinder block (5); and a head water jacket (20) provided inside the cylinder head (6).

[0022] The water-cooling apparatus causes, using the pump pressure of the water pump (17), an engine cooling water having its heat dissipated by the radiator to circulate sequentially through the water entrance chamber (16), the water pump (17), the water relay chamber (18), the block water jacket (19), the head water jacket (20), and the radiator, to cool the engine.

[0023] The lubricating apparatus includes: an oil pump (not shown) built inside the rear part of the cylinder block (5); and as shown in Fig. 3, an oil cooler (21) housed in the water relay chamber (18); an oil filter (23) mounted together with the oil cooler (21) on an auxiliary device mounting base (22); and an oil gallery (24) provided inside an air-intake-side wall of the cylinder block (5). The lubricating apparatus causes, using the pump pressure of the oil pump, an engine oil (4a) inside the oil pan (4) to circulate sequentially through the oil pump, the oil cooler (21), the oil filter (23), the oil gallery (24), an engine sliding part including a bearing (8a) of the crankshaft (8) shown in Fig. 3, and the oil pan (4), to forcibly lubricate the sliding part of the engine.

[0024] As shown in Fig. 3, the oil-cooling apparatus includes: an oil jet delivery passage (25) provided in parallel to the oil gallery (24) inside the air-intake-side wall of the cylinder block (5); an oil jet nozzle (25a) provided below a piston (26); and a cooling channel (26a) provided inside the piston (26). Part of the engine oil (4a) sequentially passing through the oil cooler (21) and the oil filter (23) of the lubricating apparatus is branched into the oil jet delivery passage (25) inside the auxiliary device mounting base (22) and injected into the cooling channel (26a) from the oil jet nozzle (25a), to cool the piston (26).

[0025] The water-cooling apparatus is structured as follows.

[0026] As shown in Fig. 1A, the water-cooling apparatus includes the cylinder head (6). The cylinder head (6) includes an air intake port (2), an exhaust port (3), and the head water jacket (20) that allows an engine cooling water (36) to pass around the ports (2), (3).

[0027] Accordingly, the water-cooling apparatus is advantageous in its being capable of strongly cooling the cylinder head (6) with the engine cooling water (36).

[0028] As shown in Fig. 1A, when the extending direction of the crankshaft (8) is the front-rear direction and the width direction of the cylinder head (6) perpendicular to the front-rear direction is the lateral direction, the laterally one end of the cylinder head (6) is an exhaust end (6a), and the laterally other end thereof is an air intake end (6b).

[0029] The exhaust port (3) includes: a first exhaust valve opening (3a); and a second exhaust valve opening (3b) provided on the exhaust end (6a) side relative to the first exhaust valve opening (3a). An exhaust port wall includes: a first exhaust entrance port wall (3d) on the first exhaust valve opening (3a) side; and a second exhaust entrance port wall (3e) on the second exhaust valve opening (3b) side.

[0030] The head water jacket (20) includes an inter-exhaust-port-wall water channel (29) between the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e).

[0031] The cylinder head (6) includes a cooling water injection passage (27) provided at a bottom wall (6c) of the cylinder head (6). The cooling water injection passage (27) is positioned (biased) on the exhaust end (6a) side, and includes a passage entrance (27a) provided on the exhaust end (6a) side, and a passage exit (27b) directed toward the inter-exhaust-port-wall water channel (29).

[0032] The exhaust port wall includes a heat dissipation fin (28) extending from the first exhaust entrance port wall (3d) toward the exhaust end (6a). The space between the heat dissipation fin (28) and the second exhaust entrance port wall (3e) forms a water channel entrance (29a) of the inter-exhaust-port-wall water channel (29).

[0033] Into the passage entrance (27a) of the cooling water injection passage (27), the engine cooling water (36) rising from the exhaust side of the block water jacket (19) is drawn.

[0034] Accordingly, in the present embodiment, as shown in Fig. 1A, the bottom wall (6c) of the cylinder head (6) on the exhaust end (6a) side with great heat load is strongly cooled by the engine cooling water (36) passing through the cooling water injection passage (27). Further, the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e) with great heat load are strongly cooled by the engine cooling water (36) injected from the cooling water injection passage (27). These factors improve cooling on the exhaust side, and minimize thermal strain of the cylinder head (6).

[0035] Further, by virtue of heat dissipation of the heat

dissipation fin (28), high heat dissipation performance is achieved at the first exhaust entrance port wall (3d).

[0036] Still further, as shown in Fig. 1A, by virtue of the heat dissipation fin (28), the engine cooling water (36) is prevented from diffusing into the direction distancing from the inter-exhaust-port-wall water channel (29), and instead smoothly flows into the inter-exhaust-port-wall water channel (29). Thus, high cooling performance is achieved at the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e).

[0037] Note that, by the engine cooling water (36) being injected from the cooling water injection passage (27), the engine cooling water (36) near the water channel entrance (29a) of the inter-exhaust-port-wall water channel (29) is drawn into the water channel entrance (29a). Into the water channel entrance (29a), the engine cooling water (36) rising from an inter-cylinder-bore water channel of the block water jacket (19) via a rising hole (39) is also drawn.

[0038] As shown in Fig. 1A, a water channel exit (29b) of the inter-exhaust-port-wall water channel (29) is directed to the fuel injector (15).

[0039] Accordingly, in the present embodiment, as shown in Fig. 1A, by virtue of the engine cooling water (36) having passed through the inter-exhaust-port-wall water channel (29) being directed to the fuel injector (15), high cooling performance is achieved at the fuel injector (15).

[0040] As shown in Fig. 1A, an air intake port wall includes an intake air exit port wall (2b) provided on an intake valve opening (2a) side. The head water jacket (20) includes an inter-intake/exhaust-port-wall water channel (30) between the intake air exit port wall (2b) and the second exhaust entrance port wall (3e).

[0041] The cylinder head (6) includes a second cooling water injection passage (31) provided at the bottom wall (6c) of the head water jacket (20). The second cooling water injection passage (31) includes a second passage entrance (31a) provided on the exhaust end (6a) side, and a second passage exit (31b) directed to a water channel entrance (30a) of the inter-intake/exhaust-port-wall water channel (30).

[0042] Accordingly, in the present embodiment, as shown in Fig. 1A, the second exhaust entrance port wall (3e) with great heat load is strongly cooled by the engine cooling water (36) injected from the second cooling water injection passage (31). This reduces the temperature difference between the second exhaust entrance port wall (3e) and the intake air exit port wall (2b) with small heat load, and minimizes thermal strain of the cylinder head (6).

[0043] Into the second passage entrance (31a) of the second cooling water injection passage (31), the engine cooling water (36) rising from the exhaust side of the block water jacket (19) is drawn.

[0044] As shown in Fig. 1A, the second cooling water injection passage (31) is positioned (biased) on the exhaust end (6a) side.

[0045] Accordingly, in the present embodiment, as shown in Fig. 1A, the bottom wall (6c) of the cylinder head (6) on the exhaust end (6a) side with great heat load is strongly cooled by the engine cooling water (36) passing through the second cooling water injection passage (31). This improves cooling on the exhaust side, and minimizes thermal strain of the cylinder head (6).

