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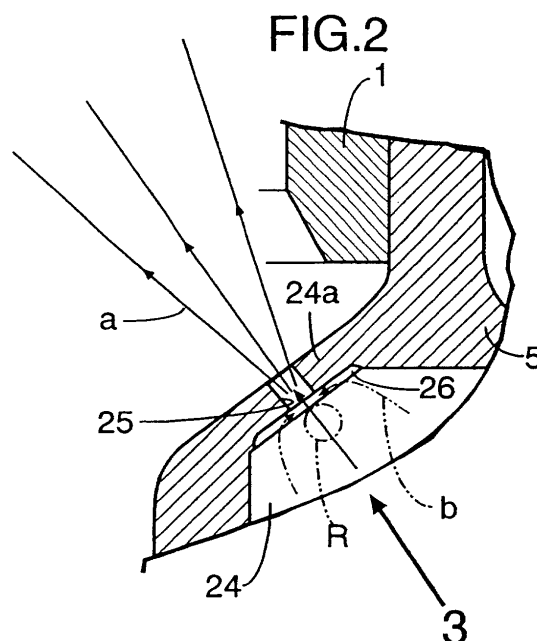
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(54) **LUBRICATION OIL PASSAGE STRUCTURE OF INTERNAL COMBUSTION ENGINE**

(57) In a lubricating oil passage structure in an internal combustion engine in which a pressurized lubricating oil flowing in a lubricating oil passage (21) is ejected to portions to be lubricated through a jet (25) provided in the lubricating oil passage (21), oil groove of a cross shape is provided at an inlet of the jet (25), so that they

are opened into the lubricating oil passage (21) and extend diametrically from the center of the jet (25). Thus, it is possible to ensure that the inlet of the jet provided in place in the lubricating oil passage in the internal combustion engine cannot be occluded by cuttings or a dust incorporated in the lubricating oil flowing in the lubricating oil passage.



Description

FIELD OF THE INVENTION

[0001] The present invention relates to a lubricating oil passage structure in an internal combustion engine for supplying a lubricating oil to portions to be lubricated in the internal combustion engine.

BACKGROUND ART

[0002] In an internal combustion engine, in general, to guarantee the smooth operation of the internal combustion engine, a lubricating oil passage for supplying a pressurized lubricating oil to portions to be lubricated such as rotating and sliding portions of the internal combustion engine is provided, and a constriction passage, i.e., a jet is provided in place in the lubricating oil passage to communicate with the latter, so that the pressurized lubricating oil flowing in the lubricating oil passage is ejected through the jet, and for example, the ejected lubricating oil is supplied to a back side of a piston to lubricate and cool the piston (for example, see Japanese Patent Application Laid-open No.9-209733).

[0003] It should be noted here that even if the lubricating oil filtered by an oil filter flows in the lubricating oil passage, the following problem is encountered: It is inevitable that a foreign matter such as a small amount of a dust and cuttings is incorporated into the lubricating oil. The foreign matter may reach the inlet of the constriction passage, i.e., the jet provided in the lubricating oil passage, thereby occluding the inlet, and in such case, the amount and pressure of lubricating oil ejected from the jet are reduced.

DISCLOSURE OF THE INVENTION

[0004] The present invention has been accomplished with such circumstances in view, and it is an object of the present invention to provide a new lubricating oil passage structure in an internal combustion engine, wherein the inlet of the jet cannot be occluded by the foreign matter.

[0005] To achieve the above object, according to the present invention, there is provided a lubricating oil passage structure in an internal combustion engine, comprising a jet provided in place in a lubricating oil passage leading to an oil pump, so that a pressurized lubricating oil flowing in the lubricating oil passage is ejected toward portions to be lubricated through the jet,

characterized in that oil grooves are provided in an inlet of the jet to communicate with the jet, the oil grooves being opened into the lubricating oil passage and extending diametrically from the center of the jet. With such feature, the inlet of the jet is prevented from being occluded by a foreign matter such as a dust and cuttings incorporated in the lubricating oil, and the lubricating oil can be ejected always in an appropriate

amount and under an appropriate pressure from the jet.

