

(12) UK Patent Application (19) GB (11) 2 251 889 (13) A

(43) Date of A publication 22.07.1992

(21) Application No 9101215.3

(22) Date of filing 19.01.1991

(71) Applicant  
Ford Motor Company Limited

(Incorporated in the United Kingdom)

Eagle Way, Brentwood, Essex, CM13 3BW,  
United Kingdom

(72) Inventor  
Thomas Tsoi-Hei MA

(74) Agent and/or Address for Service  
A Messulam & Co  
24 Broadway, Leigh-on-Sea, Essex, SS9 1BN,  
United Kingdom

(51) INT CL<sup>5</sup>  
F01M 1/02 11/00

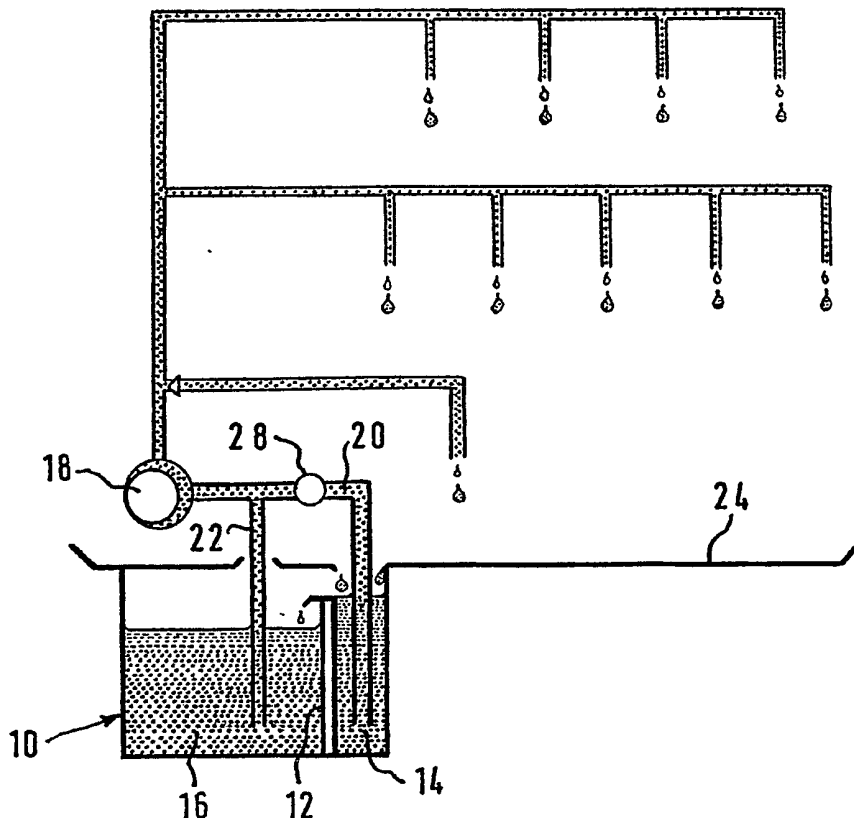
(52) UK CL (Edition K)  
F1B B4A

(56) Documents cited  
US 4616609 A US 4296716 A

(58) Field of search  
UK CL (Edition K) F1B  
INT CL<sup>5</sup> F01M, F02F 7/00

