United States Patent

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[33] **Great Britain**
[31] **35213/68**

[54] **INTERNAL COMBUSTION ENGINE LUBRICATION MEANS**
5 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** ..... **184/6 N,** 184/11 R, 123/196 R
[51] **Int. Cl.** **F01m 9/06,** F16n 7/36
[50] **Field of Search** ..... 184/6 N, 11, 11 B; 123/196

[56] **References Cited**

UNITED STATES PATENTS

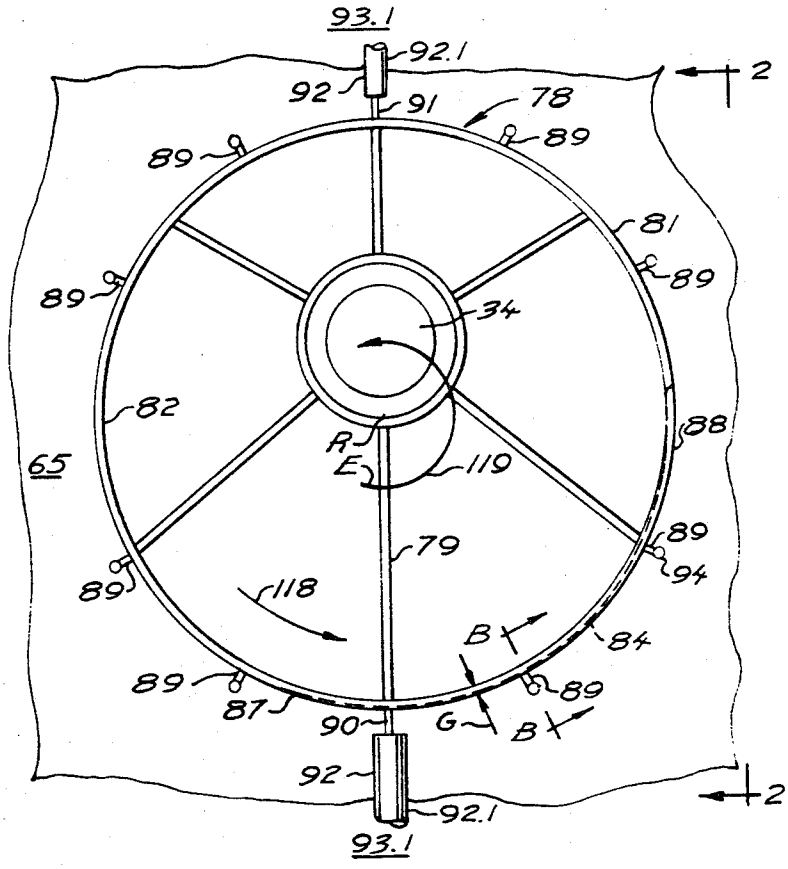
1,262,798	4/1918	Huebotter	184/11
1,437,927	12/1922	Brockway	184/11
1,440,094	12/1922	Mongermon	184/11
2,308,513	1/1943	Ioannilli	184/11
2,583,583	1/1952	Mangan	184/6 X
2,708,985	5/1955	Evans et al.	184/11

FOREIGN PATENTS

926,644	5/1963	Great Britain	184/11

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ABSTRACT: A lubrication system for small high-speed internal combustion engines including a crankshaft and an oil reservoir. Wick feed is used to convey oil to a grooved rotor picking up the oil and discharging it by centrifugal force through passages leading to lubrication points.