[0006] According to another aspect and feature of the present invention, in addition to the first arrangement, the oil grooves are cross-shaped grooves extending diametrically about the jet. With such feature, the inlet of the jet is prevented further reliably from being occluded by a foreign matter such as a dust and cuttings incorporated in the lubricating oil, and the lubricating oil can be ejected always in an appropriate amount and under an appropriate pressure from the jet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Fig.1 is a sectional view of essential portions of an internal combustion engine provided with a lubricating oil passage structure according to the present invention; Fig. 2 is an enlarged view of a portion surrounded by a phantom circle indicated by an arrow 2 in Fig. 1; and Fig.3 is a partial view of a portion indicated by an arrow 3 in Fig.2.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] The mode for carrying out the present invention will now be described by way of an embodiment shown in the accompanying drawings.

[0009] First, an embodiment of the present invention will be described with reference to Figs.1 to 3.

[0010] Referring to Fig. 1, an engine body E of a 4-cycle internal combustion engine includes a cylinder block 1 having a cylinder bore 2 provided therein, a cylinder head 3 which is fixed onto a deck surface of the cylinder block 1 and in which a combustion chamber 4 is defined to confront the cylinder bore 2, and a crankcase 5 fixed to a lower surface of the cylinder block 1. An oil pan 6 is fixed to a lower surface of the crankcase 5.

[0011] As usual, a crankshaft 7 is rotatably carried within the crankcase 5 with a ball bearing 8 interposed therebetween, and a connecting rod 10 is rotatably connected at its larger end to a crankpin 7a of the crankshaft 7 through a needle bearing 11 and at its smaller end to a piston pin 13 of a piston 12 slidably received in the cylinder bore 2.

[0012] A lubricating system L is provided in the engine body E for lubricating various portions of the engine body E. The lubricating system L is of a conventionally known construction, and a suction passage 16 connected to a suction port of an oil pump 15 connected to the lubricating system L is connected at its lower end to an oil strainer 17 immersed in a lubricating oil stored in the oil pan 6. A discharge passage 18 connected to a discharge port of the oil pump 15 communicates with a main gallery 21 defined as a lubricating oil passage in the cylinder block 1.

[0013] A piston-lubricating oil passage 24 defined in the crankcase 5 communicate with an intermediate portion of the main gallery 21, and a jet 25 is opened into a wall 24a of the passage 24, which confronts the cylin-

der bore 2 and the jet 25 has an inlet communicating with the piston-lubricating oil passage 24 and an ejecting outlet directed toward a back side of the piston 12 within the cylinder bore 2.

[0014] As clearly shown in Figs. 2 and 3, oil grooves 26 according to the present invention are provided at the inlet of the jet 25 to communicate with the inlet of the jet 25, and extend diametrically in a cross-shape about the jet 25, as shown in Fig. 3. Sides of the cross-shaped oil groove 26, which confront the piston-lubricating oil passage 24, are opened into the piston-lubricating oil passage 24 over the substantially entire region of the latter.

[0015] In Fig. 1, reference character 28 is a lubricating oil passage defined in the crankshaft 7; reference character 29 is a timing transmitting device for operating a valve-operating mechanism (not shown) in operative association with the crankshaft 7; reference character 30 is a gear for driving the oil pump; and reference character 31 is a gear for driving a clutch leading to a transmission.

[0016] Next, the operation of this embodiment will be described below. If the crankshaft 7 is now rotated by the operation of the internal combustion engine and the oil pump 15 is driven, the lubricating oil within the oil pan 6 is drawn via the oil strainer 17 and fed under pressure to the main gallery 21 defined as the lubricating oil passage in the cylinder block 1.

[0017] A portion of the pressurized lubricating oil flowing in the main gallery 21 is supplied to the piston-lubricating oil passage 24. The lubricating oil reaching the passage 24 is ejected from the jet 25 directed to the back side of the piston 12 as shown by an arrow a in Figs. 1 and 2, and is supplied to the back side of the piston 12 to lubricate and cool the piston 12 and an inner wall surface of the cylinder bore 2.

[0018] The lubricating oil flowing in the main gallery 21 is filtered by the oil strainer 17, but a portion of a foreign matter R such as a fine dust and fine cuttings may not be filtered off and may be fed through the main gallery 21 to the piston-lubricating oil passage 24. The foreign matter R may occlude a center portion of the inlet of the small-diameter jet 25, as shown by a phantom line in Fig. 2. In such case, however, since the oil grooves 26 of the cross shape are provided diametrically at the inlet of the jet 25 to communicate with the inlet of the jet 25 and opened into the piston-lubricating oil passage 24 in the embodiment, the pressurized lubricating oil within the piston-lubricating oil passage 24 can be fed under pressure via the oil grooves 26 of the cross shape to the jet 25, as shown by a phantom arrow b in Fig. 2, and can be ejected from the jet 25 toward the back side of the piston 12.

