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(54) Cylinder head

(57) A cylinder head is provided which can surely return the oil within the sub-cam chamber provided outside the rear end wall into the inside of the cylinder head. In the cylinder head, the front and the rear end wall are formed in parallel; the extension of the camshaft is disposed outside the rear end wall; a separate cover member is mounted on the outside of the rear end wall to form a sub·cam chamber for covering the extension; and an oil-returning hole is formed through the rear end wall so as to return the oil within the sub-cam chamber into the inside of the rear end wall.

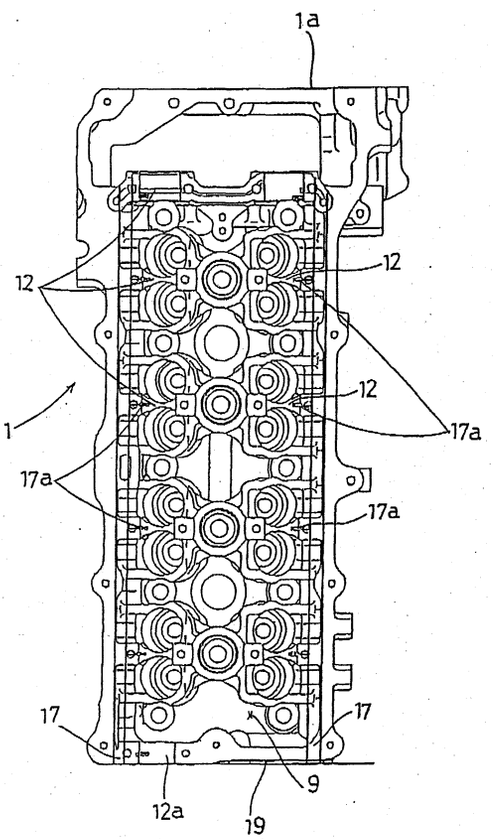

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the structure of a cylinder head that constitutes an internal combustion engine for automobiles or for industrial machines.

BACKGROUND OF THE INVENTION

[0002] In a case of the prior art, as shown in the plan view of FIG.7. on a cylinder head 1 are rotatably provided two camshafts 3, 4 for intake and for exhaust respectively through cam brackets 2, 2. On the front ends of the camshafts 3, 4 are respectively provided timing sprockets 6, 6, and each of the camshafts 3, 4 is provided with a plurality of cams 5, 5 for valve driving.

[0003] The rear end of the camshaft 3 on the left of the drawing has been extended rearward as an extension 3a, and accordingly the length of the left camshaft 3 is longer than that of the right one 4. This extension 3a is provided with a fuel pump cam 7 for driving the fuel pump and also on the rear end of the extension 3a is mounted a cam angle sensor plate 8 for detecting the cam angle.

[0004] In order to support the extension 3a of the camshaft 3 there is provided a sub-bearing portion 12a on the cylinder head 1. On the sub-bearing portion 12a is mounted a sub-cam bracket 2a with bolts to prevent bending of the camshaft 3.

[0005] In the cylinder head structure as shown in FIG. 7, the cylinder head 1 is provided with a sub-cam chamber 10 formed as a unit, which covers the rear part of the extension 3a of the camshaft 3. In case of this cylinder head structure, the sub-cam chamber 10 is projected, so that manufacture of the cylinder head 1 becomes extremely difficult.

[0006] Accordingly, as disclosed in Jpn unexamined patent publication 2001-304063, for instance, there has been proposed a structure where the front and the rear end of a cylinder head are formed substantially in parallel and a separate fuel pump case is mounted on the cylinder head. In such a structure, however, there was a new problem that it is impossible that the oil within the sub-cam chamber is surely returned into the cylinder head.

SUMMARY OF THE INVENTION

[0007] The present invention is worked out in view of the above-described problems in the prior art. It is an object of the present invention to provide a cylinder head that can surely return the oil within the sub-cam chamber provided outside the rear end wall into the inside of the cylinder head.

