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(71) Applicant: **Ford Global Technologies, Inc.**
Dearborn, Michigan 48126 (US)

(72) Inventor: **Rengmyr, Staffan**
416 56 Göterborg (SE)

(74) Representative: **Hellbom, Lars Olof et al**
Albihns Stockholm AB,
Box 5581
114 85 Stockholm (SE)

(54) Oil drainage passage for an internal combustion engine

(57) The invention relates to an internal combustion engine (1), comprising a cylinder block (2);
a cylinder head (3) mounted upon the cylinder block (2);
a crankcase (5) containing a supply of oil for lubricating the engine (1); and at least one oil drainage passage (10) extending from the cylinder head (3) under a camshaft cover (4) arranged above the cylinder head (3) and through the cylinder head (3) and the cylinder block (2). Said oil drainage passage (10) emerging into the crankcase (5) at a position below the center axis (14) of a crankshaft (9) in the engine (1).

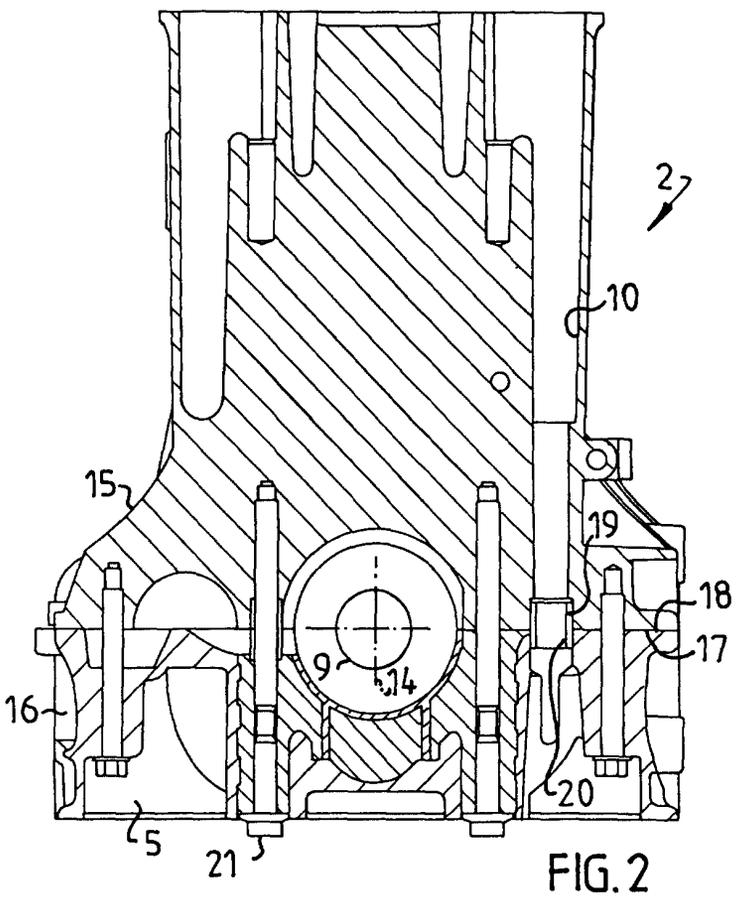

FIG. 2

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Description

TECHNICAL FIELD

[0001] The present invention relates to an internal combustion engine comprising a cylinder head mounted upon the cylinder block; a crankcase containing a supply of oil for lubricating the engine; and at least one oil drainage passage extending from the cylinder head under a camshaft cover arranged above the cylinder head and through the cylinder head and the cylinder block.

BACKGROUND OF THE INVENTION

[0002] Internal combustion engines are provided with oil passages in the cylinder block and the cylinder head for transporting lubricating oil to and from different lubrication points such as bearings and friction surfaces in the engine. A supply for the lubricating oil is arranged in the crankcase in the bottom part of the engine. The engine is provided with an oil pump for pumping the oil from the oil supply, through oil supply passages in the cylinder block and the cylinder head, and to the different lubrication points in the engine. When the oil has passed the lubrication points, it flows back to the oil supply in the crankcase through oil drainage passages.

