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(54) **Sensor mounting structure for engine**

Sensoranordnung für eine Brennkraftmaschine

Agencement d'un capteur pour un moteur à combustion interne

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- **PATENT ABSTRACTS OF JAPAN vol. 2002, no. 12, 12 December 2002 (2002-12-12) & JP 2002 221040 A (SUZUKI MOTOR CORP), 9 August 2002 (2002-08-09)**
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Description

[0001] This invention relates to a sensor mounting structure for an engine. In preferred examples, a sensor is mounted to an outer wall of a crankcase.

[0002] A conventional sensor mounting structure for an engine is disclosed in JP-A-Hei 6-288329. According to the publication, the engine has a crankcase, a crankshaft supported with the crankcase to rotate around an axis extending approximately in the horizontal direction, a cylinder supported on a top of the crankcase, and a sensor mounted to an outer wall of the crankcase for detecting engine driving conditions.

[0003] The sensor, a crank angle detecting sensor, is mounted to the outer wall of the crankcase above the axis of the crankshaft. The sensor includes a protrusion that protrudes outward from the outer wall of the crankcase. The protrusion of the sensor is provided in a space between an outer surface of the crankcase and an inner surface of a flywheel fixedly attached to an end of the crankshaft.

[0004] In the engine driving, the sensor detects a crank angle and ignition timing is determined generally based on the output signal so that the engine can obtain a desired driving condition.

[0005] The sensor described in the above prior art is mounted to the outer wall of the crankcase above the axis of the crankshaft. This results in the sensor being placed closer to the outer wall of the cylinder. In addition to that, the protrusion of the sensor protrudes outward from the outer wall of the crankcase, facing the cylinder.

[0006] The cylinder is heated to high temperature due to the engine driving. In an area adjacent to the outer side of the crankcase and the cylinder, exhaust pipes extending from the cylinder are generally provided. The protrusion of the sensor faces the exhaust pipes which are also heated to high temperature. This causes the protrusion of the sensor to tend to be subjected to high radiant heat generated by the cylinder and the exhaust pipes, which may involve a problem with sensor service life.

[0007] The sensor described in the prior art is also covered from the outside with the flywheel, which interferers with works including mounting of the sensor to the crankcase and sensor maintenance. This causes these works to be more complicated.

[0008] Another conventional sensor mounting is disclosed in JP07286537 in which the sensor 32 is mounted away from the pistion, below the crank axis.

[0009] This invention is made in view of the preceding circumstances, and the object of examples is to provide a sensor mounting structure to prevent the sensor mounted to the outer wall of the crankcase from being subjected to radiant heat generated by the cylinder and the exhaust pipes, and to facilitate works including mounting of the sensor to the crankcase and the sensor maintenance.

[0010] In order to seek to solve the foregoing problems, a sensor mounting structure for an engine according to an aspect of the present invention is as follows. Reference numerals denoting the terms herein are not to be interpreted as a limitation of the technical scope of the present invention to the descriptions of embodiments of the invention to be discussed later, or as a limitation in any way.

[0011] According to an aspect of the invention there is provided a crankcase (2) with a sensor (25) according to claim 1.

[0012] Preferably the engine has exhaust pipes 10 provided in an area adjacent to the outer side of the crankcase 2,
wherein the cover member 29 is provided between the exhaust pipes 10 and the sensor 25.

[0013] Preferably the cover member 29 is placed so as to cover the sensor 25 from below.

[0014] Preferably the engine has the crankcase 2 including upper and lower cases 13 and 14 which are separated approximately relative to the axis 3 of the crankshaft 4, the lower case 14 having the outer wall 11 comprising a vertical wall 16 extending vertically, upper and lower outward flanges 17 and 18 formed integrally with upper and lower edges of the vertical wall 16, respectively, and ribs 20 formed integrally with an outer surface of the vertical wall 16 and vertically extending;
wherein at least any one of the upper and lower outward flanges 17 and 18, and the rib 20 integrally extends outward from the crankcase 2 to form the cover member 29.