[0046] As shown in Figs. 1A and 1C, the cylinder head (6) includes a second heat dissipation fin (32) along a lower surface (6f) of a ceiling wall (6d) of the cylinder head (6).

[0047] Between the second heat dissipation fin (32) and the bottom wall (6c) of the cylinder head (6), a constricted passage (32a) is provided. The constricted passage (32a) is disposed upstream in a flow direction in the inter-intake/exhaust-port-wall water channel (30).

[0048] Accordingly, in the present embodiment, as shown in Figs. 1A and 1C, the engine cooling water (36) flowing toward the water channel entrance of the inter-intake/exhaust-port-wall water channel (30) is deflected toward the bottom wall (6c) of the cylinder head (6) with the second heat dissipation fin (32), and the side of the second exhaust entrance port wall (3e) near the second exhaust valve opening (3b) with great heat load is strongly cooled. Thus, high cooling performance is achieved at the second exhaust entrance port wall (3e).

[0049] As shown in Figs. 1A and 1C, the cylinder head (6) includes a push rod chamber wall (6e) provided on the exhaust end (6a) side at a position opposing to an intake valve shaft insertion boss (2c). The second heat dissipation fin (32) is provided to extend between the intake valve shaft insertion boss (2c) and the push rod chamber wall (6e).

[0050] Accordingly, in the present embodiment, as shown in Figs. 1A and 1C, the heat of the push rod chamber wall (6e) provided on the exhaust end (6a) side is dissipated into the intake valve shaft insertion boss (2c) via the second heat dissipation fin (32). This reduces the temperature difference between the exhaust side and the air intake side of the cylinder head (6), and minimizes thermal strain of the cylinder head (6).

[0051] As shown in Fig. 1A, the second heat dissipation fin (32) is positioned farther from the inter-intake/exhaust-port-wall water channel (30) than the second passage exit (31b) of the second cooling water injection passage (31) is.

[0052] Accordingly, in the present embodiment, as shown in Fig. 1A, the backflow of the engine cooling water (36) injected from the second passage exit (31b) of the second cooling water injection passage (31) and having its temperature increased by absorbing the heat at the water channel entrance (30a) of the inter-intake/exhaust-port-wall water channel (30) thereby rising is received by the second heat dissipation fin (32). This reduces a reduction in the amount of the engine cooling water (36) passing through the inter-intake/exhaust-port-wall water channel (30), achieving high cooling performance at the second exhaust entrance port wall (3e).

[0053] As shown in Fig. 1A, a water channel exit (30b) of the inter-intake/exhaust-port-wall water channel (30) is directed to the fuel injector (15).

[0054] Accordingly, in the present embodiment, as shown in Fig. 1A, the engine cooling water (36) flowing out from the inter-intake/exhaust-port-wall water channel (30) is directed to the fuel injector (15), whereby high cooling performance is achieved at the fuel injector (15).

[0055] As shown in Fig. 2, a head gasket (33) interposed between the cylinder block (5) and the cylinder head (6) is further provided.

[0056] The bottom wall (6c) of the cylinder head (6) includes a combustion chamber ceiling wall (34) and a pushing wall (35) positioned on the outer circumference side of the combustion chamber ceiling wall (34) and pushing a bead (33a) of the head gasket (33).

[0057] In the bottom wall (6c) of the cylinder head (6), the pushing wall (35) is greater in thickness than an outer peripheral part (34a) of the combustion chamber ceiling wall (34) being adjacent to the pushing wall (35).

[0058] Accordingly, in the present embodiment, as shown in Fig. 2, by virtue of the outer peripheral part (34a) of the combustion chamber ceiling wall (34) with great heat load being smaller in thickness, heat is less prone to accumulate and, consequently, displacement of the pushing wall (35) toward the radially outward direction of the cylinder due to thermal expansion of the combustion chamber ceiling wall (34) is less prone to occur. Further, by virtue of the pushing wall (35) pushing the bead (33a) being greater in thickness, any depression due to reaction force of the bead (33a) little occurs. Thus, high sealing performance is achieved at the head gasket (33).

[0059] Fig. 2 further shows an injector cover (15a), an injector insertion boss (34b), and the combustion chamber (40).

[0060] Fig. 1 further shows a second intake valve opening (37) provided on the air intake end (6b) side than the intake valve opening (2a) is, and a second intake air exit port wall (37a). The intake valve opening (2a) belongs to a helical air intake port, and the second intake valve opening (37) belongs to a tangential air intake port. Fig. 1 further shows an inter-intake-port-wall channel (38) between the intake air exit port wall (2b) and the second intake air exit port wall (37a).

Claims

1. A water cooled engine comprising a cylinder head (6), the cylinder head (6) including an air intake port (2), an exhaust port (3), and a head water jacket (20) that allows an engine cooling water (36) to pass around the ports (2, 3), wherein

when an extending direction of a crankshaft (8) is a front-rear direction and a width direction of the cylinder head (6) being perpendicular to the front-rear direction is a lateral direction, a laterally one end of the cylinder head (6) is an exhaust end (6a) and a laterally other end of the cylinder head (6) is an air intake end (6b),

the exhaust port (3) includes a first exhaust valve opening (3a) and a second exhaust valve opening (3b) provided on the exhaust end (6a) side relative to the first exhaust valve opening (3a), an exhaust port wall including a first exhaust entrance port wall (3d) on the first exhaust valve opening (3a) side and a second exhaust entrance port wall (3e) on the second exhaust valve opening (3b) side,

the head water jacket (20) includes an inter-exhaust-port-wall water channel (29) between the first exhaust entrance port wall (3d) and the second exhaust entrance port wall (3e),

the cylinder head (6) includes a cooling water injection passage (27) provided at a bottom wall (6c) of the cylinder head (6), the cooling water injection passage (27) being positioned on the exhaust end (6a) side, and including a passage entrance (27a) provided on the exhaust end (6a) side and a passage exit (27b) directed toward the inter-exhaust-port-wall water channel (29), and

the exhaust port wall includes a heat dissipation fin (28) extending from the first exhaust entrance port wall (3d) toward the exhaust end (6a), a space between the heat dissipation fin (28) and the second exhaust entrance port wall (3e) forming a water channel entrance (29a) of the inter-exhaust-port-wall water channel (29),

wherein an air intake port wall includes an intake air exit port wall (2b) provided on an intake valve opening (2a) side, and the head water jacket (20) includes an inter-intake/exhaust-port-wall water channel (30) between the intake air exit port wall (2b) and the second exhaust entrance port wall (3e), and

the cylinder head (6) includes a second cooling water injection passage (31) provided at the bottom wall (6c) of the head water jacket (20), the second cooling water injection passage (31) including a second passage entrance (31a) provided on the exhaust end (6a) side and a second passage exit (31b) directed to a water channel entrance (30a) of the inter-intake/exhaust-port-wall water channel (30),

characterised in that the cylinder head (6) includes a second heat dissipation fin (32) along a lower surface (6f) of a ceiling wall (6d) of the cylinder head (6), and

between the second heat dissipation fin (32) and the bottom wall (6c) of the cylinder head (6), a constricted passage (32a) is provided, the constricted passage (32a) being disposed upstream in a flow direction in the inter-intake/exhaust-port-wall water channel (30),

wherein the cylinder head (6) includes a push rod chamber wall (6e) provided on the exhaust end (6a) side at a position opposing to an intake valve shaft insertion boss (2c), and

the second heat dissipation fin (32) is provided to

extend between the intake valve shaft insertion boss (2c) and the push rod chamber wall (6e).

