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(54) **IMPROVEMENTS IN OR RELATING TO OIL TANKS FOR DRY SUMP ENGINES**

VERBESSERUNGEN VON ÖLBEHÄLTERN FÜR TROCKENSUMPFMOTOREN ODER DIESE BETREFFEND

AMELIORATIONS DE OU RELATIVES A DES RESERVOIRS D'HUILE POUR MOTEURS CARTER SEC

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Description

[0001] The present invention relates to an oil tank for a dry sump engine.

[0002] Traditionally, automobiles have wet sumps. That is, the sump is provided within the engine below the crank shaft and oil is stored in an oil pan within the sump. An oil pump sucks oil from the bottom of the oil pan and pumps it to the rest of the engine.

[0003] Racing cars, and other high performance automobiles, generally have a dry sump. In a dry sump, the oil is stored in an oil tank separated from the engine sump. The use of a dry sump reduces the amount of windage in the crank case and improves the performance of the engine. The engine height, and hence the chassis height of the automobile can be reduced and there are other advantages. However, the dry sump arrangement has been reserved for more expensive vehicles because it is more costly than a wet sump.

[0004] Traditionally, with a dry sump, the oil, together with the air which becomes mixed therein, is extracted from the engine by an oil pump and is passed by way of an oil filter back to the oil tank. Generally, the oil and air mixture is fed into the top of the oil tank and the oil is pumped from the bottom of the tank. By this means the height of the oil tank provides a path over which the oil has to travel, and during that travel air is released from the oil. However, to get efficient de-aeration, it is necessary to have a tall oil tank, and this leads to an increase in height of the engine compartment. It is also known to house a centrifuge in the top of the oil tank to assist in de-aeration. Such a centrifuge adds to the complexity of the oil tank, and hence to the cost of the engine and of its maintenance.

[0005] US-A-6,029,638 describes a dry sump lubricating system with a lubricating oil tank disposed outside an engine body. The lubricating oil drops down into a crank chamber and is immediately picked up from the crank chamber and sent back into the lubricating oil tank by a recovery pump. The lubricating oil tank is attached to an end of the engine body from which a crankshaft projects and so does not increase the overall width and height of the engine.

[0006] US-A-5,937,817 describes a dry sump oil cooling system including an oil pan reservoir, an oil return port, an oil pickup port, and a baffle. Both the oil return port and the oil pickup port are defined at a first end of the reservoir. The oil return port is located adjacent the top of the reservoir while the oil pickup port is located adjacent the bottom of the reservoir. The baffle is coupled to the reservoir between the top and the bottom or free-standing within the reservoir to divide the reservoir into a top chamber and a bottom chamber. The baffle at least partially defines an oil passageway between the top chamber and the bottom chamber at the second end such that most of the oil flows substantially across the length of the oil pan reservoir twice before being returned to the engine by the oil pickup port.

[0007] The present invention seeks to provide, in a simple and effective manner, an oil tank for a dry sump engine.

[0008] According to the present invention there is provided an oil tank for a dry sump engine, the oil tank having a housing for containing oil, the housing being formed from a body member, a top end member and a bottom end member, an inlet for oil and air and an air outlet being formed in said top end member, and an outlet for oil being formed in said bottom end member, wherein said body member has been extruded from metal and has at least one substantially upright compartment therein defined by an integral, extruded peripheral wall.

[0009] Preferably, at least three, substantially upright, communicating compartments are defined within the housing to provide a tortuous path for the oil which encourages de-aeration thereof. In a preferred embodiment, a first one of the compartments is defined by the extruded peripheral wall, and a removable wall is mounted within the body member to define two additional compartments.

[0010] The provision of at least three communicating compartments in an oil tank of an embodiment of the invention not only provides a tortuous path which encourages de-aeration of the oil, but also provides a path whose length is effectively at least three times the height of the oil tank. By this simple means, therefore, de-aeration is enhanced. It will also be appreciated that, even though the length of the path for the oil has been effectively increased by three times as compared to the height of the oil tank, the oil tank itself can be kept compact.