[0015] Preferred features of the present invention will now be described, purely by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view showing a part of a lower case of a crankcase.
Fig. 2 is a side view of an engine.
Fig. 3 is a sectional view showing a front part of the engine.

[0016] In the drawings, reference numeral 1 designates a multi-cylinder (four-cylinder) four-cycle engine (internal combustion engine) mounted on a vehicle such as an automobile.

[0017] The engine 1 has a crankcase 2 supported on a vehicle body, a crankshaft 4 supported with the crankcase 2 to rotate around an axis 3 extending approximately in the horizontal direction, a cylinder 6 integrally attached to and supported with the top of the crankcase 2, an oil pan 8 attached to and supported with the bottom of the crankcase 2, intake pipes 9 extending outward in the radial direction of the crankshaft 4 from one side of the cylinder 6, and exhaust pipes 10 extending outward from the other side of the cylinder 6 and then extending downward.

[0018] The exhaust pipes 10 each have an extending portion provided across an area adjacent to the outer side of the other side of the cylinder 6, and an area adjacent to the outer side of the outer wall 11 of the crankcase 2 and continuing below the other side of the cylinder

6. The extending portions of the respective exhaust pipes 10 are provided in the axial direction of the crankshaft 4 in an area adjacent to the outer side of an approximate midsection between the crankcase 2 and the cylinder 6.

[0019] The crankcase 2 includes an upper case 13 and a lower case 14 which are separated approximately relative to the axis 3 of the crankshaft 4. The crankshaft 4 is supported between the upper case 13 and the lower case 14. The lower case 14 is a bulkhead or rudder frame. The outer wall 11 of the lower case 14 comprises a vertical wall 16 extending vertically, upper and lower outward flanges 17 and 18 integrally formed with upper and lower edges of the vertical wall 16 respectively, an edge outward flange 19 integrally formed with an edge of the vertical wall 16 in the axial direction of the crankshaft 4, and plural ribs 20 integrally formed with the outer surface of the vertical wall 16 and vertically extending to reinforce the vertical wall 16.

[0020] The bottom of the upper case 13 and the upper outward flange 17 of the lower case 14 are fastened to each other with a fastener 22. To the lower outward flange 18 of the lower case 14 is fastened a top of the oil pan 8 with a fastener 23 so that the oil pan 8 is supported with the bottom of the crankcase 2.

[0021] The engine 1 comprises a sensor 25 mounted to the outer wall 11 of the crankcase 2 with a fastener 24 for detecting engine driving conditions, and a disc-shaped detected element 26 to be detected by the sensor 25, which rotates with the crankshaft 4. The sensor 25, a crank angle detecting sensor, uses a magnetic sensor or an optical sensor. On an outer circumferential surface of the detected element 26 are formed multiple detected teeth. When the detected element 26 rotates with the crankshaft 4, the sensor 25 outputs an electrical pulse signal as a detection signal every time each detected tooth approaches the sensor 25. In other words, the sensor 25 outputs a crankshaft angle detection signal. Ignition timing is determined based on the detection signal, which allows the engine 1 to be driven under desired conditions.

[0022] The sensor 25 is mounted to the vertical wall 16 of the outer wall 11 of the lower case 14 provided below the axis 3 of the crankshaft 4. The sensor 25 is mounted to the end on the edge outer flange 19 in the axial direction of the crankshaft 4. The sensor 25 includes a protrusion 25a protruding outward from the vertical wall 16 of the outer wall 11 of the lower case 14.

[0023] A cover member 29 for covering the protrusion 25a of the sensor 25 from the outside is integrally formed to protrude outward from the outer wall 11 of the lower case 14 in the direction along the outer surface of the outer wall 11 of the crankcase 2.

[0024] The cover member 29 comprises upper and lower cover members 30 and 31 formed by integrally extending outer peripheries of the upper and lower outward flanges 17 and 18 outward from the lower case 14 of the crankcase 2, and a side cover member 32 formed by extending an outer periphery of one of the ribs 20, which is adjacent to the edge outward flange 19 in the axial direction of the crankshaft 4.

