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(54) Engine with a lubricating device for reducing wear between a timing chain and a tension pulley

(57) An engine (2) has an oil slot unit with an oil inlet (271) that is communicated with an oil passage (26), and an oil outlet (272) that is directed to at least one of a timing chain (24, 34, 44, 54, 64) and a tension pulley (25, 35, 45, 55, 65) . Lubricating oil is pumped to flow from a crankcase (22, 52) to the oil slot unit via the oil passage (26), and is sprayed from the oil outlet (272) of the oil slot unit onto the at least one of the timing chain (24, 34, 44, 54, 64) and the tension pulley (25, 35, 45, 55, 65). Accordingly, wear between the timing chain (24, 34, 44, 54, 64) and the tension pulley (25, 35, 45, 55, 65) is reduced.

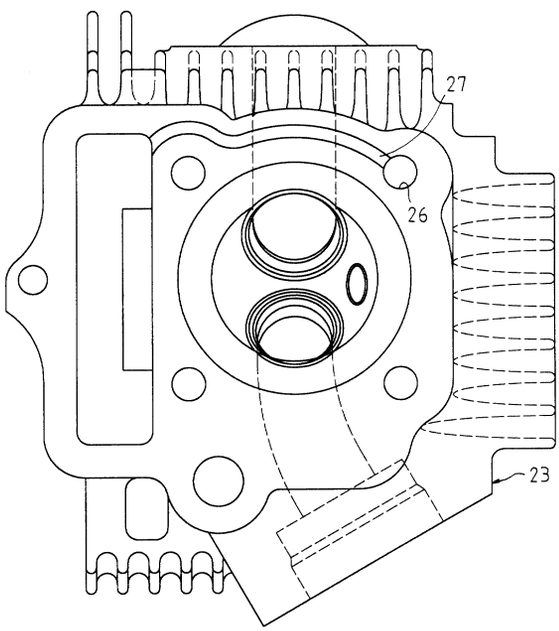

FIG. 4

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Description

[0001] This invention relates to an engine that includes a timing chain and a tension pulley, more particularly to an engine, which is provided with a lubricating device for reducing wear between the timing chain and the tension pulley.

[0002] Referring to Fig. 1, a conventional motorcycle engine 1 is shown to include a cylinder body 11, a crankcase 12 that is connected fixedly to the lower end of the cylinder body 11, and a cylinder head 13 that is connected fixedly to the upper end of the cylinder body 11. The crankcase 12 includes a left housing 121, a right housing 122, a left housing cover 123, a right housing cover 124, and a crankshaft 125, on which alower sprocket wheel 246 is sleeved fixedly. A camshaft 131 is journalled within the cylinder head 13, and has an oil inlet passage 134 and a plurality of oil outlets 132. An upper sprocket wheel 133 is sleeved fixedly on the camshaft 131. A timing chain 14 engages the upper and lower sprocket wheels 133, 126, and is tautened by a tension pulley 127, which is disposed in the cylinder body 11. An oil passage 15 (shown by the dotted lines) has an upper portion that is communicated with the oil inlet passage 134 in the camshaft 131, and a lower portion that is formed in the crankcase 12. Lubricating oil in the crankcase 12 is forced by an oil pump (not shown) to the oil passage 15, and is then sprayed from the oil outlets 132 in the camshaft 131, thereby lubricating the parts under the camshaft 131. In addition, a part of the lubricating oil in the crankcase 12 is carried by the timing chain 14 to move onto the upper sprocket wheel 133 and the tension pulley 127 when the timing chain 14 circulates. In this way, the timing chain 14, the upper sprocket wheel 133 and the tension pulley 127 can be lubricated. When the horsepower number of the engine 1 is up to about 7.4, however, it is difficult to move the lubricating oil from the timing chain 14 to the upper sprocket wheel 133 and the tension pulley 127. In this case, serious wear occurs between the timing chain 14 and the tension pulley 127.

[0003] The object of this invention is to provide an engine, which is provided with a lubricating device for reducing wear between a timing chain and a tension pulley.

[0004] According to this invention, an engine includes a cylinder body, and a crankcase connected fixedly to the lower end of the cylinder body and including a crankshaft that is journalled within the crankcase, a lower sprocket wheel that is sleeved fixedly on the crankshaft, and an oil pump that is disposed in the crankcase. A cylinder head is connected fixedly to the upper end of the cylinder body, and includes a camshaft that is journalled therein, and an upper sprocket wheel that is sleeved fixedly on the camshaft. An oil passage is formed through the cylinder body, and has an upper portion that is formed in the cylinder head, and a lower portion that is formed in the crankcase. Lubricating oil is forced by the oil pump to flow through the oil passage. A timing chain engages the upper and lower sprocket wheels for transferring rotation between the camshaft and the crankshaft. An adjustable tension pulley is disposed in the cylinder body for maintaining the timing chain in a tautened condition. An oil slot unit is formed in the engine, and has an oil inlet that is communicated with the oil passage, and an oil outlet that is directed to at least one of the timing chain and the tension pulley so that the lubricating oil is sprayed from the oil slot unit onto the at least one of the timing chain and the tension pulley, thereby reducing wear between the timing chain and the tension pulley.

[0005] Preferred features of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:- with reference to the accompanying drawings, in which:

Fig. 1 illustrates a conventional motorcycle engine;
Fig. 2 illustrates a first preferred embodiment of a motorcycle engine according to this invention;
Fig. 3 is a sectional view illustrating how an oil pump is provided in a crankcase of the first preferred embodiment;
Fig. 4 is a bottom view of a cylinder head of the first preferred embodiment;
Fig. 5 illustrates a second preferred embodiment of a motorcycle engine according to this invention;
Fig. 6 is a top view of a cylinder body of the second preferred embodiment;
Fig. 7 illustrates a third preferred embodiment of a motorcycle engine according to this invention;
Fig. 8 is a bottom view of a cylinder body of the third preferred embodiment;
Fig. 9 illustrates a fourth preferred embodiment of a motorcycle engine according to this invention;
Fig. 10 is a top view of a crankcase of the fourth preferred embodiment;
Fig. 11 illustrates a fifth preferred embodiment of a motorcycle engine according to this invention;
Fig. 12 is a schematic side view illustrating a cylinder body of the fifth preferred embodiment; and
Fig. 13 is a sectional view taken along Line XIII-XIII in Fig. 12.

[0006] Referring to Fig. 2, a first preferred embodiment of a motorcycle engine according to this invention is shown to include a cylinder 21, a crankcase 22, a cylinder head 23, a timing chain 24, an adjustable tension pulley 25, an oil passage 26, and an oil slot unit that consists of a single slot 27.

[0007] The crankcase 22 is connected fixedly to the lower end of the cylinder 21, and includes a left housing 221, a right housing 222, a left housing cover 223, a right housing cover 224, an oil pump 225 (see Fig. 3), a crankshaft 226, and a lower sprocket wheel 227. The oil pump 225 is disposed in the crankcase 22. The crankshaft 226 is journalled in the crankcase 22. The lower sprocket

wheel 227 is sleeved fixedly on the crankshaft 226.

[0008] The cylinder head 23 is connected fixedly to the upper end of the cylinder body 21, and includes a camshaft 231 that is journalled therein, and an upper sprocket wheel 233 that is sleeved fixedly on the camshaft 231.

[0009] The timing chain 24 engages the upper and lower sprocket wheels 233, 227 for transferring rotation between the camshaft 231 and the crankshaft 226.

[0010] The tension pulley 25 is disposed in the cylinder body 21 for maintaining the timing chain 24 in a tautened condition.

[0011] The oil passage 26 is formed through the cylinder body 21, and has an upper end portion that is formed in the cylinder head 23, and a lower end portion that is formed in the crankcase 22. Lubricating oil is forced by the oil pump 225 to flow through the oil passage 26.

