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Brazeel

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(54) **OIL RESERVOIR FOR HIGH-PERFORMANCE ENGINE**

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F01M 11/00 (2006.01)

(52) **U.S. Cl.**
CPC . ***F01M 11/0004*** (2013.01); *F01M 2011/0041* (2013.01); *F01M 2011/005* (2013.01); *F01M 2011/007* (2013.01)

(58) **Field of Classification Search**
CPC F01M 11/0004; F01M 11/062; F01M 11/064; F01M 11/065; F01M 2011/0041; F01M 2011/005; F01M 2011/007
See application file for complete search history.

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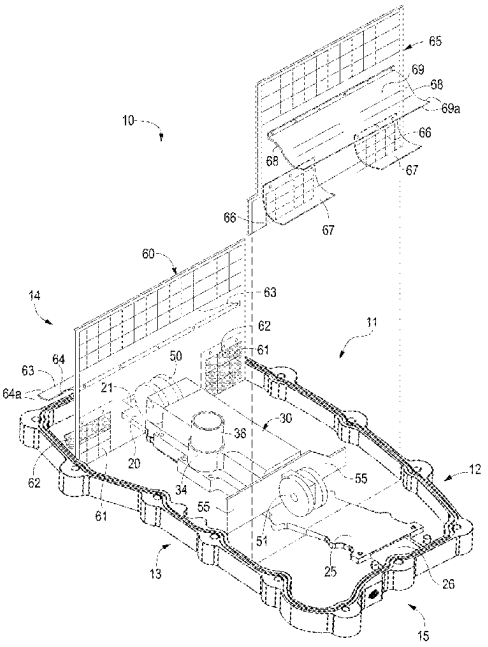
(57) **ABSTRACT**

A lubrication fluid reservoir apparatus for a vehicle engine is disclosed herein. The apparatus includes a sump plate having a tunnel port assembly, a valve assembly, and a baffle assembly that are operable to minimize agitation of lubrication fluid in the sump plate and maintain lubrication fluid available to a lubrication fluid take-up tube during high G-force turns of the vehicle to prevent engine oil starvation, in various aspects.

