

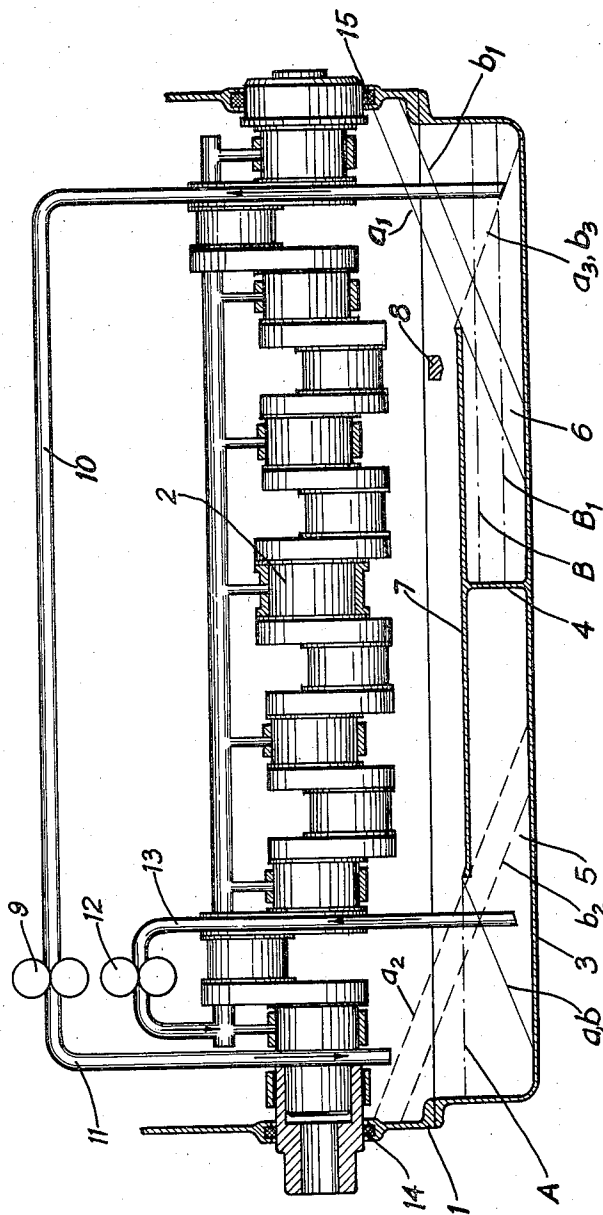
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LUBRICATING SYSTEM FOR INTERNAL COMBUSTION ENGINES

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## LUBRICATING SYSTEM FOR INTERNAL COMBUSTION ENGINES

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5 Claims. (Cl. 184-6)

This invention relates to an oil-circulating system, and, in particular, to an oil-circulating system for an internal combustion engine. More particularly still the invention is concerned with a novel oil sump in an oil-circulating system of this nature and a novel manner of mounting the oil sump in the engine.

Cross-country vehicles, as, for instance, jeeps, trucks for military, farming or foresting purposes and the like require quite particular adaptations in regard to their construction. One of the problems recognized in the art is the supply to the motor of lubricating oil under all operating conditions, and especially in cases where the vehicle assumes a slanted position when climbing or descending a slope. It is known in the art that slanted positions up to 40% upwardly or downwardly may occur and it has been a great problem to maintain the oil supply to the motor under such circumstances. The oil level in the motor must never be allowed to be displaced to such a degree that elements pertaining to the drive strike into the oil and thus convert the liquid oil into a mass of foam and/or result in oiling up the motor. Furthermore, the sealing means for sealing the motor against leakage of lubricating oil must be kept in a dry condition and oil must be prevented from splashing against the seals. This is particularly important in cases where the motor is not sealed by sealing means running on the crank shaft of the motor but where the sealing is effected by elements performing a thrusting or advancing function.

Several attempts have been made in the art to solve these problems. For example, it has been proposed to subdivide the oil sump into two separate chambers adjacent each other in the direction of the axis of the crank shaft, and further to provide for a pump for continually pumping oil from one of the subdivided chambers into the other chamber. Although this system works quite satisfactorily, the two chambers have to be located each at a different level. As a consequence, the entire motor has to be built excessively high.