[0011] It will be appreciated that additional upright compartments could be provided to increase the effective path for the oil still further. These may be provided by integral walls extruded with the body member or by insertable, removal walls. Filter elements may be incorporated in one or more of the walls.

[0012] Preferably, means are provided to swirl or centrifuge the oil and air mixture entering into the oil and air inlet.

[0013] In one preferred embodiment, the oil and air inlet opens into said first, compartment, and the extruded peripheral wall thereof has at least a part circular shape facing the inlet.

[0014] In a presently preferred embodiment, the extruded peripheral wall is generally circular in shape such that the first compartment in the housing is substantially cylindrical and has a radially extending air and oil inlet.

[0015] Preferably, an air outlet pipe is arranged to extend axially of the cylindrical first compartment to enhance the centrifugal effect and to guide air released from the oil and air mixture to the air outlet.

[0016] In an embodiment, the extruded body member is formed with internal supports for receiving one or more slidable plates to divide the interior of the body member into further upright compartments.

[0017] Preferably, the body member is extruded to have external cooling fins thereon.

[0018] Embodiments of the present invention will hereinafter be described, with reference to the accompanying drawings, in which,

Figure 1 shows a longitudinal section through an oil tank of the present invention, and

Figure 2 shows a plan view from above of the oil tank of Figure 1.

[0019] The oil tank shown in the drawings comprises a housing made from an extruded body member 2, a top end member 4, and a bottom end member 6. In this respect, and as is apparent from Figure 2, the body member 2 is extruded, preferably from aluminium, to have a first substantially cylindrical compartment 8 defined therein by a part circular, peripheral wall 10. Supports 12 for receiving a plate 14 which defines two further compartments within the body member 2 are also provided. It will be seen from Figure 2 that cooling fins 16 can also be extruded with the body member 2.

[0020] The top end member 4 is provided with an oil and air inlet 20 and an air outlet 22. The bottom end member 6 is provided with an oil outlet 24. Thus, in use, the oil and air inlet 20 and the air outlet 22 are above the oil level L, and the oil outlet 24 is spaced below the oil and air inlet 20 and the air outlet 22 and is below the oil level L.

[0021] When the oil tank is assembled from the body member 2 and the end members 4 and 6, and the plate 14 has been positioned it will be seen that there is defined within the housing three substantially upright compartments 31, 32, and 33. It will be seen that the first compartment 31 communicates with the oil and air inlet 20 and around the bottom of the peripheral wall 10 with the second compartment 32. The second compartment 32 communicates, through gaps in the plate 14, with the third compartment 33. The third compartment 33 is in communication with the oil outlet 24. By this means, and as is shown by the arrow A on Figure 1, a tortuous path for the oil through the oil tank is provided and it will be appreciated that as the oil follows the path A it will have time to discharge air therefrom.

[0022] The gaps in the plate 14 can simply be exit holes for the oil. However, usefully, these gaps may support filter elements, indicated at 40, arranged to filter the oil.

[0023] Whilst it would be possible to allow the tortuous path A defined within the oil tank alone to de-aerate the air, it is preferred, as shown in Figure 1, to centrifuge the oil and air mixture arriving into the oil tank. The centrifugal effect is obtained by providing a substantially cylindrical first compartment 31 and arranging the oil and air inlet 20 in a tangential direction with respect thereto. These means tend to give a circular flow to the air and oil mixture entering by way of the inlet 20. This effect is enhanced by an air tube 36 which extends within the first compartment 31 and is in communication with the air outlet 22. In fact, and as is shown, the tube 36 may be continued to define the air outlet.

[0024] The construction as illustrated provides a particularly effective de-aeration for the oil whilst being more compact than previously proposed oil tanks. The use of an aluminium extrusion enables the relatively complex arrangement to be constructed by simple means. Preferably, the top and bottom end members 4 and 6 are aluminium castings.

