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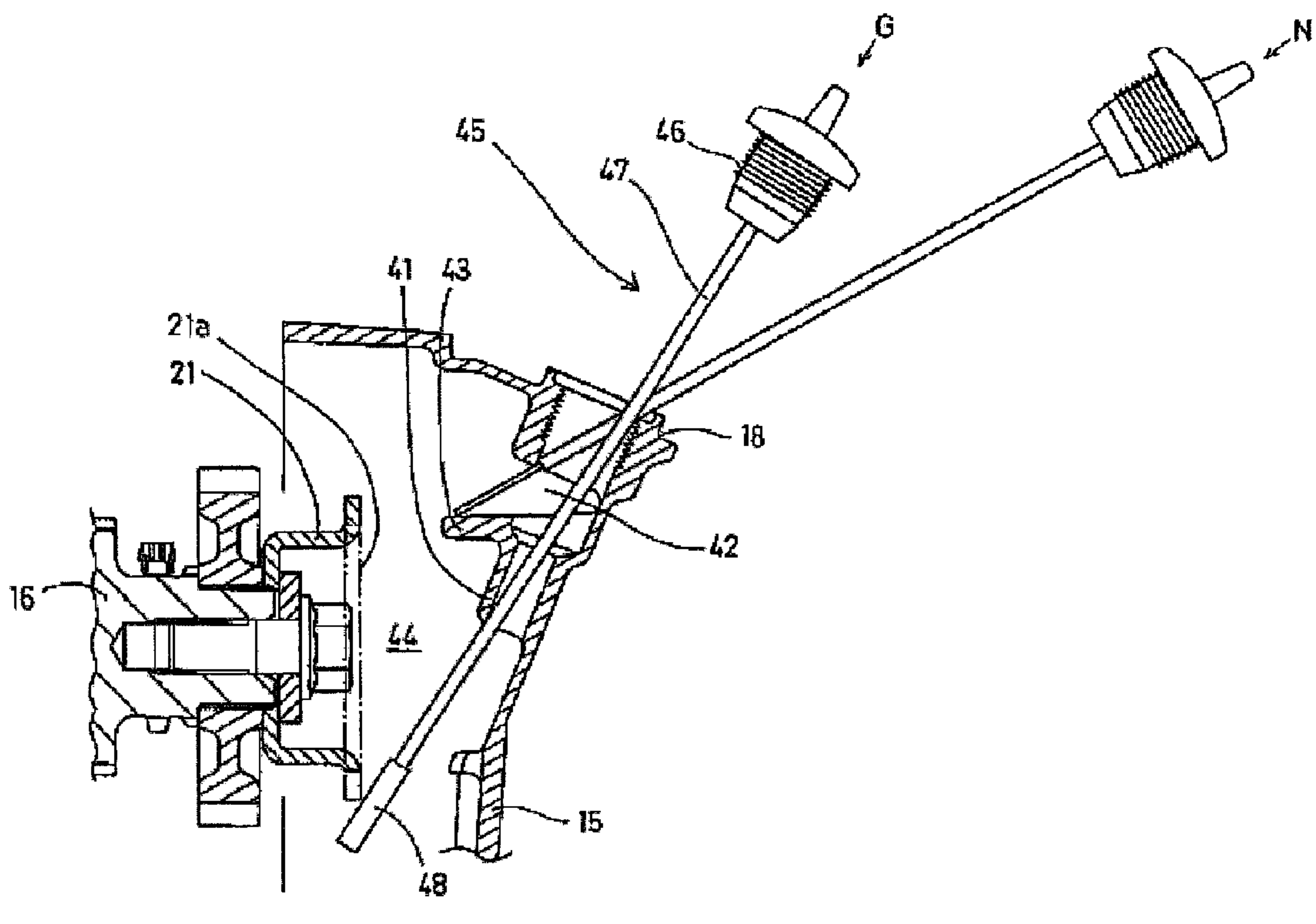


(57) **Abrégé/Abstract:**

In an internal combustion engine including an oil-filler-port/oil-level-gauge attachment hole on a side of the internal combustion engine, onto which an oil-level-gauge for measuring the amount of oil in the inside of the internal combustion engine, the oil-level-gauge being integral with a cap of the oil-filler-port, is mounted, to provide an oil filling structure that makes it possible to enhance workability of filling the oil and to enhance workability of checking the oil level. A guide cylinder portion that guides the gauge deep inside of the oil-level-gauge attachment hole is provided to be extended, a side outflow hole where the filled oil detours around the guide cylinder portion and directly flows down to the inside is formed on the way of the guide cylinder portion, and a guide wall that prevents the gauge from entering the side outflow hole is formed on a lower portion of the side outflow hole.