In order to avoid the last mentioned considerable drawback it has also been proposed to subdivide the oil sump in a different manner. According to these known constructions, the oil sump is provided with two oil collecting chambers, which are located at opposite ends of the oil sump, while a main chamber is located between these two end chambers, making a total of three separate subchambers. The lubricating oil is first collected in the two end chambers, and is then pumped by an auxiliary pump into the central, main chamber. Another pump then sucks the oil out of this main chamber, and finally communicates the oil to the points of lubrication. While this construction allows for building small-sized lubricating systems and hence small-sized motors, it has the drawback of requiring an additional pump; it will also be evident that the oil-sump is rather difficult and complicated to build.

Having the foregoing in mind, the present invention has as the primary object to provide an improved oil

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circulation system for an internal combustion engine that eliminates the drawbacks referred to above.

Another object of the present invention is the provision of an oil circulation system for an internal combustion engine which works perfectly on cross-country rides.

The additional object of the present invention is the provision of an oil circulation system for an internal combustion engine which works perfectly even if the vehicle and the engine assume strongly slanted position.

A further object of the present invention is the provision of an uncomplicated oil sump for the oil circulation system for an internal combustion engine which makes possible the construction of a motor having a small height and considerable clearance from the ground.

Still a further object of the present invention is the provision of an oil sump for an oil circulation system for an internal combustion engine which is extremely simple to manufacture and which can be connected to the crank case in a very simple and uncomplicated manner.

These objects as well as other objects and advantages which will become apparent hereinafter are accomplished by the following features of the present invention:

The oil sump is subdivided in the direction of the axis of the crank shaft in two adjacent chambers by means of a separating wall, preferably at right angle to the axis of the crank shaft. The oil sump is provided with a pump and conduit system for transporting the oil from the first chamber to the second chamber and with a partial top wall or cover for each of these chambers which may form a kind of baffle plate. This baffle plate or the like wall element is preferably horizontally arranged, i.e. above and parallel to the bottom of the oil sump. It may be mounted as a continuous baffle plate vertically upon the separating wall so as to partly cover both oil chambers. Preferably, this horizontal baffle plate covers a portion of each of the two adjoining chambers which corresponds to not less than  $\frac{1}{3}$  and not more than  $\frac{2}{3}$  of the longitudinal extension of each of the two chambers.

In consequence thereof, instead of having two flat pan-shaped oil spaces, the oil sump according to the invention comprises two chambers partly covered at the top and preferably open at opposite ends of the sump.

The invention will be better understood by referring to the following drawing wherein the single figure is a longitudinal section of the lower part of the crank case and the oil sump.

Referring to the drawing somewhat more in detail, a crank case 1 encloses a crank shaft 2, and an oil sump 3 is attached to the lower part of the crank case. The oil sump 3 is very flat and extends through the entire length of the crank case. In its interior, a central separating wall 4 divides the oil sump into two chambers 5 and 6, having equal volumes. The upper edge of the separating wall 4 meets a baffle plate 7 which is mounted on the separating wall at a right angle thereto and extends in a direction parallel to the bottom of the oil sump. The baffle plate 7 covers substantially half of the longitudinal extension of each of the chambers 5 and 6. The plate may also cover more or less than half the two chambers, but preferably each chamber is covered by not less than  $\frac{1}{3}$  and not more than  $\frac{2}{3}$  of its area. The baffle plate 7 is also mounted at such a height within the oil sump that the connecting rod 8 has sufficient play.

A circulation pump 9 sucks the oil from the chamber 6 through a pipe 10 and transports the oil through a conduit 11 continuously into the chamber 5. Therefore, the chamber 5 always contains a sufficient amount of oil. A suction pump 12 sucks the lubricating oil from the chamber 5 and conveys the oil through a pipe conduit 13

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to the lubricating points of the engine. Both the pumps 9 and 12 form one structure and are arranged in a position where they can be easily driven by the crank shaft 2.

An amount of, for example, 20 liters of oil is filled into the left chamber 5 and flows over the upper surface of the baffle plate 7 into the right chamber 6.