[0003] A known internal combustion engine is disclosed in US,A,4 493 295. Two vertically arranged oil drainage passages extend from the cylinder head under a camshaft cover arranged above the cylinder head and through the cylinder head and the cylinder block and emerge into the crankcase at a position above a crankshaft in the engine. Ventilation passages extend parallel to the oil drainage passages and are separated from the oil drainage passages. In this manner oil returning from the cylinder head is prevented from being mixed with the ventilated air.

[0004] Another known internal combustion engine is disclosed in GB,A,2 172 061. Oil supply passages are defined in the cylinder block extending through the joined surfaces of bearing bridges in the crankcase. Knock pins or dowels are inserted into the supply passages for relatively position the bearing bridges to each other. The dowels are provided with a bore for defining an oil passage.

[0005] However, due to the rotating motion of the crankshaft when the returning oil from the oil drainage passages hits the crankshaft oil particles may be mixed with the air in the crankcase. An excessive amount of oil drops or oil particles may therefore be removed from the crankcase through the crankcase ventilation arrangement. As a result there will be an increase in the oil consumption, since the ventilated air and oil mixture is guided through the ventilation arrangement to the combustion chambers of the engine.

SUMMARY OF THE INVENTION

[0006] According to the present invention, the above-mentioned problem is solved by an internal combustion engine mentioned in the introduction of this specification, wherein said oil drainage passage emerging into the crankcase at a position below the center axis of a crankshaft in the engine.

[0007] The present solution to the problem caused by the contact between the returning oil and the rotating crankshaft is to reduce or eliminate this contact and thereby reduce the mixing of oil and air in the crankcase which leads to an increased oil consumption. When the oil drainage passage emerges into the crankcase at a position below the center axis of the crankshaft the returning oil is prevented to hit the crankshaft. Instead of getting into contact with the crankshaft, the returning oil is directly guided back to the oil supply in the crankcase.

[0008] According to another aspect of the present invention the cylinder block comprises two parts defining bearing halves for the crankshaft and that said oil drainage passage extends through the joined surfaces of the two parts. In this way the returning oil is guided back to the crankcase at a level below the crankcase.

[0009] According to a further aspect of the present invention a fixating dowel is inserted into the oil drainage passage across the joined surfaces of the two parts and the dowel is provided with a bore defining an oil passage through the dowel. Since the cylinder block is divided into two parts dowels are arranged to fixate the parts in relation to each other. A cylinder block contains a lot of passages for oil, cooling water and crankcase ventilation. When oil passages are arranged trough the fixating dowels the available volume of the cylinder block is used in an optimized manner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention will now be described by way of example and with reference to the accompanying drawings in which:

Fig. 1 is an exploded view in perspective of an internal combustion engine according to a first embodiment of the present invention,

Fig. 2 is a section view of the cylinder block disclosed in fig. 1,

Fig. 3 is a view from above of a cylinder block according to a second embodiment of the present invention, and

Fig. 4 is a view from the underside of the upper part of the cylinder block disclosed in fig. 3.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Fig. 1 is an exploded view in perspective of an internal combustion engine 1 according to the present invention. The internal combustion engine 1 is in this embodiment an inline-6 cylinder engine. The engine 1 comprises a cylinder block 2, a cylinder head 3 mounted upon the cylinder block 2 and a camshaft cover 4 arranged above the cylinder head 3. The cylinder head 3 is only partly disclosed in Fig. 1. In the bottom part of the cylinder block 2 a crankcase 5 is formed. The crankcase 5 defines a space containing a supply of oil for lubricating the engine 1.

[0012] The cylinder block 2 is provided with six cylinder bores 7 in which reciprocating pistons 8 are arranged. Also the cylinder head 3 is provided with cylinder bores 7. Each piston 8 is connected to a crankshaft 9 arranged in the crankcase 5.

[0013] The engine 1 according to the present invention is provided with oil drainage passages 10 for guiding the lubricating or engine oil from different lubricating points, such as bearings and friction surfaces in the engine. The cylinder block 2 according to the embodiment disclosed in Fig. 1 is provided with four vertically arranged oil drainage passages 10. Each oil drainage passage 10 extends from the cylinder head 3 under the camshaft cover 4 arranged above the cylinder head 3 and through the cylinder head 3 and the cylinder block 2. The oil drainage passages 10 emerge into the crankcase 5.

