June 15, 1965 W. M. MAY 3,189,126

ENGINE CRANKCASE

Filed March 18, 1963

FIG. 1.

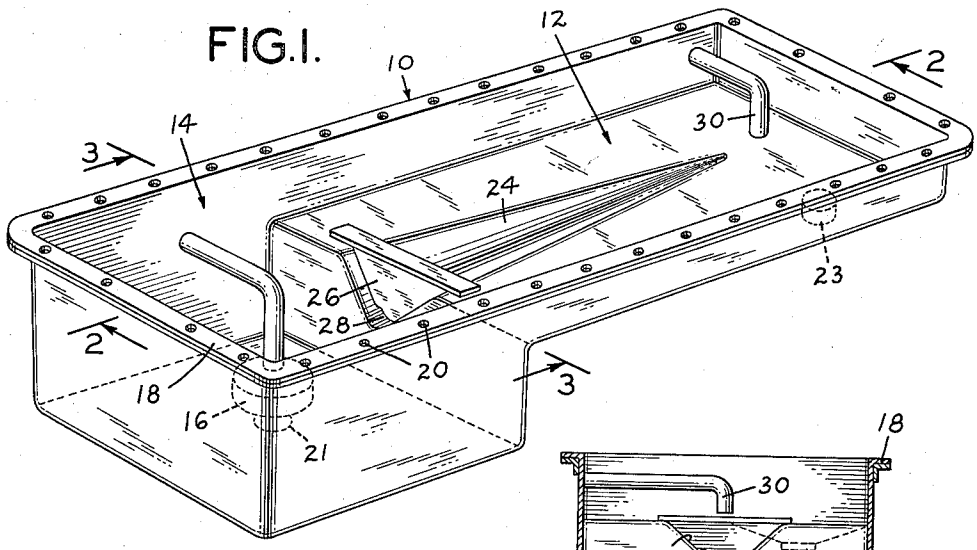


FIG. 3.

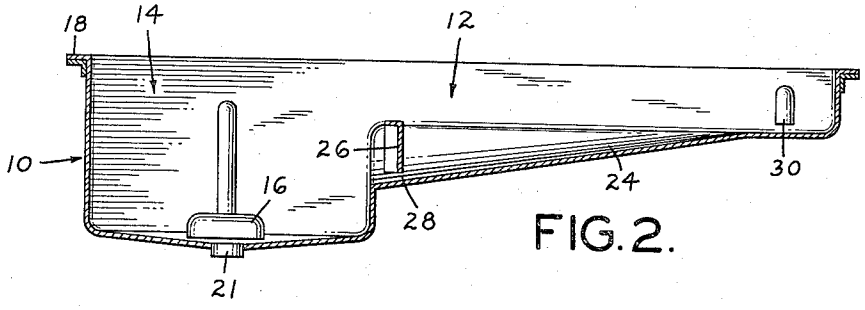


FIG. 2.

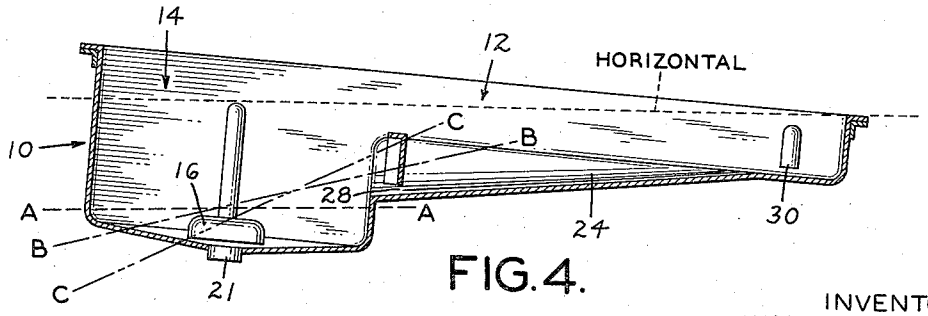


FIG. 4.