The presence of baffle plate and nature of its arrangement in the oil sump regulate the oil level prevailing within the oil sump in the various positions of the vehicle. If the vehicle moves in a horizontal direction and the oil sump is, therefore, accordingly in a horizontal position, the oil level in the chambers 5 and 6 is parallel to the bottom of the oil sump and also extends horizontally. This position of the oil level is shown in the drawing by the lines A and B, showing the oil level in a horizontal position of the vehicle if 20 liters of oil had been filled into the oil sump. After a certain period of operation and a corresponding consumption of oil, the oil level may come down to line B<sub>1</sub>, indicating a total of 14 liters of oil left in the oil sump. If these conditions would prevail under all circumstances, the entire new construction constituting the invention would, of course, be unnecessary. However, vehicles frequently have to adopt a more or less slanted position, for example, when they mount or descend a hill. In these cases, the baffle plate 7 comes into play. If the vehicle climbs or descends and thus assumes a slanted position, the baffle plate holds back a sufficient amount of oil within the chamber which is temporarily located higher than the other chamber and thus assures that the oil in the lower chamber cannot reach the motor seals. In addition, the baffle plate 7 prevents the connecting rods from beating the lubricating oil and causing the formation of a mass of oil foam.

The varying oil levels adopted during a climbing or descending movement of the vehicle will be explained by way of two illustrative examples. In the first example, 20 liters of oil are filled into the oil sump and according to the second example, 14 liters of oil are filled into the oil sump. In both cases it is assumed that the vehicle first climbs and then descends at a degree of 40%, which is an extreme inclined position.

#### Example I

20 liters of oil are filled into the oil sump. If the vehicle performs a climbing movement of 40%, the oil level in the chamber 5 will be as shown by the line *a*, *b*, in the drawing. The oil level in the chamber 6 is shown by the line *a*<sub>1</sub>. If the vehicle descends 40%, the oil level in the chamber 5 will be as shown by the line *a*<sub>2</sub> and the oil level in chamber 6 will be as shown by the line *a*<sub>3</sub>*b*<sub>3</sub>.

#### Example II

14 liters of oil are filled into the oil sump. However, after 20 liters of oil had been originally filled in, 14 liters may remain after a certain period of operation which will result in a consumption of oil. If the vehicle performs a descending movement of 40%, the oil level in

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the chamber 5 will be as shown by the line *b*<sub>2</sub> and the oil level in chamber 6 will be as shown by the line *a*<sub>3</sub>*b*<sub>3</sub>.

It is apparent that in neither during the climbing nor the descending movement wherein the vehicle assumes the extreme inclined position of 40% will the oil reach the seals 14, 15 of the engine.

It will be apparent that, because of the features of the invention just described, all the surfaces of the oil sump are utilized in storing the oil supply. Consequently, the oil sump can be built in the form of a flat shallow pan.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions, and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What I claim is:

1. An oil circulation system for an internal combustion engine for automotive vehicles comprising an oil sump, a separating wall dividing said oil sump into two chambers having separate oil contents, a baffle plate on the upper edge of said separating wall, said baffle plate covering each of said chambers at least in the vicinity of said separating wall so that each chamber will retain oil therein upon inclination of the engine, a first oil pump having an inlet extending into one of said chambers through the space uncovered by said baffle plate and continually conveying oil from said one chamber into the other chamber, said first oil pump constituting the sole direct communication between said two chambers, and a second oil pump conveying oil from said other chamber to the lubricating points of said engine.

2. In an oil circulation system as claimed in claim 1 with said separating wall dividing said oil sump into two chambers of substantially equal dimensions and said baffle plate centrally mounted upon said separating wall at a right angle thereto and extending horizontally over a portion of each of said chambers.

3. In an oil circulation system as claimed in claim 1 with said baffle plate being centrally mounted upon said separating wall at a right angle thereto and below the limit of movement of a connecting rod of the engine.

4. In an oil circulation system as claimed in claim 1 with said baffle plate extending horizontally over half of the area of each of said chambers.

5. In an oil circulation system as claimed in claim 1 with said baffle plate extending horizontally over at least one-third and not more than two-thirds of the area of each of said chambers.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |        |             |
|-----------|--------|-------------|
| 1,667,728 | Fisher | May 1, 1928 |
| 2,440,815 | Wharam | May 4, 1948 |

##### FOREIGN PATENTS

|         |               |               |
|---------|---------------|---------------|
| 705,683 | Great Britain | Mar. 17, 1954 |
|---------|---------------|---------------|