[0008] The subject matter of the present invention is that in a cylinder head having the structure where two camshafts for intake and for exhaust are provided respectively on the top, one of which camshafts has an extension for providing a fuel pump cam made by extending the rear end opposite the timing sprocket, the front and the rear end wall are formed in parallel; the extension of the camshaft is disposed outside the rear end wall; a separate cover member is mounted on the outside of the rear end wall to form a sub-cam chamber for covering the extension; and an oil-returning hole is formed through the rear end wall so as to return the oil within the sub-cam chamber into the inside of the rear end wall.

[0009] Accordingly, it is possible to obtain easy casting of the cylinder head and to favorably form a sub-cam chamber on the rear end wall of the cylinder head. Further, it is possible to surely return the oil within the sub-cam chamber through the oil-returning hole into the inside of the cylinder head. As a result, it is possible to satisfactorily lubricate the sub-bearing portion for supporting the extension of the camshaft and further to circulate the oil smoothly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the drawings;

FIG.1 is a plan view of a cylinder head;
FIG.2 is an enlarged rear end view thereof;
FIG.3 is a right side view thereof;
FIG.4 is a plan view of the cylinder head on which and integrated unit of cover member and water outlet is mounted;
FIG.5 is an enlarged rear end view of the cylinder head of FIG.4;
FIG.6 is a right side view of the cylinder head of FIG. 4; and
FIG.7 is a plan view of a cylinder head provided with a camshaft having an extension in the prior art.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

[0012] FIG. 1 is a plan view of a cylinder head, FIG. 2 is an enlarged rear end view of FIG.1, and FIG.3 is a right side view of FIG.1.

[0013] Also, FIG.4 is a plan view of the cylinder head on which an integrated unit of cover member and water outlet is mounted. FIG.5 and FIG.6 are an enlarged rear end view and a right side view of FIG.4 respectively.

[0014] Also in this embodiment, a cylinder head 1 is provided with two camshafts for intake and for exhaust (not shown) on the top, one of which camshafts has an extension for providing a fuel pump cam (not shown) made by extending the rear end opposite the timing sprocket (not shown). A sub-bearing portion 12a for supporting the extension is provided on the cylinder head 1. This sub-bearing portion 12a is formed as a unit on the top of the rear end wall of the cylinder head 1. The

rear end wall of the cylinder head 1, which is a water outlet-mounting surface 19, is formed in parallel to the front-end wall 1a of the cylinder head 1,

[0015] In the cylinder head 1 of this embodiment, a cover member 30, which is to be mounted on the rear end wall as a separate unit, forms the sub-cam chamber 10. The cover member 30 is made previously together with a water outlet 22 as a unit and mounted on the water outlet-mounting surface 19 with bolts, In the rear end wall or water outlet surface 19 of the cylinder head 1 is formed water jacket openings 20, 20 to circulate the cooling water, to which the water outlet 22 is connected. The water outlet 22 is disposed in a separate position from the sub-cam chamber-forming portion 30a, and thereby it is prevented that the longitudinal length of the cylinder head 1 becomes too long.

[0016] Namely, the water outlet 22 is formed integrally with the cover member 30. The cover member 30 is integrally composed of a sub-cam chamber- forming portion 30a that forms a sub-cam chamber 10 on the mounted condition and a core hole-closing portion 30b that is capable of closing the core-supporting holes 15, 15 of a valve case 9 (see FIG.5). The sub-cam chamber-forming portion 30a and core hole-closing portion 30b are made as a unit together with the water outlet 22, This core hole-closing portion 30b is formed in a flat plate with thickness less than the size of the sub-cam chamber forming portion 30a protruding from the rear end wall. Accordingly, the entire length of the cylinder head 1 is prevented from becoming larger size.

[0017] On the top of the cylinder head 1 is formed a plurality of bearing portions 12, 12 in hollow fashion and on the top of the rear end wall, or the water outlet-mounting surface 19, is disposed a sub-bearing portion 12a. Under the sub-bearing portion 12a of the water outlet-mounting surface 19 is pierced through an oil return hole 23 to return the oil accumulated in the sub-cam chamber 10 into the valve case 9.

[0018] Also, on the top of the cylinder head 1 are formed a left and a right oil supply passage 17, 17 to supply lubricating oil for each of bearing portions 12, 12a. Each oil supply passage 17 is provided with a branch passage 17a facing on each bearing portion 12 or 12a.