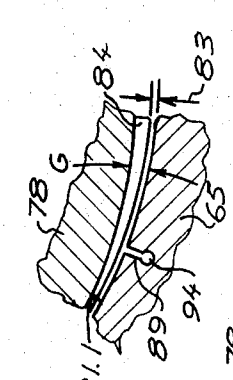


Fig. 2-A

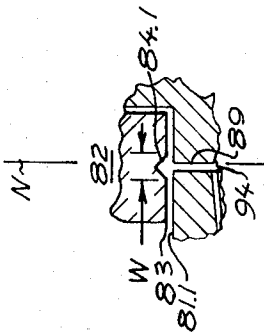


Fig. 2-B

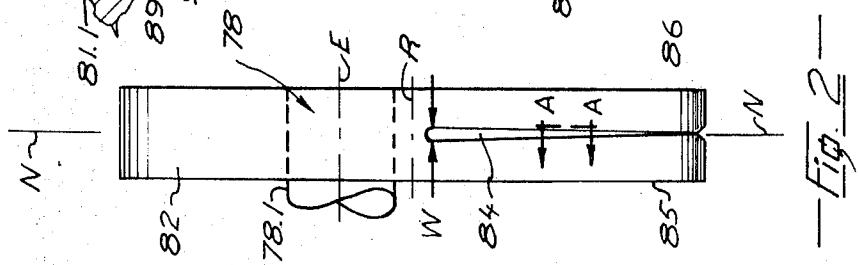


Fig. 2

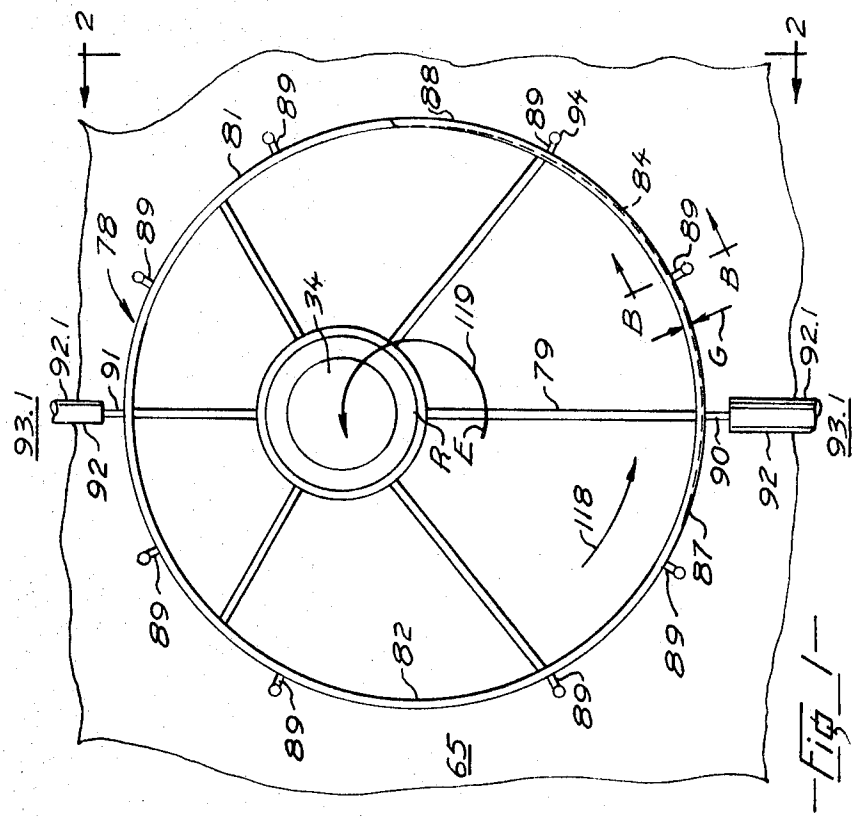