[0014] Due to the rotating motion of the crankshaft 9 when the returning oil from the oil drainage passages 10 hits the crankshaft 9, oil particles may be mixed with the air in the crankcase 5. An excessive amount of oil drops or oil particles may therefore be removed from the crankcase 5 through a crankcase ventilation arrangement 11. As a result there will be an increase in the oil consumption, since the ventilated air and oil mixture is guided through the ventilation arrangement 11 to the combustion chambers 13 of the engine. Therefore the oil drainage passages 10 according to the present invention emerge into the crankcase 5 at a position or level below the center axis 14 of the crankshaft 9 in the engine, which is disclosed in fig. 2.

[0015] Fig. 2 is a section view of the cylinder block 2 disclosed in fig. 1. In the cylinder block 2 an oil drainage passage 10 extends essentially parallel to the cylinders 7 and the oil drainage passage 10 follows an essentially straight line. The cylinder block 2 comprises two parts 15, 16 defining bearing halves 12 for the crankshaft 9. The oil drainage passage 10 extends through the joined surfaces 17, 18 of the two parts 15, 16. A fixating dowel 19 is inserted into the oil drainage passage 10 across the joined surfaces 17, 18 of the two parts 15, 16 and the dowel 19 is provided with a bore 20 defining an oil passage through the dowel 19. Since the cylinder block 2 is divided into two parts 15, 16 dowels 19 are arranged to fixate the parts 15, 16 in relation to each other. Preferably, a fixating dowel 19 is arranged in each oil drainage passage 10. A cylinder block contains a lot of passages for oil, cooling water and crankcase ventilation. When oil passages are arranged trough the fixating dowels 19 the available volume of the cylinder block 2 is used in an optimized manner. The joined surfaces 17, 18 of the two parts 15, 16 essentially coincide with the center axis 14 of the crankshaft 9 and the two parts 15, 16 are attached to each other by means of threaded bolts 21.

[0016] When the oil drainage passage 10 emerges into the crankcase 5 at a position below the center axis 14 of the crankshaft 9 the returning oil is prevented to hit the crankshaft 9. Instead of getting into contact with the crankshaft 9, the returning oil is directly guided back to the oil supply in the crankcase 5.

[0017] Fig. 3 is a view from above of the cylinder block 2 according to the present invention. The vertical oil drainage passages 10 are arranged substantially between and offset to the cylinders 7. On the opposite side to the row of cylinders, five crankcase ventilation passages 22 are arranged in the block 2. The oil drainage passages 10 extend essentially parallel to the ventilation passages 22 and are in this way separated from the ventilation passages 22. As a result of this separation oil returning from the cylinder head 3 and into the crankcase 5 is prevented from being mixed with the ventilated air in the ventilation passages 22.

[0018] Fig. 4 is a view from the underside of the upper part 15 of the cylinder block 2 disclosed in fig. 3. One of the bearing halves 12 for the crankshaft are disclosed in this figure. On each side of the bearing bridges 23, holes 24 for the threaded bolts 21 are arranged. Also, the oil drainage passages 10 are disclosed. The outer surface 25 of the upper part 15 of the cylinder block 2 forms a frame, which is intended to cooperate with a corresponding surface of the lower part 16 of the cylinder block 2, so that a sealed space is defined, forming the crankcase 5.

Claims

1. An internal combustion engine, comprising
a cylinder block (2);
a cylinder head (3) mounted upon the cylinder block (2);
a crankcase (5) containing a supply of oil for lubricating the engine (1);
at least one oil drainage passage (10) extending from the cylinder head (3) under a camshaft cover (4) arranged above the cylinder head (3) and through the cylinder head (3) and the cylinder block (2),
characterized in
that said oil drainage passage (10) emerging into the crankcase (5) at a position below the center axis (14) of a crankshaft (9) in the engine (1).

2. An engine according to claim 1, **characterized in that** the oil drainage passage (10) extends essentially parallel to cylinders (7) arranged in the cylinder block (2).