2. The water cooled engine according to claim 1, wherein a water channel exit (29b) of the inter-exhaust-port-wall water channel (29) is directed to a fuel injector (15).

3. The water cooled engine according to claims 1 or 2, wherein the second cooling water injection passage (31) is positioned on the exhaust end (6a) side.

4. The water cooled engine according to any preceding claim, wherein the second heat dissipation fin (32) is positioned farther from the inter-intake/exhaust-port-wall water channel (30) than the second passage exit (31b) of the second cooling water injection passage (31) is.

5. The water cooled engine according to any preceding claim, wherein a water channel exit (30b) of the inter-intake/exhaust-port-wall water channel (30) is directed to a fuel injector (15).

6. The water cooled engine according to any preceding claim, further comprising a head gasket (33) interposed between the cylinder block (5) and the cylinder head (6), wherein
the bottom wall (6c) of the cylinder head (6) includes a combustion chamber ceiling wall (34) and a pushing wall (35) positioned on an outer circumferential side of the combustion chamber ceiling wall (34) and pushing a bead (33a) of the head gasket (33), and
in the bottom wall (6c) of the cylinder head (6), the pushing wall (35) is greater in thickness than an outer peripheral part (34a) of the combustion chamber ceiling wall (34) being adjacent to the pushing wall (35).

Patentansprüche

1. Wassergekühlter Motor, einen Zylinderkopf (6) umfassend, wobei der Zylinderkopf (6) einen Lufteinlasskanal (2), einen Auslasskanal (3) und einen Kopfwassermantel (20) einschließt, der einem Motorkühlwasser (36) ermöglicht, um die Kanäle (2, 3) herum zu strömen, wobei,
wenn eine Erstreckungsrichtung einer Kurbelwelle (8) eine Front-Heck-Richtung und eine Breitenrichtung des Zylinderkopfs (6), die senkrecht zur Front-Heck-Richtung verlauft, eine Seitenrichtung ist, ein seitliches Ende des Zylinderkopfs (6) ein Auslassende (6a) ist und ein anderes seitliches Ende des Zylinderkopfs (6) ein Lufteinlassende (6b) ist,
der Auslasskanal (3) eine erste Auslassventilöffnung (3a) und eine zweite Auslassventilöffnung (3b) einschließt, die im Verhältnis zur ersten Auslassventilöffnung (3a) auf der Seite des Auslassendes (6a) vorgesehen ist, wobei eine Auslasskanalwand eine erste Auslasseingangskanalwand (3d) auf der Seite der ersten Auslassventilöffnung (3a) und eine zweite Auslasseingangskanalwand (3e) auf der Seite der zweiten Auslassventilöffnung (3b) einschließt,
der Kopfwassermantel (20) einen in einer Wand zwischen Auslasskanälen befindlichen Wasserkanal (29) zwischen der ersten Auslasseingangskanalwand (3d) und der zweiten Auslasseingangskanalwand (3e) einschließt,
der Zylinderkopf (6) einen Kühlwasserinjektionsdurchgang (27) einschließt, der an einer unteren Wand (6c) des Zylinderkopfs (6) vorgesehen ist, wobei der Kühlwasserinjektionsdurchgang (27) auf der Seite des Auslassendes (6a) angeordnet ist und einen Durchgangseingang (27a) einschließt, der auf der Seite des Auslassendes (6a) vorgesehen ist, und einen Durchgangsausgang (27b), der in Richtung des in einer Wand zwischen Auslasskanälen befindlichen Wasserkanals (29) zeigt, und
die Auslasskanalwand eine Wärmeableitungsrippe (28) einschließt, die sich von der ersten Auslasseingangskanalwand (3d) in Richtung des Auslassendes (6a) erstreckt, wobei ein Zwischenraum zwischen der Wärmeableitungsrippe (28) und der zweiten Auslasseingangskanalwand (3e) einen Wasserkanaleingang (29a) des in einer Wand zwischen Auslasskanälen befindlichen Wasserkanals (29) bildet,
wobei eine Lufteinlasskanalwand eine Einlassluftausgangskanalwand (2b) einschließt, die auf einer Seite der Einlassventilöffnung (2a) vorgesehen ist, und der Kopfwassermantel (20) einen in einer Wand zwischen Einlass-und Auslasskanal befindlichen Wasserkanal (30) zwischen der Einlassluftausgangskanalwand (2b) und der zweiten Auslasseingangskanalwand (3e) einschließt und
der Zylinderkopf (6) einen zweiten Kühlwasserinjektionsdurchgang (31) einschließt, der an der unteren Wand (6c) des Kopfwassermantels (20) vorgesehen ist, wobei der zweite Kühlwasserinjektionsdurchgang (31) einen Eingang des zweiten Durchgangs (31a) einschließt, der auf der Seite des Auslassendes (6a) vorgesehen ist, und einen Ausgang des zweiten Durchgangs (31b), der in Richtung eines Wasserkanaleingangs (30a) des in einer Wand zwischen Einlass-und Auslasskanal befindlichen Wasserkanals (30) zeigt,
dadurch gekennzeichnet, dass der Zylinderkopf (6) eine zweite Wärmeableitungsrippe (32) entlang einer unteren Fläche (6f) einer Deckenwand (6d) des Zylinderkopfs (6) einschließt und
zwischen der zweiten Wärmeableitungsrippe (32) und der unteren Wand (6c) des Zylinderkopfs (6) ein verengter Durchgang (32a) vorgesehen ist, wobei der verengte Durchgang (32a) in einer Strömungsrichtung im in einer Wand zwischen Einlass-und Auslasskanal befindlichen Wasserkanal (30) stromaufwärts angeordnet ist,

wobei der Zylinderkopf (6) eine Stößelstangenkammerwand (6e) einschließt, die auf der Seite des Auslassendes (6a) in einer Position gegenüber einem Einlassventilschaft-Einführungsvorsprung (2c) vorgesehen ist, und
die zweite Wärmeableitungsrippe (32) so vorgesehen ist, dass sie sich zwischen dem Einlassventilschaft-Einführungsvorsprung (2c) und der Stößelstangenkammerwand (6e) erstreckt.

2. Wassergekühlter Motor gemäß Anspruch 1, wobei ein Wasserkanalausgang (29b) des in einer Wand zwischen Auslasskanälen befindlichen Wasserkanals (29) in Richtung eines Einspritzventils (15) zeigt.

3. Wassergekühlter Motor gemäß Anspruch 1 oder 2, wobei der zweite Kühlwasserinjektionsdurchgang (31) auf der Seite des Auslassendes (6a) angeordnet ist.