[0012] The oil slot 27 is horizontal, and is located between the camshaft 231 and the crankshaft 226.

[0013] Fig. 4 is a top view of the cylinder head 23. As illustrated, the oil slot 27 is formed in a horizontal bottom surface of the cylinder head 23, which abuts against a horizontal top surface of the cylinder body 21 (see Fig. 2) . Referring to Figs. 2 and 4, the slot 27 has an oil inlet that is located at the right end thereof and that is communicated with the oil passage 26, and an oil outlet, which is located at the left end of the slot 27 and which is directed to a portion of the timing chain 14 that is located over the tension pulley 25.

[0014] Fig. 5 illustrates a second preferred embodiment of this invention, which is similar to the first embodiment in construction except for the position of the oil slot unit in the engine. In this embodiment, the oil slot unit consists of a single horizontal slot 37.

[0015] Fig. 6 is a top view of a cylinder body 31 of the second embodiment, in which the slot 37 is formed in a horizontal top surface of the cylinder body 31. The slot 37 has a right end that constitutes an oil inlet, and a left end, which constitutes an oil outlet that is directed to a portion of a timing chain 34 (see Fig. 5) immediately over a tension pulley 35 (see Fig. 5) .

[0016] Fig. 7 illustrates a third preferred embodiment of this invention, which is similar to the first embodiment in construction except for the position of the oil slot unit in the engine. In this embodiment, the oil slot unit consists of a single horizontal slot 47.

[0017] Fig. 8 is a bottom view of a cylinder body 41 of the third embodiment, in which the slot 47 is formed in a horizontal bottom surface of the cylinder body 41. The slot 47 has a right end that constitutes an oil inlet, and a left end, which constitutes an oil outlet that is directed to a portion of a timing chain 44 (see Fig. 7) under a tension pulley 45 (see Fig. 7).

[0018] Fig. 9 illustrates a fourth preferred embodiment of this invention, which is similar to the first embodiment in construction except for the position of the oil slot unit in the engine. In this embodiment, the oil slot unit consists of a single horizontal slot 57.

[0019] Fig. 10 is a top view of a crankcase 52 of the fourth embodiment, in which the slot 57 is formed in a horizontal top surface of the crankcase 52. The slot 57 has a right end that constitutes an oil inlet, and a left end, which constitutes an oil outlet that is directed to a portion of a timing chain 54 (see Fig. 9) under a tension pulley 55 (see Fig. 9).

[0020] Figs. 11 illustrates a fifth preferred embodiment of this invention, which is similar to the first embodiment in construction except for the oil slot unit in the engine. In this embodiment, the oil slot unit 67 consists of two intersecting slots 611, 612.

[0021] Figs. 12 and 13 show a cylinder body 61 of the fourth embodiment, in which the slots 611, 612 are formed in the cylinder body 61. The right ends of the slots 611, 612 are closed by two plugs 613, 614, respectively. The left end of the slot 611 is opened, and constitutes an oil inlet. The left end of the slot 612 is opened, and constitutes an oil outlet that is directed to a tension pulley 65 (see Fig. 11).

[0022] As such, a part of the lubricating oil in the crankcase is carried by the timing chain onto the tension pulley. In addition, another part of the lubricating oil in the crankcase is sprayed from the oil outlet of the oil slot unit onto the timing chain and the tension pulley, thereby reducing wear between the timing chain and the tension pulley.

[0023] While the present invention has been described in its preferred embodiments, it is to be understood that the words which have been used are words of description rather than limitation and that changes may be made to the invention without departing from its scope as defined by the appended claims.

[0024] Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

[0025] Statements in this specification of the "objects of the invention" relate to preferred embodiments of the invention, but not necessarily to all embodiments of the invention falling within the claims.

[0026] The text of the abstract filed herewith is repeated here as part of the specification.

[0027] An engine has an oil slot unit with an oil inlet that is communicated with an oil passage, and an oil outlet that is directed to at least one of a timing chain and a tension pulley. Lubricating oil is pumped to flow from a crankcase to the oil slot unit via the oil passage, and is sprayed from the oil outlet of the oil slot unit onto the at least one of the timing chain and the tension pulley. Accordingly, wear between the timing chain and the tension pulley is reduced.

Claims

1. An engine (2) including:

a cylinder body (21, 31, 41, 61);
a crankcase (22, 52) connected fixedly to the lower end of the cylinder body (21, 31, 41, 61) and including a crankshaft (226) that is journalled within the crankcase (22, 52), a lower sprocket wheel (227) that is sleeved fixedly on the crankshaft (226), and an oil pump (225) that is disposed in the crankcase (22, 52);
a cylinder head (23) connected fixedly to the upper end of the cylinder body (21, 31, 41, 61) and including a camshaft (231) that is journalled therein, and an upper sprocket wheel (233) that is sleeved fixedly on the camshaft (231);
a timing chain (24, 34, 44, 54, 64) engaging the upper and lower sprocket wheels (233, 227) for transferring rotation between the camshaft (231) and the crankshaft (226);
an adjustable tension pulley (25, 35, 45, 55, 65) disposed in the cylinder body (21, 31, 41, 61) for maintaining the timing chain (24, 34, 44, 54, 64) in a tautened condition; and
an oil passage (26) formed through the cylinder body (21, 31, 41, 61) and having an upper end portion that is formed in the cylinder head (23), and a lower end portion that is formed in the crankcase (22, 52), lubricating oil being forced by the oil pump (225) to flow through the oil passage (26);

characterized in that an oil slot unit is formed in the engine (2), and has an oil inlet that is communicated with the oil passage (26), and an oil outlet that is directed to at least one of the timing chain (24, 34, 44, 54, 64) and the tension pulley (25, 35, 45, 55, 65) so that the lubricating oil is sprayed from the oil slot unit onto the at least one of the timing chain (24, 34, 44, 54, 64) and the tension pulley (25, 35, 45, 55, 65), thereby reducing wear between the timing chain (24, 34, 44, 54, 64) and the tension pulley (25, 35, 45, 55, 65).

2. An engine (2) as claimed in Claim 1, characterized in that the oil slot unit is horizontal, and is located between the camshaft (231) and the crankshaft (226).

3. An engine (2) as claimed in Claim 2, characterized in that the oil slot unit includes a single slot (27), which is formed in a horizontal bottom surface of the cylinder head (23).

4. An engine (2) as claimed in Claim 2, characterized in that the oil slot unit includes a single slot (37), which is formed in a horizontal top surface of the cylinder body (31).

5. An engine (2) as claimed in Claim 2, characterized in that the oil slot unit includes a single slot (47), which is formed in a horizontal bottom surface of the cylinder body (41).

6. An engine (2) as claimed in Claim 2, characterized in that the oil slot unit includes a single slot (57), which is formed in a horizontal top surface of the crankcase (52).

7. An engine (2) as claimed in Claim 2, characterized in that the oil slot unit (67) includes two intersecting slots (611, 612), which are formed in the cylinder body (61), each of the slots (611, 612) having a closed end and an open end, the open ends constituting the oil inlet and the oil outlet of the oil slot unit.

8. An engine having a camshaft (231) driven by a timing chain (24, 34, 44, 54, 64), the chain being tensioned by a chain tensioner (25,35,45,55,65) characterised by an oil supply conduit (27,37,47,57,67) for delivering lubricating oil directly to the chain and/or the chain tensioner.