Fig. 1

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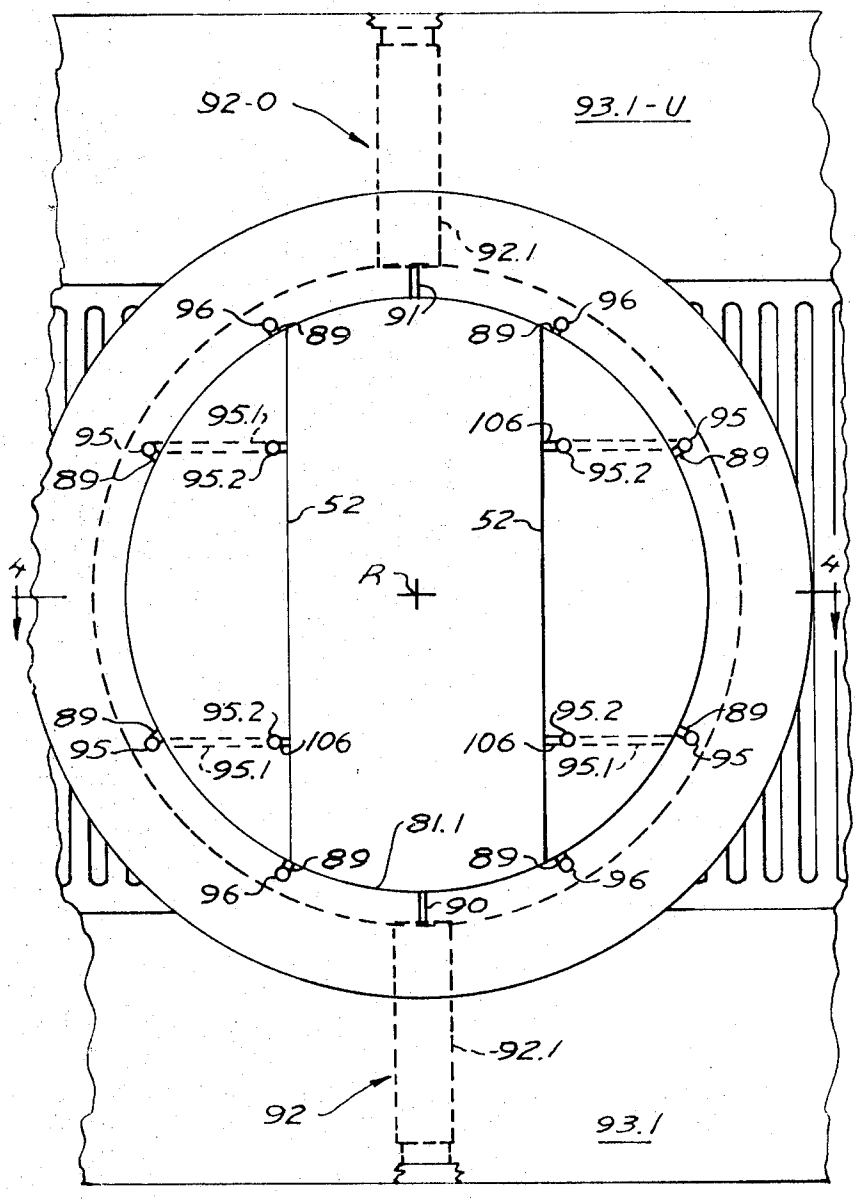


Fig. 3

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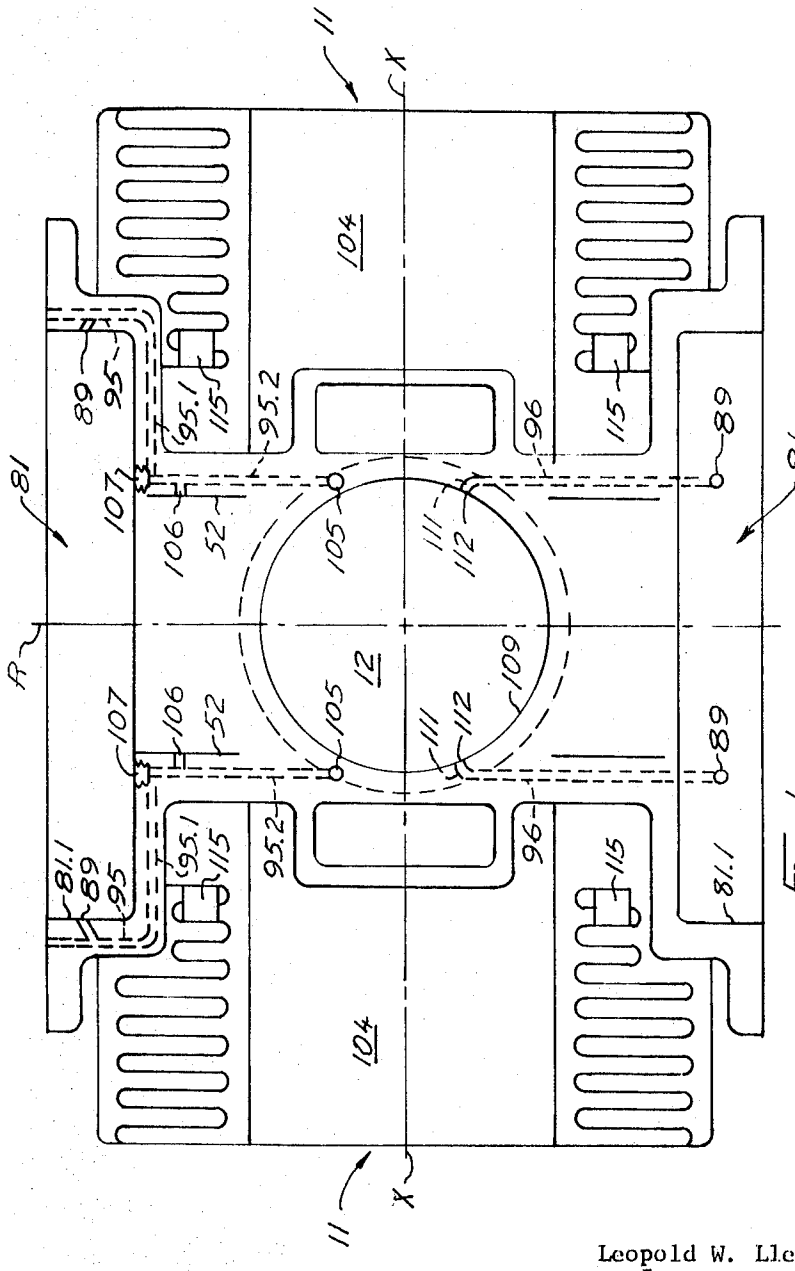