[0019] On the rear end wall are provided a plurality of mounting boltholes 24, 24. The integrated unit of cover member 30 and water outlet 22 is mounted on the rear end wall by tightening mounting bolts 28, 28 into the mounting boltholes 24, 24. At this time, on the water outlet mounting surface 19 is placed a metal gasket 26 for sealing. Also on the mated surfaces at the upper part, where chamfering is performed, is applied liquid gasket 27 for sealing.

[0020] Thus, by mounting the integrated unit of cover member 30 and water outlet 22 on the rear end wall of the cylinder head 1 with the bolt 28, the sub-cam chamber-forming portion 30a of the cover member 30 can form the sub-cam chamber 10 on the outside of the rear end wall. Within this sub-cam chamber 10 is disposed the extension 3a of the camshaft 3. Namely, the sub-cam chamber-forming portion 30a covers the extension 3a protruded outside from the cylinder head 1.

[0021] Also, the core hole-closing portion 30b of the cover member 30 closes the core-supporting holes 15, 15 used at the time of casting the valve case 9 and the rear ends of the oil passages 17, 17.

[0022] In this embodiment, the sub-bearing portion 12a for the extension 3a and the sub-cam bracket 2a are satisfactorily lubricated by oil that is sufficiently supplied through the oil passage 17. Besides, it is possible that the oil accumulated in the sub-cam chamber 10 is surely returned through an oil-returning hole 23 into the valve case 9 in the cylinder head 1, so that the oil is smoothly circulated.

[0023] As described above in this embodiment, the separate cover member 30 is mounted on the rear end wall 19 of the cylinder head 1 favorably to form the sub-cam chamber 10. Further, the oil-returning hole 23 is formed through the cylinder head 1 so as to communicate with the inside of this sub-cam chamber 10, As a result, it is possible to surely return the oil through the oil-returning hole 23 into the cylinder head 1.

[0024] Having described the invention in detail and by reference to the preferred embodiment thereof, it will be apparent that other modifications and variations are possible without departing from the scope of the invention defined in the

Claims

1. A cylinder head having the structure where two camshafts for intake and exhaust are provided respectively on the top, one of which camshafts has an extension made by extending the rear end opposite the timing sprocket, comprising:

   the front and the rear end wall of said cylinder head formed in parallel;
   said extension disposed outside said rear end wall;
   a separate cover member mounted on the outside of said rear end wall to form a sub-cam chamber for covering said extension; and
   said rear end wall pierced by an oil-returning hole to return the oil within said sub-cam chamber into the inside of said rear end wall.

2. A cylinder head as claimed in claim 1, wherein a sub-bearing portion to support said extension is provided on the rear part of said cylinder head.

3. A cylinder head as claimed in claim 2, wherein said sub-bearing portion is provided on the top of said rear end wall.

4. A cylinder head as claimed in claim 1, wherein said cover member comprises a sub-cam chamber-forming portion to form said sub-cam chamber and a core hole-closing portion to be capable of closing the core.supporting hole used at the time of casting said cylinder head, as a unit.

5. A cylinder head as claimed in claim 4, wherein said core hole-closing portion is formed in a flat plate with thickness less than the size of said sub-cam chamber forming portion protruding from said rear end wall.

6. A cylinder head as claimed in claim 1, wherein said cover member is integrated with a water outlet to be connected to the water jacket openings in said rear end wall.

7. A cylinder head as claimed in claim 6, wherein said water outlet is disposed in a separate position from said sub-cam chamber forming portion.