ABSTRACT OF THE DISCLOSURE

In an internal combustion engine including an oil-filler-port/oil-level-gauge attachment hole on a side of the internal combustion engine, onto which an oil-level-gauge for measuring the amount of oil in the inside of the internal combustion engine, the oil-level-gauge being integral with a cap of the oil-filler-port, is mounted, to provide an oil filling structure that makes it possible to enhance workability of filling the oil and to enhance workability of checking the oil level. A guide cylinder portion that guides the gauge deep inside of the oil-level-gauge attachment hole is provided to be extended, a side outflow hole where the filled oil detours around the guide cylinder portion and directly flows down to the inside is formed on the way of the guide cylinder portion, and a guide wall that prevents the gauge from entering the side outflow hole is formed on a lower portion of the side outflow hole.

OIL FILLING STRUCTURE OF INTERNAL COMBUSTION ENGINE

FIELD OF THE INVENTION

The present invention relates to an oil filling structure of an internal combustion engine including, on a side of the internal combustion engine, an oil-filler-port/oil-level-gauge attachment hole, and an oil-level-gauge integral with a cap of the oil-filler-port.

BACKGROUND OF THE INVENTION

Heretofore, an oil-level-gauge has been short, and an oil-level-gauge attachment hole-oil-filler-port has been provided in a lower portion of an internal combustion engine (for example, refer to Japanese Patent Application Laid-Open Publication No. 2003-97241). Therefore, a worker must take a low posture for checking the oil level and performing oil filling work, and workability of such has been decreased.

An object of the present invention is to provide an oil filling structure that makes it possible to enhance the workability of filling oil, and to enhance the workability of checking the oil level.

SUMMARY OF THE INVENTION

A first aspect of the invention relates to an oil filling structure of an internal combustion engine including an oil-filler-port/oil-level-gauge attachment hole on a side of the internal combustion engine, onto which an oil-level-gauge for measuring the amount of oil in the inside of the internal combustion engine, the oil-level-gauge being integral with a cap of the oil-filler-port, is mounted. In the oil filling structure, a guide cylinder portion that guides the gauge deep inside of the oil-level-gauge attachment hole is provided to be extended, a side outflow hole where filled oil detours around the guide cylinder portion and directly flows down to the inside is formed on the way of the guide cylinder portion, and a guide wall that prevents the gauge from entering the side outflow hole is formed on a lower portion of the side outflow hole.

A second aspect of the invention provides the oil filling structure of an internal combustion engine according to the first aspect, characterized as follows. The oil-level-gauge attachment hole is provided on a cover member that covers a rotator in the inside of the internal combustion engine, and the guide cylinder portion is formed to be smaller in diameter than the oil-filler-port.

A third aspect of the invention provides the oil filling structure of an internal combustion engine according to the second aspect, characterized as follows The internal combustion engine includes a clutch on an end portion of a transmission shaft provided on rear of a crankshaft in parallel thereto, and the oil-level-gauge is provided in an upper portion of a space around a shaft end portion of the crankshaft in front of the clutch.

By using the first aspect of the invention, a positional shift of the oil-level-gauge can be prevented while enhancing easiness of filling the oil by providing the side outflow hole, and accordingly, the length of the oil-level-gauge can be longer, and the degree of freedom in position of the oil-filler-port is enhanced, and thus the oil-filler-port is provided at the optimum position.

In the second aspect of the invention, even if the guide cylinder portion is formed to be small in diameter, efficiency of the oil filling work is enhanced due to direct oil flow from the side hole. Accordingly, by forming the guide cylinder portion to be small in diameter, the inserting direction of the gauge can be properly controlled. In addition, the cover member is prevented from being protruded, and thus the internal combustion engine can be downsized.

In the third aspect of the invention, the oil-level-gauge is placed utilizing the space around the shaft end portion of the crankshaft in front of the clutch, and accordingly, high space usability is obtained. Moreover, the oil-filler-port is provided above the crankshaft above an oil level of the oil pan, and accordingly, the efficiency of the oil filling work from a relatively narrow space on the side of the cylinder is also enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Fig. 1 is a side view of a V-type internal combustion engine 1 to which an oil filling structure of the present invention is applied.

Fig. 2 is a cross-sectional view along a line II-II of Fig. 1.

Fig. 3 is a cross-sectional view along a line III-III of Fig. 1.

Fig. 4 is an explanatory view of work of checking the oil level.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a side view of a V-type internal combustion engine 1 to which an oil filling structure of the present invention is applied. An arrow F indicates forward in a traveling direction in a state where the internal combustion engine 1 is attached to a vehicle. This internal combustion engine is mounted on a motorcycle. Reference numeral 2 represents a crankcase, onto an upper surface of which a front cylinder A composed of a cylinder block 3, a cylinder head 4, and a head cover 5, and a rear cylinder B composed of a cylinder block 6, a cylinder head 7, and a head cover 8 are assembled. An inlet port 9 and an exhaust port 11 are provided on the front cylinder A, and an inlet port 10 and an exhaust port 12 are provided on the rear cylinder B. Reference numeral 13 represents a spark plug mounting hole provided on the front cylinder A. A spark plug of the rear cylinder B is provided on an opposite side surface to the spark plug 13 of the front cylinder A, and accordingly, is not shown.