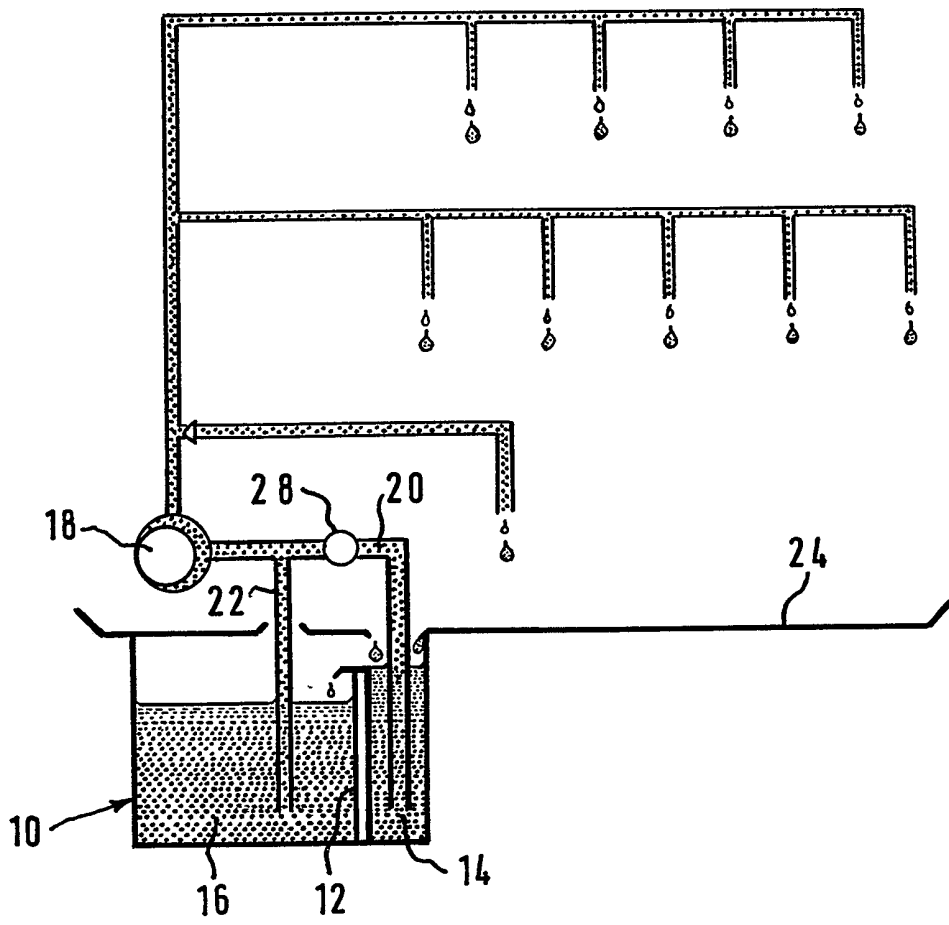
(54) I.c. engine lubrication system

(57) A sump 10 is divided into a smaller 14 and a larger 16 compartment. An oil pump 18 is connected to draw oil from both compartments 14, 16, the major proportion of the oil being drawn from the smaller compartment 14. The return line 24 returns more oil to the smaller compartment 14 than the amount drawn from 14 by the pump 18, excess oil in the smaller compartment 14 being arranged to over spill into the larger compartment 16. The compartment dividing wall 12 may be thermally insulated. A valve 28 in the suction line 20 to the compartment 14 may be closed in response to a fall in level in the compartment, an oil temperature above a predetermined valve, or for a predetermined time from starting.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 251 889 A



Title

**ENGINE LUBRICATION SYSTEM**

5 Field of the invention

The present invention relates to a lubricating system for an internal combustion engine.

10 Background of the invention

During starting and warm up, the oil in an engine is cold and viscous. This increases engine friction but more seriously reduces engine efficiency by increasing the  
15 pumping work which must be carried out by the engine to pump the oil to its various bearing surfaces. For these reasons, it is desirable to ensure that the oil circulating in the engine during the warm up phase is heated to its normal temperature as rapidly as possible.

20

To this end, it is known to attempt to reduce the volume of the oil in circulation during the warm up phase. One proposal for achieving this aim has been to divide the sump into a small and a large compartment and to draw the  
25 oil from the small compartment only. The two compartments are then connected to one another directly by a control valve which is opened when the temperature in the smaller compartment reaches a certain value.