[0025] As described and illustrated, the plate 14, which incorporates oil filter elements 40, is slidable into and out of the supports 12 provided within the extrusion. This enables the filter elements 40 to be changed readily if they become blocked. The provision of filtering means within the oil tank has the advantage that any foreign matter in the oil is prevented from exiting the oil tank and thereby entering the oil pump in the system.

[0026] It will be appreciated that variations in and modifications to the embodiments as described and illustrated may be made within the scope of the following claims.

Claims

1. An oil tank for a dry sump engine, the oil tank having a housing for containing oil, the housing being formed from a body member (2), a top end member (4) and a bottom end member (6), an inlet (20) for oil and air and an air outlet (22) being formed in said top end member (4), and an outlet (24) for oil being formed in said bottom end member (6), wherein said body member (2) has been extruded from metal and has at least one substantially upright compartment (31) therein defined by an integral, extruded peripheral wall (10).

2. An oil tank for a dry sump engine as claimed in Claim 1, wherein at least three substantially upright communicating compartments (31, 32, 33) are defined within the housing to provide a tortuous path for the oil and thereby encourage de-aeration of the oil.

3. An oil tank for a dry sump engine as claimed in Claim 2, wherein a first one of the compartments (31) is defined by the extruded peripheral wall (10), and a removable wall (14) is mounted within the body member to define two additional compartments (32, 33).

4. An oil tank for a dry sump engine as claimed in any preceding claim, further comprising additional upright compartments provided to increase the effective path for the oil.

5. An oil tank for a dry sump engine as claimed in Claim 4, wherein integral walls are extruded with the body member to provide said additional upright compartments.

6. An oil tank for a dry sump engine as claimed in claim 4, wherein insertable removal walls (14) are provided to define said additional upright compartments.

7. An oil tank for a dry sump engine as claimed in Claim 5 or Claim 6, further comprising filter elements (40) incorporated in one or more of said walls (14).

8. An oil tank for a dry sump engine as claimed in any preceding claim, further comprising means to swirl or centrifuge the oil and air mixture entering into the oil and air inlet (20).

9. An oil tank for a dry sump engine as claimed in Claim 8, wherein the oil and air inlet (20) opens into said first, compartment (31), and the extruded peripheral wall (10) thereof has at least a part circular shape facing the inlet.

10. An oil tank for a dry sump engine as claimed in any preceding claim, wherein the extruded peripheral wall (10) is generally circular in shape such that the first compartment (31) in the housing is substantially cylindrical and has a radially extending air and oil inlet (20).

11. An oil tank for a dry sump engine as claimed in Claim 10, wherein an air outlet pipe (36) is arranged to extend axially of the cylindrical first compartment (31) to enhance the centrifugal effect and to guide air released from the oil and air mixture to the air outlet (22).

12. An oil tank for a dry sump engine as claimed in any preceding claim, wherein the extruded body member (2) is formed with internal supports (12) for receiving one or more slidable plates (14) to divide the interior of the body member into further upright compartments (32, 33).

13. An oil tank for a dry sump engine as claimed in any preceding claim, wherein the body member (2) is extruded to have external cooling fins (16) thereon.

Patentansprüche

1. Öltank für einen Trockensumpfmotor, wobei der Öltank ein Gehäuse zur Aufnahme von Öl aufweist, das Gehäuse aus einem Körperbauteil (2), einem oberen Endbauteil (4) und einem unteren Endbauteil (6) gebildet ist, ein Einlass (20) für Öl und Luft sowie ein Luftauslass (22) in dem oberen Endbauteil (4) gebildet sind, und ein Auslass (24) für Öl in dem unteren Endbauteil (6) gebildet ist, wobei das Körperbauteil (2) aus Metall extrudiert ist und mindestens eine im Wesentlichen aufrechte Kammer (31) darin hat, die durch eine integrierte, extrudierte Umfangswand (10) gebildet ist.

2. Öltank für einen Trockensumpfmotor nach Anspruch 1, bei dem mindestens drei im Wesentlichen aufrechte, kommunizierende Kammern (31, 32, 33) in dem Gehäuse definiert sind, um einen gewundenen Pfad für das Öl zu bilden und **dadurch** die Entlüftung des Öls zu unterstützen.