An oil pan 14 is provided on a lower portion of the crankcase 2. Reference numeral 15 represents a right crankcase cover that covers a rotating portion in a right side of the crankcase. A left crankcase cover is not shown. Reference numeral 16c represents a center portion of a crankshaft, and reference numeral 17c represents a center portion of a main shaft of a constant-mesh transmission. Reference numeral 18 represents an oil-filler-port/oil-level-gauge attachment hole, of which details will be described later.

Fig. 2 is a cross-sectional view along a line II-II of Fig. 1, mainly showing the right crankcase cover 15, the crankshaft 16, a main shaft 17 of the constant-mesh transmission, and devices attached thereto. In the drawing, an arrow F indicates the forward in the traveling direction of the vehicle. Both of the crankshaft 16 and the main shaft 17 of the transmission are arranged perpendicularly to the traveling direction of the vehicle.

Onto an end surface of the crankshaft 16, a pulsar 21 is fixed by a bolt 22, and the pulsar 21 rotates together with the crankshaft 16. A drive gear 23 is fixed to an end portion of the crankshaft 16. Onto a position on the main shaft 17 of the transmission, which corresponds to the drive gear 23, a driven gear 24 that constantly meshes with the drive gear 23 and is rotatable in a circumferential direction relatively to the main shaft 17 of the transmission is fitted. On an end portion of the main shaft, there is provided a multi-plate clutch 25 which is normally engaged with the main shaft 17, but which is disengaged therefrom when a manipulation mechanism is operated. The clutch 25 is placed on a rotation power transmission path from the crankshaft 16 toward the main shaft 17 of the transmission, and is engaged with and disengaged from the main shaft 17 in response to a gear shift operation by a rider.

In the multi-plate clutch 25, a clutch outer 26 is fixed to the driven gear 24 by rivets 27, and a clutch inner 28 is fixed to the main shaft 17. A plurality of outer friction plates 29 are held on the clutch outer 26 so as to be axially movable, and a plurality of inner friction plates 30 are held on the clutch inner 28 so as to be axially movable. The outer friction plates 29 and the inner friction plates 30 are overlapped in a state of being alternating with each other. A pressure plate 31 is attached to the clutch inner 28. The clutch inner 28 and the pressure plate 31 sandwich the pluralities of friction plates 29 and 30 therebetween with spring force of a coil spring 32, thereby generating friction force. Rotational drive force of the crankshaft 16 propagates from the drive gear 23 to the driven gear 24, and propagates to the main shaft 17 of the transmission through the clutch outer 26, the friction plates 29 and 30, and the clutch inner 28. A shock absorbing device 33 is provided in the driven gear 24.

One end of the coil spring 32 abuts on the clutch inner 28, and the other end thereof abuts on an annular member 35 fixed by a bolt 34 to an end of a projection portion 31a of the pressure plate 31. Into a recessed portion 15a in the inside of the right crankcase cover 15, an operation shaft 36 is mounted so as to be movable in a direction of the main shaft. The annular member 35 is held on the operation shaft 36 while interposing a ball bearing 37 therebetween. The operation mechanism 38 engaged with the operation shaft 36 from an upper portion of the right crankcase cover is provided. Through the operation mechanism 38, the operation shaft 36 is externally driven by the rider. In order to release the engaged state of the clutch, the operation shaft 36 is pushed toward the main shaft through the operation mechanism 38, and the pressure plate 31 is separated from a group of the friction plates 29 and 30 while overcoming the force of the coil spring 32. In this way, the connection between the driven gear 24 and the main shaft 17 is cut.

In Fig. 2, the oil-filler-port/oil-level-gauge attachment hole 18 is provided on the right crankcase cover 15 in the vicinity of the end portion of the crankshaft 16. This attachment hole 18 is formed so as to be projected outward from an outer surface of the right crankcase cover.

Fig. 3 is a cross-sectional view along a line III-III of Fig. 1. The oil-filler-port/oil-level-gauge attachment hole 18 is provided so as to be projected outward from the outer surface of the right crankcase cover 15. An oil-level-gauge 45 (Fig. 4) integral with a cap of the oil-filler-port is mounted onto a screw portion 18a at an opening of the attachment hole 18. A guide cylinder portion 41 that guides the gauge deep inside from the oil-level-gauge attachment hole 18 is provided so as to be extended. On the way of the guide cylinder portion 41, a side outflow hole 42 is formed, where the filled oil directly flows down to the inside without passing through the guide cylinder portion 41 when the oil is filled. On a lower portion of the side outflow hole 42, a guide wall 43 that prevents the oil-level-gauge from entering the side outflow hole 42 is formed. The guide cylinder portion 41 is formed to be smaller in diameter than the oil-filler-port 18. This is for controlling the inserting direction of the oil-level-gauge. The filled oil can directly flow down the inside via the side outflow hole 42 without passing through the guide cylinder portion 41, and accordingly, the smallness of the diameter of the guide cylinder portion 41 does not hinder the oil from being filled. The oil-level-gauge attachment hole 18 is provided in an upper portion of a vacant space 44 (Fig. 2, Fig. 3) around a shaft end portion of the crankshaft 16 in front of the multi-plate clutch 25. Accordingly, the vacant space is effectively utilized in the event of placing the oil-level-gauge 45.

