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(54) Title: ENGINE LUBRICATION ARRANGEMENT

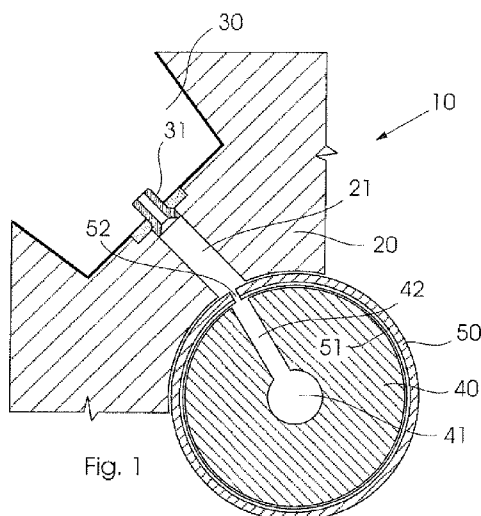


Fig. 1

(57) Abstract: This invention relates to an engine lubrication arrangement, and more particularly but not exclusively, to an engine lubrication arrangement suitable for use in an internal combustion engine. The engine lubrication arrangement includes a crankshaft having an internal flow passage provided therethrough, and a radially outwardly extending flow passage extending between the internal flow passage and an outer surface of the crankshaft; and a cylinder for receiving a reciprocating piston, a bore of the cylinder having a lubricant inlet opening. The engine lubrication arrangement is characterized in that the flow passage extending from the crankshaft is in flow communication with the lubricant inlet opening of the cylinder.



ENGINE LUBRICATION ARRANGEMENT

BACKGROUND TO THE INVENTION

THIS invention relates to an engine lubrication arrangement, and more particularly but not exclusively, to an engine lubrication arrangement suitable for use in an internal combustion engine.

The lubrication system of an engine is designed to deliver clean oil at the correct temperature and pressure to every part of the engine, including reciprocating parts and surfaces exposed thereto. It is therefore a very important design requirement to ensure the supply of sufficient fluid lubricant to the rotating and reciprocating elements of the engine to achieve maximum efficiency and minimum wear.

In the case of rotating parts, such as a crankshaft rotating inside a sleeve, the lubricant is generally supplied by a high pressure pump and fed, via a gallery in the engine casing, to the rotating parts. The lubricant can be

introduced on the outside of the sleeve, and is subsequently fed through a radial aperture in the sleeve into the space between the bearing and the rotating part in order to lubricate the surfaces where the bearing and rotating part interface. In some embodiments the lubricant is conveyed through an internal flow passage provided inside the rotating part, for example a camshaft, and is then fed through a radially outwardly extending aperture from the rotating part towards the interface surface.

Lubricant is also often fed through a gallery in the casing to a spray bar that is in flow communication with a cylinder of the engine in order to lubricate reciprocating components. The use of galleries to supply lubrication to reciprocating and rotating engine components creates complex casing geometry which in turn results in high pressure drops and correspondingly high required supply pressures. A high pressure lubrication system causes a loss of efficiency, and increases the load on seals.

It is accordingly an object of the invention to provide an engine lubrication arrangement that will, at least partially, alleviate the above shortcoming.

It is also an object of the invention to provide an engine lubrication arrangement which will be a useful alternative to existing engine arrangements.

It is furthermore an object of the invention to provide a simple but effective engine lubrication arrangement which will reduce the pressure required for sufficient lubrication, while also simplifying the design of the casing of the engine.

SUMMARY OF THE INVENTION

According to the invention there is provided an engine lubrication arrangement including:

a crankshaft having an internal flow passage provided therethrough, and a radially outwardly extending flow passage extending between the internal flow passage and an outer surface of the crankshaft; and

a cylinder for receiving a reciprocating piston, a bore of the cylinder having a lubricant inlet opening;

characterized in that the flow passage extending from the crankshaft is in flow communication with the lubricant inlet opening of the cylinder.

There is provided for the internal flow passage to extend substantially longitudinally inside the crankshaft.

There is provided for a cylinder lubrication flow passage to extend through the casing of the engine, and more particularly for the cylinder lubrication flow passage to bring the lubricant inlet opening in flow communication with the radially outwardly extending flow passage of the crankshaft.

A crankshaft bearing may be provided between the casing and the crankshaft, and a flow passage may be provided through the crankshaft bearing.

The flow passage provided through the crankshaft bearing may be in the form of a radially directed aperture extending through the crankshaft bearing.

A circumferential groove may be provided in an inner surface of the crankshaft bearing, with the flow passage provided through the crankshaft bearing extending radially outwardly from this groove.

The flow passage through the crankshaft bearing may connect the cylinder lubrication flow passage with the radially outwardly extending flow passage of the crankshaft.

There is also provided for a lubricant spray bar to be provided in the lubricant inlet opening.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention is described by way of a non-limiting example, and with reference to the accompanying drawings in which:

Figure 1 is a schematic cross-sectional end view of part of an engine incorporating the engine lubrication arrangement in accordance with the invention; and

Figure 2 is a schematic cross-sectional side view of the part of the engine of Figure 1.