3 Claims, 5 Drawing Sheets



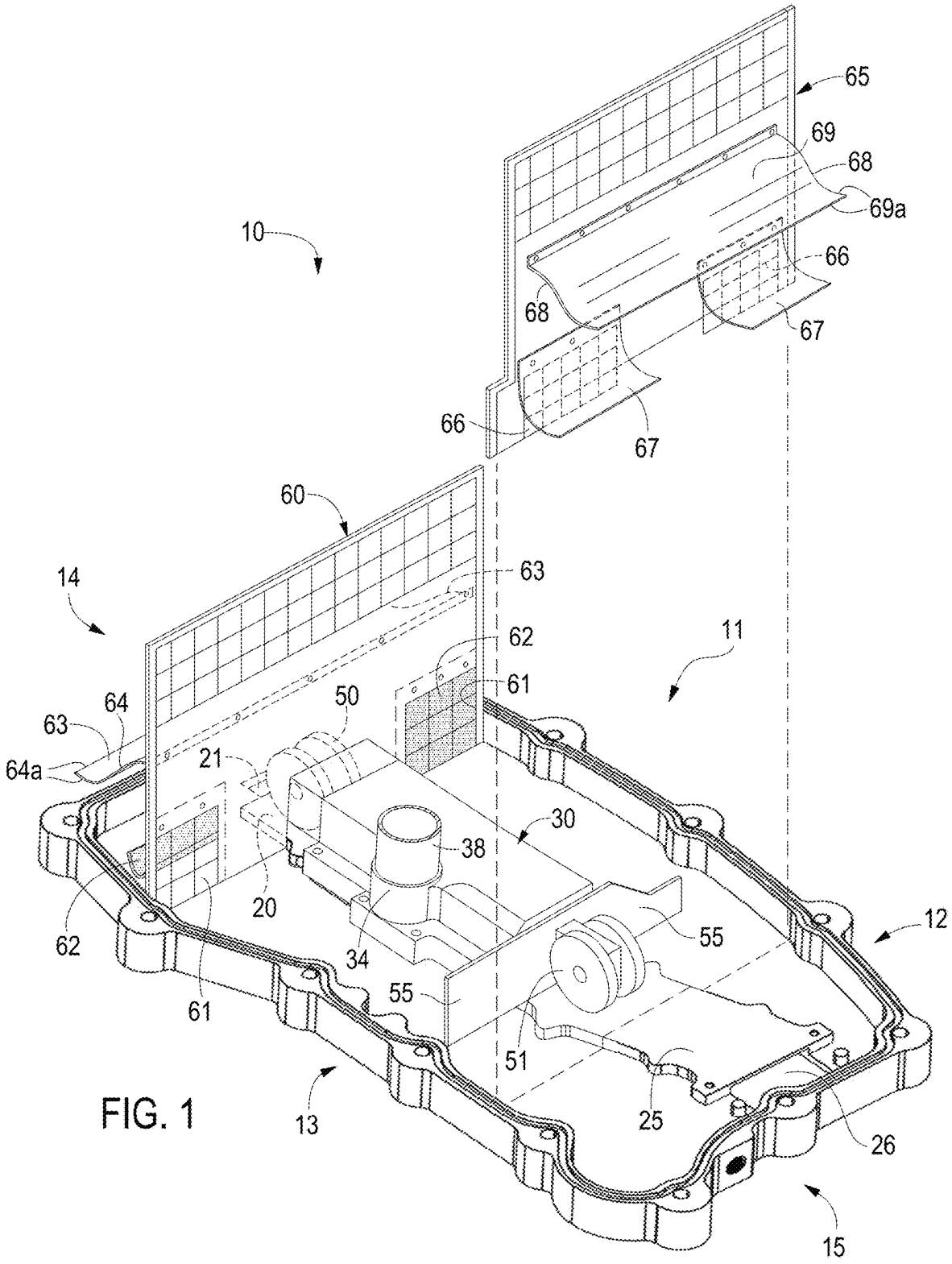

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FIG. 1

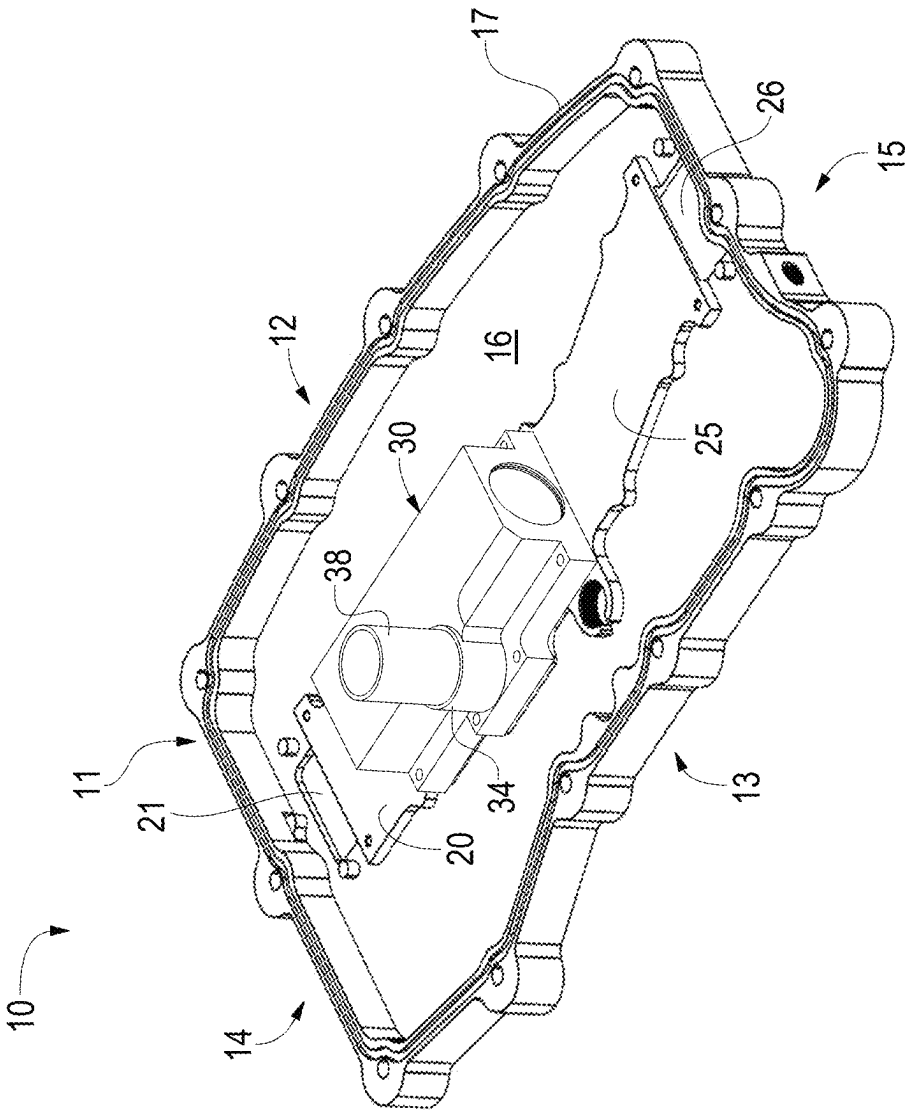

FIG. 2

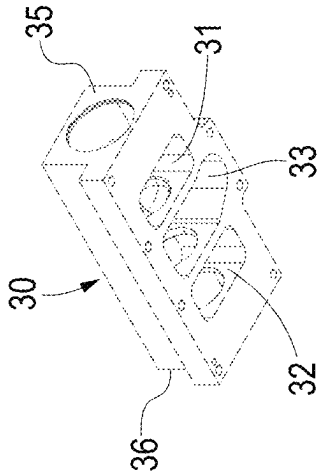
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FIG. 4