Fig. 4 is an explanatory view of the oil level check. As for the oil-level-gauge 45, one end of a stick-like portion 47 thereof is connected to a cap 46 of the oil-filler-port, and a gauge portion 48 is formed on the other end of the stick-like portion 47. Usually, the oil-level-gauge 45 is fixed by screwing the cap 46 into the oil-filler-port 18 in a state where the stick-like portion 47 and the gauge portion 48 are housed in the right crankcase cover 15. In the case of checking the oil level, the oil-level-gauge 45 is pulled out from the oil-filler-port 18, the oil adhered onto the gauge portion 48 on a tip end of the oil-level-gauge 45 is wiped off. Then, the oil-level-gauge 45 is inserted into the inside from the oil-filler-port 18 again, and by looking at how the gauge portion 48 is wet with the oil, the amount of the filled oil can be found.

In the case of performing such oil level checking, it is usually difficult to set the inserting direction of the oil-level-gauge. However, in this embodiment, an oil-level-gauge G of Fig. 4 enters in a substantially normal direction by being guided by the guide cylinder portion 41. Even in the most tilted state, that is, in an illustrated state, the oil-level-gauge G does not touch a rotation track 21a of the pulsar 21, and accordingly, a checking result can be obtained safely. An oil-level-gauge N of Fig. 4 has taken the wrong inserting direction entering from the oil-filler-port 18 slantingly in a direction of the side outflow hole 42. When the oil-level-gauge N enters in such a way, the oil-level-gauge N touches the guide wall 43 formed on the lower portion of the side outflow hole 42, and does not advance forward. Accordingly, a worker finds that the inserting direction was wrong, and can retry to insert the gauge in the right direction.

In the oil filling structure of this embodiment, which has been described above in detail, the following effects are brought about.

(1) A positional shift of the oil-level-gauge can be prevented while enhancing easiness of filling the oil by providing the side outflow hole. Accordingly, the length of the oil-level-gauge can be longer than that of the conventional one, and the degree of freedom in position of the oil-filler-port is enhanced, and thus the oil-filler-port can be provided at the optimum position.

(2) Even if the guide cylinder portion is formed to be small in diameter, efficiency of the oil filling work is enhanced due to direct oil flow from the side hole. Accordingly, by forming the guide cylinder portion to be small in diameter, the inserting direction of the gauge can be controlled. In addition, the cover member is prevented from being protruded, and thus, the internal combustion engine can be downsized.

(3) The oil-level-gauge is placed utilizing the space around the shaft end portion of the crankshaft in front of the clutch, and accordingly, high space usability is obtained. Moreover, the oil-filler-port is provided above the crankshaft above the oil level of the oil pan, and accordingly, the efficiency of the oil filling work performed from a relatively narrow space on the side of the cylinder is also enhanced.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