Fig. 4

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INTERNAL COMBUSTION ENGINE LUBRICATION MEANS

FIELD OF THE INVENTION

This invention relates to lubrication means for internal combustion engines.

BACKGROUND OF THE INVENTION

U.S. Pat. No. 3,329,134, entitled Internal Combustion Engine issued to the present inventor 4 July 1967. This engine is characterized by a double-ended power piston assembly in a power cylinder journaled directly on a crankpin of a crankshaft, thus avoiding the use of connecting rods. The crankshaft ends are journaled in a reciprocating charging piston assembly in a charging cylinder, and an axis of the charging piston cylinder is mutually perpendicular to, and intersects, an axis of the power cylinder. Provision is made for passage of the power piston assembly through the charging piston assembly, the latter assembly having two power pistons interconnected by spaced slide blocks which oscillate in spaced guides integral with a crankcase assembly.

Commonly, lubrication of small two-stroke engines is accomplished by mixing oil with fuel and, notwithstanding known disadvantages, lubrication as above is widespread possibly because of its extreme simplicity. This lubrication can be employed in the engine of the patent above. The present invention is directed to positive lubrication means thus avoiding disadvantages of lubrication by oil mixed with the fuel.

OUTLINE OF THE INVENTION

The lubrication means of the instant invention is adapted for use with an internal combustion engine according to U.S. Pat. No. 3,329,134 above, a detailed description following being of the lubrication means applied to that engine.

The invention provides lubrication means having structure including elements as follows in combination.

An oil reservoir containing a supply of lubricating oil—there can be one or more such reservoirs.

A rotor driven by a crankshaft of the engine. The rotor distributes oil by centrifugal force through discharge passages distributing oil to points requiring lubrication. In a very high speed version of the instant engine, obvious reduction gearing can be provided to drive the rotor at reduced speed. Rotor speed of one or two thousand r.p.m. is adequate for effective centrifugal discharge. Particular mechanism for rotating the rotor is not important, it could in fact be rotated by external means. For practical reasons, drive by the crankshaft with or without speed reduction gearing is contemplated.

Means are provided for oil from the reservoir to be conveyed to the rotor. A wick feed is contemplated this being largely although not entirely independent of gravity, i.e. a wick will feed uphill so that such feed is effective regardless of the attitude of the engine.

A detail description following exemplifies such lubrication of the engine aforesaid—the invention not being restricted to use with this particular engine and, whether used in the said engine or in other engines, being capable of expression in structure other than that particularly described and illustrated.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic plan of one rotor of an oil distribution means of the invention applied to an engine according to U.S. Pat. No. 3,329,134, also showing an end of the crankshaft and an oil metering system,

FIG. 2 is an elevation of FIG. 1 seen from 2—2 FIG. 1,

FIG. 2–A is a fragmented detail section on line A–A FIG. 2,

FIG. 2–B is a fragmented section on B—B of FIG. 1,

FIG. 3 is a simplified fragmented plan of a crankcase of the engine with the rotor removed, looking in the same direction as in FIG. 1, and illustrating oil distribution,

FIG. 4 is a schematic section on 4—4 of FIG. 3 hatching being omitted; a portion of the figure above line X—X shows passages supplying oil to slide block guides and power cylinders, and a portion below line X—X shows passages supplying oil to the charge cylinders; the rotor being removed.