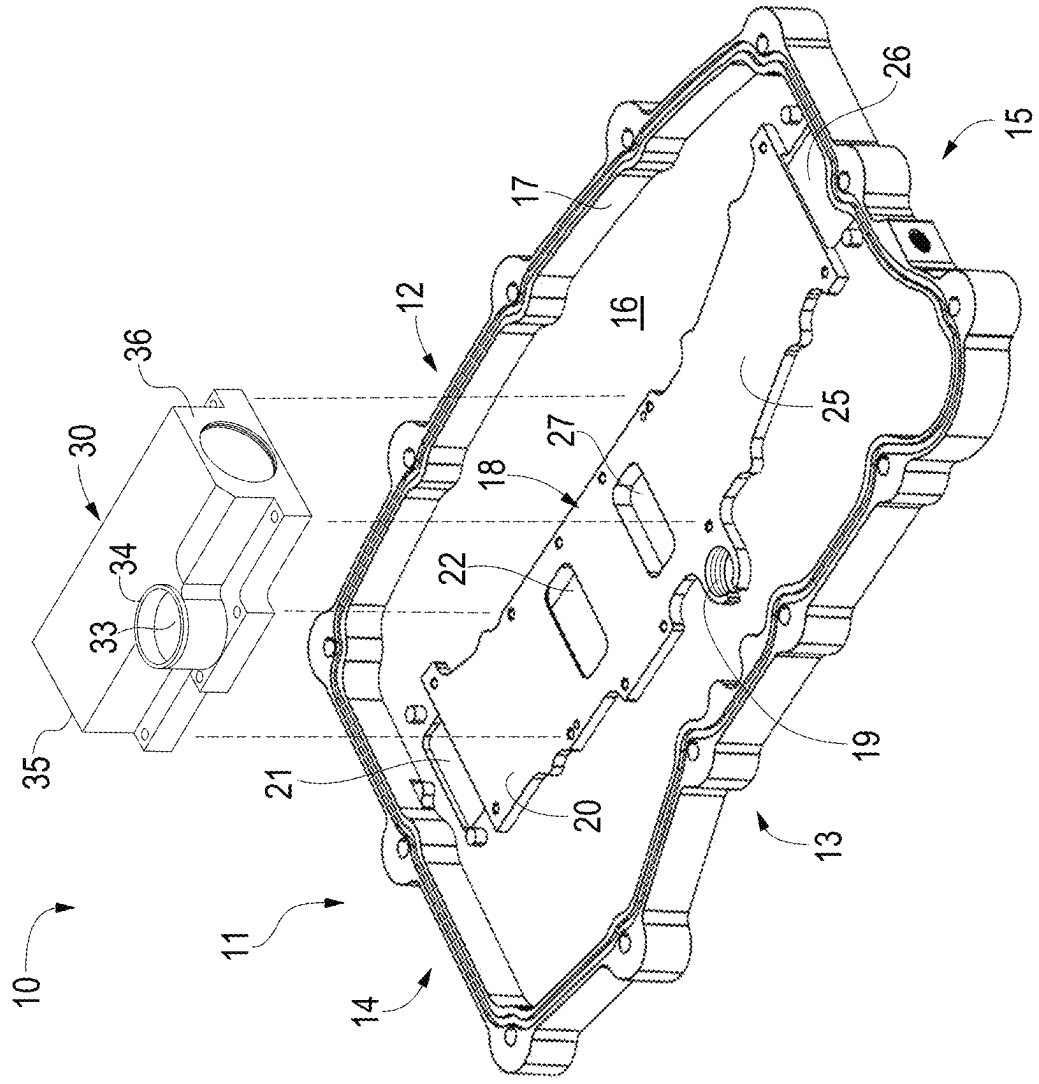
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FIG. 3