INVENTOR
WALTER M. MAY
BY
Brumbaugh, Free, Graves & Donohue
HIS ATTORNEYS

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ENGINE CRANKCASE

Walter M. May, Allentown, Pa., assignor to Mack Trucks, Inc., Plainfield, N.J., a corporation of New York

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This invention relates to an engine crankcase, and, more particularly, to a novel and improved engine crankcase having a deep sump, a communicating shallow portion, and means to minimize the trapping of oil in the shallow portion and to restrict the flow of oil into the shallow portion from the sump.

A conventional form of oil pan or crankcase now widely used has a deep sump affording a large supply of oil readily available in close proximity to the oil pump intake and a communicating shallow portion for catching oil returning to the crankcase from the engine parts not located above the sump. Such crankcases permit a reduction in the quantity of oil required to be maintained in the crankcase, thereby reducing the cost of each oil change without, in normal circumstances, substantially affecting optimum pump inlet coverage. Additionally, this structural arrangement eliminates excessive sloshing by confining the major portion of the oil to the sump, which has a relatively small surface area, thereby restricting the available distance of travel.

There are, however, a number of important disadvantages to conventional crankcases of the type described. In particular, the functioning of the conventional crankcase during operation of the vehicle on a slope or grade is relatively inefficient. For example, when the crankcase is mounted with the sump at the front of the engine and the vehicle is operated on an upgrade, the oil in the sump flows rearwardly to the back of the communicating shallow portion, thus reducing the amount available in the sump for effective lubrication. Additionally, since the lubrication needs of the engine are usually increased during uphill operation, the amount available in the sump is further reduced. In fact on very steep upgrades, almost no oil is left in the sump because of the increased circulation of oil throughout the engine and the trapping of oil in the shallow portion of the crankcase. This substantial decrease in available oil supply results in greatly increased engine wear, in a large reduction in engine power, at a time when the power requirements of the vehicle are at the greatest, and a danger of permanent damage to the engine.

Furthermore, when the conventional crankcase is used on an engine mounted at a relatively large angle to the horizontal, the amount of oil moving to the shallow portion on uphill grades is even greater, not only leaving even less oil in the sump for lubrication, but very often accumulating to a depth sufficient to cause undesirable splashing by the crankshaft which reduces power and aerates the oil. Also, the oil running back to the shallow portion does not return to the sump but remains entrapped until the vehicle traverses a downgrade. The amount of oil in the sump is thus reduced for even longer times, and the oil dip-stick readings are rendered entirely inaccurate, the quantity measured depending upon whether the vehicle has operated uphill or downhill immediately before stopping to check the oil level.

These and other disadvantages of conventional crankcases are overcome by providing, in accordance with the invention, an engine crankcase having a deep sump, a relatively shallow communicating portion, and a tapered trough extending longitudinally along the bottom of the shallow portion and sloping downwardly toward the bottom of the sump. The sloping trough enables oil which flows into the shallow portion to return to the sump. In

the trough near its juncture with the sump there is positioned a baffle having a small passage therethrough which, while allowing oil to flow from the shallow portion into the sump, restricts the flow of oil rearward when the vehicle traverses an upgrade.

During operation on road grades normally encountered, the movement of oil to the shallow portion of the crankcase is substantially eliminated, the trough having a sufficient slope to permit oil to return to the sump even during operation on normal grades with rearwardly tilted engines. However, to prevent oil from collecting in the shallow portion during operation on severe grades, a scavenger pump inlet may be located in the crankcase near the end of the shallow portion to pump out any temporarily trapped oil. Also, the baffle serves as a dam to prevent oil from rushing into the shallow portion.

In addition to preventing the trapping of oil in the shallow portion, thereby affording optimum oil pump inlet coverage at all times, the crankcase, constructed in accordance with the invention ensures accurate dip-stick readings.

While the use of the novel crankcase on horizontally mounted engines will improve their uphill operation considerably by providing a better pump coverage, its function is particularly beneficial and effective in engines mounted at large inclinations to the horizontal.