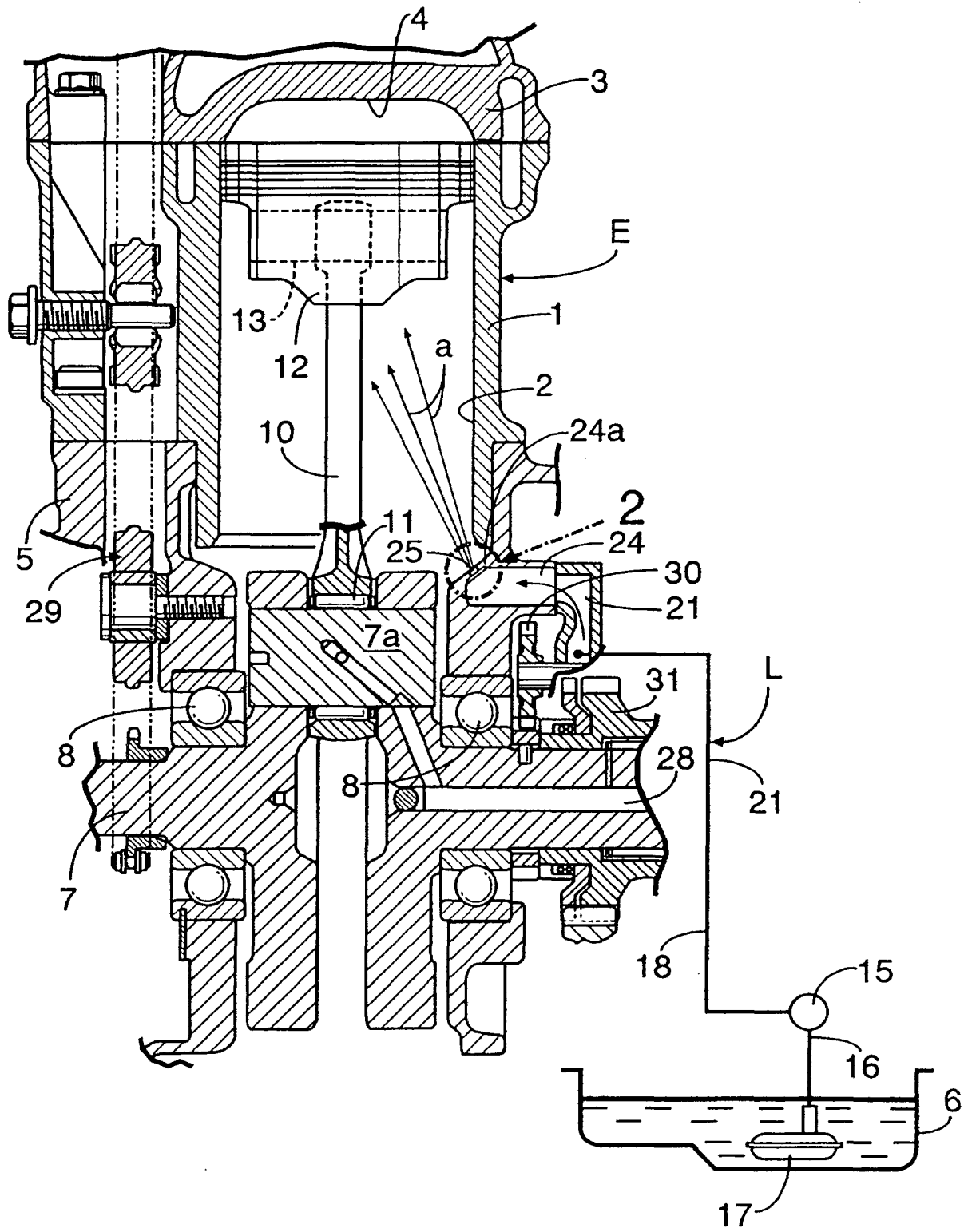
[0019] Although the embodiment of the present invention has been described in detail, it will be understood that the present invention is not limited to the above-described embodiment, and various embodiments may be made within the scope of the invention. For example,

although the four oil grooves 26 are defined in the cross shape diametrically from the center of the jet 25 in the oil passage provided at the inlet of the jet 25 in the above-described embodiment, one to three or five or more oil grooves may be defined diametrically from the center of the jet 25 in place of the four oil grooves. In addition, the lubricating oil passage structure according to the present invention has been described as being carried out in the jet directed to the back side of the piston in the above-described embodiment, but it is of course that the lubricating oil passage structure can be carried out in another jet provided in a lubricating oil passage.