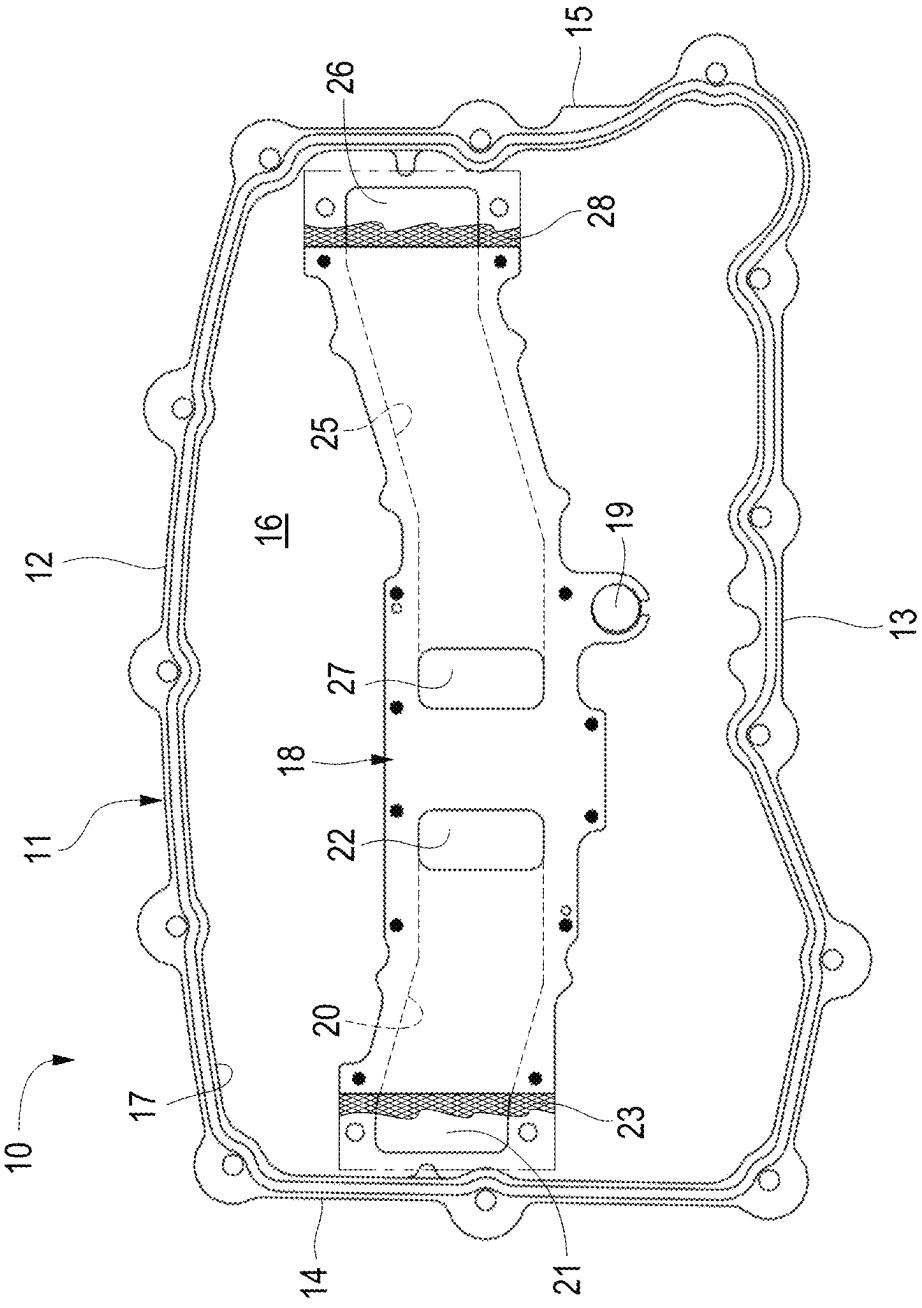

FIG. 5

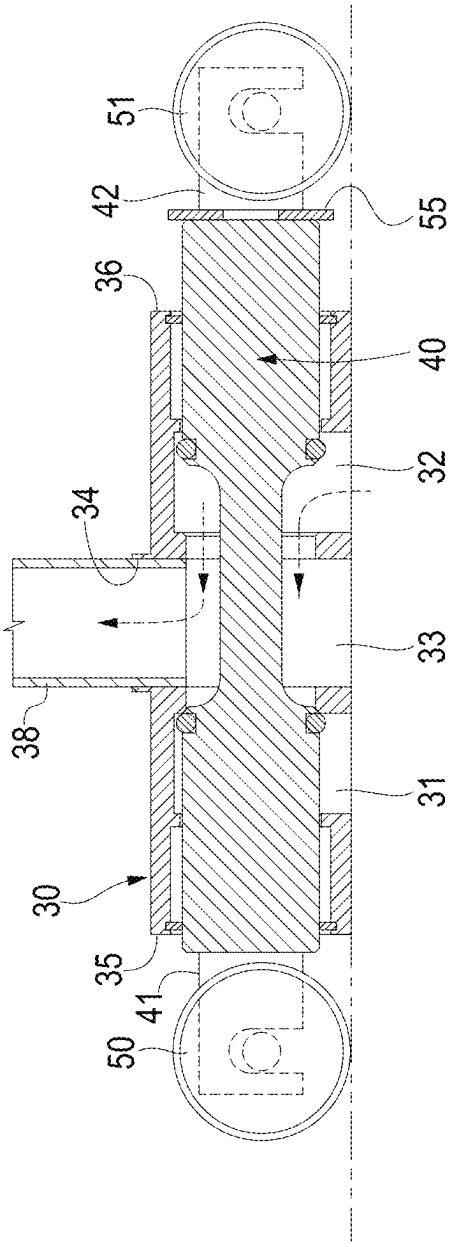
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FIG. 6

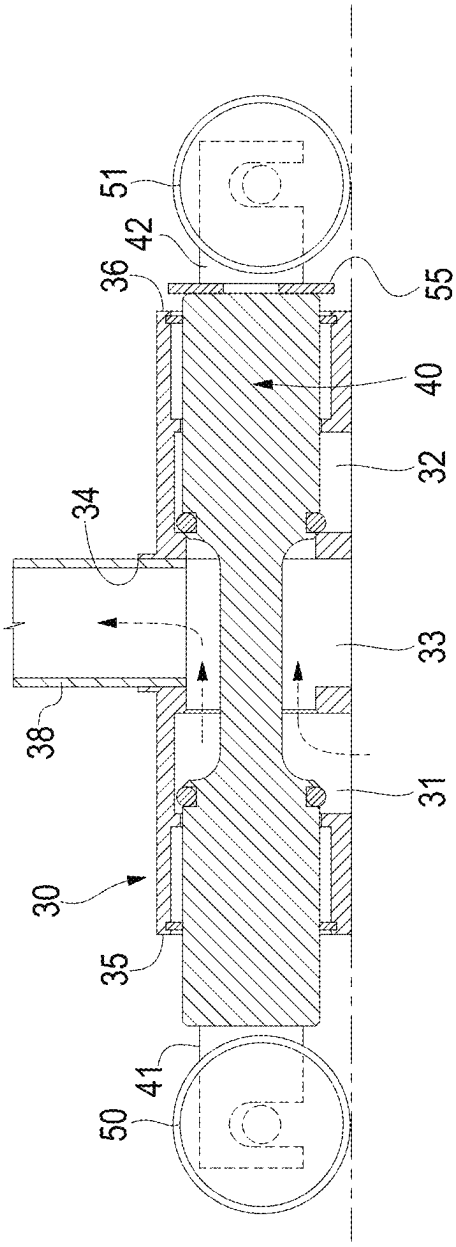
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FIG. 7

OIL RESERVOIR FOR HIGH-PERFORMANCE ENGINE

FIELD OF THE INVENTION

The present application relates to an oil reservoir apparatus for a high-performance vehicle engine that prevents engine oil starvation.