3. Öltank für einen Trockensumpfmotor nach Anspruch 2, bei dem eine erste der Kammern (31) durch die extrudierte Umfangswand (10) definiert ist und eine entfernbare Wand (14) in dem Körperbauteil montiert ist, um zwei zusätzliche Kammern zu definieren.

4. Öltank für einen Trockensumpfmotor nach einem der vorhergehenden Ansprüche, außerdem mit zusätzlichen aufrechten Kammern, die vorgesehen sind, um den wirksamen Pfad für das Öl zu verlängern.

5. Öltank für einen Trockensumpfmotor nach Anspruch 4, bei dem die integrierten Wände mit dem Körperbauteil extrudiert sind, um die zusätzlichen aufrechten Kammern zur Verfügung zu stellen.

6. Öltank für einen Trockensumpfmotor nach Anspruch 4, bei dem einsetzbare, entfernbare Wände (14) vorgesehen sind, um die zusätzlichen aufrechten Kammern zu definieren.

7. Öltank für einen Trockensumpfmotor nach Anspruch 5 oder Anspruch 6, außerdem mit Filterelementen (40), die in einer oder mehreren der Wände (14) integriert sind.

8. Öltank für einen Trockensumpfmotor nach einem der vorhergehenden Ansprüche, außerdem mit Einrichtungen, um die Mischung aus Öl und Luft, die in den Öl- und Lufteinlass (20) eintritt, zu verwirbeln oder zu zentrifugieren.

9. Öltank für einen Trockensumpfmotor nach Anspruch 8, bei dem der Öl- und Lufteinlass (20) in die erste Kammer (31) geöffnet ist und deren extrudierte Umfangswand (10) mindestens eine teilkreisförmige Gestalt hat, die dem Einlass zugewandt ist.

10. Öltank für einen Trockensumpfmotor nach einem der vorhergehenden Ansprüche, bei dem die extrudierte Umfangswand (10) allgemein eine kreisförmige Gestalt hat, so dass die erste Kammer (31) in dem Gehäuse im Wesentlichen zylindrisch ist und einen radial verlaufenden Luft- und Öleinlass (20) hat.

11. Öltank für einen Trockensumpfmotor nach Anspruch 10, bei dem ein Luftauslassrohr (36) angeordnet ist,

um sich in axialer Richtung der zylindrischen ersten Kammer (31) zu erstrecken, um die Zentrifugalwirkung zu verbessern und um Luft, die aus der Mischung aus Öl und Luft freigegeben ist, zum Luftauslass (22) zu leiten.

12. Öltank für einen Trockensumpfmotor nach einem der vorhergehenden Ansprüche, bei dem das extrudierte Körperbauteil (2) mit inneren Abstützungen (12) ausgebildet ist, um eine oder mehrere verschiebbare Platten (14) aufzunehmen, um das Innere des Körperbauteils in weitere aufrechte Kammern (32, 33) zu unterteilen.

13. Öltank für einen Trockensumpfmotor nach einem der vorhergehenden Ansprüche, bei dem das Körperbauteil (2) extrudiert ist, um daran äußere Kühlrippen (16) zu haben.

Revendications

1. Réservoir d'huile pour carter sec, le réservoir d'huile ayant un logement pour contenir de l'huile, le logement étant formé à partir d'un élément de corps (2), d'un élément d'extrémité supérieur (4) et d'un élément d'extrémité inférieur (6), une entrée (20) pour l'huile et l'air et une sortie d'air (22) étant formées dans ledit élément d'extrémité supérieur (4), et une sortie (24) pour l'huile étant formée dans ledit élément d'extrémité inférieur (6), dans lequel ledit élément de corps (2) a été extrudé à partir de métal et a au moins un compartiment sensiblement vertical (31) défini à l'intérieur par une paroi périphérique intégrée extrudée (10).

2. Réservoir d'huile pour carter sec selon la revendication 1, dans lequel au moins trois compartiments de communication sensiblement verticaux (31, 32, 33) sont définis à l'intérieur du logement pour fournir une trajectoire tortueuse pour l'huile et favoriser ainsi la désaération de l'huile.