[0025] The sensor 25 is provided in a space 33 enclosed by the edge outward flange 19, the upper cover member 30, the lower cover member 31, and the side cover member 32. The space 33 is opened to the outside of the lower case 14 of the crankcase 2. The sensor 25 can be inserted in the space 33 through its opening. The space 33 is used as a part of the working space to mount the sensor 25 to the lower case 14 and maintain the sensor 25.

[0026] According to the structure described above, the sensor 25 is mounted to the outer wall 11 of the crankcase 2 below the axis 3 of the crankshaft 4.

[0027] This allows the sensor 25 to be placed apart from and further below the cylinder 6 heated to high temperature, which differs from the conventional art in which the sensor 25 is mounted to the outer wall 11 of the crankcase 2 above the axis 3 of the crankshaft 4. The protrusion 25a of the sensor 25 is therefore prevented from being subjected to radiant heat generated by the cylinder 6, which is preferable to the sensor 25 for its service life.

[0028] The cover member 29 for covering at least a part of the sensor 25 from the outside is integrally formed to protrude outward from the outer wall 11 of the crankcase 2 in the direction along the outer surface of the crankcase 2.

[0029] The cover member 29 can therefore prevent the radiant heat generated by the cylinder 6 and the exhaust pipes 10 in the direction along the outer surface of the crankcase 2 from reaching the protrusion 25a of the sensor 25. This can avoid the protrusion 25a of the sensor 25 from being subjected to the radiant heat more reliably.

[0030] The cover member 29 covers the protrusion 25a of the sensor 25 as described above, which also prevents the sensor 25 from being accidentally subjected to external forces generated by objects external to the sensor 25 during assembly and the deliveries of the engine 1. The sensor 25 is therefore protected from these external forces, and from damage.

[0031] In addition, the cover member 29 integrally protrudes outward from the outer wall 11 of the crankcase 2, which differs from the conventional art in which the sensor 25 is covered from the outside. This can prevent the cover member 29 from interfering with works, including mounting of the sensor 25 to the outer wall 11 of the crankcase 2 and maintenance of the sensor 25, to be performed from the outside of the crankcase 2, which facilitates these works.

[0032] As described above, in the engine having the exhaust pipes 10 provided in the area adjacent to the outer side of the crankcase 2, the upper cover member 30 and the side cover member 32 of the cover member 29 are provided between the exhaust pipes 10 and the protrusion 25a of the sensor 25.

[0033] This allows the upper cover member 30 and the side cover member 32 of the cover member 29 to more reliably prevent the protrusion 25a of the sensor 25 from

being subjected to the radiant heat generated by the exhaust pipes 10.

[0034] Also as described above, the lower cover member 31 of the cover member 29 is placed so as to cover the sensor 25 from below.

[0035] Thus, in the engine 1 mounted to a vehicle; for example, the lower cover member 31 of the cover member 29 prevents small stones thrown up by the wheels while driving from hitting the sensor 25, which avoid damage to the sensor 25.

[0036] Also as described above, the cover member 29 is formed by allowing the upper and lower outward flanges 17 and 18, and the ribs 20 to integrally extend outward from the crankcase 2.

[0037] The cover member 29 is formed with the upper and lower outward flanges 17 and 18, and the ribs 20. This means that the sensor 25 can be prevented from being subjected to heat and being damaged by the simply-structured cover member 29.

[0038] In addition, the upper and lower outward flanges 17 and 18, and the ribs 20 have high strength for their functions. Accordingly, the cover member 29 formed with them can readily have high strength. Therefore, the cover member 29 can more reliably prevent the sensor 25 from being damaged due to external forces.

[0039] The lower outward flange 18 and the lower cover member 31 have the respective bottom surfaces flush with each other. During the engine 1 assembly, when the lower case 14 is fixed to a workbench with cramps, the lower cover member 31 of the cover member 29 is placed on the workbench. This allows the lower cover member 31 to be used to fix the lower case 14 thereto with the cramps.