BACKGROUND OF THE INVENTION

High-performance vehicle engines may include an oil sump located at the base of the engine for storing oil. An oil pump draws oil from the oil sump via a take-up tube and delivers the oil to the engine to lubricate the engine parts. The oil is then drained or pumped back into the oil sump for reuse.

During high G-force turns of these high-performance vehicles, the oil will tend to flow towards the sides of the oil sump, which can move oil away from the take-up tube and thereby prevent oil from being pumped into the engine, a condition known as engine oil starvation. This is very undesirable because it reduces engine performance and can result in damage to the engine parts.

Various improvements have been made to these oil sump systems to maintain oil around the take-up tube during high G-force turns to prevent engine oil starvation with varying degrees of success, but the problem still persists. Accordingly, there is a need for an improved oil reservoir apparatus for a high-performance engine that prevents engine oil starvation.

BRIEF SUMMARY OF THE INVENTION

These and other needs and disadvantages may be overcome by the apparatus and methods disclosed herein. Additional improvements and advantages may be recognized by those of ordinary skill in the art upon study of the present disclosure.

In various aspects, a lubrication fluid reservoir apparatus for a vehicle engine is disclosed herein. The apparatus includes a sump plate adapted for attachment to the base of the vehicle engine, in various aspects. Tunnel ports are formed along the sump plate floor, in various aspects. A first tunnel port has a first opening at a first side of the sump plate and a second opening at a central area of the sump plate, in various aspects. A second tunnel port has a first opening at a second side of the sump plate and a second opening at the central area of the sump plate, in various aspects.

A valve body is mounted above the first tunnel port second opening and the second tunnel port second opening, wherein the valve body has a first chamber in fluid communication with the first tunnel port second opening, a second chamber in fluid communication with the second tunnel port second opening, a central chamber in fluid communication with the first and second chambers, and a top opening in communication with the central chamber for receiving a lubrication fluid take-up tube, in various aspects. The lubrication fluid take-up tube is adapted to withdraw lubrication fluid from the valve body central chamber through the valve body top opening for delivery to the engine for lubrication purposes, in various aspects.

A valve shaft is slidably mounted within the valve body, wherein the valve shaft has a first end extending out of a first side of the valve body and a second end extending out of a second side of the valve body, in various aspects. A first weighted roller is mounted to the valve shaft first end and a second weighted roller is mounted to the valve shaft second end, wherein the first and second weighted rollers are adapted to move the valve shaft within the valve body in response to G-force acting upon the first and second weighted rollers, in various aspects. At least one fin is attached to the valve shaft, external of the valve body, wherein the fin is adapted to move the valve shaft within the valve body in response to lubrication fluid pushing against the fin in response to G-force acting upon the lubrication fluid, in various aspects.

A first baffle is mounted between the first tunnel port first opening and the valve body, wherein the first baffle is adapted to maintain lubrication fluid at the first tunnel port first opening, in various aspects. A first deaerator hood is mounted to the first baffle and extends towards the sump plate first side, wherein the first deaerator hood is adapted to prevent agitation of lubrication fluid in the area between the first baffle and the sump plate first side, in various aspects. A second baffle is mounted between the second tunnel port first opening and the valve body, wherein the second baffle is adapted to maintain lubrication fluid at the second tunnel port first opening, in various aspects. A second deaerator hood is mounted to the second baffle and extends towards the sump plate second side, wherein the second deaerator hood is adapted to prevent agitation of lubrication fluid in the area between the second baffle and the sump plate second side, in various aspects.

The valve shaft is operable to slide between a first open position and a second open position, in various aspects. The first tunnel port first opening is in fluid communication with the central chamber through the first chamber when the valve shaft is in the first open position and the second tunnel port first opening is blocked from fluid communication with the central chamber through the second chamber when the valve shaft is in the first open position, in various aspects. The second tunnel port first opening is in fluid communication with the central chamber through the second chamber when the valve shaft is in the second open position and the first tunnel port first opening is blocked from fluid communication with the central chamber through the first chamber when the valve shaft is in the second open position, in various aspects.

The lubrication fluid reservoir apparatus is operable to maintain lubrication fluid, such as lubrication oil, adjacent the tunnel port first openings during high G-force turns of the vehicle. This ensures that lubrication fluid is always available to be drawn up by the lubrication fluid take-up tube via the valve body and thus prevents engine oil starvation. In addition, the baffles with attached deaerator hoods are operable to minimize agitation of the lubrication fluid in the sump plate to help prevent air from becoming entrapped within the lubrication fluid and being drawn up into the engine, thus optimizing engine performance.