30 Disadvantages of this system are that a valve is required to control the connection between the smaller and the larger compartment of the oil sump and that there is poor mixing between the oil in the two compartments even when the valve is open so that the risk of deterioration of the  
35 oil quality is increased.

Object of the invention

The invention therefore seeks to provide a lubricating system which allows rapid warm up of the oil in  
5 circulation during the warm up phase of the engine yet which ensures with a little or no external control full circulation of the entire oil content of the sump during engine operation.

10 Summary of the invention

According to the present invention, there is provided a lubricating system for an internal combustion engine having a sump divided into a smaller and a larger  
15 compartment, an oil pump connected to draw oil from both compartments, the major proportion of the oil being drawn from the smaller compartment, and a return line for returning more oil to the smaller compartment than the amount drawn therefrom by the pump, excess oil in the  
20 smaller compartment being arranged to over spill into the larger compartment.

Under all operating conditions, the major proportion of the oil in circulation in the engine is drawn from and  
25 returned to the smaller sump compartment and consequently the oil can heat up rapidly during the warm up phase. On the other hand, at all times replenishment oil is drawn from the larger compartment and this causes forced mixing of the oil in the two compartments so that all the oil is  
30 uniformly used in the long term and there is no tendency for the oil to deteriorate rapidly.

Typically, over eighty per cent of the oil may be drawn from the smaller compartment of the sump and the rest from  
35 the larger compartment.

The entire return oil may be collected in a tray and funnelled to the smaller compartment. However, a small

amount can be allowed to drain directly into the larger compartment provided that it does not exceed the amount drawn from the larger compartment by the circulation pump.

5

If the smaller compartment is dimensioned to hold enough oil to coat all the walls of the engine and fill the ducts of the oil circuits then no further complication is necessary to the system described. However, if an even  
10 smaller compartment is desired to enable still more rapid warm up of the engine, then this can be achieved provided that steps are taken to ensure that oil diversion occurs when there is a risk of the smaller compartment running dry.

15

A valve may for example be arranged within the suction pipe connecting the smaller compartment to the circulation pump which valve is closed either in response to a drop in the level of the oil in the smaller compartment or for a  
20 predetermined time following the switching on of the engine from cold. The valve may as a further alternative be temperature operated to close off the smaller compartment.

25 The advantages of the system of the invention reside in its simplicity as it requires little more than partitioning of the sump and re-routeing of some of the oil lines to enable it to be implemented. Furthermore, the system need have no control valves at all if the  
30 smaller compartment is made large enough to cope with oil demand on start-up and even if a valve is used to allow the use of a smaller compartment, then this valve can itself be of simple, robust and fail safe construction.

35 The smaller compartment can be formed by placing a partition wall in the main sump. Preferably, the wall is thermally insulated to maintain initially a temperature differential between the oil in the two compartments.

Brief description of the drawing

The invention will now be described further, by way of example, with reference to the accompanying drawings which is a schematic diagram of a lubrication system of the invention.

Detailed description of the drawing

10 A sump 10 is divided by a thermally insulated partition wall 12 into a smaller compartment 14 and a larger compartment 16. Oil is drawn from the sump 10 by a circulation pump 18 which is connected by a main suction line 20 to the smaller compartment 14 and by a branch  
15 suction line 22 to the larger compartment 16. The two suction lines 20 and 22 are dimensioned in such a manner that about ninety per cent of the oil supply is taken from the compartment 14 and the remaining ten per cent is taken from the larger compartment 16.

20

The output from the pump 18 is fed in a conventional manner to the various surfaces of the engine which require lubrication and cooling and the return from all oil consumers drop under gravity into a collection tray 24.

25 From there, the oil returns to the smaller compartment 14.

Because more oil is returned to the compartment 14 than is drawn from it, this compartment soon overflow and the excess oil falls into the larger compartment 16.