8. A cylinder head as claimed in claim 1, wherein said cover member is mounted on said rear end wall with bolts.

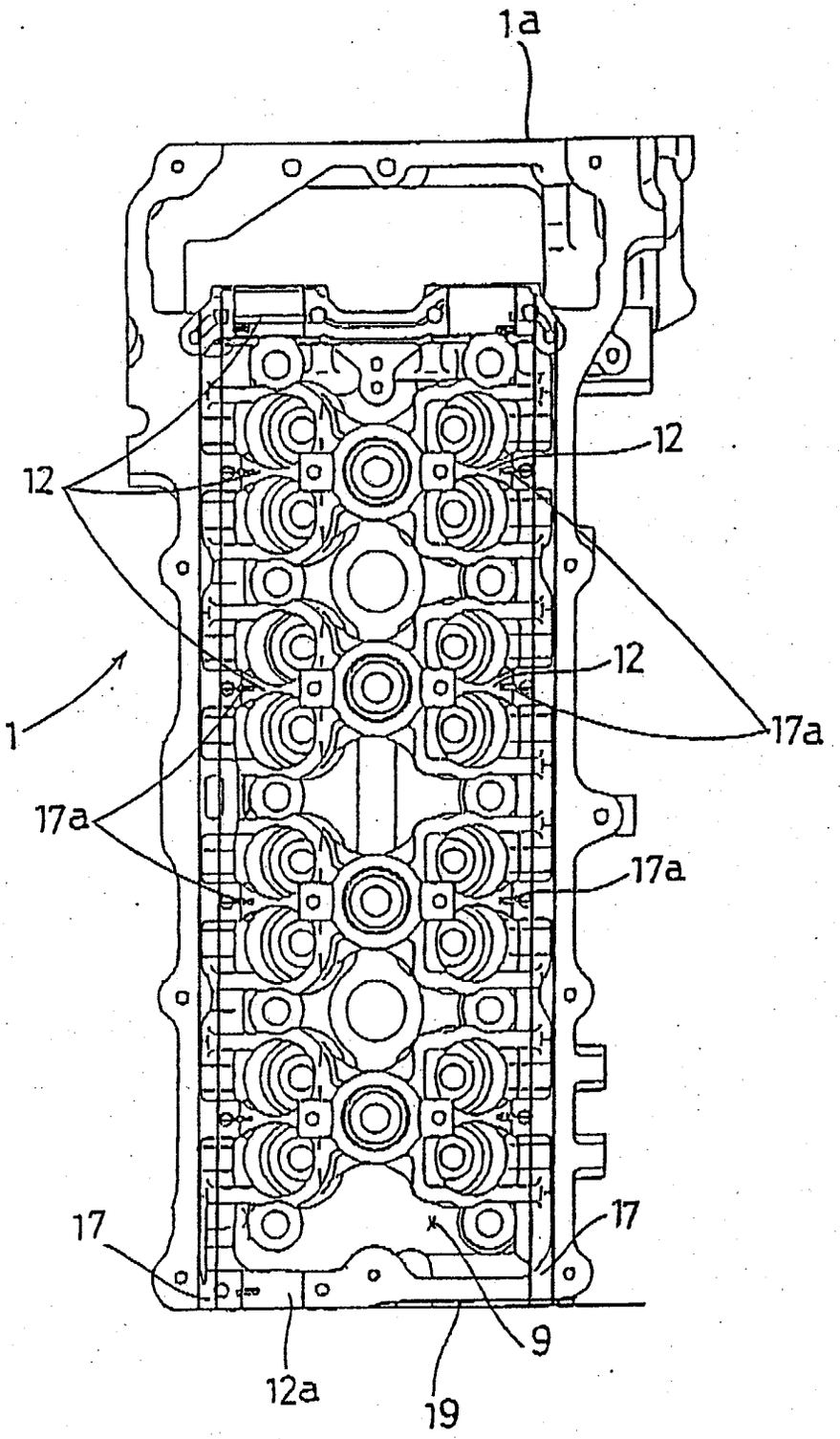

FIG. 1

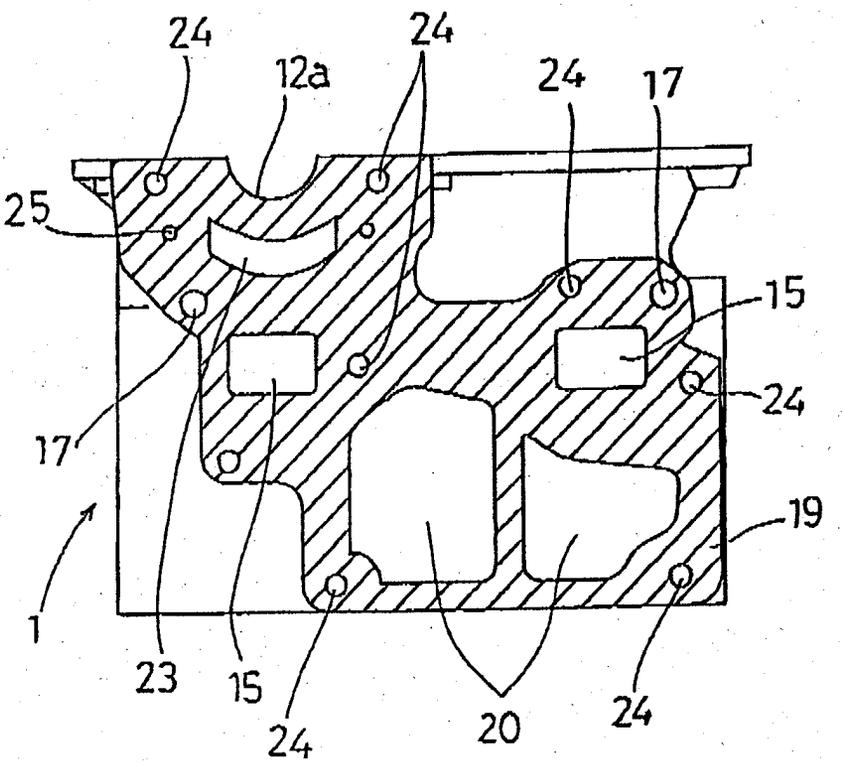