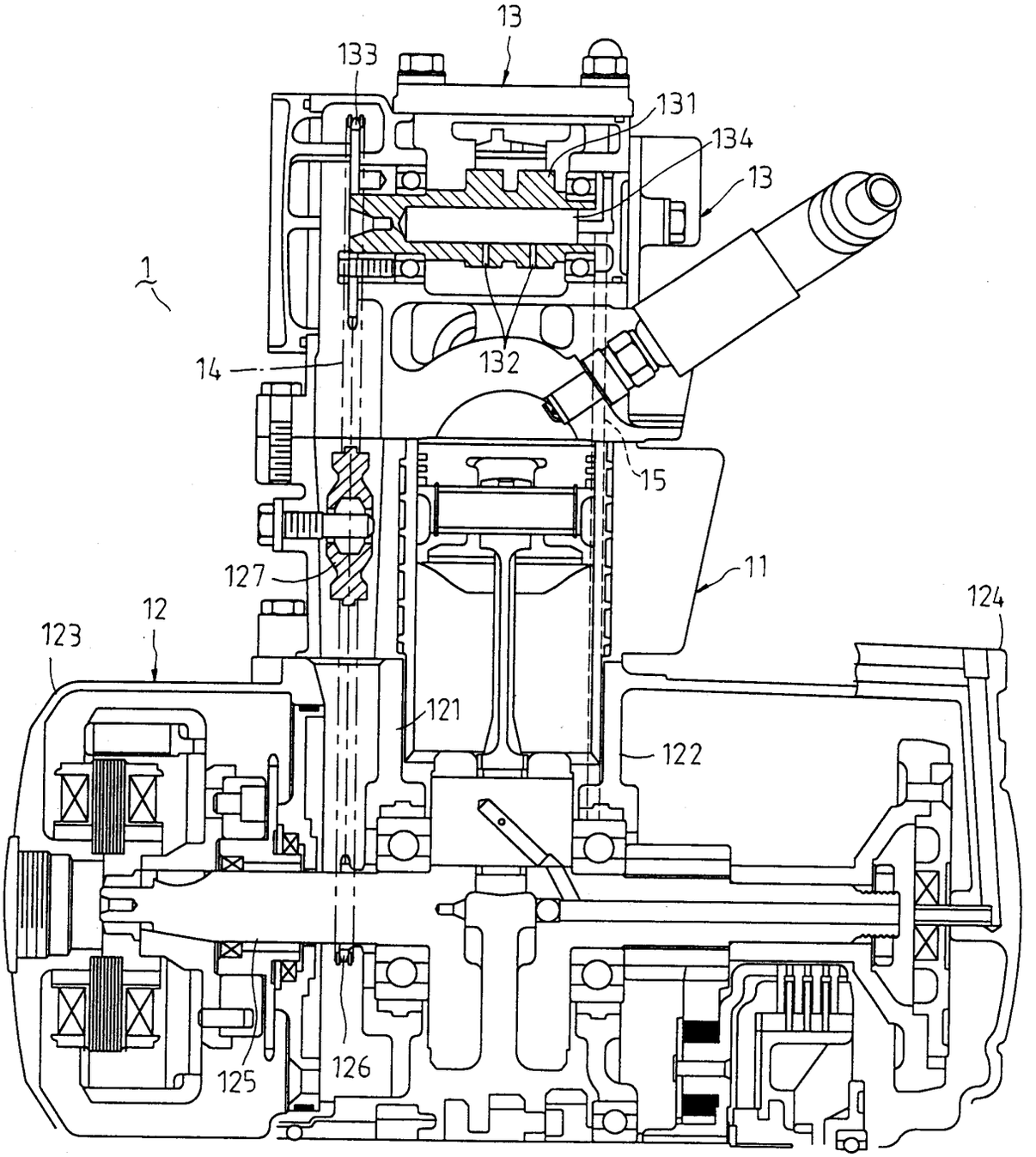

FIG.1

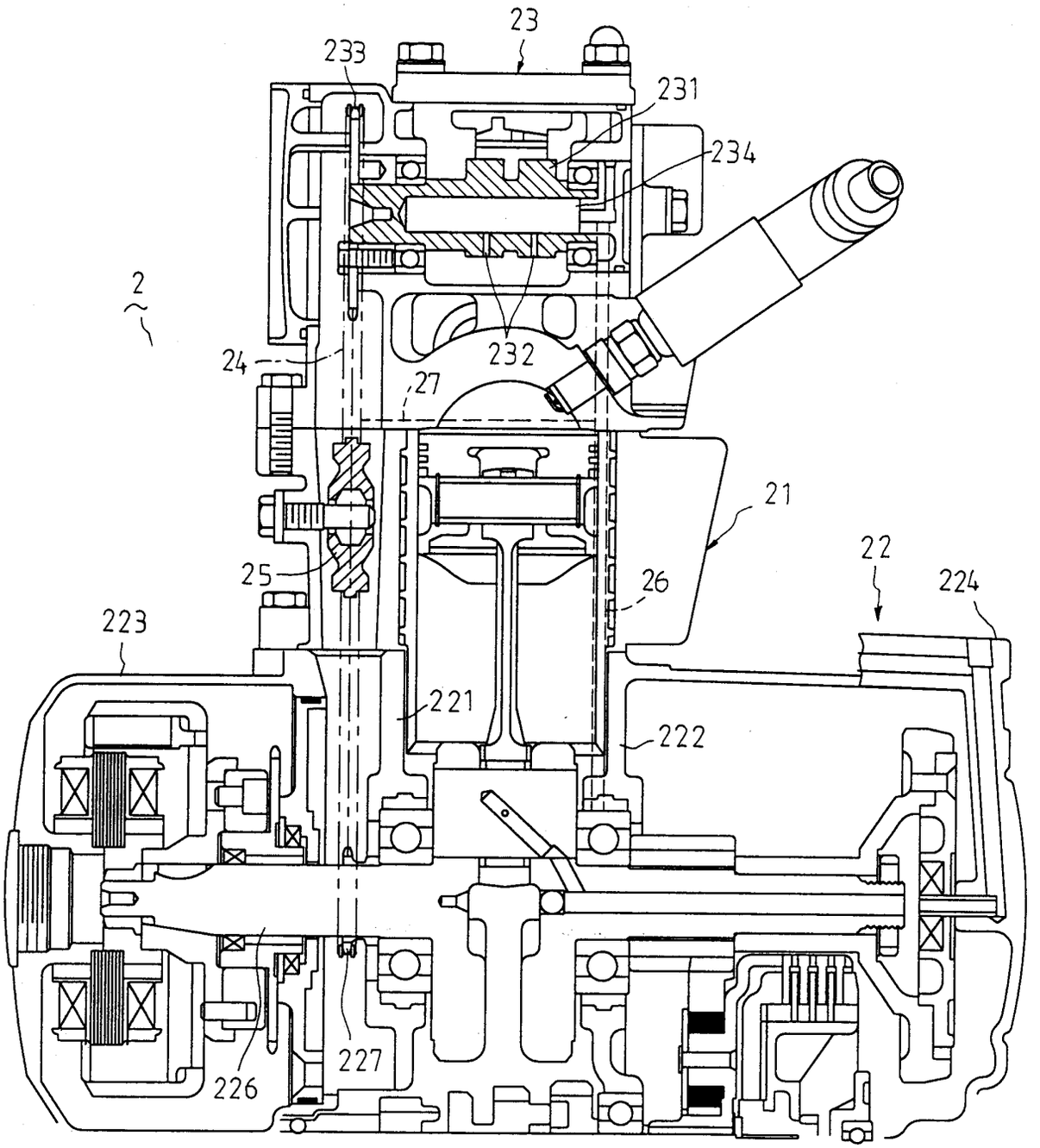

FIG. 2

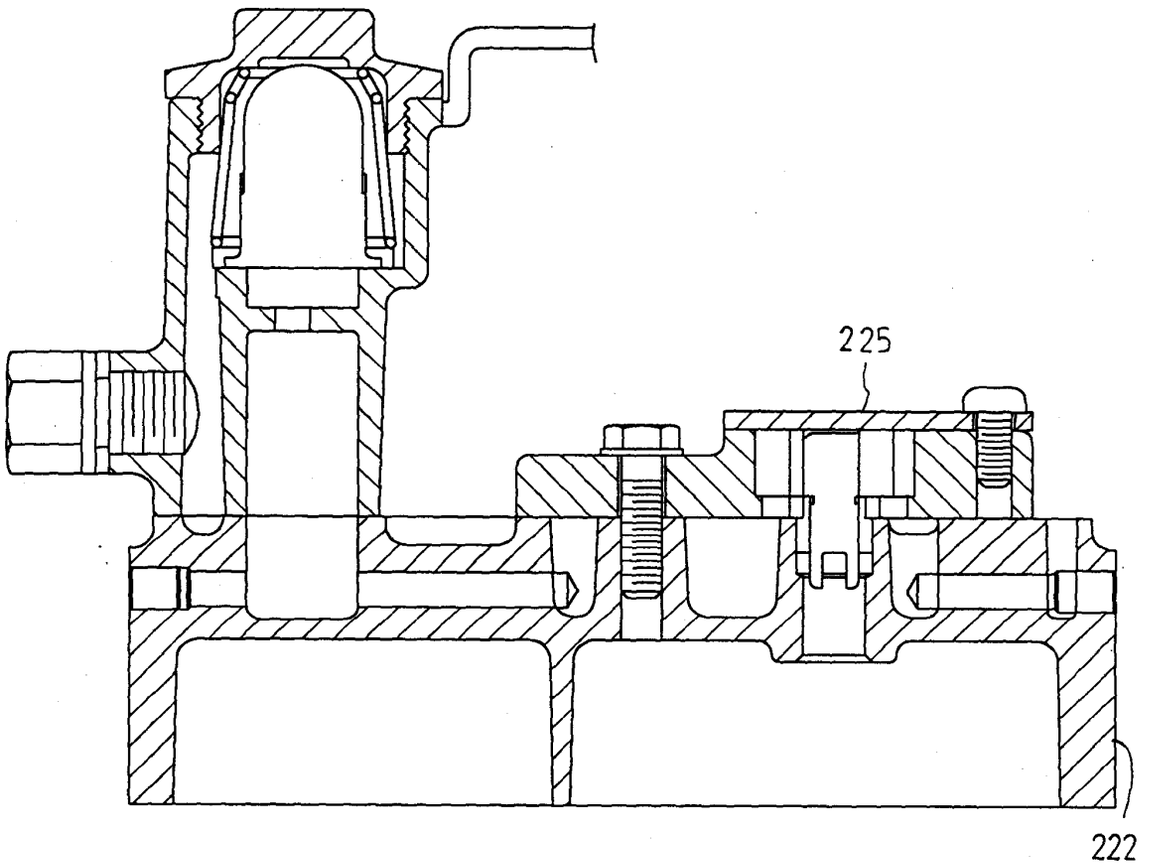

FIG. 3

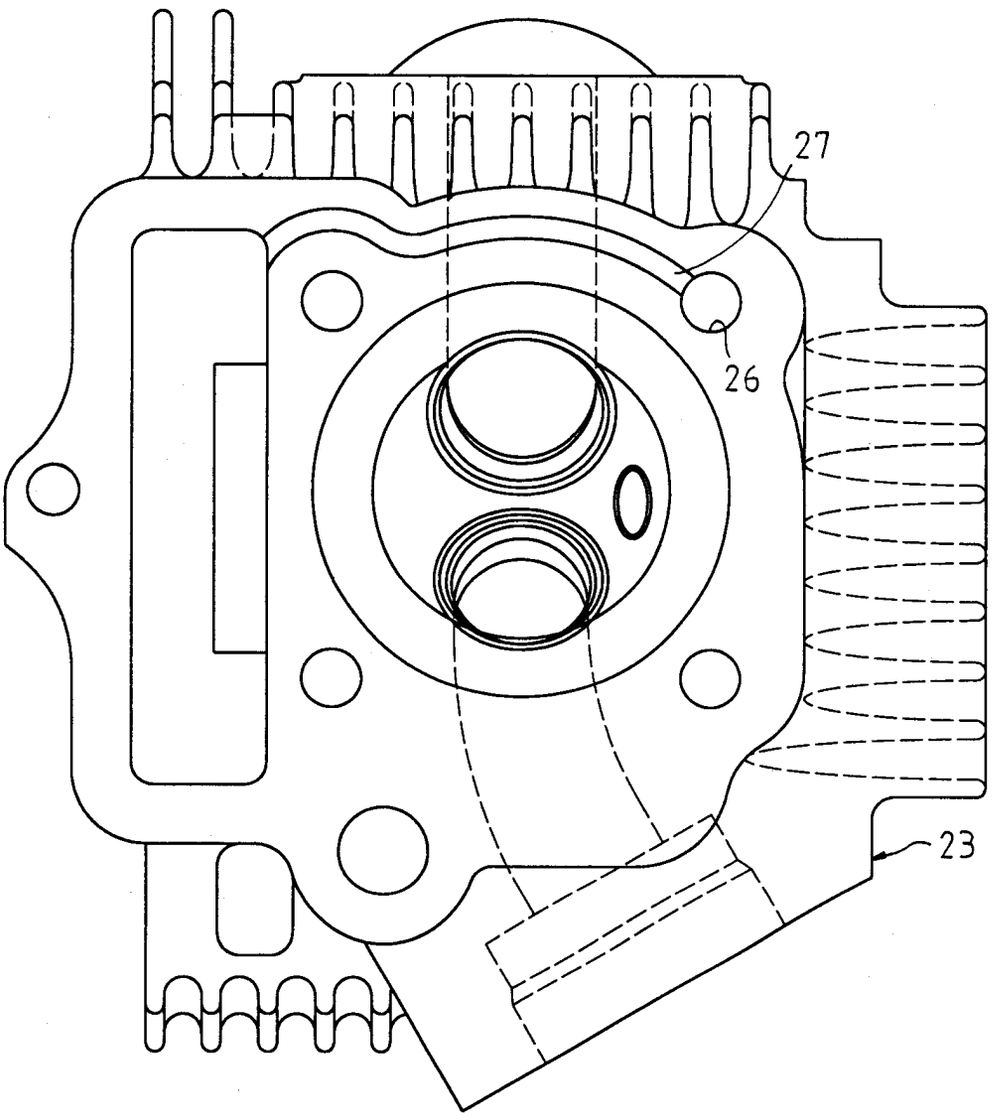

FIG.4

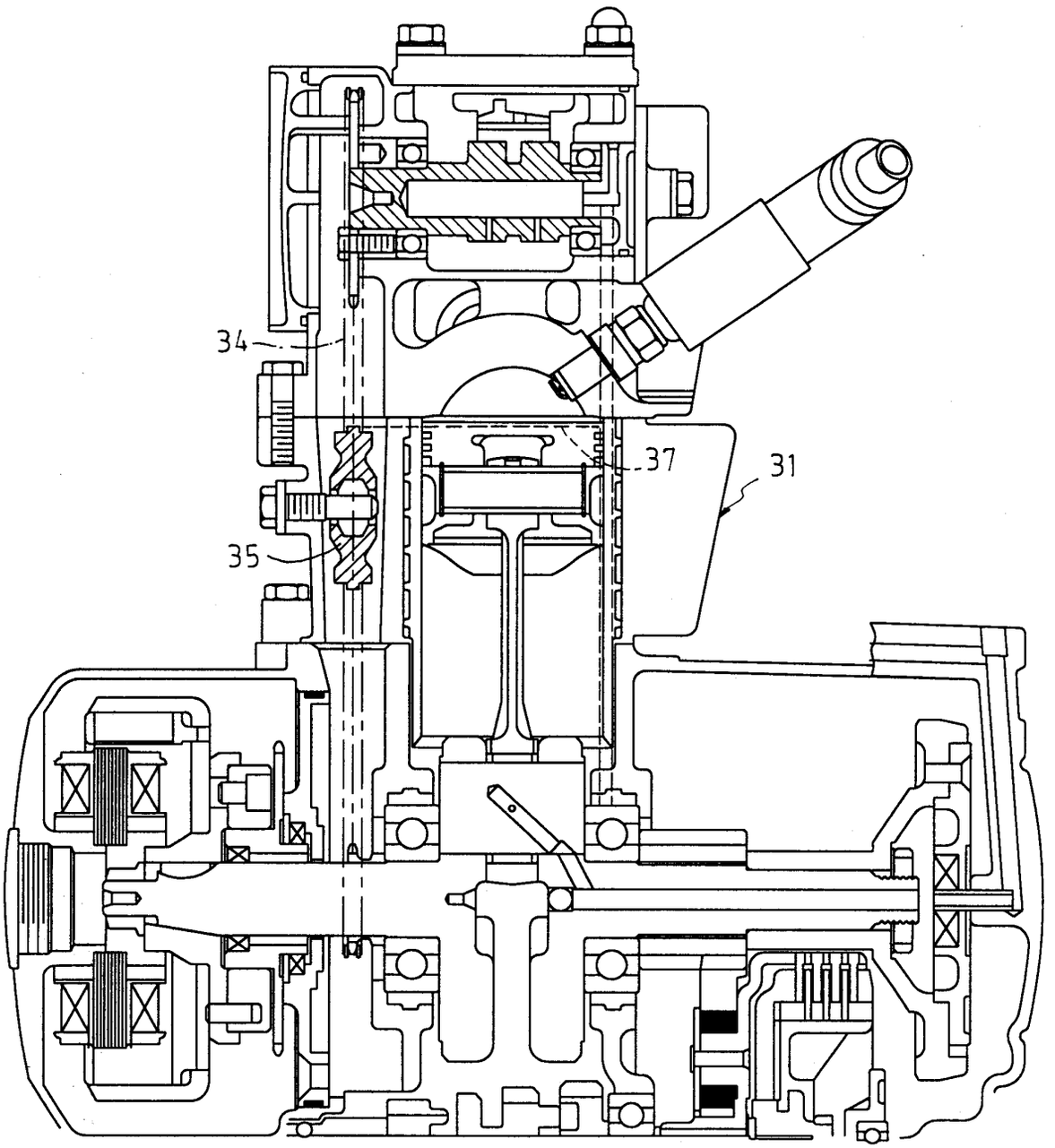

FIG.5