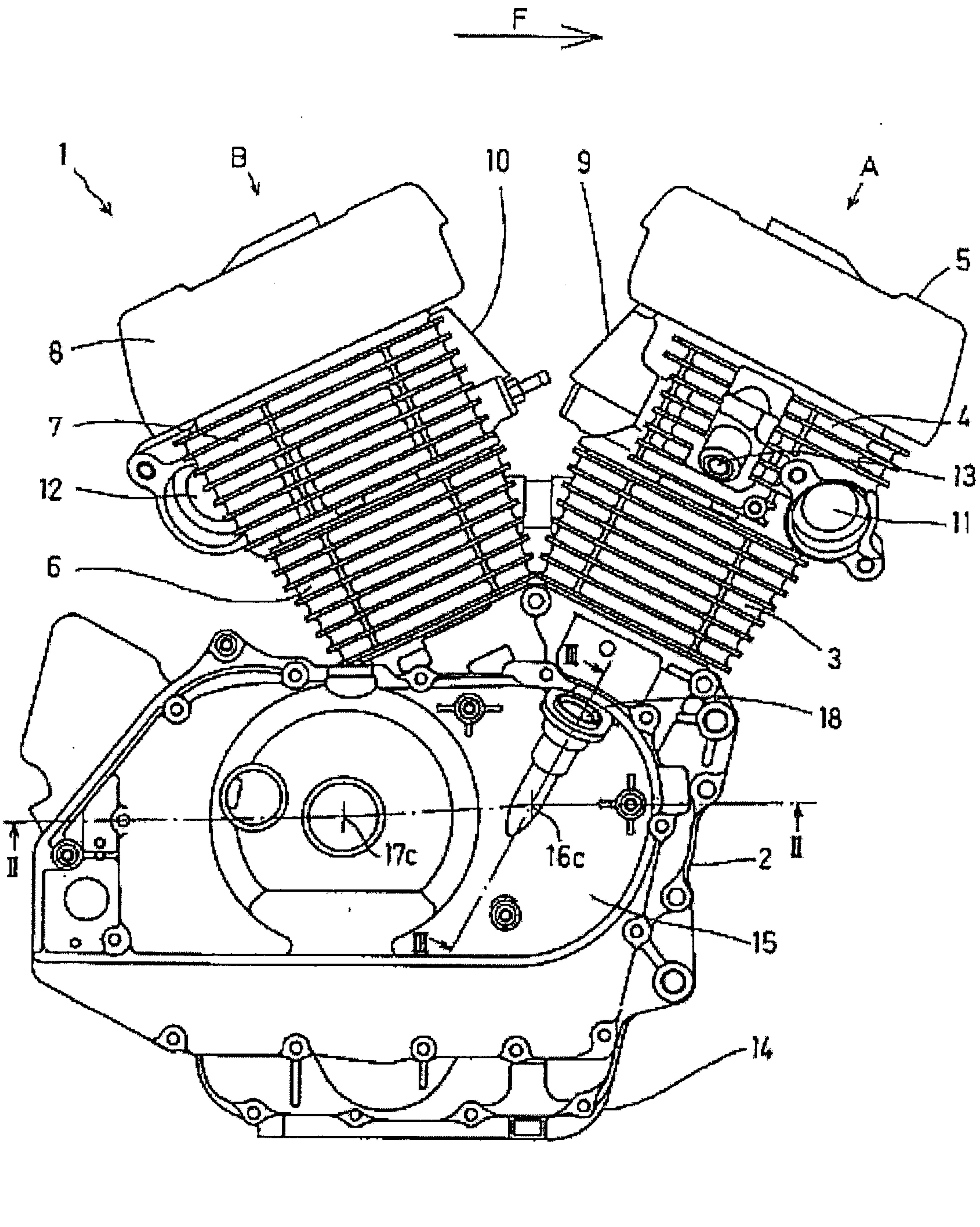
THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An oil filling structure of an internal combustion engine comprising: an oil-filler-port/oil-level-gauge attachment hole on a side of the internal combustion engine, onto which an oil-level-gauge for measuring the amount of oil in the inside of the internal combustion engine, the oil-level-gauge being integral with a cap of the oil-filler-port, is mounted, wherein a guide cylinder portion that guides the gauge deep inside of the oil-level-gauge attachment hole is provided to be extended, a side outflow hole where filled oil detours around the guide cylinder portion and directly flows down to the inside is formed on the way of the guide cylinder portion, and a guide wall that prevents the gauge from entering the side outflow hole is formed on a lower portion of the side outflow hole.