DETAILED DESCRIPTION OF INVENTION

Referring to the drawings, in which like numerals indicate like features, a non-limiting example of an engine lubrication arrangement in accordance with the invention is generally indicated by reference numeral 10. The engine lubrication arrangement 10 comprises a casing 20, a cylinder 30 and a crankshaft 40.

The crankshaft 40 may be of many different configurations, and the detail design of the crankshaft 40 is not relevant or limiting insofar as this invention is concerned. The only requirement is that the crankshaft 40 must have an internal lubrication passage 41 which generally extends longitudinally along the crankshaft. A radially outwardly directed flow passage 42 in the form of a cross-drilling links the internal lubrication passage 41 with the surface of the crankshaft 40, and more particularly with a journal surface of the crankshaft.

A crankshaft bearing 50 is housed in the casing 20 that surrounds the crankshaft 40. The bearing comprises a sleeve having an inner surface, with an inner circumferential groove 51 provided in the inner surface of the sleeve for the distribution of the lubricant about the bearing, and hence about the entire periphery of the crankshaft. A further radially outwardly directed aperture 52 is provided in the bearing, and defines a flow passage through the bearing. The radially outwardly directed aperture or flow passage 52 is in flow communication with a conduit 21, in the form of a cross-drilling, provided in the casing 20.

The conduit 21 in turn defines a cylinder lubrication flow passage, and is in flow communication with a lubricant opening 31 provided in a lower part of a cylinder bore 20 of the engine. A spray bar 31, as is known in the art, is

located in the lubricant inlet opening 21. The spray bar 31 is therefore effectively in flow communication with the internal lubrication passage 41 of the crankshaft 40, and the lubrication arrangement 10 therefore lubricates the reciprocating components using oil emanating from the crankshaft lubrication passage 41, and not from a gallery (not shown) provided in the casing 20.

The above configuration reduces the delivery pressure required from the oil pump, as the lubricant is fed with the assistance of centrifugal force from the crankshaft to the spray bar. In addition, the inherent lubricant pressure curve around the crankshaft can also be optimally utilized to ensure that lubricant is taken from a high pressure zone. The new design furthermore simplifies the casing geometry.

It will be appreciated that the above is only one embodiment of the invention and that there may be many variations without departing from the spirit and/or the scope of the invention.

CLAIMS:

1. An engine lubrication arrangement including:
 - a crankshaft having an internal flow passage provided therethrough, and a radially outwardly extending flow passage extending between the internal flow passage and an outer surface of the crankshaft; and
 - a cylinder for receiving a reciprocating piston, a bore of the cylinder having a lubricant inlet opening;characterized in that the flow passage extending from the crankshaft is in flow communication with the lubricant inlet opening of the cylinder.
2. The engine lubrication arrangement of claim 1 in which the internal flow passage extends substantially longitudinally inside the crankshaft.
3. The engine lubrication arrangement of claim 1 or claim 2 in which a cylinder lubrication flow passage extends through the casing of the engine towards the crankshaft.
4. The engine lubrication arrangement of claim 3 in which the cylinder lubrication flow passage brings the lubricant inlet opening in flow communication with the radially outwardly extending flow passage of the crankshaft.
5. The engine lubrication arrangement of any one of the preceding claims in which a crankshaft bearing is housed in the casing for receiving the crankshaft, and a flow passage is provided through the crankshaft bearing.

6. The engine lubrication arrangement of claim 5 in which the flow passage provided through the crankshaft bearing is in the form of a radially directed aperture extending through the crankshaft bearing.
7. The engine lubrication arrangement of claim 5 or claim 6 in which a circumferential groove is provided in an inner surface of the crankshaft bearing, with the flow passage provided through the crankshaft bearing extending radially outwardly from such groove.
8. The engine lubrication arrangement of any one of claims 5 to 7 in which the flow passage through the crankshaft bearing connects the cylinder lubrication flow passage with the radially outwardly extending flow passage of the crankshaft.
9. The engine lubrication arrangement of any one of the preceding claims in which a lubricant spray bar is provided in the lubricant inlet opening.
10. The engine lubrication arrangement of claim 1 substantially as herein described with reference to the accompanying figures.
11. An engine including an engine lubrication arrangement of any one of claims 1 to 10.