4. Wassergekühlter Motor gemäß einem der vorhergehenden Ansprüche, wobei die zweite Wärmeableitungsrippe (32) weiter vom in einer Wand zwischen Einlass-und Auslasskanal befindlichen Wasserkanal (30) weg ist als der Ausgang des zweiten Durchgangs (31b) des zweiten Kühlwasserinjektionsdurchgangs (31).

5. Wassergekühlter Motor gemäß einem der vorhergehenden Ansprüche, wobei ein Wasserkanalausgang (30b) des in einer Wand zwischen Einlass-und Auslasskanal befindlichen Wasserkanals (30) in Richtung eines Einspritzventils (15) zeigt.

6. Wassergekühlter Motor gemäß einem der vorhergehenden Ansprüche, ferner eine Kopfdichtung (33) umfassend, die zwischen den Zylinderblock (5) und den Zylinderkopf (6) gelegt ist, wobei
die untere Wand (6c) des Zylinderkopfs (6) eine Brennraumdeckenwand (34) und eine Druckwand (35) einschließt, die an einer Außenumfangsseite der Brennkammerdeckenwand (34) angeordnet ist und einen Wulst (33a) der Kopfdichtung (33) drückt, und
in der unteren Wand (6c) des Zylinderkopfs (6) die Druckwand (35) eine größere Dicke hat als ein Außenumfangsteil (34a) der Brennkammerdeckenwand (34), das sich neben der Druckwand (35) befindet.

Revendications

1. Moteur refroidi par eau comprenant une culasse (6), la culasse (6) comprenant un orifice d'admission d'air (2), un orifice d'échappement (3), et une chemise d'eau de culasse (20) permettant à l'eau de refroidissement d'un moteur (36) de circuler autour des orifices (2, 3), dans lequel
lorsqu'une direction d'extension d'un vilebrequin (8) est une direction d'avant en arrière, et le sens de la largeur de la culasse (6), étant perpendiculaire à la direction d'avant en arrière, est une direction latérale, une extrémité latérale de la culasse (6) est une extrémité d'échappement (6a), et un autre extrémité latérale de la culasse (6) est une extrémité d'admission d'air (6b),
l'orifice d'échappement (3) comprend une première ouverture de soupape d'échappement (3a) et une deuxième ouverture de soupape d'échappement (3b), pratiquées sur l'extrémité d'échappement (6a) relativement à la première ouverture de soupape d'échappement (3a), une paroi d'orifice d'échappement comprend une première paroi d'orifice d'entrée de l'échappement (3d) sur le côté de la première ouverture de soupape d'échappement (3a), et une deuxième paroi d'orifice d'entrée de l'échappement (3e) sur le côté de la deuxième ouverture de soupape d'échappement (3b),
la chemise d'eau de culasse (20) comprend une conduite d'eau inter paroi d'orifice d'échappement (29) entre la première paroi d'orifice d'entrée de l'échappement (3d) et la deuxième paroi d'orifice d'entrée de l'échappement (3e),
la culasse (6) comprend un passage d'injection d'eau de refroidissement (27) pratiqué sur une paroi inférieure (6c) de la culasse (6), le passage d'injection d'eau de refroidissement (27) étant positionné sur le côté de l'extrémité d'échappement (6a), et comprenant une entrée du passage (27a) pratiquée sur l'extrémité d'échappement (6a), et une sortie du passage (27b) dirigée vers la conduite d'eau inter paroi d'orifice d'échappement (29), et
la paroi d'orifice d'échappement comprend une ailette de dissipation thermique (28) déployée de la paroi d'orifice d'entrée de l'échappement (3d) vers l'extrémité d'échappement (6a), un espace entre l'ailette de dissipation thermique (28) et la deuxième paroi d'orifice d'entrée de l'échappement (3e) formant une entrée de la conduite d'eau (29a) de la conduite d'eau inter paroi d'orifice d'échappement (29),
une paroi d'orifice d'admission d'air comprend une paroi d'orifice d'évacuation d'air (2b) placée sur un côté d'ouverture de soupape d'admission (2a), et la chemise d'eau de culasse (20) comprend une conduite d'eau inter paroi d'orifice d'admission/échappement (30) entre la paroi d'orifice d'échappement d'air (2b) et la deuxième paroi d'orifice d'entrée de l'échappement (3e), et
la culasse (6) comprend un deuxième passage d'injection d'eau de refroidissement (31) pratiqué sur la paroi inférieure (6c) de la chemise d'eau de culasse (20), le deuxième passage d'injection d'eau de refroidissement (31) comprend une entrée du deuxième passage (31a) pratiquée sur le côté de l'extrémité d'échappement (6a), et une sortie du deuxième pas-

sage (31b), dirigée vers une entrée de conduite d'eau (30a) de la conduite d'eau inter paroi d'orifice d'admission/échappement (30),
caractérisé en ce que la culasse (6) comprend une deuxième ailette de dissipation thermique (32) le long d'une surface inférieure (6f) d'une paroi de plafond (6d) de la culasse (6), et
entre la deuxième ailette de dissipation thermique (32) et la paroi inférieure (6c) de la culasse (6), un passage resserré (32a) a été pratiqué, le passage resserré (32a) étant disposé en amont dans un sens du débit de la conduite d'eau inter paroi d'orifice d'admission/échappement (30),
la culasse (6) comprend une paroi de chambre de tige poussoir (6e) pratiquée sur un côté d'extrémité d'échappement (6a), dans une position opposée à un bossage d'insertion d'arbre de soupape d'admission (2c), et
la deuxième ailette de dissipation thermique (32) a été agencée pour se déployer entre le bossage d'insertion d'arbre de soupape d'admission (2c) et la paroi de chambre de tige poussoir (6e).

2. Moteur refroidi par eau selon la revendication 1, une sortie de la conduite d'eau (29b) de la conduite d'eau inter paroi d'orifice d'échappement (29) étant dirigée vers un injecteur de carburant (15).

3. Moteur refroidi par eau selon la revendication 1 ou 2, le deuxième passage d'injection d'eau de refroidissement (31) étant positionné sur le côté de l'extrémité d'échappement (6a).

4. Moteur refroidi par eau selon une quelconque des revendications précédentes, la deuxième ailette de dissipation thermique (32) étant positionnée plus loin de la conduite d'eau inter paroi d'orifice d'admission/échappement (30) que la sortie du deuxième passage (31b) du deuxième passage d'injection d'eau de refroidissement (31).

5. Moteur refroidi par eau selon une quelconque des revendications précédentes, une sortie de la conduite d'eau (30b) de la conduite d'eau inter paroi d'orifice d'admission/échappement (30) étant dirigée vers un injecteur de carburant (15).

6. Moteur refroidi par eau selon une quelconque des revendications précédentes, comprenant en outre un joint de culasse (33) intercalé entre le bloc-cylindres (5) et la culasse (6), dans lequel
la paroi inférieure (6c) de la culasse (6) comprend une paroi de plafond de chambre de combustion (34) et une paroi de poussée (35) positionnée sur un côté circonférentiel extérieur de la paroi de plafond de chambre de combustion (34), et poussant une nervure (33a) du joint de culasse (33), et
dans la paroi inférieure (6c) de la culasse (6), l'épaisseur de la paroi de poussée (35) est supérieure à celle d'une partie périphérique extérieure (34a) de la paroi de plafond de chambre de combustion (34) adjacente à la paroi de poussée (35).