3. Réservoir d'huile pour carter sec selon la revendication 2, dans lequel un premier des compartiments (31) est défini par la paroi périphérique extrudée (10), et une paroi amovible (14) est montée à l'intérieur de l'élément de corps pour définir deux compartiments supplémentaires (32, 33).

4. Réservoir d'huile pour carter sec selon l'une quelconque des revendications précédentes, comprenant en outre des compartiments verticaux supplémentaires prévus pour augmenter la trajectoire efficace de l'huile.

5. Réservoir d'huile pour carter sec selon la revendication 4, dans lequel des parois intégrées sont extrudées avec l'élément de corps pour fournir lesdits compartiments verticaux supplémentaires.

6. Réservoir d'huile pour carter sec selon la revendication 4, dans lequel des parois amovibles insérables (14) sont prévues pour définir lesdits compartiments verticaux supplémentaires.

7. Réservoir d'huile pour carter sec selon la revendication 5 ou la revendication 6, comprenant en outre des éléments de filtre (40) incorporés dans une ou plusieurs desdites parois (14).

8. Réservoir d'huile pour carter sec selon l'une quelconque des revendications précédentes, comprenant en outre des moyens pour brasser ou centrifuger le mélange d'huile et d'air entrant dans l'entrée d'huile et d'air (20).

9. Réservoir d'huile pour carter sec selon la revendication 8, dans lequel l'entrée d'huile et d'air (20) s'ouvre dans ledit premier compartiment (31), et la paroi périphérique extrudée (10) de celle-ci a au moins une forme en partie circulaire faisant face à l'entrée.

10. Réservoir d'huile pour carter sec selon l'une quelconque des revendications précédentes, dans lequel la paroi périphérique extrudée (10) est généralement de forme circulaire, de telle sorte que le premier compartiment (31) dans le logement est sensiblement cylindrique et possède une entrée d'air et d'huile s'étendant radialement (20).

11. Réservoir d'huile pour carter sec selon la revendication 10, dans lequel un conduit de sortie d'air (36) est agencé de sorte à s'étendre axialement par rapport au premier compartiment cylindrique (31) pour améliorer l'effet centrifuge et guider l'air libéré du mélange d'huile et d'air vers la sortie d'air (22).

12. Réservoir d'huile pour carter sec selon l'une quelconque des revendications précédentes, dans lequel l'élément de corps extrudé (2) est formé de supports internes (12) pour recevoir une ou plusieurs plaques coulissantes (14) pour diviser l'intérieur de l'élément de corps en d'autres compartiments verticaux (32, 33).

13. Réservoir d'huile pour carter sec selon l'une quelconque des revendications précédentes, dans lequel l'élément de corps (2) est extrudé de sorte à former des ailettes de refroidissement externes (16) sur celui-ci.