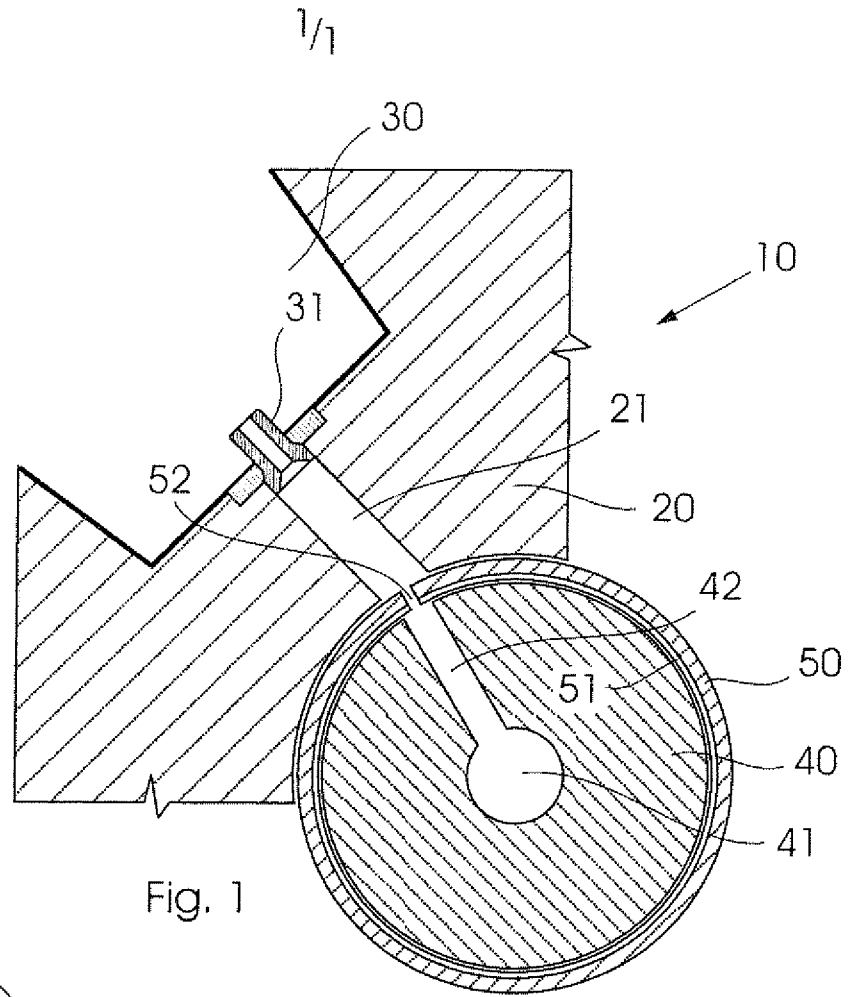


Fig. 1

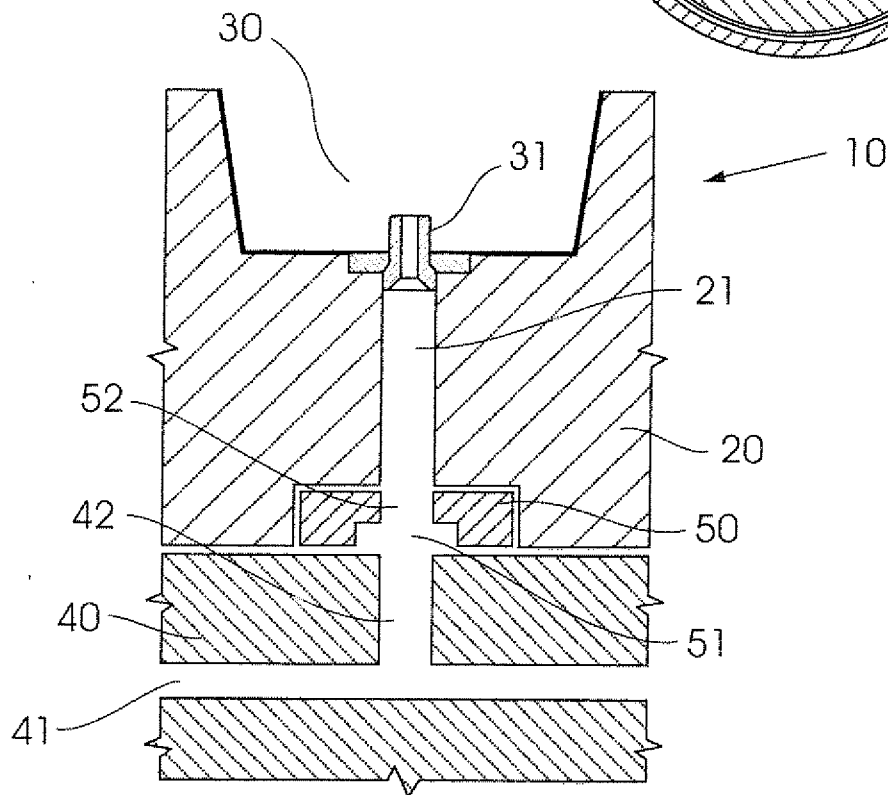


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2013/054990

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F01M1/06 F16C9/02
 ADD.

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)
 F01M F16C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/142240 A1 (NTN TOYO BEARING CO LTD [JP]; KATAYAMA AKIHIKO [JP]; TERADA TAKANORI []) 17 November 2011 (2011-11-17)	1,2,4
Y	abstract; figures	3,5-7
Y	----- US 2006/272609 A1 (MIZUNO KINYA [JP] ET AL) 7 December 2006 (2006-12-07) paragraphs [0023] - [0025]; figure 1 -----	3,5-7

Further documents are listed in the continuation of Box C.

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

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"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

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011142240	A1	17-11-2011	NONE

US 2006272609	A1	07-12-2006	AU 2006201522 A1 07-12-2006
			CA 2542028 A1 20-11-2006
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