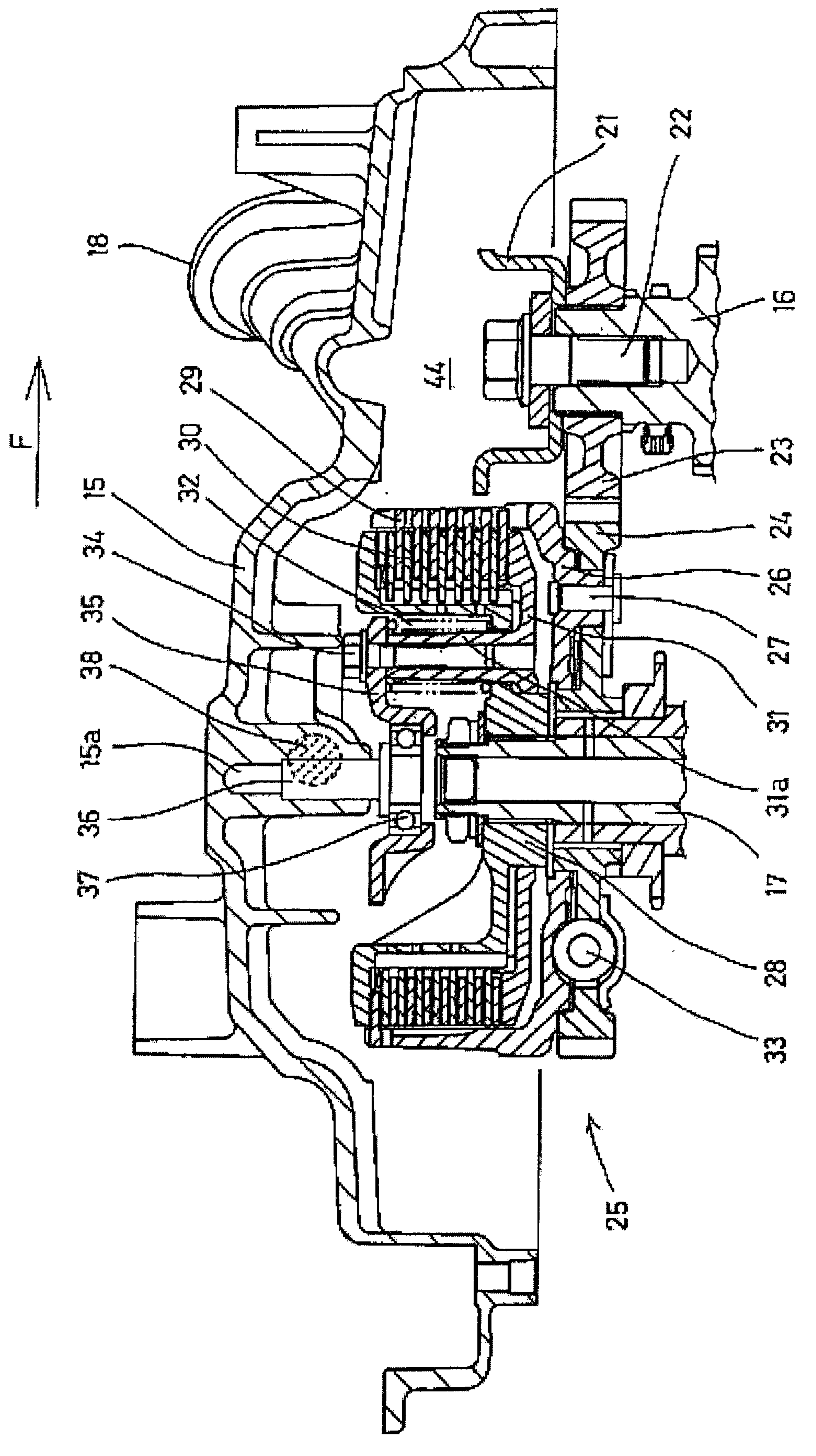
2. The oil filling structure of an internal combustion engine according to claim 1, wherein: the oil-level-gauge attachment hole is provided on a cover member that covers a rotator in the inside of the internal combustion engine, and the guide cylinder portion is formed to be smaller in diameter than the oil-filler-port.

3. The oil filling structure of an internal combustion engine according to claim 2, wherein the internal combustion engine includes a clutch on an end portion of a transmission shaft provided on rear of a crankshaft in parallel thereto, and the oil-level-gauge is provided in an upper portion of a space around a shaft end portion of the crankshaft in front of the clutch.

[FIG.1]