FIG. 1A

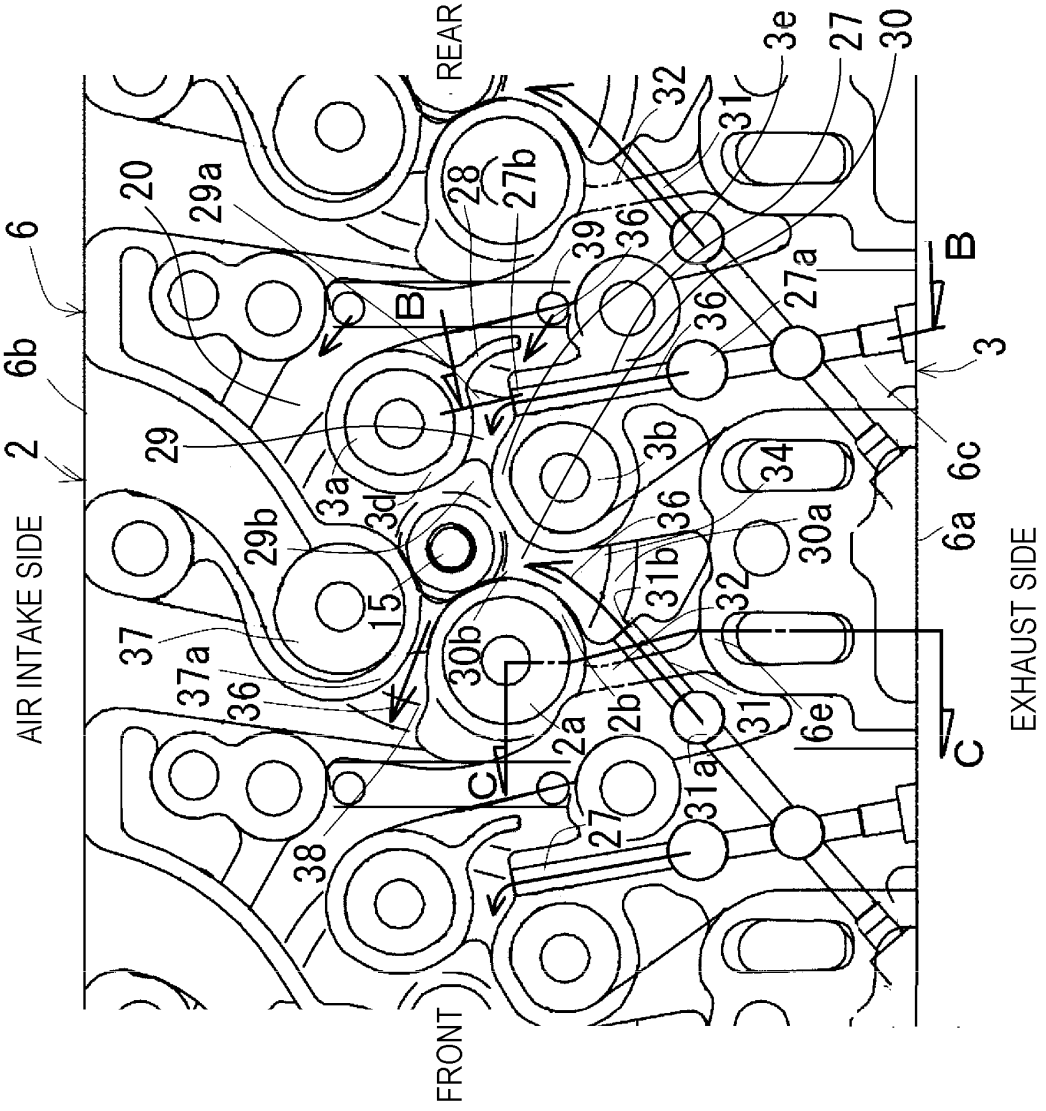


FIG. 1B

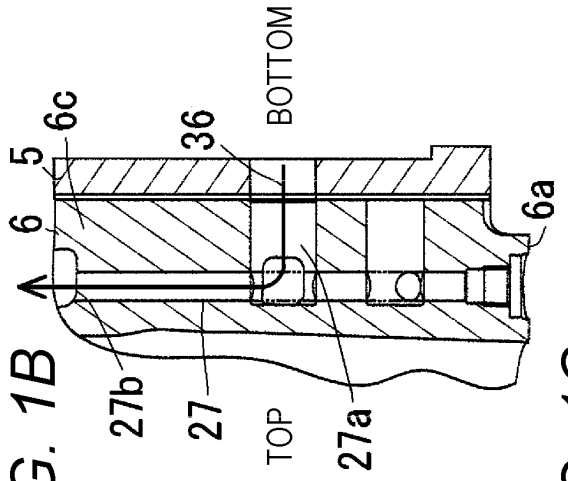


FIG. 1C