For a more complete understanding of the invention, reference may be had to the following detailed description of an exemplary embodiment, taken in conjunction with the accompanying figures of the drawings, in which:

FIGURE 1 is a perspective view of an engine crankcase, in accordance with the invention;

FIG. 2 is a side elevational view in section taken generally along the line 2—2 of FIG. 1 and looking in the direction of the arrows;

FIG. 3 is an end view in section taken generally along the line 3—3 of FIG. 1 and looking in the direction of the arrows; and

FIG. 4 is a side view in section, similar to that in FIG. 2, showing the crankcase as it might be installed on an engine mounted at an inclination and illustrating by dashed lines the optimum oil level and the effect on the oil level of the vehicle traversing grades.

Referring to FIG. 1, a crankcase 10, having a generally rectangular configuration in plan, includes a shallow rear portion 12 communicating with a relatively deep front portion or sump 14, in which an oil pump intake 16 is located. The crankcase 10 may be stamped from sheet metal and have rounded corners to prevent the accumulation of dirt which otherwise might be collected if the corners were sharp. A flange 18 about the perimeter of the crankcase provides a broad bearing surface for a gasket (not shown) and has holes 20 for bolting the crankcase 10 to an engine block. The bottoms of both the rear portion 12 and the sump 14 of the crankcase slope slightly toward draincocks 21 and 23 which may, respectively, be opened to drain out the oil when it is changed.

In the bottom of the shallow rear portion 12 of the crankcase is a tapered V-shaped trough 24 which extends longitudinally from the rear part of the crankcase into the back wall of the sump 14. The bottom of the trough 24 slopes toward the sump 14 at an angle at least sufficient to permit oil to flow into the sump 14 when the vehicle in which the crankcase is installed is horizontal, a slope in the trough of two or three degrees between the base of the trough and the horizontal as installed being generally adequate. Preferably, however, the slope of the trough is as great as the depth relationship between the shallow portion 12 and the sump 14 will permit, thus af-

fording the maximum drainage of oil from the shallow portion into the sump.

Near the entrance of the trough **24** into the sump **14** is a baffle **26**, best shown in FIG. 3, which has a passage **28** located at the base thereof adjacent to the bottom of the trough **24**. As illustrated in FIG. 4, the oil level in the sump **14** (represented by line AA) generally lies just below the bottom of the entrance of the trough **24** when the vehicle is horizontal. Oil returning from the engine into the crankcase drains from the shallow rear portion **12** through the trough **24** and back into the sump **14** through the passage **28**. When the truck is traversing a downgrade, there is, of course, no problem of oil shifting to the rear of the crankcase. On the other hand when the vehicle is climbing a hill, the oil will seek a level such as the line BB, for example. However, since the baffle **26** is disposed in the trough **24**, only a relatively small amount of oil will be permitted to flow back to the rear part **12** of the crankcase, inasmuch as the passage **28** is small enough to restrict the flow of oil therethrough to a relatively low rate. The design of the passage **28** will, of course, involve a balancing of the flow rate desired from the rear portion **12** back into the sump **14** and a minimal flow rate from the sump **14** to the rear portion **12**. At steeper inclinations, such as that defined by the line CC, the oil level in the sump would generally be relatively low because of increased circulation throughout the engine. Consequently, only rarely will any oil flow over the baffle **26** into the rear portion **12**.

It will be apparent that the trapping of small amounts of oil in the rear portion **12** cannot altogether be avoided during prolonged runs on steep uphill grades solely by the use of the trough **24**, since oil will be returning to the crankcase from the engine parts and small quantities will flow rearwardly through the passage **28** or, occasionally, over the top of the baffle **26**. Accordingly, a scavenger oil pump intake **30** may be located at the rear of the shallow portion **12** of the crankcase to remove and utilize for engine lubrication any oil accumulated in the shallow portion **12**.