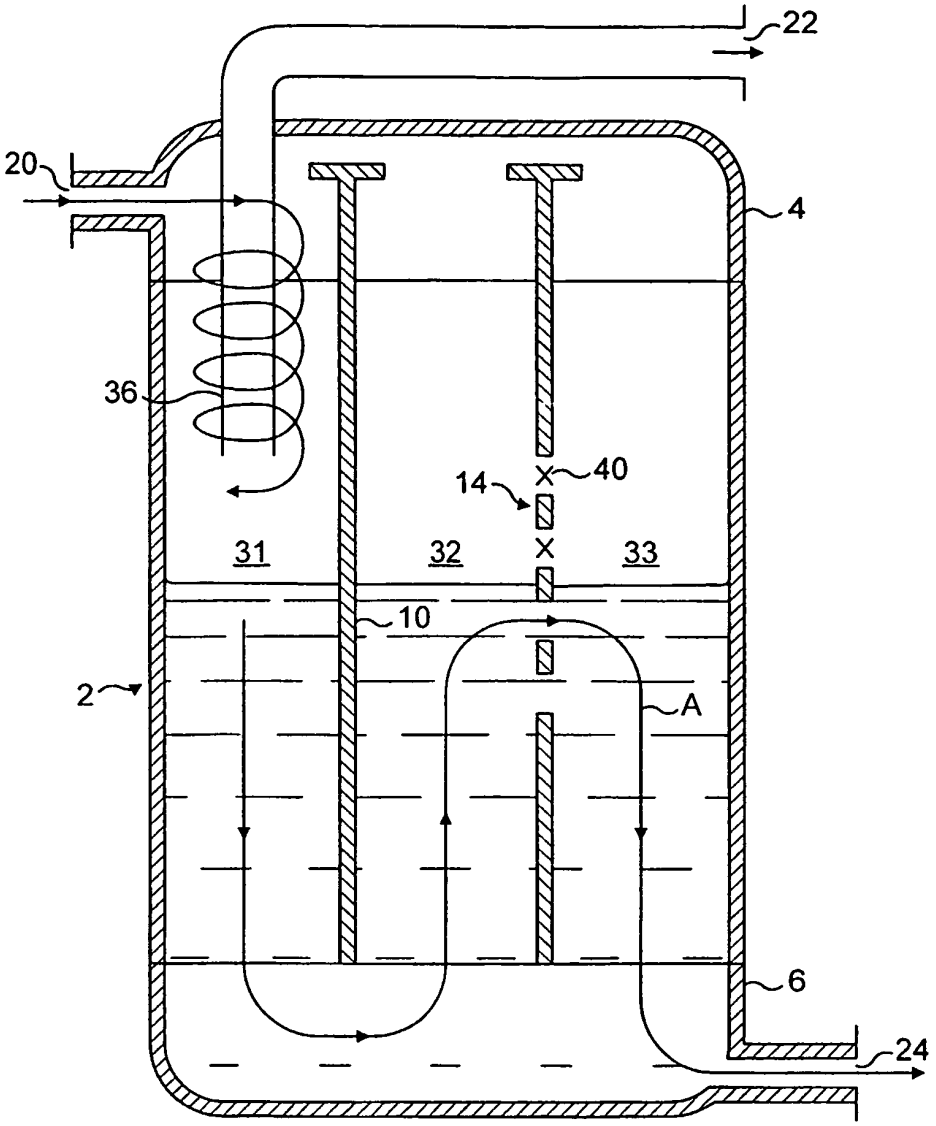
22
20
4
36
14
40
31
32
33
10
2
A
6
24

FIG. 1

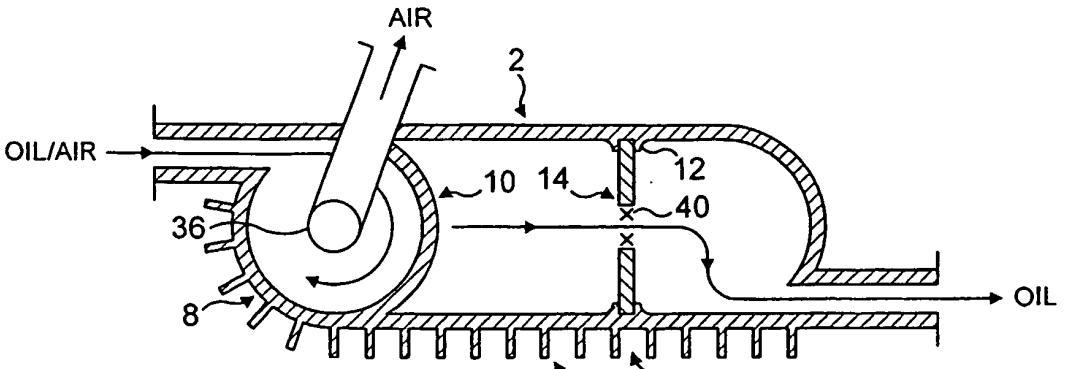
AIR
2
OIL/AIR
10
14
12
40
36
8
OIL
16

FIG. 2

REFERENCES CITED IN THE DESCRIPTION

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