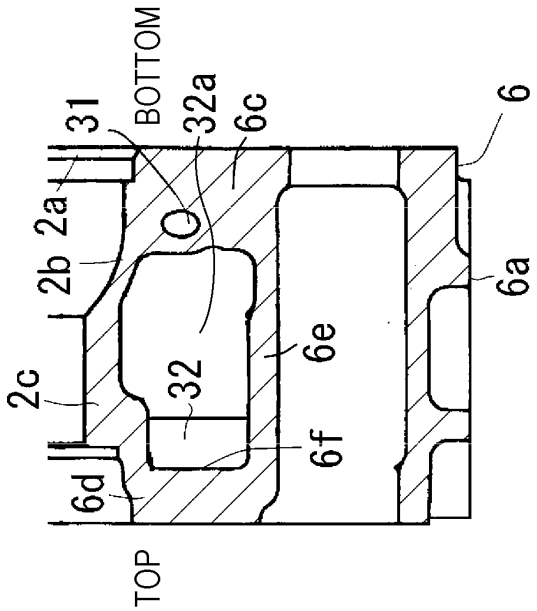


FIG. 2

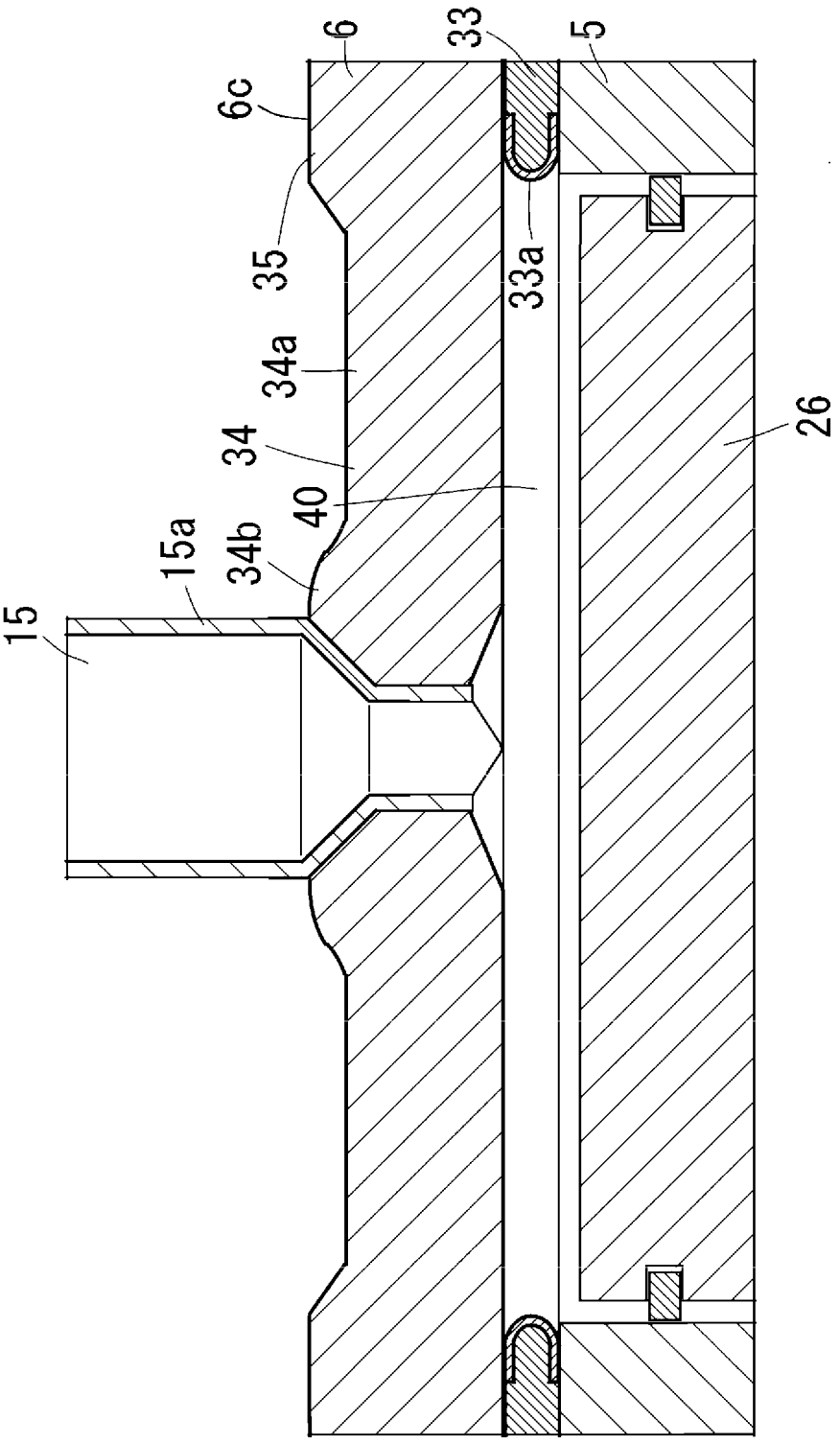


FIG. 3

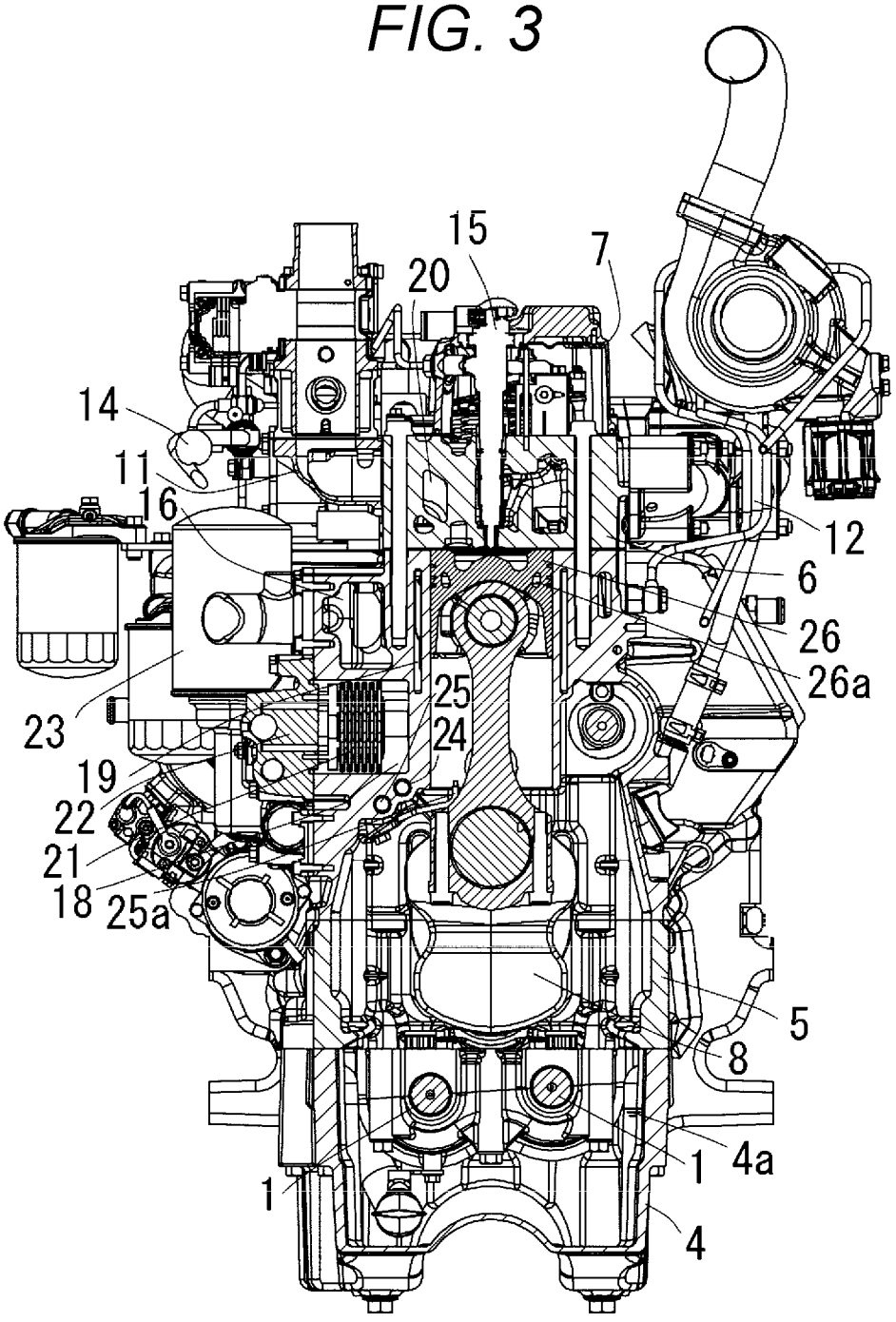