FIG. 2

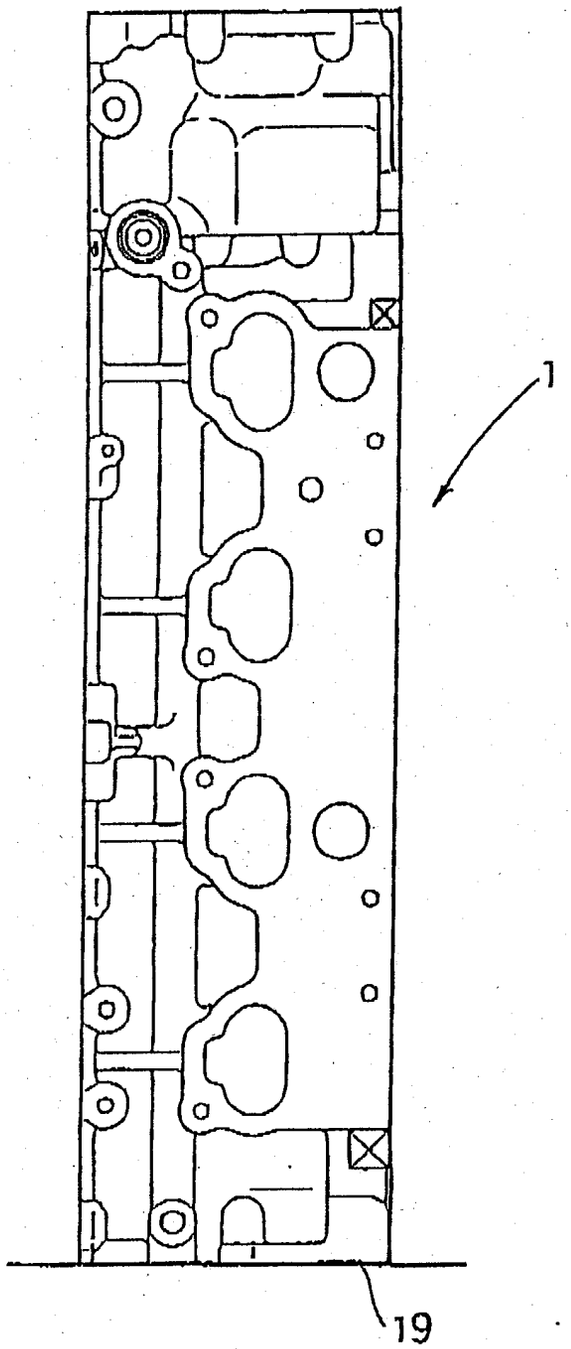

FIG. 3