Thus there is provided, in accordance with the invention, a crankcase of novel configuration which, by means of a sloping trough and baffle, restricts the movement of oil away from the oil pump intake, thereby enhancing the efficiency of lubrication, parucularly during uphill operation of a vehicle when increased power demands on the engine make effective lubrication imperative. Further, oil temporarily accumulating in the rear of the crankcase returns to the sump through the trough, thereby eliminating undesirable splashing by the engine crankshaft and enabling accurate dipstick measurement of the oil level.

It will be understood by those skilled in the art that the above-described embodiment is susceptible of variation and modification, particularly with respect to the shape, size, and slope of the trough and the design of the baffle and associated passage, without departing from the spirit and scope of the invention. Therefore, the invention is not deemed to be limited except as defined in the appended claims.

I claim:

1. An engine crankcase for accumulating lubricating oil for an engine, comprising a deep sump, a relatively shallow portion communicating with said sump, trough means in said shallow portion sloping toward said sump to direct oil into said sump from said shallow portion when the crankcase is tilted downwardly in the direction of said shallow portion, and means in said trough for limiting the flow of oil from said sump into said shallow portion to a predetermined flow rate.

2. An engine crankcase for accumulating lubricating oil for an engine, comprising a deep sump, a relatively shallow portion communicating with said sump, a trough disposed in the bottom of said shallow portion sloping longitudinally therefrom toward said sump and entering said sump at an end wall thereof, a baffle disposed in said trough, and means defining a small passage in said baffle for limiting the flow of oil from said sump into said trough to a predetermined flow rate.

3. An engine crankcase for accumulating lubricating oil for an engine, comprising a deep front sump, a relatively shallow elongated and rearwardly disposed portion having a substantially flat bottom communicating with and disposed adjacent said sump, a tapered trough having a rounded bottom portion and walls sloping convergently from said flat bottom toward said bottom portion disposed longitudinally in said shallow portion flat bottom and sloping downwardly therefrom toward said sump and entering said sump at an end wall thereof, a baffle disposed in said trough, and means defining a small passage in said baffle for limiting the flow of oil from said sump into said trough to a predetermined flow rate while permitting oil to flow from said trough into said sump.

4. An engine crankcase as claimed in claim **3**, in which said passage is a narow slot extending transversly along the bottom of said trough at the base of said baffle.

5. An engine crankcase as claimed in claim **3**, in which said bottom portion of said trough has a slope relative to said flat bottom sufficient to facilitate the flow of oil from said shallow portion into said sump when a vehicle in which an engine having the crankcase installed thereon is in a horizontal position.

6. An engine crankcase for accumulating lubricating oil for an engine, comprising a deep sump, a relatively shallow elongated portion disposed adjacent and communicating with said sump, a tapered trough disposed in the bottom of said shallow portion and having a rounded bottom portion and walls sloping convergently from the bottom of said shallow portion toward said bottom portion, said trough sloping longitudinally from the bottom of said shallow portion toward said sump and entering said sump at an end wall thereof, a baffle disposed in said trough, means defining a small passage in said baffle for limiting the flow of oil from said sump into said trough to a predetermined flow rate, a primary oil pump intake located in said sump, and a scavenger oil pump intake located in said shallow portion.

7. An engine crankcase for accumulating lubricating oil for an engine, comprising a deep front sump, a relatively shallow rear portion communicating with said sump, a tapered trough formed in the bottom of said rear portion and having a rounded bottom portion and walls sloping convergently therefrom toward said rounded bottom, shaid bottom portion of said trough sloping longitudinally relative to the bottom of said rear portion from a point near the back of said rear portion toward said sump at a slope sufficient to permit oil to flow from said rear portion into said sump when a vehicle in which an engine having the crankcase installed thereon is in a horizontal position, said trough entering said sump at an end wall thereof, and a baffle disposed in the entrance of said trough into said sump, said baffle having a narrow slot extending along the bottom of said trough to permit a relatively small flow of oil through said baffle.

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LAVERNE D. GEIGER, *Primary Examiner.*

MILTON KAUFMAN, *Examiner.*