FIG. 4

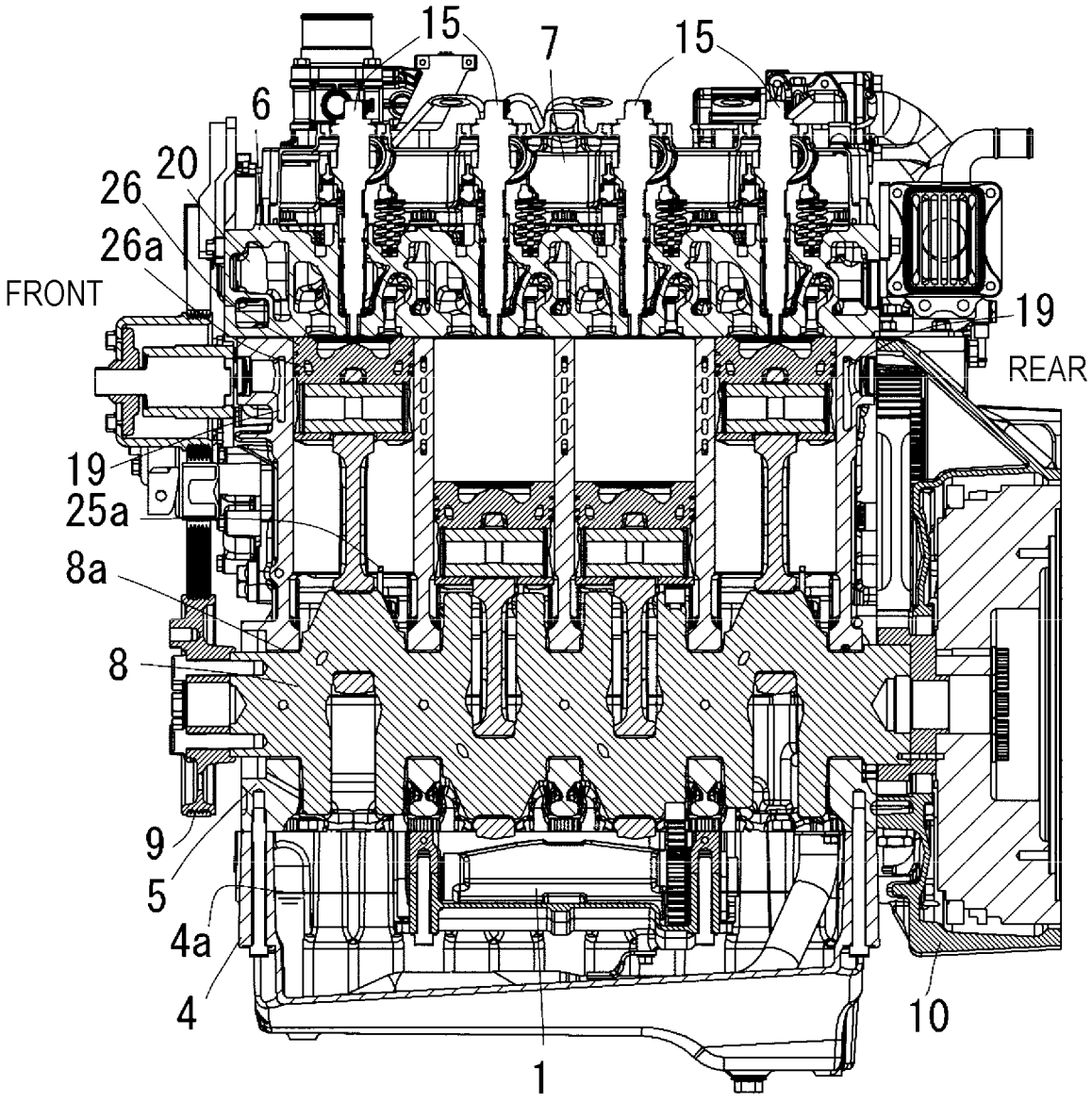


FIG. 5

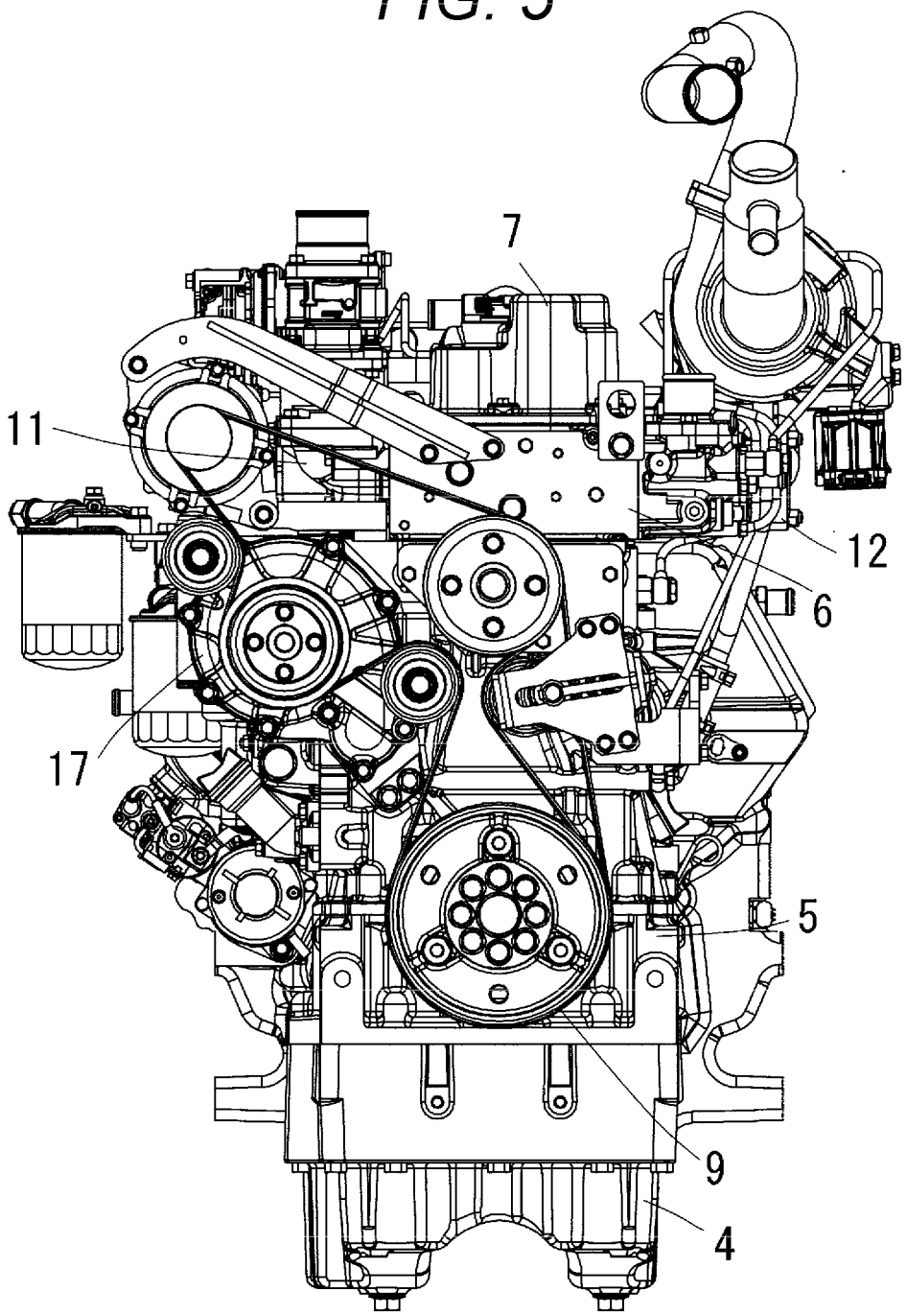


FIG. 6