[0040] Unlike the above embodiment exemplified by the accompany drawings, the sensor 25 may be mounted to the outer wall 11 constituting an end face of the crankcase 2 in the axial direction of the crankshaft 4. The cover member 29 may be provided separately from the upper and lower outward flanges 17 and 18, and the ribs 20.

[0041] The protrusion 25a of the sensor 25, which protrudes from the outer wall 11 of the crankcase 2, may be smaller in dimension than that of the cover member 29. This can more reliably prevent the protrusion 25a of the sensor 25 from being subjected to the external radiant heat and being damaged due to the external forces.

[0042] Effects of preferred features of the invention are as follows.

[0043] An aspect of the present invention provides a sensor mounting structure for an engine having a crankcase, a crankshaft supported with the crankcase to rotate around an axis extending approximately in the horizontal direction, a cylinder supported on a top of the crankcase, and a sensor, mounted to an outer wall of the crankcase, for detecting engine driving conditions;
wherein the sensor is mounted to the outer wall of the crankcase below the axis of the crankshaft.

[0044] This allows the sensor to be placed apart from and further below the cylinder heated to high temperature, which differs from the conventional art in which the sensor is mounted to the outer wall of the crankcase above the axis of the crankshaft. The sensor is therefore prevented from being subjected to radiant heat generated by the cylinder, which is preferable to the sensor for its service life.

[0045] The cover member for covering the sensor from the outside is preferably integrally formed to protrude outward from the outer wall of the crankcase in the direction along the outer surface of the crankcase.

[0046] A cover member can therefore prevent the radiant heat generated by the cylinder and the exhaust pipes in the direction along the outer surface of the crankcase from reaching the sensor. This can avoid the sensor from being subjected to the radiant heat more reliably.

[0047] The cover member preferably covers the sensor as described above, which also prevents the sensor from being accidentally subjected to external forces generated by objects external to the sensor during engine assembly and the deliveries. The sensor is therefore protected from these external forces, and from damage.

[0048] In addition, the cover member preferably integrally protrudes outward from the outer wall of the crankcase, which differs from the conventional art in which the sensor is covered from the outside. This can prevent the cover member from interfering with works, including mounting of the sensor to the outer wall of the crankcase and maintenance of the sensor, to be performed from the outside of the crankcase, which facilitates these works.

[0049] Preferably the engine has exhaust pipes provided in an area adjacent to the outer side of the crankcase;
wherein the cover member is provided between the exhaust pipes and the sensor.

[0050] The cover member can therefore avoid the sensor from being subjected to the radiant heat generated by the exhaust pipes more reliably.

[0051] Preferably in the sensor mounting structure for an engine, the cover member is placed so as to cover the sensor from below.

[0052] Thus, in the engine mounted to a vehicle, for example, the cover member prevents small stones thrown up by the wheels while driving from hitting the sensor, which avoid damage to the sensor.

[0053] Preferably in the sensor mounting structure for an engine, in which the engine has the crankcase including upper and lower cases which are separated approximately relative to the axis of the crankshaft, the lower case having the outer wall comprising a vertical wall extending vertically, upper and lower outward flanges formed integrally with upper and lower edges of the vertical wall, respectively, and ribs formed integrally with an outer surface of the vertical wall and vertically extending;
wherein at least any one of the upper and lower outward flanges, and the rib integrally extends outward from the crankcase to form the cover member.

[0054] The cover member is preferably formed with

the upper and lower outward flanges, and the ribs. This means that the sensor can be prevented from being subjected to heat and being damaged by the simply-structured cover member.

[0055] In addition, the upper and lower outward flanges, and the ribs preferably have high strength for their functions. Accordingly, the cover member formed with them can readily have high strength. Therefore, the cover member can more reliably prevent the sensor from being damaged due to external forces.

[0056] In a preferred example, an engine 1 has a crankcase 2, a crankshaft supported with the crankcase 2 to rotate around an axis 3 extending approximately in the horizontal direction, a cylinder 6 supported on a top of the crankcase 2, and a sensor 25, mounted to an outer wall 11 of the crankcase 2, for detecting engine driving conditions. The sensor 25 is mounted to the outer wall 11 of the crankcase 2 below the axis 3 of the crankshaft. A cover member 29 for covering the sensor 25 from the outside is integrally formed to protrude outward from the outer wall 11 of the crankcase 2 in the direction along the outer surface of the crankcase 2.