3. An engine according to any of claim 1 or 2, **characterized in that** the oil drainage passage (10) follows an essentially straight line.

4. An engine according to any of the preceding claims, **characterized in that** cylinder block (2) comprises two parts (15, 16) defining bearing halves (12) for the crankshaft (9) and that said oil drainage passage (10) extends through the joined surfaces (17, 18) of the two parts (15, 16).

5. An engine according to claim 4, **characterized in that** a fixating dowel (19) is inserted into the oil drainage passage (10) across the joined surfaces (17, 18) of the two parts (15, 16) and that the dowel (19) is provided with a bore (20) defining an oil passage through the dowel (19).

6. An engine according to any of claim 4 or 5, **characterized in that** a plane defined by the joined surfaces (17, 18) of the two parts (15, 16) essentially coincide with the center axis (14) of the crankshaft (9).

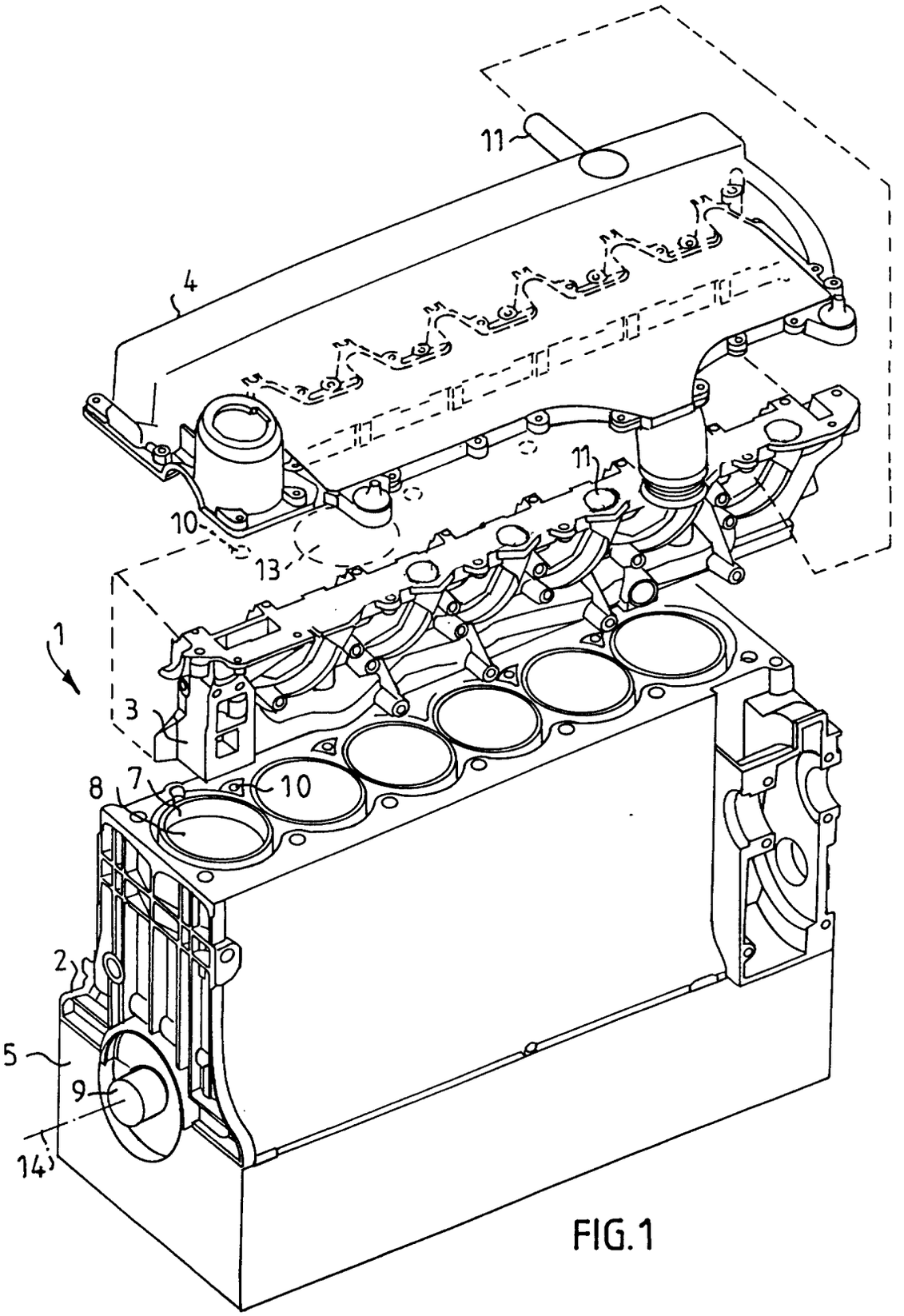

FIG.1

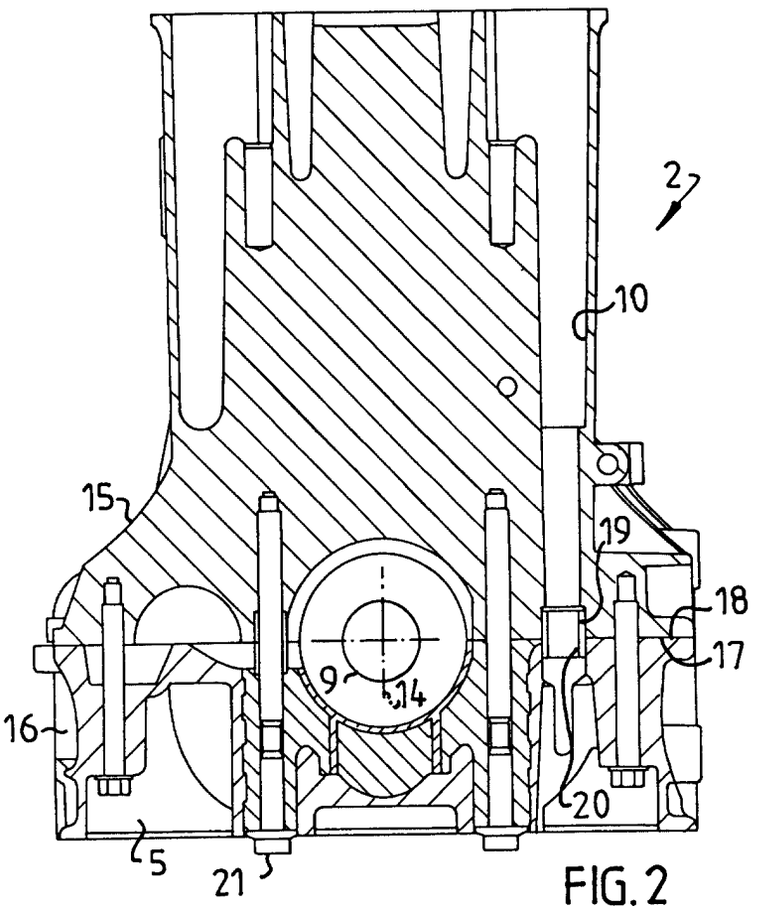

FIG. 2

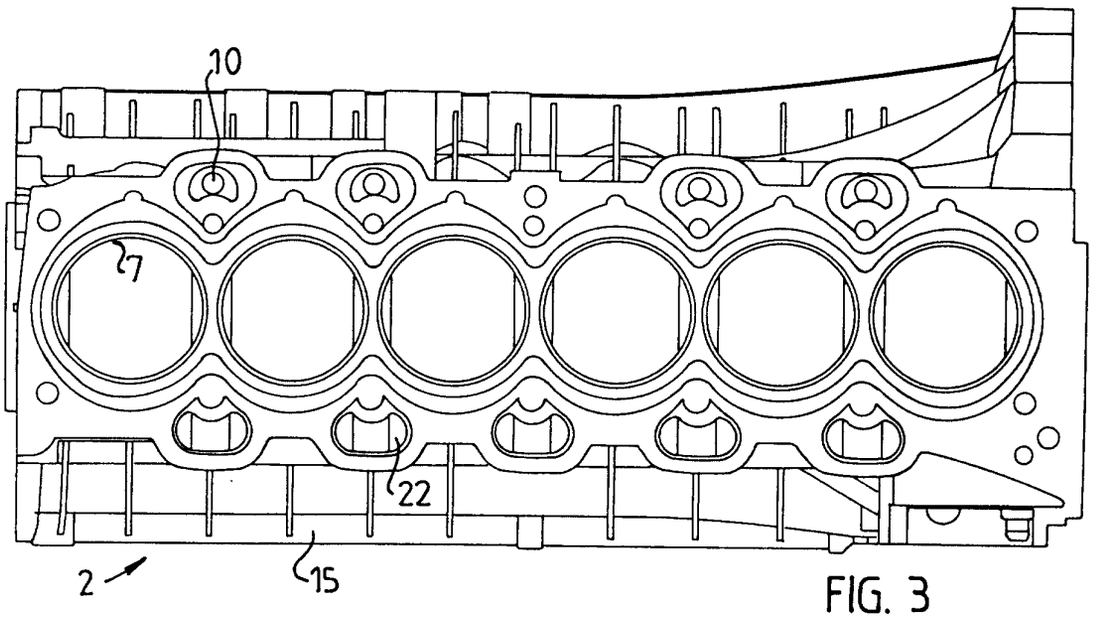

FIG. 3

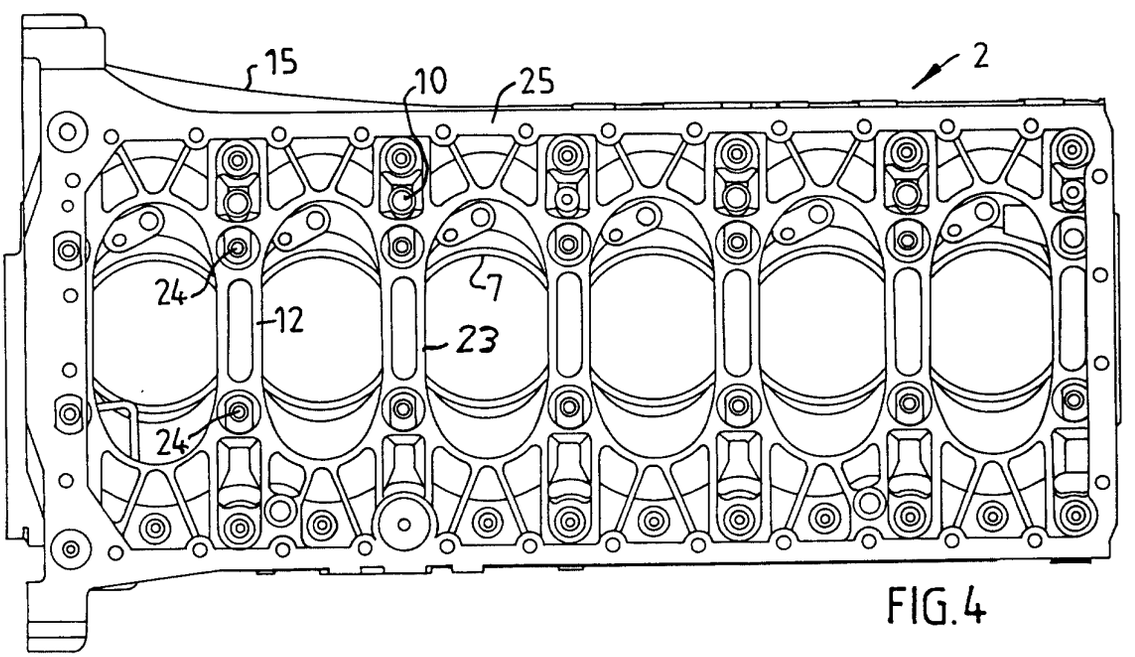

FIG. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 85 0221

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y	* figure 2 *	5	
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Y	GB 2 172 061 A (HONDA MOTOR CO LTD) 10 September 1986 (1986-09-10) * page 3; figures 1,3 *	5	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F01M
F02F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	21 May 2002	Vedoato, L

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 85 0221

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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