30

When first starting, most of the oil in circulation is taken from and returned to the compartment 14 and as this oil forms only a minor part of the total oil available it warms up rapidly. At all times, however, oil is being  
35 drawn from the larger compartment 16 and mixed in the pump 18 with the oil from the smaller compartment 14 so that the oil is constantly being replenished with clean oil and its quality is not allowed to deteriorate in time.

If the smaller compartment 14 is made very small, it risks running out of oil when the engine is first started from cold after a long standing period. It is preferred to ensure that the smaller compartment should remain capable  
5 of meeting the oil needs of the engine at all times without running dry but if it is essential to make the compartment any smaller then the risk of running dry can be avoided by the use of a valve 28 in the suction line 20 to isolate the smaller compartment 14 when this danger  
10 arises.

The valve 28 can be shut off in response to a change in oil level in the compartment 14, in dependence upon oil temperature or it may be an electrically controlled valve  
15 which is maintained closed for a fixed time after start up to allow enough oil to be drawn from the larger compartment 16 to wet the walls of the engines and prime the lubrication circuit. Thereafter, the valve is left open permanently.

20

It should be noted that the valve 28 does not harm engine even if it fails to open as it will then merely cause all the oil supply for the pump 18 to be derived from the larger compartment 16 in the same way as in a conventional  
25 engine. The system is therefore entirely fail safe and can operate without external control making for a simple and inexpensive implementation.

CLAIMS

1. A lubricating system for an internal combustion engine having a sump divided into a smaller and a larger  
5 compartment, an oil pump connected to draw oil from both compartments, the major proportion of the oil being drawn from the smaller compartment, and a return line for returning more oil to the smaller compartment than the amount drawn therefrom by the pump, excess oil in the  
10 smaller compartment being arranged to over spill into the larger compartment.

2. A lubricating system as claimed in claim 1, wherein more than eighty per cent of the oil is drawn from the  
15 smaller compartment of the sump and the remainder from the larger compartment.

3. A lubricating system as claimed in claim 1 or 2, wherein the entire return oil is collected in a tray and  
20 funnelled to the smaller compartment.

4. A lubricating system as claimed in any preceding claim, wherein a valve is arranged in the line connecting the smaller compartment to the pump, which valve may be  
25 closed to prevent the smaller compartment from running dry.

5. A lubricating system as claimed in claim 4, wherein the valve is closed in response to a drop in the level of  
30 the oil in the smaller compartment.

6. A lubricating system as claimed in claim 4, wherein the valve is closed until oil temperature exceeds a predetermined value.

35

7. A lubricating system as claimed in claim 4, wherein the valve is closed for a fixed time period during engine start-up.



8. A lubricating system as claimed in any preceding claim, wherein the smaller compartment is formed by placing a partition wall in the sump.

5 9. A lubricating system as claimed in claim 8, wherein the partition wall in the sump is thermally insulated to maintain initially a temperature differential between the oil in the two compartments of the sump.

10 10. A lubricating system constructed, arranged and adapted to operate substantially as herein described with reference to, and as illustrated in, the accompanying drawing.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number  
 9101215.3

**Relevant Technical fields**

(i) UK Cl (Edition K ) F1B

(ii) Int Cl (Edition 5 ) F01M 1/ AND 11/, F02F 7/00

**Databases (see over)**

(i) UK Patent Office

(ii)

**Search Examiner**

R J DENNIS

**Date of Search**

1.3.91

Documents considered relevant following a search in respect of claims

1 to 10

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	US 4616609 (MUNCH.....)	1
X	US 4296716 (VOLKSWAGENWERK ....)	1 to 4, 6 and 8

Category	Identity of document and relevant passages	Relevant to claim(s)

**Categories of documents**

- X: Document indicating lack of novelty or of inventive step.
- Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.
- A: Document indicating technological background and/or state of the art.

- P: Document published on or after the declared priority date but before the filing date of the present application.
- E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- &: Member of the same patent family, corresponding document.

**Databases:** The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).