[0057] Such an arrangement can prevent a sensor mounted to an outer wall of a crankcase from being subjected to radiant heat generated by a cylinder and exhaust pipes, and to facilitate works including mounting of the sensor to the crankcase and the sensor maintenance.

[0058] It will be understood that the present invention has been described above purely by way of example, and modification of detail can be made within the scope of the invention.

Explanation of Reference Numerals

[0059]

1: engine
2: crankcase
3: axis
4: crankshaft
6: cylinder
10: exhaust pipe
11: outer wall
13: upper case
14: lower case
16: vertical wall
17: upper outward flange
18: lower outward flange
19: edge outward flange
20: rib
22: fastener
23: fastener
24: fastener
25: sensor
25a: protrusion
26: detected element
29: cover member
30: upper cover member
31: lower cover member
32: side cover member
33: space

Claims

1. A crankcase (2) with a sensor (25) comprising a sensor mounting structure for an engine (1) having a crankshaft (4) supported with the crankcase to rotate around an axis (3) extending approximately in the horizontal direction, a cylinder (6) supported on a top of the crankcase, and a sensor, mounted to an outer wall (11) of the crankcase, for detecting engine driving conditions,
wherein the sensor is mounted to the outer wall of the crankcase below the axis of the crankshaft, and
characterized in that
a cover member (29) for covering the sensor from the outside is integrally formed to protrude outward from the outer wall of the crankcase in the direction along the outer surface of the crankcase.

2. The crankcase (2) with a sensor (25) comprising a sensor mounting structure for an engine according to Claim 1, the engine having exhaust pipes (10) provided in an area adjacent to the outer side of the crankcase,
wherein the cover member is provided between the exhaust pipes and the sensor.

3. The crankcase (2) with a sensor (25) comprising a sensor mounting structure for an engine according to Claim 1, wherein the cover member is placed so as to cover the sensor from below.

4. The crankcase (2) with a sensor (25) comprising a sensor mounting structure for an engine according to any one of Claims 1 through 3, the crankcase including upper and lower cases (13, 14) which are separated approximately relative to the axis of the crankshaft, the lower case having the outer wall (11) comprising a vertical wall extending substantially vertically, upper and lower outward flanges (17, 18) formed integrally with upper and lower edges of the vertical wall, respectively, and ribs (20) formed integrally with an outer surface of the vertical wall and substantially vertically extending,
wherein at least any one of the upper and lower outward flanges, and the rib integrally extends outward from the crankcase to form the cover member.

Patentansprüche

1. Kurbelgehäuse (2) mit einem Sensor (25) umfassend eine Sensormontagekonstruktion für einen Mo-

tor (1) aufweisend eine Kurbelwelle (4), die in dem Kurbelgehäuse gehalten wird, um sich um eine Achse (3) zu drehen, die sich ungefähr in der Horizontalen erstreckt, einen Zylinder (6), der an einem Oberteil des Kurbelgehäuses gehalten wird, und einen Sensor, der an einer Außenwand (11) des Kurbelgehäuses montiert ist, um Motorbetriebsbedingungen zu detektieren,
wobei der Sensor an der Außenwand des Kurbelgehäuses unterhalb der Achse der Kurbelwelle montiert ist,
dadurch gekennzeichnet, dass
ein Abdeckglied (29) zum Abdecken des Sensors gegenüber Außen integral ausgebildet ist, um nach außen von der Außenwand des Kurbelgehäuses in der Richtung entlang der Außenfläche des Kurbelgehäuses vorzustehen.

2. Kurbelgehäuse (2) mit einem Sensor (25) umfassend eine Sensormontagekonstruktion für einen Motor nach Anspruch 1, wobei der Motor Abgasleitungen (10) aufweist, die in einem Gebiet benachbart zu der Außenseite des Kurbelgehäuses vorgesehen sind,
wobei das Abdeckglied zwischen den Abgasleitungen und dem Sensor vorgesehen ist.