[FIG.2]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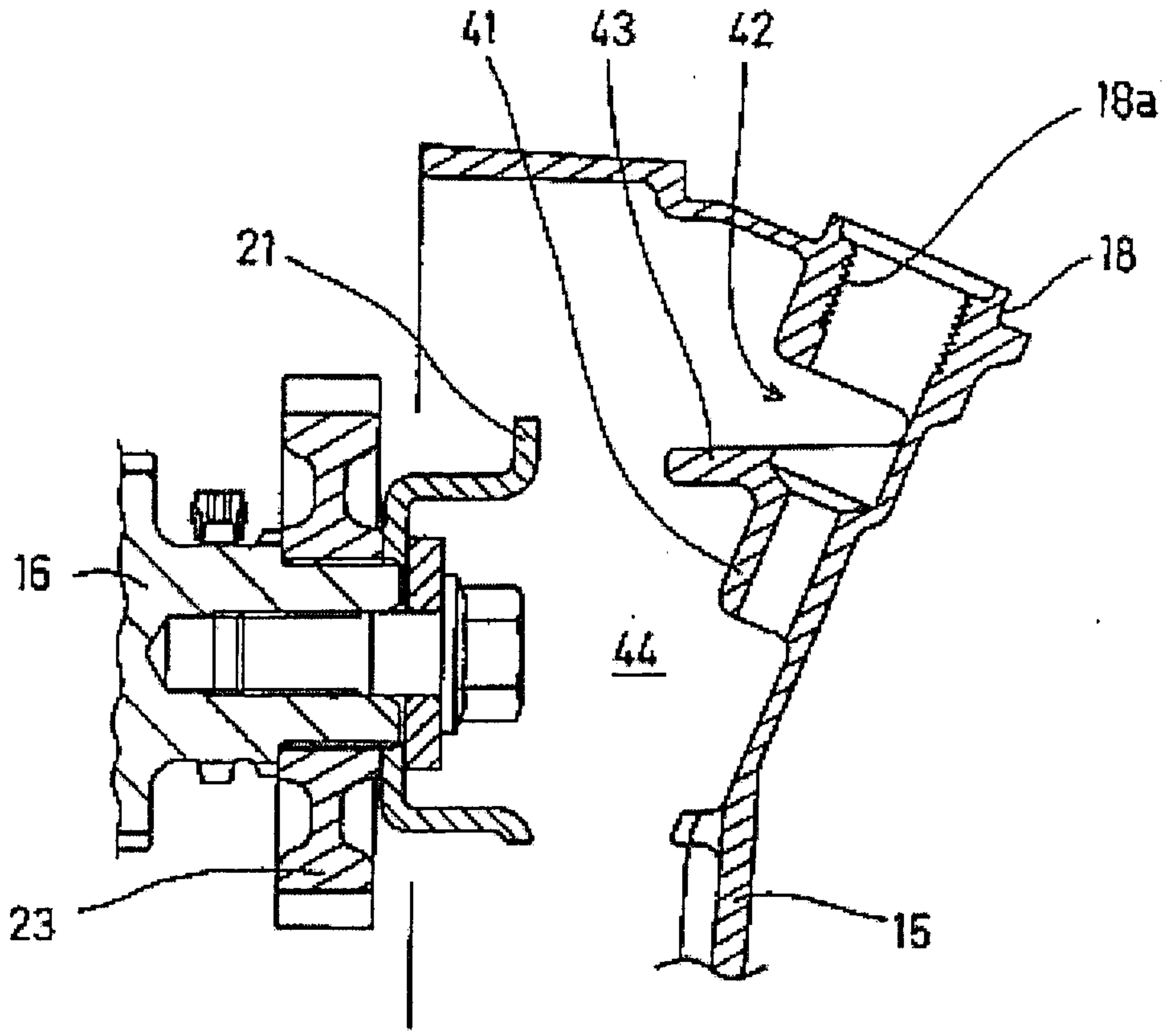
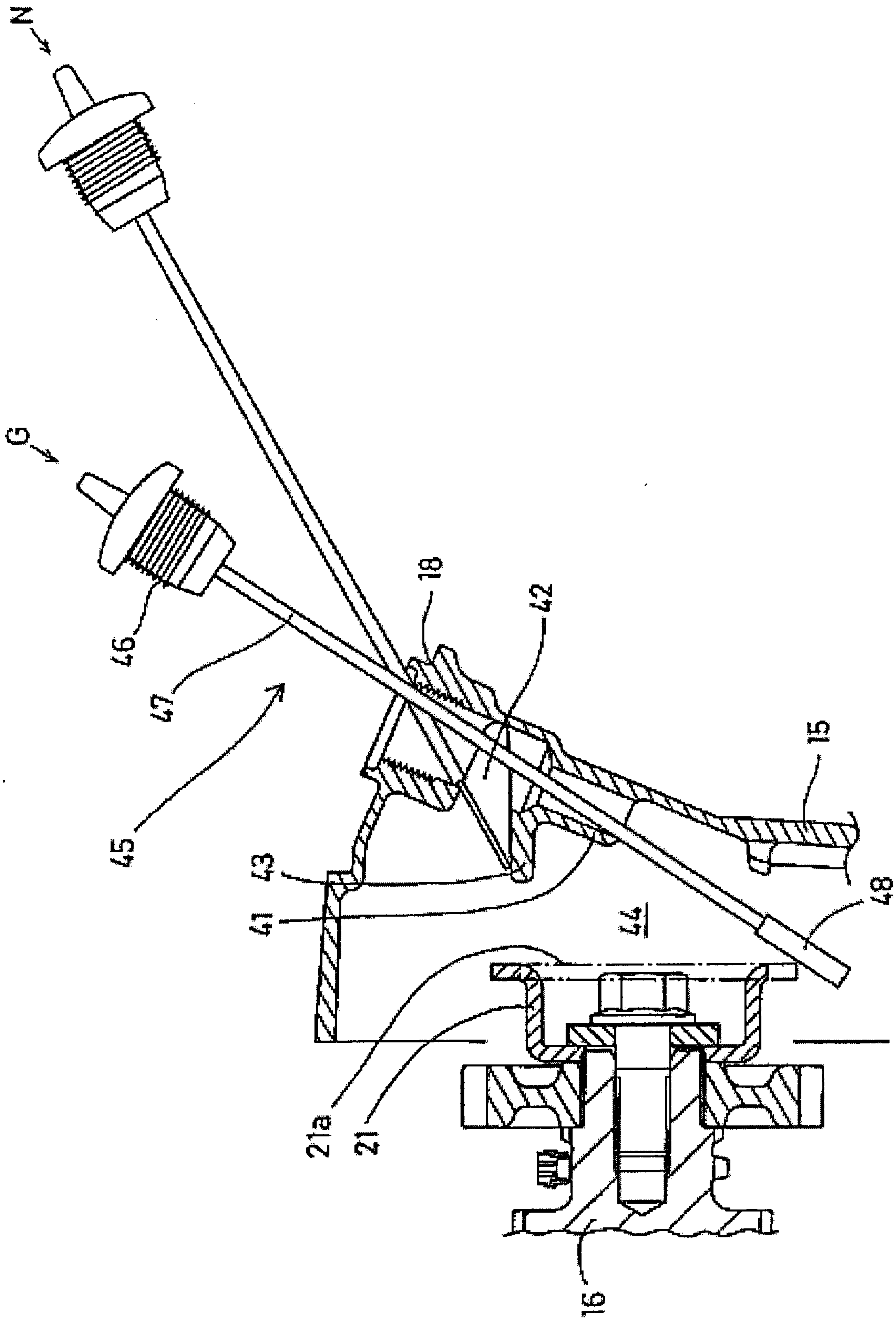