This summary is presented to provide a basic understanding of some aspects of the apparatus and methods disclosed herein as a prelude to the detailed description that follows below. Accordingly, this summary is not intended to identify key elements of the apparatus and methods disclosed herein or to delineate the scope thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates by partially exploded top perspective view an exemplary lubrication fluid reservoir apparatus.

FIG. **2** illustrates by top perspective view a portion of the lubrication fluid reservoir apparatus shown in FIG. **1**.

FIG. **3** illustrates by partially exploded top perspective view a portion of the lubrication fluid reservoir apparatus shown in FIG. **1**.

FIG. **4** illustrates by bottom perspective view a portion of the lubrication fluid reservoir apparatus shown in FIG. **1**.

FIG. **5** illustrates by top plan view a portion of the lubrication fluid reservoir apparatus shown in FIG. **1**.

FIG. **6** illustrates by sectional view a portion of the lubrication fluid reservoir apparatus shown in FIG. **1**.

FIG. **7** illustrates by sectional view a portion of the lubrication fluid reservoir apparatus shown in FIG. **1**.

The Figures are exemplary only, and the exemplary implementations illustrated therein are selected to facilitate explanation. For example, the components of various apparatus illustrated in the Figures may be selected for explanatory purposes, and the components may be grouped in the Figures in various ways to facilitate description, so that the apparatus may include various other components or the components may be grouped in various other ways, in other implementations. The number, position, relationship and dimensions of the elements shown in the Figures to form the various implementations described herein are explained herein or are understandable to a person of ordinary skill in the art upon study of this disclosure. Where used in the various Figures, the same numerals designate the same or similar elements. Furthermore, when the terms "top," "bottom," "right," "left," "forward," "rear," "first," "second," "inside," "outside," and similar terms are used, the terms should be understood in reference to the orientation of the implementations shown in the Figures and are utilized to facilitate description thereof. Use herein of relative terms such as generally, about, approximately, essentially, may be indicative of engineering, manufacturing, computational, or scientific tolerances such as ±0.1%, ±1%, ±2.5%, ±5%, or other such tolerances, as would be recognized by those of ordinary skill in the art upon study of this disclosure.

DETAILED DESCRIPTION OF THE INVENTION

In various aspects, a lubrication fluid reservoir apparatus **10** for a vehicle engine is disclosed herein. The apparatus **10**, illustrated in FIGS. **1-7**, comprises a substantially rectangular sump plate **11** adapted for attachment to the base of the vehicle engine (not shown), the sump plate **11** having a front end **12** and an opposing rear end **13**, a first side **14** and an opposing second side **15**, a floor **16**, a perimeter wall **17**, and a central area **18**, the sump plate **11** adapted to store lubrication fluid (not shown). A drain hole **19** allows the lubrication fluid to be drained from the sump plate **11**.

A first tunnel port **20** is formed along the sump plate floor **16**, the first tunnel port **20** having a first opening **21** at the first side **14** of the sump plate **11** and a second opening **22** at the central area **18** of the sump plate **11**, wherein the first tunnel port first and second openings **21**, **22** are in fluid communication with each other through the first tunnel port **20**. A size exclusion screen **23** preferably covers the first tunnel port first opening **21** to prevent larger particulate matter from entering the first tunnel port **20**.

A second tunnel port **25** is formed along the sump plate floor **16**, the second tunnel port **25** having a first opening **26** at the second side **15** of the sump plate **11** and a second opening **27** at the central area **18** of the sump plate **11**, wherein the second tunnel port first and second openings **26**, **27** are in fluid communication with each other through the second tunnel port **25**. A size exclusion screen **28** preferably covers the second tunnel port first opening **26** to prevent larger particulate matter from entering the second tunnel port **25**.

A valve body **30** is mounted above the first tunnel port second opening **22** and the second tunnel port second opening **27**, the valve body **30** having a first chamber **31** in fluid communication with the first tunnel port second opening **22**, a second chamber **32** in fluid communication with the second tunnel port second opening **27**, and a central chamber **33** in fluid communication with the first and second chambers **31**, **32**, the valve body **30** having a top opening **34** in communication with the central chamber **33** for receiving a lubrication fluid take-up tube **38**. The lubrication fluid take-up tube **38** is adapted to withdraw lubrication fluid from the valve body central chamber **33** through the valve body top opening **34**. A valve shaft **40** is slidably mounted within the valve body **30**, the valve shaft **40** having a first end **41** extending out of a first side **35** of the valve body **30** and a second end **42** extending out of a second side **36** of the valve body **30**.

At least one first weighted roller **50** is mounted to the valve shaft first end **41** and at least one second weighted roller **51** is mounted to the valve shaft second end **42**, wherein the first and second weighted rollers **50**, **51** are adapted to move the valve shaft **40** within the valve body **30** in response to G-force acting upon the first and second weighted rollers **50**, **51**. A fin **55** is attached to the valve shaft **40** external of the valve body **34**, wherein the fin **55** is adapted to move the valve shaft **40** within the valve body **30** in response to lubrication fluid pushing against the fin **55**. The fin **55** may be attached to the valve shaft first end **41** or second end **42**. Additional fins may be attached to the valve shaft first and/or second end **41**, **42**.