3. Kurbelgehäuse (2) mit einem Sensor (25) umfassend eine Sensormontagekonstruktion für einen Motor nach Anspruch 1, wobei das Abdeckglied angeordnet ist, um den Sensor von unten abzudecken.

4. Kurbelgehäuse (2) mit einem Sensor (25) umfassend eine Sensormontagekonstruktion für einen Motor nach einem der Ansprüche 1 bis 3, wobei das Kurbelgehäuse ein oberes und ein unteres Gehäuse (13, 14) aufweist, die ungefähr relativ zu der Achse der Kurbelwelle getrennt sind, wobei das untere Gehäuse die Außenwand (11) mit einer vertikalen Wand, die sich im Wesentlichen vertikal erstreckt, einem oberen und einem unteren Auswärtsflansch (17, 18), die integral mit dem oberen bzw. unteren Rand der vertikalen Wand ausgebildet sind, und Rippen (20) aufweist, die integral mit einer Außenfläche der vertikalen Wand ausgebildet sind und sich im Wesentlichen vertikal erstrecken,
wobei sich zumindest eines von dem oberen und unteren Auswärtsflansch und der Rippe integral nach außen von dem Kurbelgehäuse erstreckt, um das Abdeckglied zu bilden.

Revendications

1. Carter de moteur (2) avec un capteur (25) comprenant une structure de montage de capteur pour un moteur à combustion interne (1) ayant un vilebrequin (4) soutenu avec le carter de moteur pour tourner autour d'un axe (3) s'étendant approximativement dans la direction horizontale, un cylindre (6) soutenu sur le haut du carter de moteur, et un capteur, monté sur une paroi extérieure (11) du carter de moteur, pour détecter les conditions de conduite du moteur à combustion interne,
dans lequel le capteur est monté sur la paroi extérieure du carter de moteur sous l'axe du vilebrequin, et **caractérisé en ce qu'**un organe de couvercle (29) pour couvrir le capteur de l'extérieur est formé intégralement pour dépasser vers l'extérieur à partir de la paroi extérieure du carter de moteur en direction de la surface extérieure du carter du moteur.

2. Carter de moteur (2) avec un capteur (25) comprenant une structure de montage de capteur pour un moteur à combustion interne selon la revendication 1, le moteur à combustion interne ayant des tuyaux d'échappement (10) prévus dans une zone adjacente à la face externe du carter de moteur,
dans lequel l'organe de couvercle est prévu entre les tuyaux d'échappement et le capteur.

3. Carter de moteur (2) avec un capteur (25) comprenant une structure de montage de capteur pour un moteur à combustion interne selon la revendication 1,
dans lequel l'organe de couvercle est placé de façon à recouvrir le capteur depuis le dessous.

4. Carter de moteur (2) avec un capteur (25) comprenant une structure de montage de capteur pour un moteur à combustion interne selon l'une des revendications 1 à 3, le carter de moteur comportant des carters supérieur et inférieur (13, 14) qui sont séparés approximativement selon l'axe du carter de moteur, le carter inférieur ayant la paroi extérieure comprenant un paroi verticale s'étendant essentiellement verticalement, des flasques de vilebrequin supérieure et inférieure vers l'extérieur, respectivement, formés intégralement avec des bords supérieur et inférieur de la paroi verticale respectivement, et des nervures (20) formées intégralement avec la surface extérieure de la paroi verticale et s'étendant essentiellement verticalement,
dans lequel au moins l'une des flasques supérieure et inférieure vers l'extérieur, et la nervure s'étendent intégralement vers l'extérieur à partir du carter de moteur pour former l'organe de couvercle.