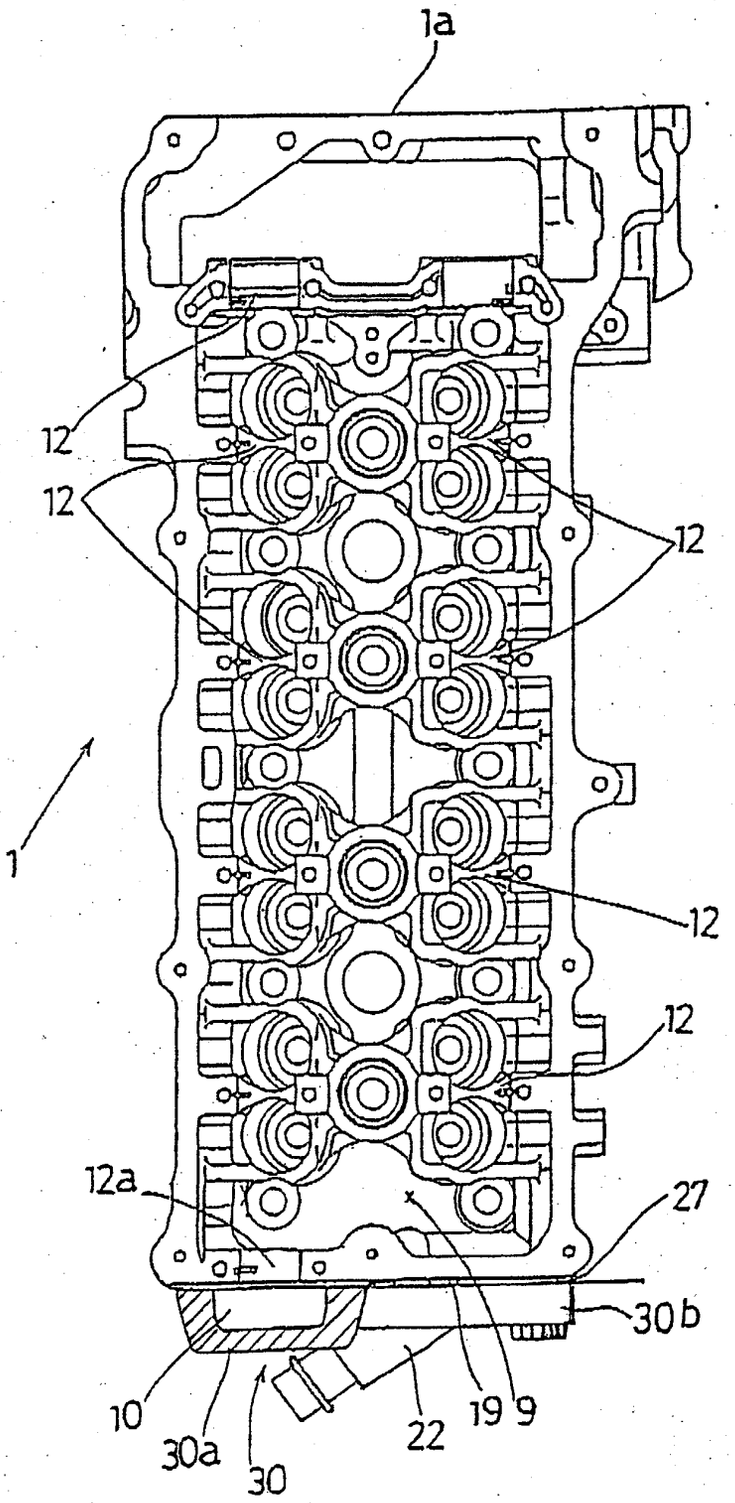

FIG. 4

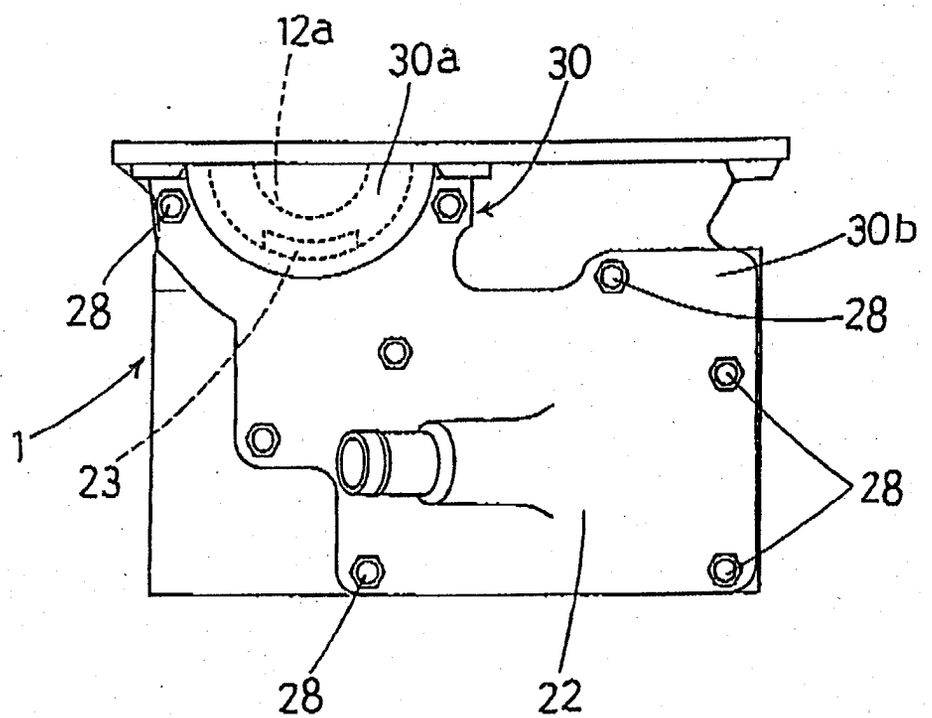

FIG. 5