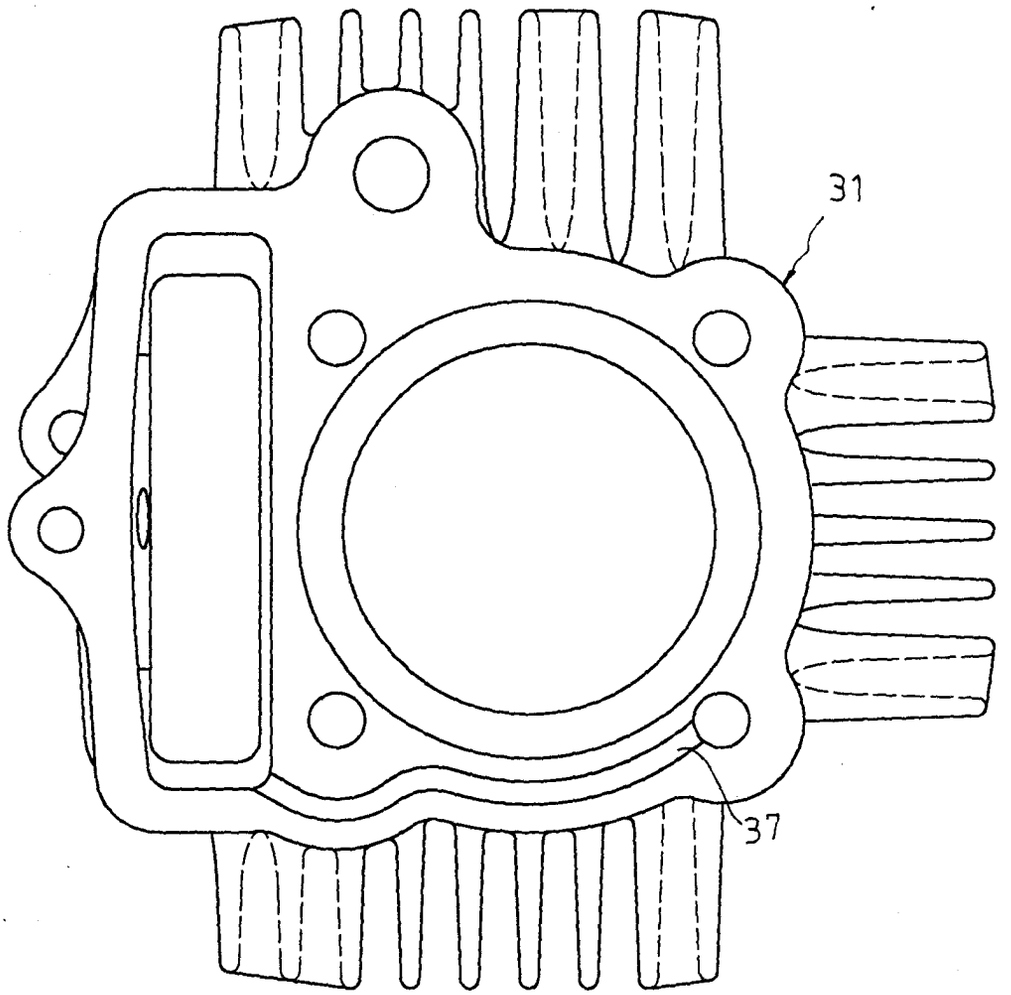

FIG. 6

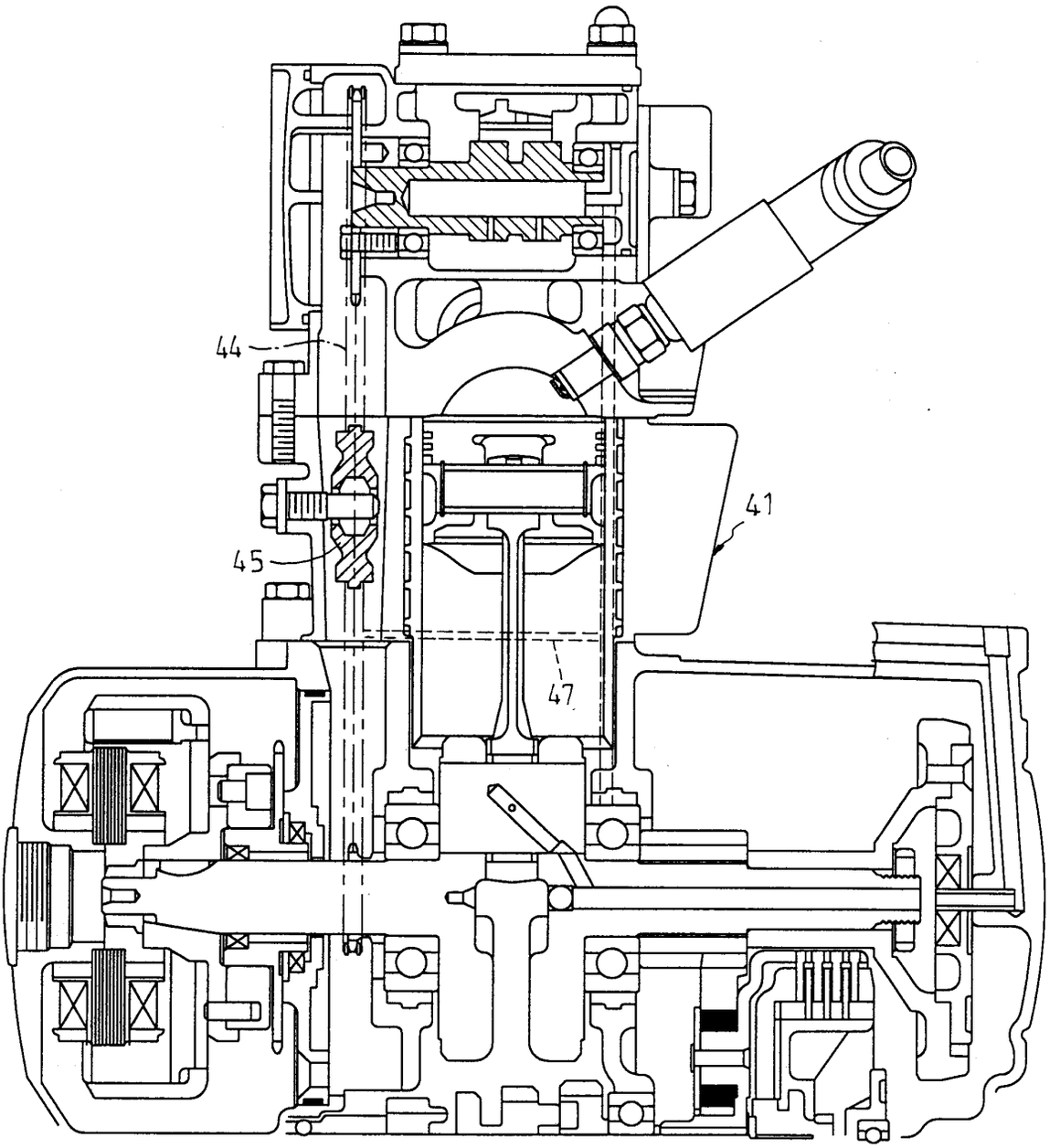

FIG. 7

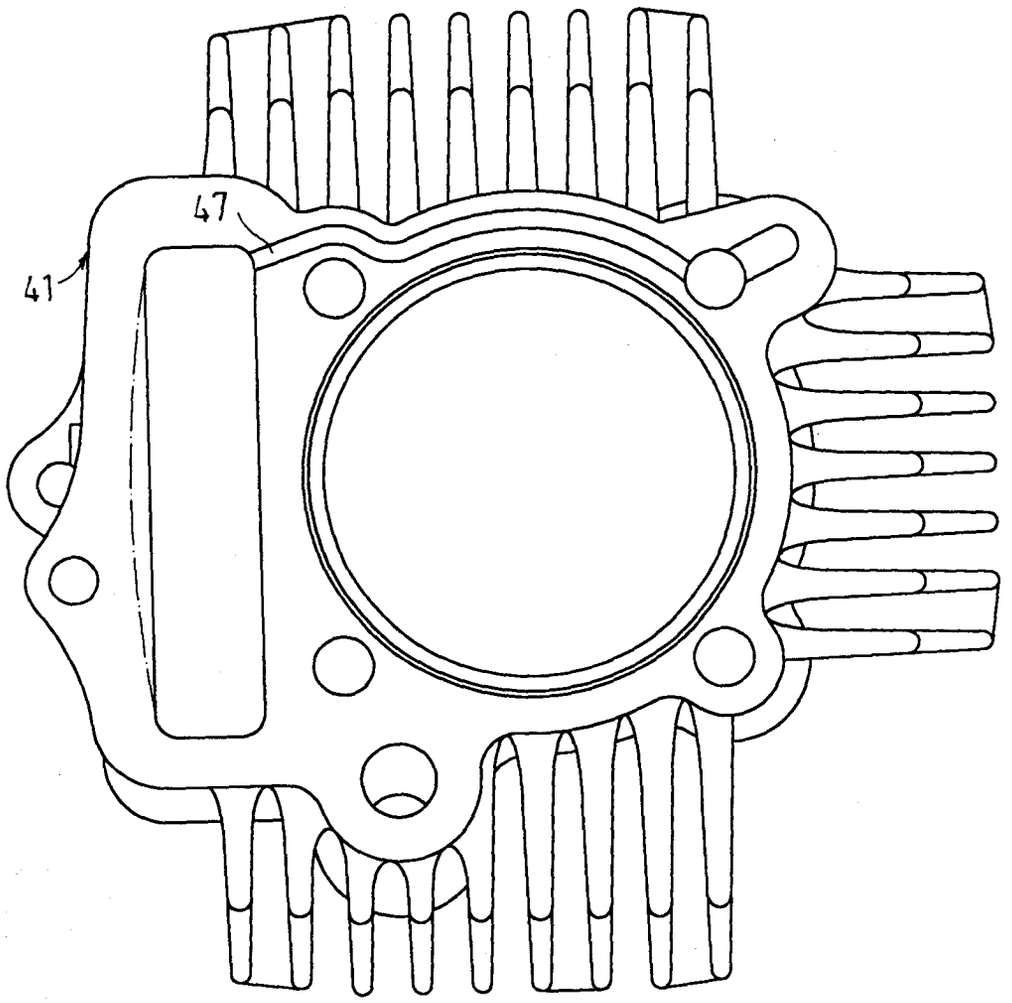

FIG.8

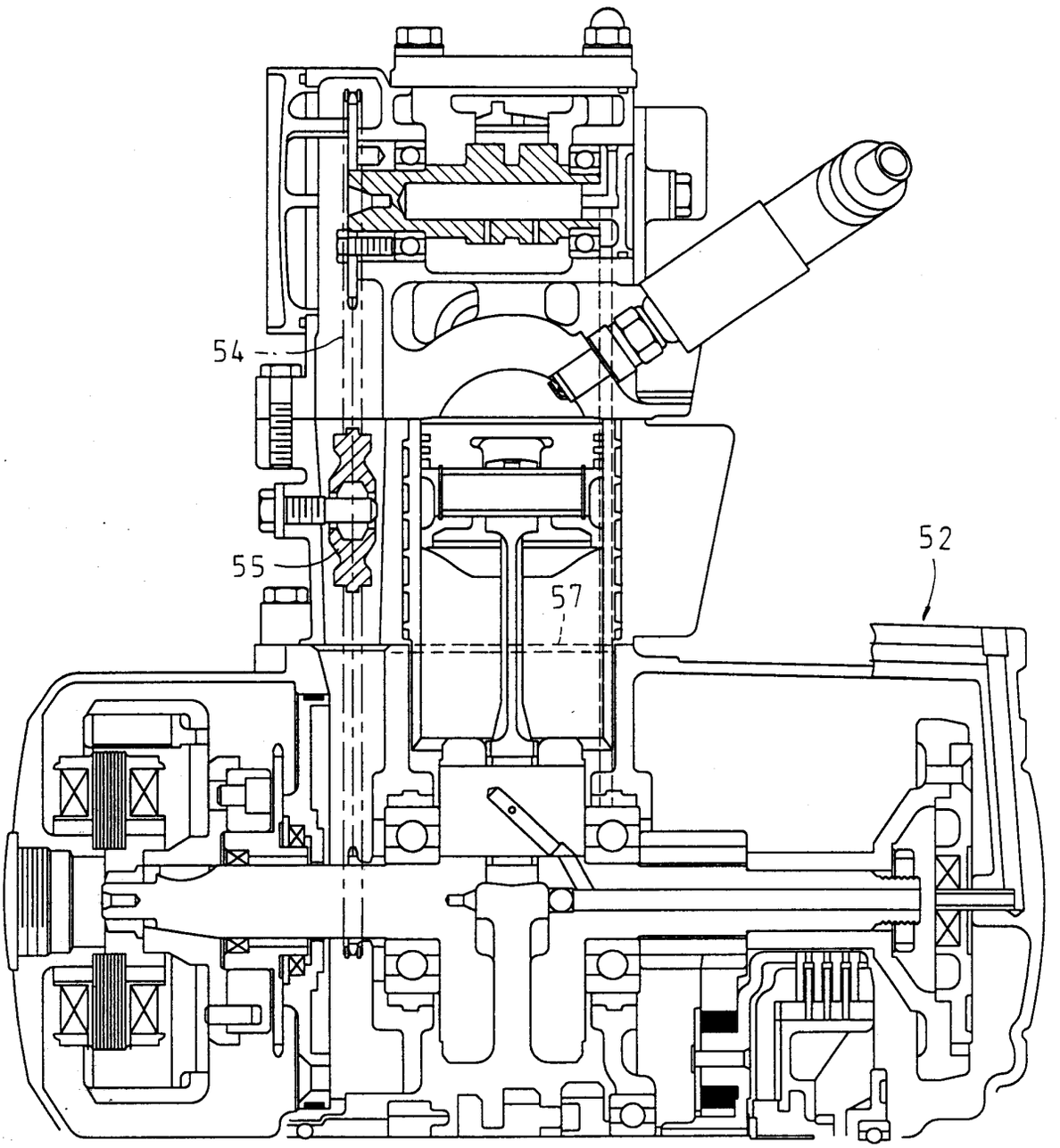

FIG. 9

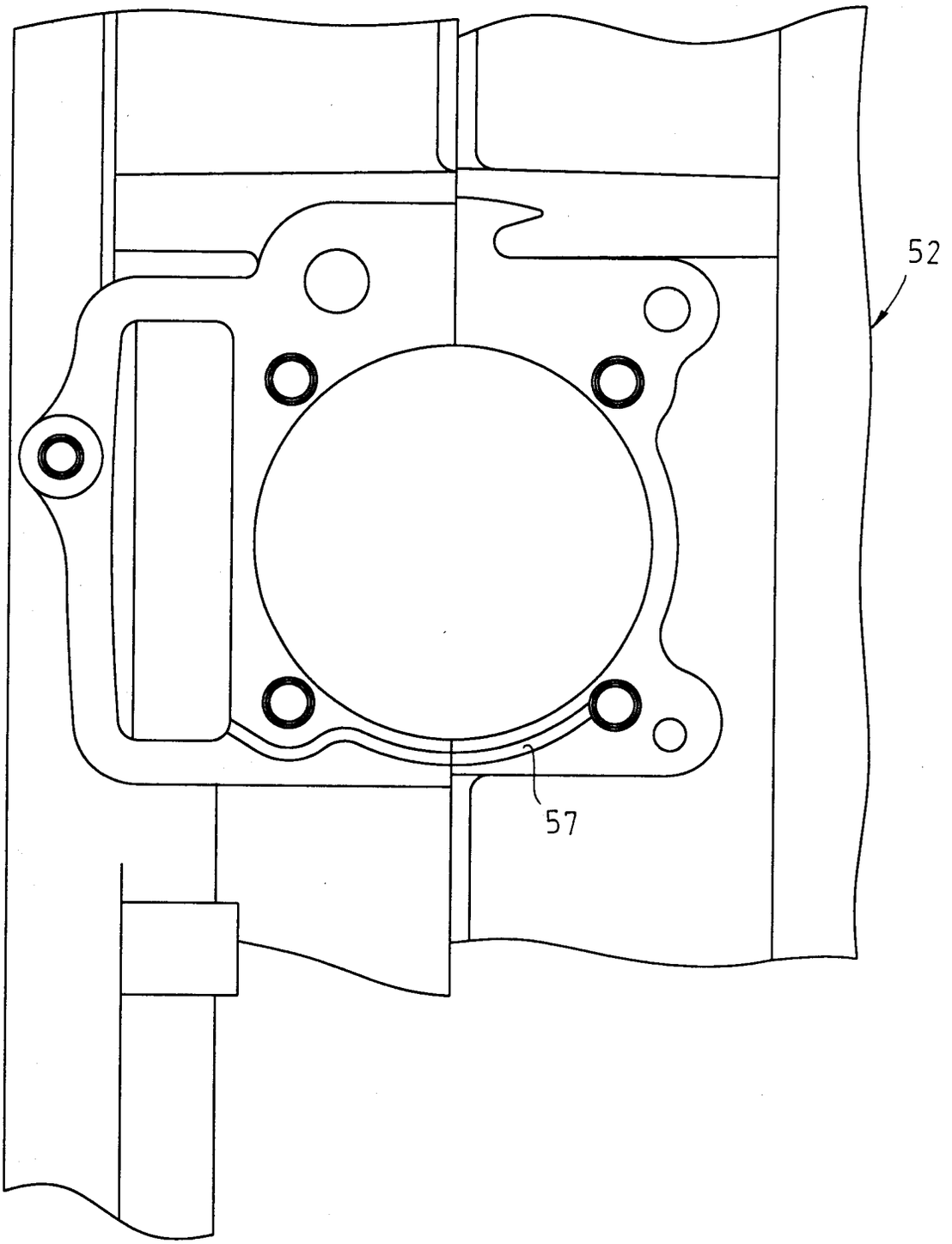