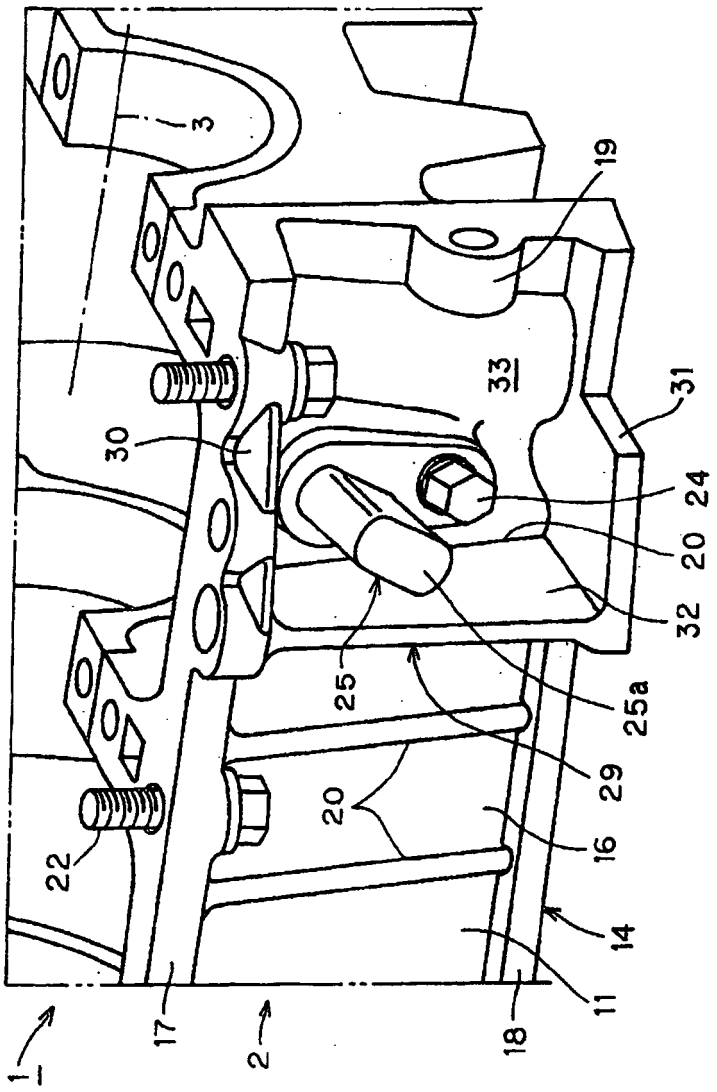


FIG. 1

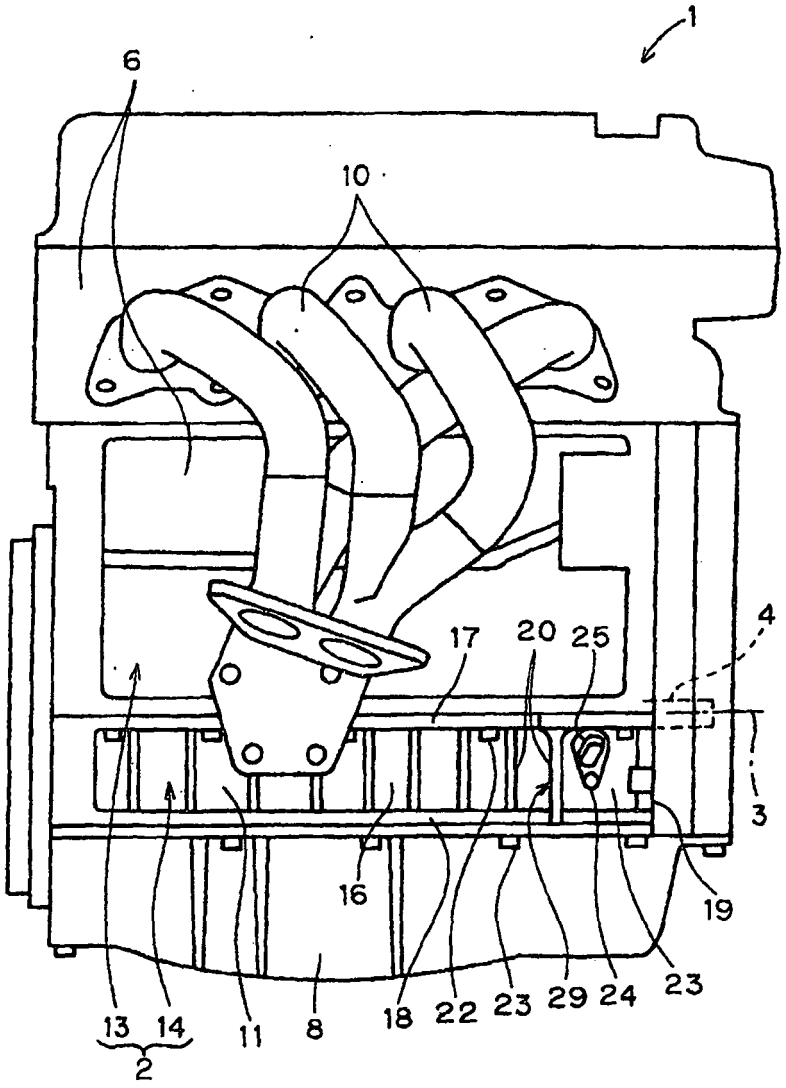