DESCRIPTION OF FIGS. 1 THROUGH 2–B

An oil supply means has a rotor **78** journaled eccentrically on a crankshaft extension **78.1**. The eccentricity is defined by the distance between an axis of rotation R of the rotor and an axial center E of the extension **78.1**. As the crankshaft is symmetrical about a plane radially through a midpoint of the crankpin, only one end of the crankshaft is considered in the following description. As shown, the rotor has strengthening webs **79** extending to a rim **82**. The rim is concentric with and rotates within a space **81** defined by a peripheral wall **81.1** of a body portion **65** of the engine, the wall being separated from the rotor by a clearance **83**, FIG. 2–A.

An outer peripheral wall of the rim **82** has a tapered groove **84** (FIG. 2) V-shaped in section and defined by walls **84.1** FIG. 2–B. The groove extends circumferentially for about a quarter of the rim as shown, and lies between edges **85** and **86** (FIG. 2) of the rim in a plane N, normal to the axis R. The groove has a depth, designated G in FIG. 2–A progressing from zero depth at a shallow end **87** FIG. 1 uniformly to a depth of about 0.05 inch at a terminating end wall **88** as indicated in broken outline in FIG. 1.

The groove has a width W (FIG. 2) at the end wall **88** of about one-sixteenth of an inch, and tapers uniformly to about one thirty-second of an inch the shallow end **87**. Disposed around the wall **81.1** are a number of small peripherally spaced discharge passages, in this instance eight severally designated **89**. The passages extend radially outwards and in the plane N. Thus the groove and the passages **89** are in register as shown in FIG. 2–B as the rim rotates.

Two other small holes are drilled in the wall **81.1**, these also being contained in the plane N, and forming oil supply passages diametrically opposite from each other designated **90** and **91**, each being of such size as to act as a capillary for a wick feed **92**. The supply passages **90**, **91**, are also in register with the groove as the rim rotates, and are spaced between adjacent discharge passages as seen in FIG. 1.

WICK FEED, FIGS. 1 and 3

Wick feeds **92** and **92–U** extend respectively to a lower reservoir **93.1** and an upper reservoir **93.1–U**. The wick-feeds use fiber wick, to give a continuous-flow low-rate oil supply from the oil reservoirs. The reservoirs can be interconnected as is later explained.

The passages **89** extend radially through the wall **81.1** each communicating with a space as shown in FIGS. 2–A and B. These spaces **94** are parts of an oil distribution system which utilizes passages drilled in the crankcase through to the cylinders, to distribute oil to lubricate the cylinder walls.

The rim thus rotates in close spaced relationship to the wall **81.1**, being spaced by the clearance **83** suitably a few thousandths of an inch according to the viscosity of the oil. The clearance is such that the oil is picked up in the groove **84** and discharged by centrifugal force to the passages **89**. The rotor thus provides means for distributing the oil through the passages. As before stated, rotor speed of one or two thousand r.p.m. is adequate, and obvious reduction gearing (not shown) can be provided.

DESCRIPTION OF FIGS. 3 and 4

In FIGS. 3 and 4 the rotor is removed, and in the following description the axis R is the axis or centerline of the engine (i.e. axis of rotation of the rotor) and each space **94** communicates with an oil distribution passage. Oil which is to be fed to the power cylinder flows through axial passages designated **95** of which there are four, and oil to be fed to the charge cylinder axial flows through passages designated **96** of which there are also four.

Because there is a rotor at each end of the crankshaft, and oil is fed symmetrically inwards axially, one half only of the oil distribution system is considered. With reference to FIGS. 4, a portion of the figure about X—X shows routing of oil passages 95 to lubricate the power cylinder 11 and the slide block guides 52, routing of passages 96 to lubricate the charge cylinder 12 is shown below X—X.

To lubricate the power cylinder, a continuation 95.2 of the passage 95 breaks out into a power cylinder wall 104 FIG. 4 at 105. The passages 95.2 are also connected through passages 106 FIG. 3 to the slide block guides 52. As shown in FIG. 4, in manufacture a plug 107 blanks off drill holes used in drilling the axial passages 95.2. The axial passage 95.2 is connected to the axial passage 95 by a radial passage 95.1, an outer end of which is similarly plugged.