FIG . 10

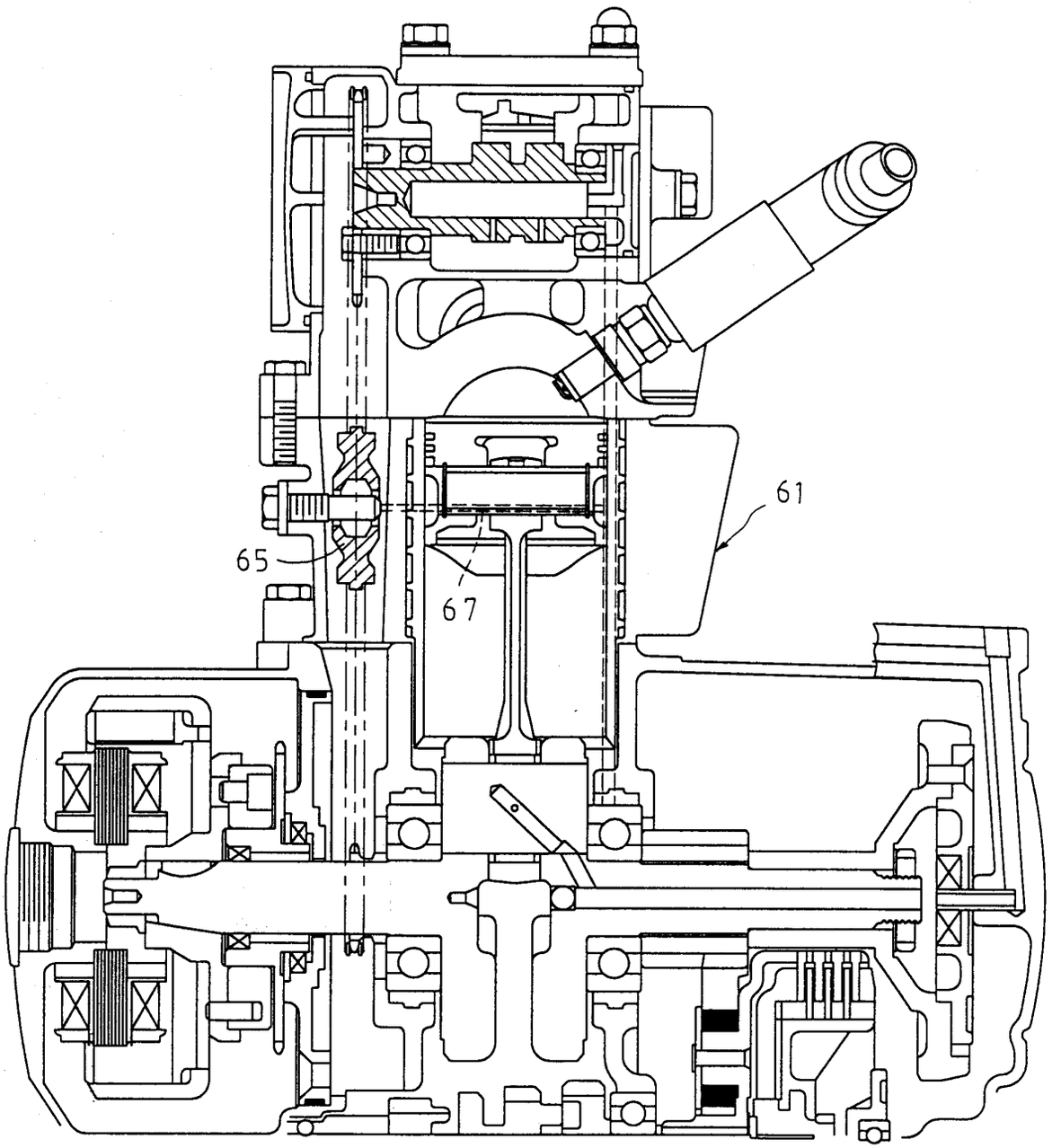

FIG. 11

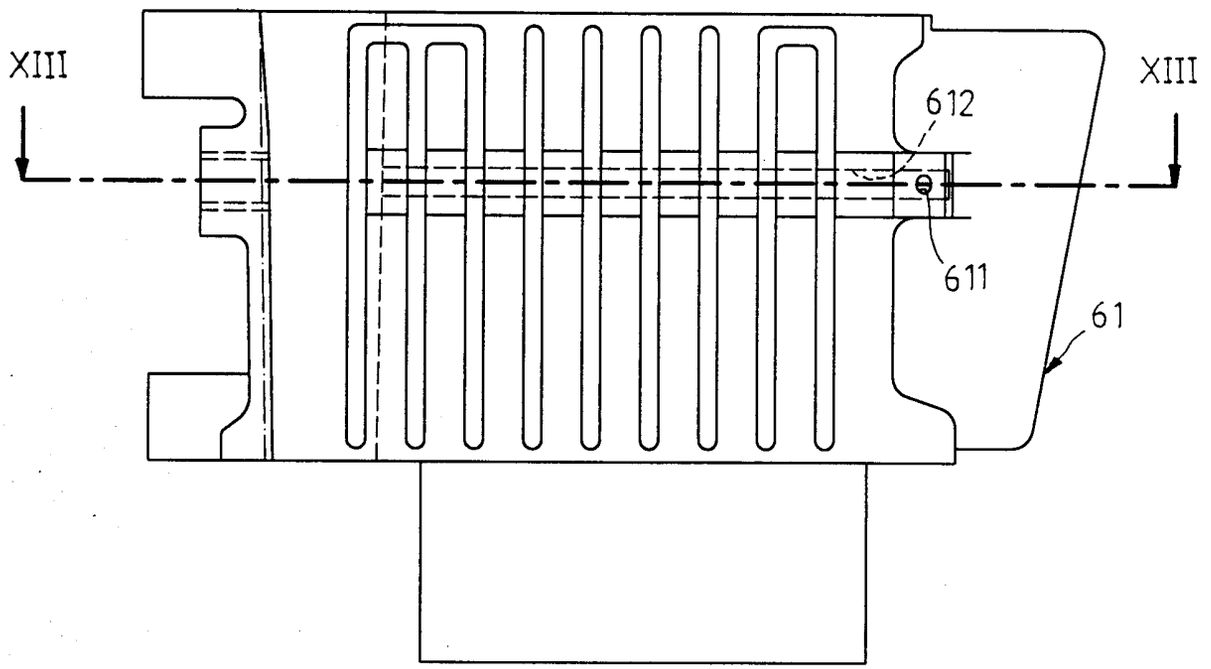

FIG. 12

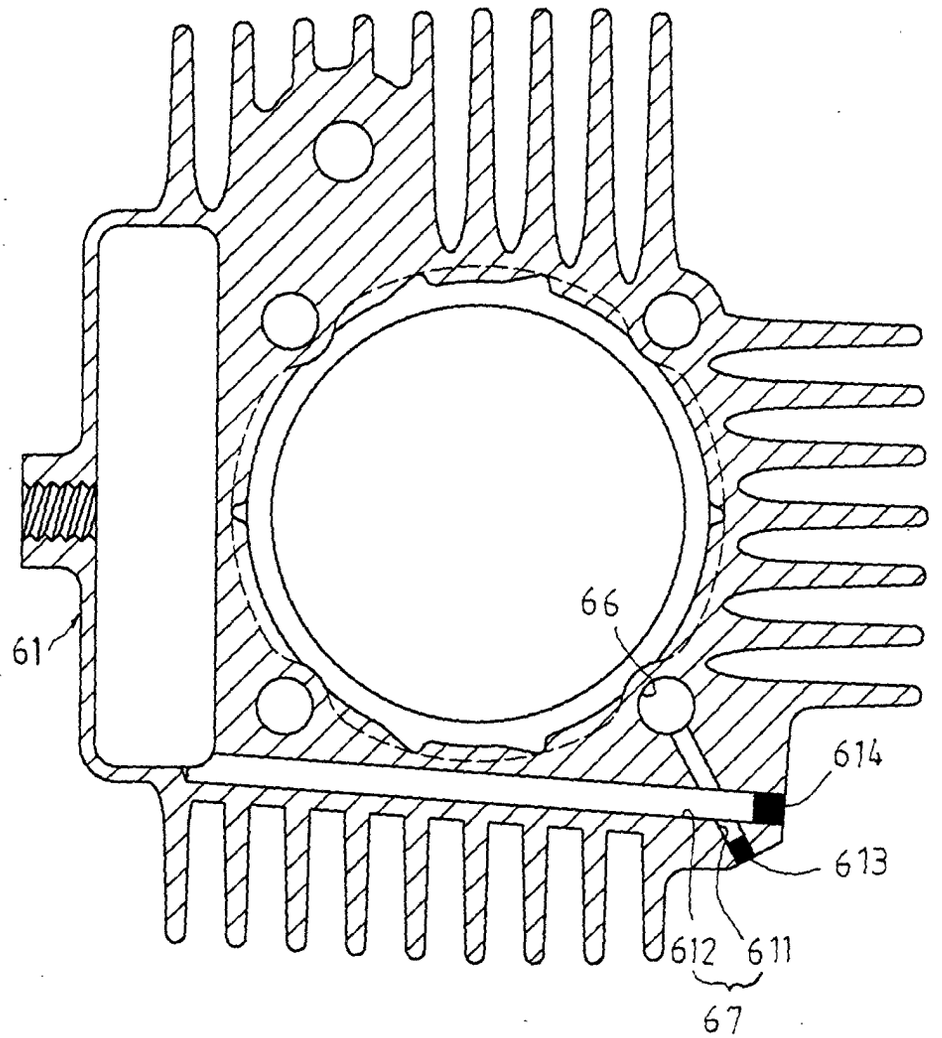

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 9079

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 197 29 971 C (PORSCHE AG) 8 October 1998 (1998-10-08) * column 2, line 20 - column 3, line 60; figures *	1,4,5	F01M11/02
A	US 5 309 878 A (KANDLER WILLIAM C ET AL) 10 May 1994 (1994-05-10) * column 3, line 1 - column 5, line 2; figures *	1,2,4	
A	DE 40 37 188 A (AUDI NSU AUTO UNION AG) 27 May 1992 (1992-05-27) * abstract; figures *	1	
A	US 4 974 561 A (JINGU NOBUHISA ET AL) 4 December 1990 (1990-12-04) * abstract; figure 2 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F01M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 April 2000	Mouton, J

CATEGORY OF CITED DOCUMENTS

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11-04-2000

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