FIG. 2

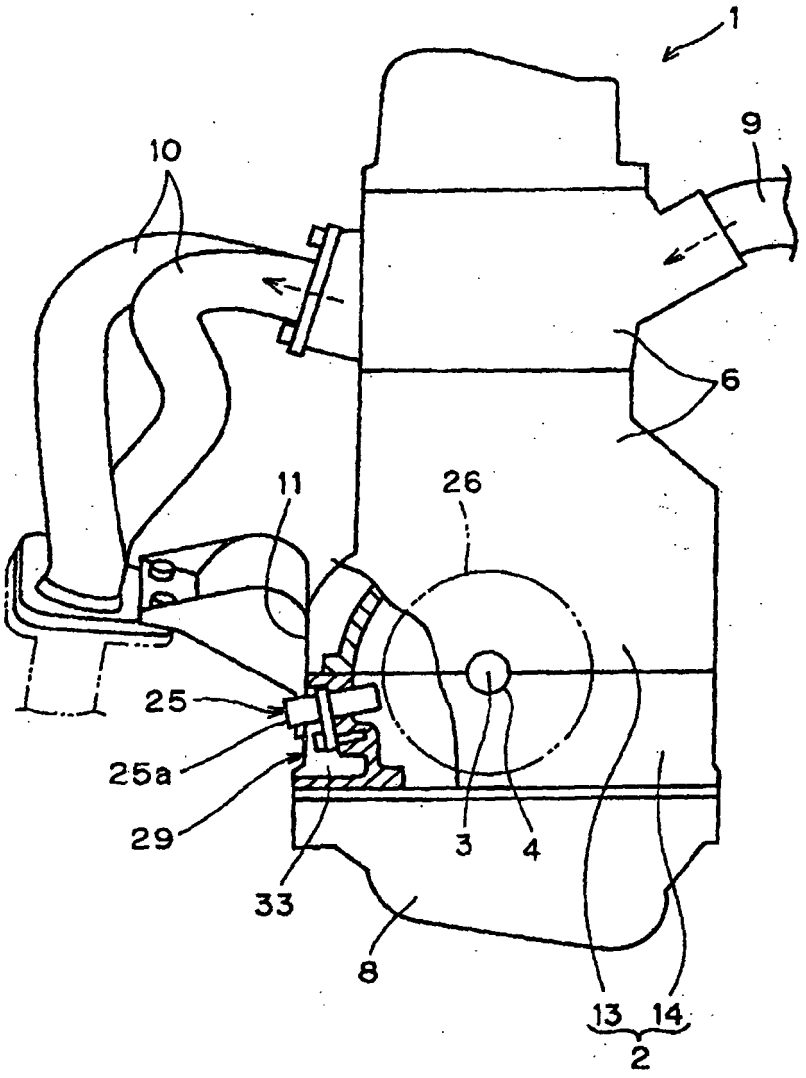


FIG. 3