A first baffle **60** is mounted between the first tunnel port first opening **21** and the valve body **30**, the first baffle **60** having at least one opening **61** covered by a one-way flap **62**, the first baffle **60** adapted to reduce agitation of lubrication fluid in the area between the first baffle **60** and the sump plate first side **14** and maintain lubrication fluid at the first tunnel port first opening **21**. A first deaerator hood **63** is mounted to the first baffle **60** and extends towards the sump plate first side **14**. The first deaerator hood **63** has a downwardly sloped upper surface **64** that provides an impact surface for lubrication fluid returning to the sump plate **11** from the vehicle engine. The returning lubrication fluid lands on the upper surface **64** and runs to the edges **64***a* of the upper surface **64** and into the sump plate first side **14**. This prevents the returning lubrication fluid from splashing into lubrication fluid in the sump plate **11** and introducing bubbles into the lubrication fluid. In addition, the first deaerator hood **63** is adapted to engage the upper surface of the lubrication fluid and thereby prevent the lubrication fluid from sloshing around or swirling within the sump plate first side **14** and thus preventing air from entering the first tunnel port first opening **21**.

A second baffle **65** is mounted between the second tunnel port first opening **26** and the valve body **30**, the second baffle **65** having at least one opening **66** covered by a one-way flap **67**, the second baffle **65** adapted to reduce agitation of lubrication fluid in the area between the second baffle **65** and the sump plate second side **15** and maintain lubrication fluid at the second tunnel port first opening **26**. A second deaerator hood **68** is mounted to the second baffle **65** and extends towards the sump plate second side **15**. The second deaerator hood **68** has a downwardly sloped upper surface **69** that provides an impact surface for lubrication fluid returning to the sump plate **11** from the vehicle engine. The returning

lubrication fluid lands on the upper surface **69** and runs to the edges **69***a* of the upper surface **69** and into the sump plate second side **15**. This prevents the returning lubrication fluid from splashing into lubrication fluid in the sump plate **11** and introducing bubbles into the lubrication fluid. In addition, the second deaerator hood **68** is adapted to engage the upper surface of the lubrication fluid and thereby prevent the lubrication fluid from sloshing around or swirling within the sump plate second side **15** and thus preventing air from entering the second tunnel port first opening **26**.

The valve shaft **40** is operable to slide between a first open position and a second open position. The first tunnel port first opening **21** is in fluid communication with the central chamber **33** through the first chamber **31** when the valve shaft **40** is in the first open position, shown in FIG. **7**, wherein the second tunnel port first opening **26** is blocked from fluid communication with the central chamber **33** through the second chamber **32** when the valve shaft **40** is in the first open position. The second tunnel port first opening **26** is in fluid communication with the central chamber **33** through the second chamber **32** when the valve shaft **40** is in the second open position, shown in FIG. **6**, wherein the first tunnel port first opening **21** is blocked from fluid communication with the central chamber **33** through the first chamber **31** when the valve shaft **40** is in the second open position.

The lubrication fluid reservoir apparatus **10** is operable to maintain lubrication fluid, such as lubrication oil, adjacent the tunnel port first openings **21**, **26** during high G-force turns of the vehicle. This ensures that lubrication fluid is always available to be drawn up by the lubrication fluid take-up tube **38** via the valve body **30** and thus prevents engine oil starvation. In addition, the baffles **60**, **65** with attached deaerator hoods **63**, **68** are operable to minimize agitation of the lubrication fluid in the sump plate **11** to help prevent air from becoming entrapped within the lubrication fluid and being drawn up into the engine, thus optimizing engine performance.

The foregoing discussion along with the Figures disclose and describe various exemplary implementations. These implementations are not meant to limit the scope of coverage, but, instead, to assist in understanding the context of the language used in this specification and in the claims. The Abstract is presented to meet requirements of 40 C.F.R. § 1.72(b) only. Accordingly, the Abstract is not intended to identify key elements of the apparatus and methods disclosed herein or to delineate the scope thereof. Upon study of this disclosure and the exemplary implementations herein, one of ordinary skill in the art may readily recognize that various changes, modifications and variations can be made thereto without departing from the spirit and scope of the inventions as described herein and as defined in the following claims.

The invention claimed is:

1. A lubrication fluid reservoir apparatus for a vehicle engine, comprising:

a. a substantially rectangular sump plate adapted for attachment to a base of the vehicle engine, the sump plate having a front end and an opposing rear end, a first side and an opposing second side, a floor, and a perimeter wall, the sump plate adapted to store lubrication fluid;

b. a first tunnel port formed along the sump plate floor, the first tunnel port having a first opening at the first side of the sump plate and a second opening at a central area of the sump plate, wherein the first tunnel port first and second openings are in fluid communication with each other through the first tunnel port;

c. a second tunnel port formed along the sump plate floor, the second tunnel port having a first opening at the second side of the sump plate and a second opening at the central area of the sump plate, wherein the second tunnel port first and second openings are in fluid communication with each other through the second tunnel port;

d. a valve body mounted above the first tunnel port second opening and the second tunnel port second opening, the valve body having a first chamber in fluid communication with the first tunnel port second opening, a second chamber in fluid communication with the second tunnel port second opening, a central chamber in fluid communication with the first and second chambers, and a top opening in communication with the central chamber for receiving a lubrication fluid take-up tube;