Axial passages 96 are connected to charge cylinder walls 109 by a short radial passage 111. The passages 111 break out into the charge cylinder walls at 112.

SUMMARY

Summarizing the lubrication structure, each rotor is associated with eight passages 89 making a total of 16 passages collecting oil distributed as follows. Eight passages 89 connect to eight passages 95 of which each one lubricates slide block guides and the power cylinders. Thus each power cylinder has four points of lubrication which break out into the cylinder wall in a position near an upper compression ring of the piston when the piston is in a position of bottom dead center. The power piston is suitably drilled at a midpoint on its length in order to lubricate a center bearing thereof (not shown). As one slide block is mounted in each pair of guides, each slide block guide has two points of lubrication. At a midpoint on the length of each slide block a passage is drilled to lubricate a bearing centrally located therein (not shown).

Eight passages 89 connect eight passages 96 which break out into the charge cylinders. Thus each charge cylinder has four points of lubrication that are similarly designed to break out into the charge cylinder wall at a position near a compression ring of the charge piston when the piston is in a position of bottom dead center.

This structure thus distributes oil through walls of fixed members to surfaces of the fixed member and of elements e.g. a piston or a slide block moving relatively thereto.

As shown in FIG. 3, there is an upper reservoir 93.1–U and a lower reservoir 93.1. Capillary action of the wicks causes oil to enter both oil supply passages 90 and 91. Oil entering the passage 90 does so by capillary action of the wick, oil entering the passage 91 flows by capillary action also, but this flow is augmented by gravity feed from the upper reservoir. It is seen that there will be feed regardless of the attitude of the engine with two diametrically opposed reservoirs as shown. The two reservoirs are interconnected by tubes 115 hence, while the actions above still take place, these interconnecting means 115 maintain and equalize oil flow in different attitudes of the engine.

OPERATION

In operation, see FIG. 1, the rotor revolves in a direction shown by an arrow 118, driven by rotation of the crankshaft extension 34 about the axis R as shown by an arrow 119.

Depending on attitude of the engine and depth to which the oil tanks are filled, both of the passages 90 and 91 feed oil into the rotor groove by capillarity, and with the rotor revolving, each time the groove 84 traverses a passage 90 or 91, oil is trapped near the end wall 88. The trapped oil, because of the tapering of the groove, will be swept partially around the walls 81.1, to be discharged by centrifugal force to enter the several discharge passages 89, and then pass into the axial passages 95 and 96, whence it will flow through the passages aforesaid.

The viscosity of the oil is as required by the particular motor and operating condition according to known practice. Optimum feed for the particular viscosity is attained with proper selection of design parameters including capillary characteristic of the wick and passage diameter.

What I claim is:

1. Means for lubrication of moving parts of an internal combustion engine having a rotation crankshaft, the means including in combination.
   a. a reservoir (93.1) containing a supply of lubricating oil.
   b. means (78) rotated by the crankshaft for distributing the oil by centrifugal force through discharge passages (89) in a body portion (65) of the engine, the passages opening through a wall of a fixed member of the engine distributing oil on surfaces of the fixed member and of an element moving relative thereto, so as to lubricate the surfaces.
   c. and means (92, 92.1) to convey oil from the reservoir to the means aforesaid for distributing the oil, the means for distributing the oil being a rotor including,
      i. a rim (82) rotating in closely spaced relationship to a peripheral wall (81.1) of a body portion (65) of the engine and having a tapered groove (84) extending circumferentially of the rim,
      ii. the groove (84) tapering in width and depth from a shallow end (87) to a terminating end wall (88),
      iii. the groove being in register, as the rim rotates, with the discharge passage (89).

2. Structure as defined in claim 1, the means as aforesaid for supplying oil from the reservoir including,
   i. the peripheral wall (81.1) of the body portion having a hole forming an oil supply passage (90) walls of the hole defining a bore also in register with the groove as the rim rotates,
   ii. a wick feed having a wick (92.1) supplying the oil from the reservoir to the groove of the rim of the rotor; the oil being supplied to the supply passage.

3. Structure as defined in claim 2, having two diametrically opposed reservoirs (FIG. 1).

4. Structure as defined in claim 3, the supply passage having a capillary bore.

5. Structure as defined in claim 4, and means (115), interconnecting the reservoirs for maintaining and equalizing oil flow in different attitudes of the engine.