Claims

1. A lubricating oil passage structure in an internal combustion engine, comprising a jet (25) provided in place in a lubricating oil passage (21) leading to an oil pump (15), so that a pressurized lubricating oil flowing in the lubricating oil passage (21) is ejected toward portions to be lubricated through said jet (25),
characterized in that oil grooves (26) are provided in an inlet of said jet (25) to communicate with said jet (25), said oil grooves (26) being opened into said lubricating oil passage (21) and extending diametrically from the center of said jet (25).
2. A lubricating oil passage structure in an internal combustion engine according to claim 1, wherein said oil grooves (26) are cross-shaped grooves extending diametrically about said jet (25).

FIG.1



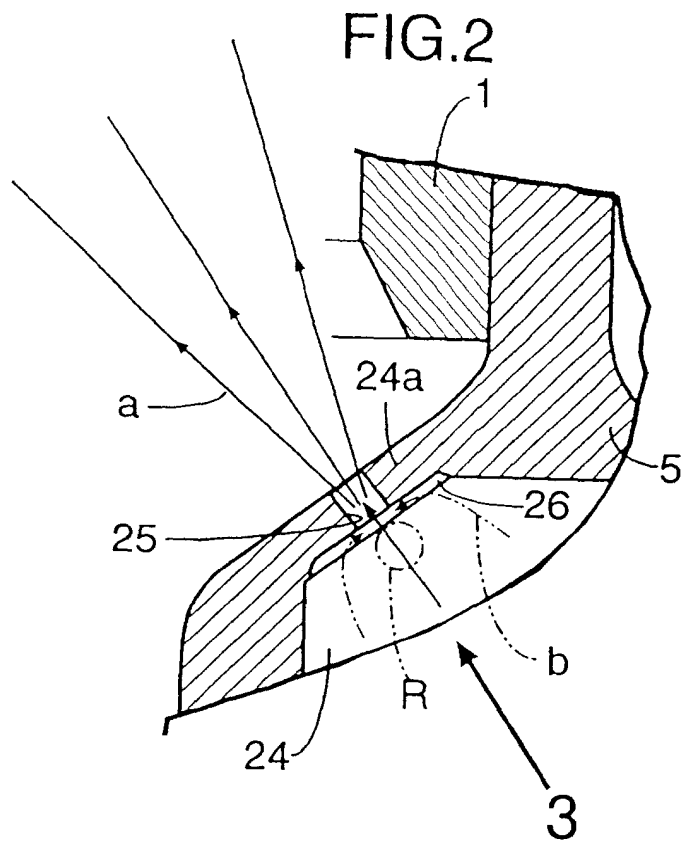
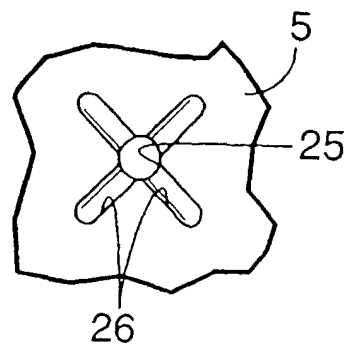


FIG.3



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/08677

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ F01M1/08		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) Int.Cl ⁷ F01M1/08		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2002 Kokai Jitsuyo Shinan Koho 1971-2002 Jitsuyo Shinan Toroku Koho 1996-2002		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 76326/1976 (Laid-open No. 168136/1977) (Mitsubishi Heavy Industries, Ltd.), 20 December, 1977 (20.12.77), Full text; Figs. 1 to 5 (Family: none)	1-2
A	JP 4-1408 A (Yanmar Diesel Engine Co., Ltd.), 06 January, 1992 (06.01.92), Full text; Figs. 1 to 3 (Family: none)	1-2
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 05 December, 2002 (05.12.02)		Date of mailing of the international search report 17 December, 2002 (17.12.02)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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