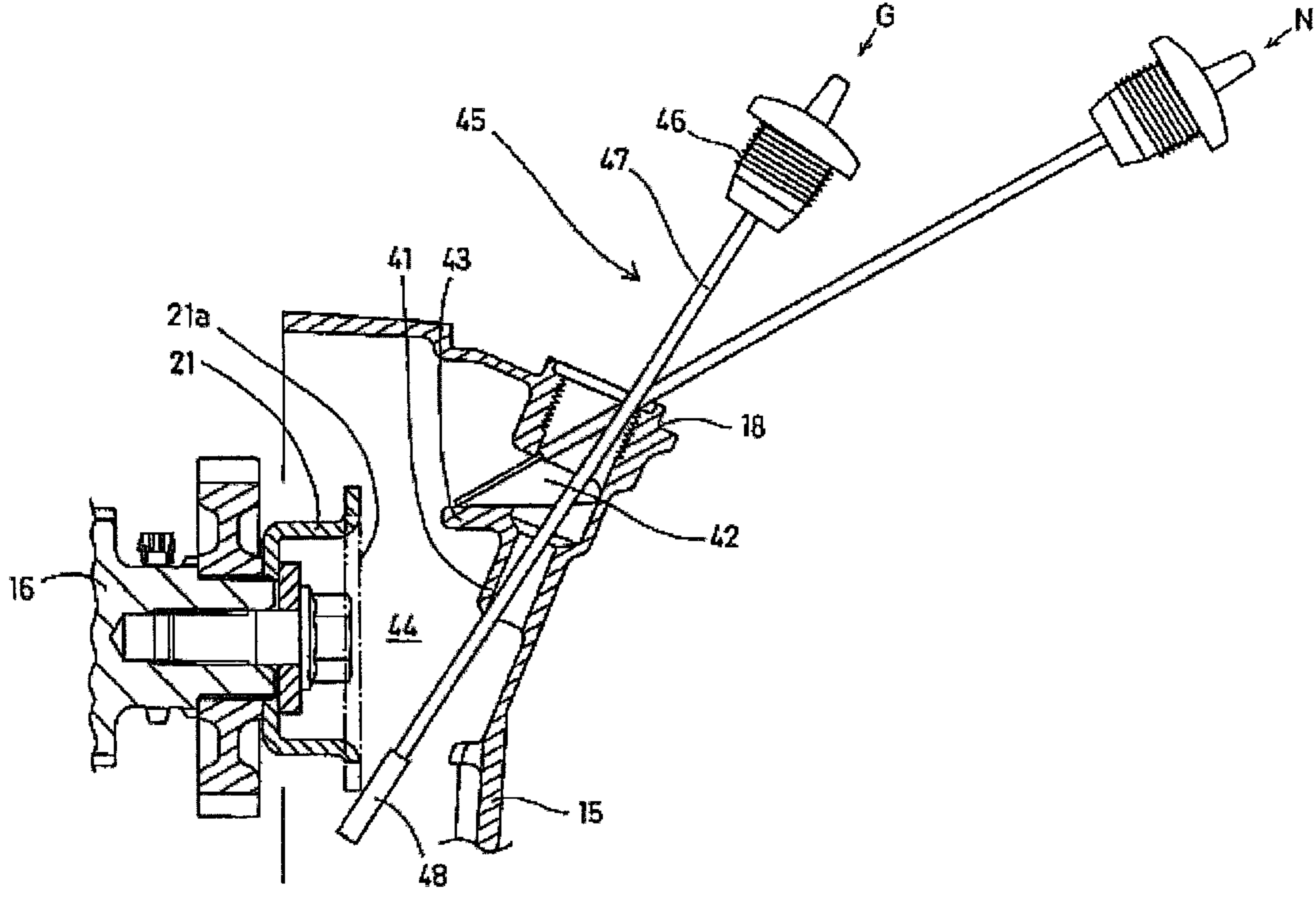
[FIG.3]



[FIG.4]

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