e. a valve shaft slidably mounted within the valve body, the valve shaft having a first end extending out of a first side of the valve body and a second end extending out of a second side of the valve body;

f. a first weighted roller mounted to the valve shaft first end and a second weighted roller mounted to the valve shaft second end, wherein the first and second weighted rollers are adapted to move the valve shaft within the valve body in response to G-force acting upon the first and second weighted rollers;

g. a fin attached to the valve shaft external of the valve body, wherein the fin is adapted to move the valve shaft within the valve body in response to lubrication fluid pushing against the fin in response to G-force acting upon the lubrication fluid;

h. a first baffle mounted between the first tunnel port first opening and the valve body, the first baffle having at least one opening covered by a one-way flap, the first baffle adapted to maintain lubrication fluid at the first tunnel port first opening;

i. a first deaerator hood mounted across a substantial portion of the first baffle and comprising a downwardly sloped upper surface extending towards the sump plate first side, the first deaerator hood adapted to prevent agitation of lubrication a fluid in area between the first baffle and the sump plate first side;

j. a second baffle mounted between the second tunnel port first opening and the valve body, the second baffle having at least one opening covered by a one-way flap, the second baffle adapted to maintain lubrication fluid at the second tunnel port first opening; and

k. a second deaerator hood mounted to the second baffle and extending towards the sump plate second side, the second deaerator hood adapted to prevent agitation of a lubrication fluid in area between the second baffle and the sump plate second side;

l. wherein the valve shaft is operable to slide between a first open position and a second open position, wherein the first tunnel port first opening is in fluid communication with the central chamber through the first chamber when the valve shaft is in the first open position, wherein the second tunnel port first opening is blocked from fluid communication with the central chamber through the second chamber when the valve shaft is in the first open position, wherein the second tunnel port first opening is in fluid communication with the central chamber through the second chamber when the valve shaft is in the second open position, wherein the first

tunnel port first opening is blocked from fluid communication with the central chamber through the first chamber when the valve shaft is in the second open position;

m. wherein the lubrication fluid take-up tube is adapted to withdraw lubrication fluid from the valve body central chamber through the valve body top opening.

2. A lubrication fluid reservoir apparatus for a vehicle engine, comprising:

a. a sump plate adapted for attachment to a base of the vehicle engine, the sump plate having a front end and an opposing rear end, a first side and an opposing second side, a floor, and a perimeter wall, the sump plate adapted to store lubrication fluid;

b. a first tunnel port formed along the sump plate floor, the first tunnel port having a first opening at the first side of the sump plate and a second opening at a central area of the sump plate, wherein the first tunnel port first and second openings are in fluid communication with each other through the first tunnel port;

c. a second tunnel port formed along the sump plate floor, the second tunnel port having a first opening at the second side of the sump plate and a second opening at the central area of the sump plate, wherein the second tunnel port first and second openings are in fluid communication with each other through the second tunnel port;

d. a valve body mounted above the first tunnel port second opening and the second tunnel port second opening, the valve body having a central chamber in fluid communication with the first tunnel port second opening and the second tunnel port second opening, the valve body having a top opening in communication with the central chamber for receiving a lubrication fluid take-up tube;

e. a valve shaft slidably mounted within the valve body, the valve shaft having a first end extending out of a first side of the valve body and a second end extending out of a second side of the valve body;

f. a fin attached to the valve shaft external of the valve body, wherein the fin is adapted to move the valve shaft within the valve body in response to lubrication fluid pushing against the fin in response to G-force acting upon the lubrication fluid;

g. a first baffle mounted between the first tunnel port first opening and the valve body, the first baffle having at least one opening covered by a one-way flap, the first baffle adapted to maintain lubrication fluid at the first tunnel port first opening;

h. a first deaerator hood mounted across a substantial portion of the first baffle and comprising a downwardly sloped upper surface extending towards the sump plate first side, the first deaerator hood adapted to prevent agitation of lubrication a fluid in area between the first baffle and the sump plate first side;

i. a second baffle mounted between the second tunnel port first opening and the valve body, the second baffle having at least one opening covered by a one-way flap, the second baffle adapted to maintain lubrication fluid at the second tunnel port first opening; and

j. a second deaerator hood mounted to the second baffle and extending towards the sump plate second side, the second deaerator hood adapted to prevent agitation of a lubrication fluid in area between the second baffle and the sump plate second side;

k. wherein the valve shaft is operable to slide between a first open position and a second open position, wherein the first tunnel port first opening is in fluid communication with the central chamber when the valve shaft is in the first open position, wherein the second tunnel port first opening is blocked from fluid communication with the central chamber when the valve shaft is in the first open position, wherein the second tunnel port first opening is in fluid communication with the central chamber when the valve shaft is in the second open position, wherein the first tunnel port first opening is blocked from fluid communication with the central chamber when the valve shaft is in the second open position;

l. wherein the lubrication fluid take-up tube is adapted to withdraw lubrication fluid from the valve body central chamber through the valve body top opening.

3. The apparatus according to claim **2**, further comprising a first weighted roller mounted to the valve shaft first end and a second weighted roller mounted to the valve shaft second end, wherein the first and second weighted rollers are adapted to move the valve shaft within the valve body in response to G-force acting upon the first and second weighted rollers.

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