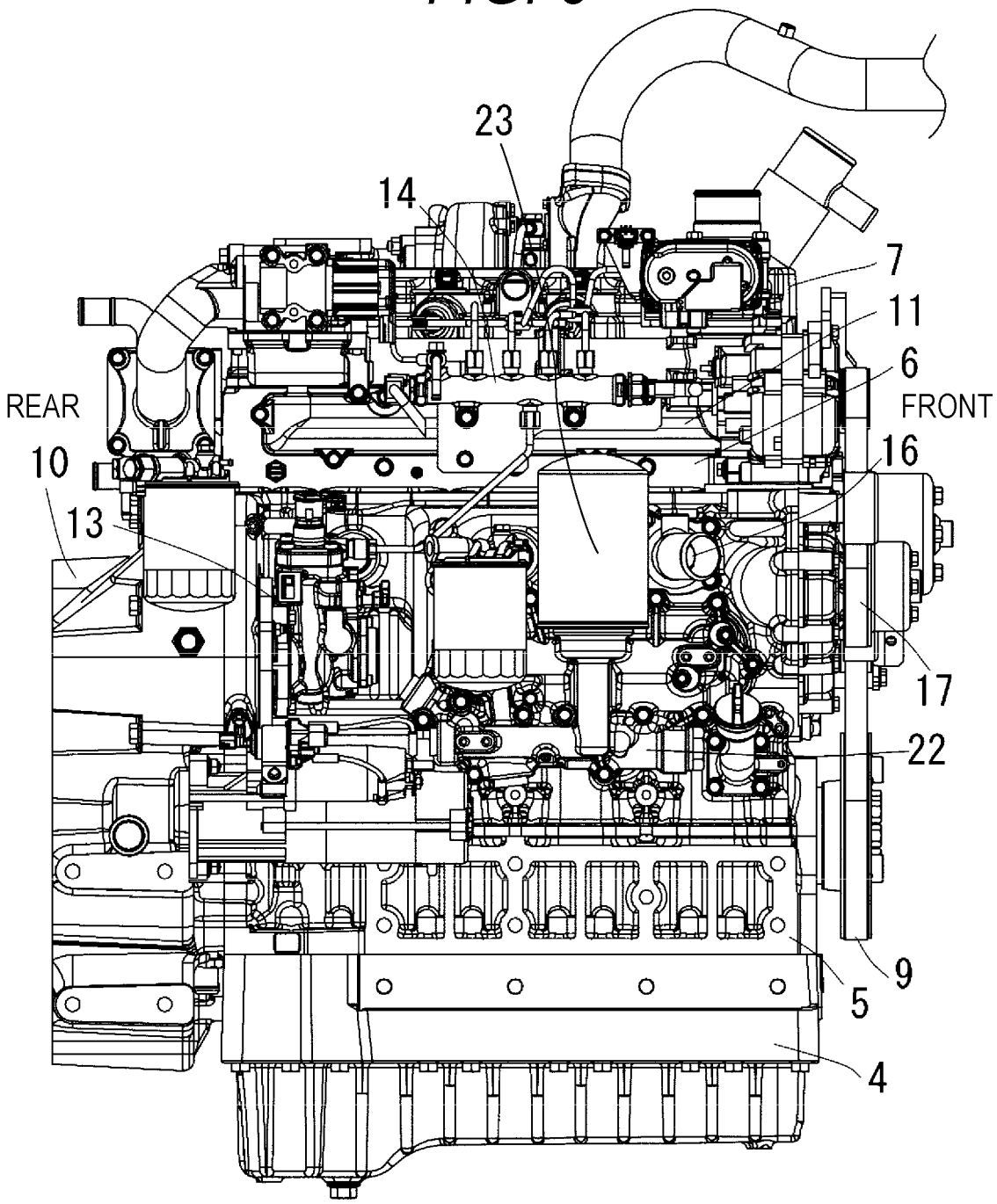
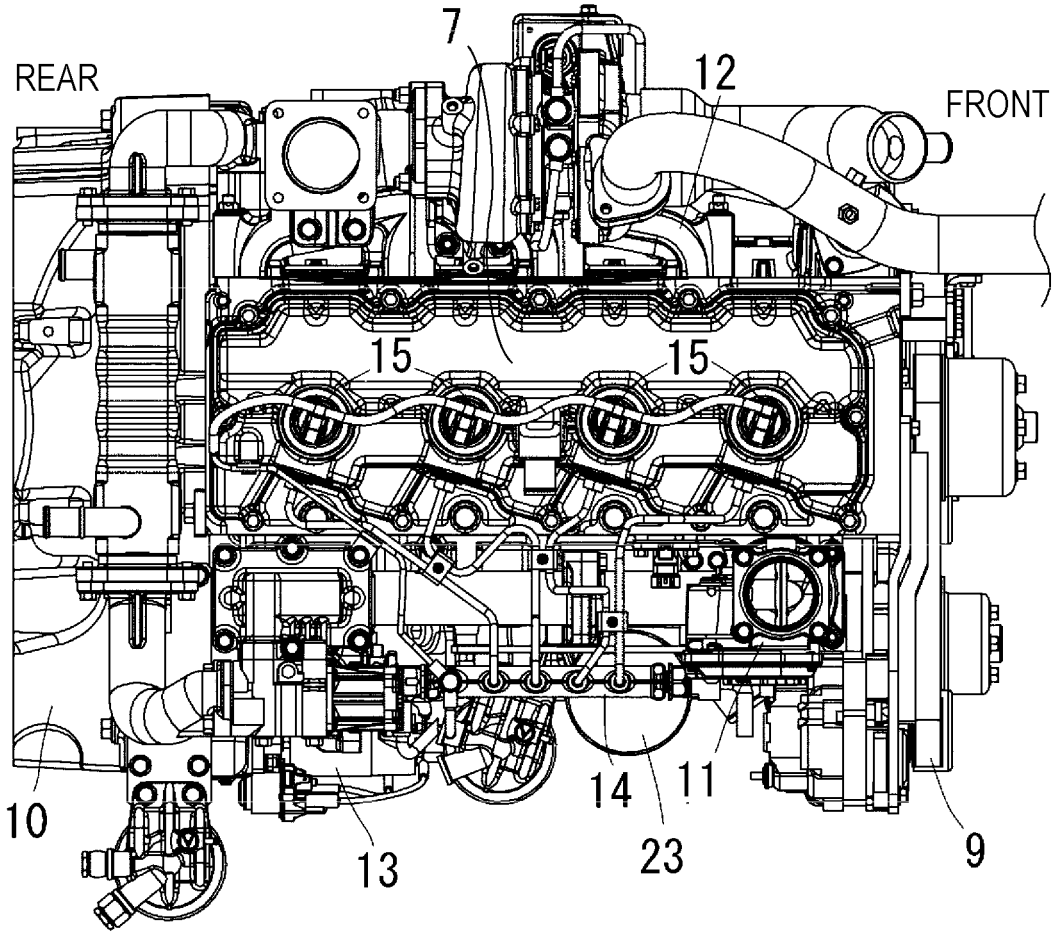


FIG. 7



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