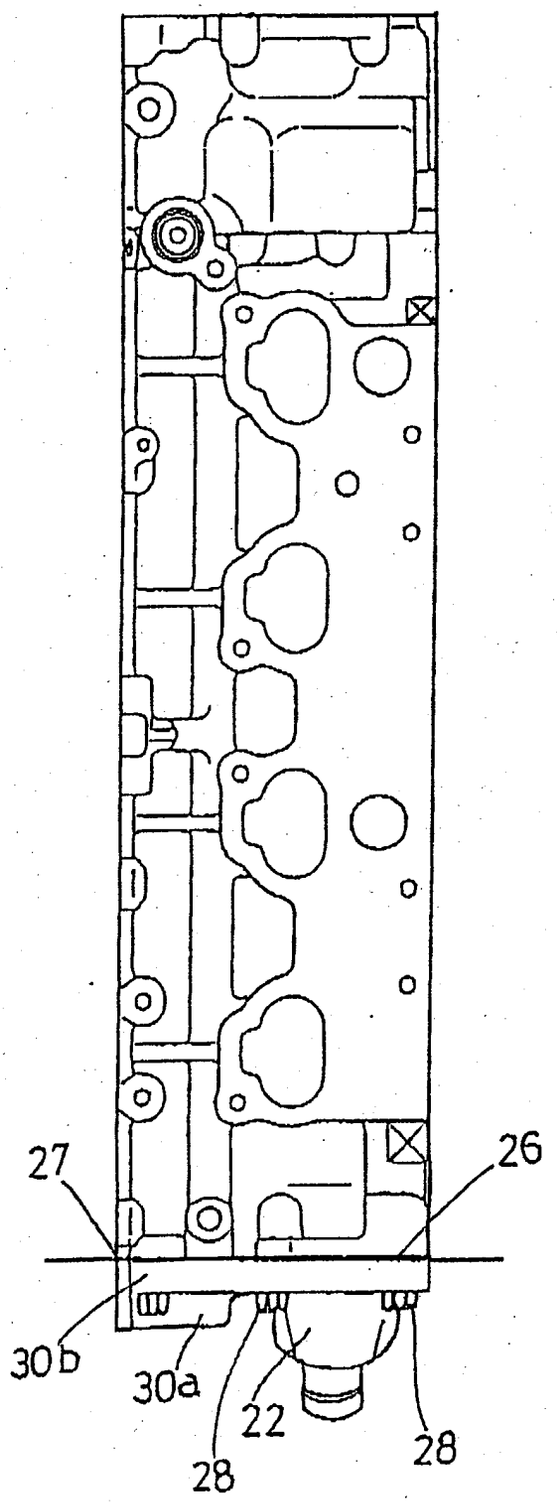

FIG. 6

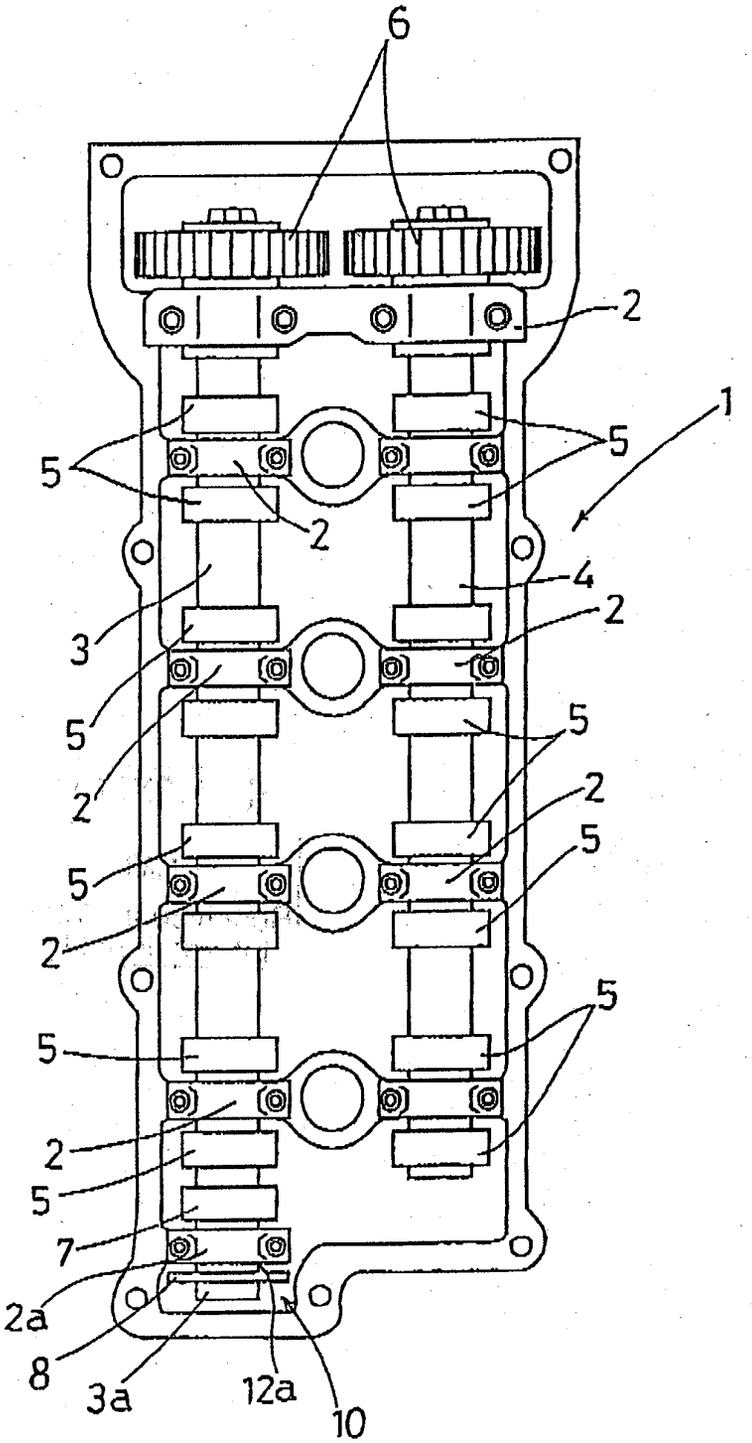

FIG. 7 PRIOR ART