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Oil drain plug system and method

Abstract

An oil drain plug assembly includes a threaded drive nut rotatable to open and close a valve assembly controlling the flow of oil from an oil reservoir, the valve assembly including a valve body with a threaded hollow valve rod extending therethrough, wherein the distal end of the valve assembly is in fluid communication with the oil reservoir, the threads of the hollow valve rod are positioned on the outer surface of the hollow valve rod away from its distal end, and the threaded drive nut is threaded onto the threads of the hollow valve rod.

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Background/Summary

FIELD OF THE DISCLOSURE

(1) The invention relates generally to a vehicle oil drain plug, and more particularly, to a drain plug including a threaded drive nut rotatable to open and close a fluid pathway through a threaded hollow valve rod.

BACKGROUND

(2) Vehicles, such as trucks, automobiles, ATVs, snow machines, lawnmowers, etc., typically include a store of oil for the lubrication of internal engine parts. It is necessary to periodically change the oil in such vehicles. Often, a simple threaded plug in the bottom of an oil pan is used. However, removal of the plug to drain the oil can be difficult and messy. Thus, there remains a need for an improved oil drain plug system and method.

SUMMARY

(3) The present disclosure provides in one specific embodiment an oil drain plug assembly including a threaded drive nut rotatable to open and close a valve assembly controlling the flow of oil from an oil reservoir. The valve assembly includes a valve body with a threaded hollow valve rod extending therethrough. The distal end of the valve assembly is in fluid communication with the oil reservoir. The threads of the hollow valve rod are positioned on the outer surface of the hollow valve rod away from its distal end. The threaded drive nut is threaded onto the threads of the hollow valve rod.

(4) The hollow valve rod includes an inner lumen extending along its length. The hollow valve rod is open at it proximal end and closed at its distal end. However, a plurality of holes through the wall of the hollow valve rod are disposed proximate the hallow valve rod's distal end.
(5) When the oil drain plug assembly is closed, the holes proximate the distal end of the hollow valve rod are fully disposed inside the distal end of the valve body, so that no oil from the oil reservoir may pass through the holes and into the inner lumen of the hollow valve rod.
(6) Opening the oil drain plug assembly is accomplished by rotating the threaded drive nut in a first direction, which causes the hollow valve rod to move distally to move the holes outside the valve body and into fluid communication with the oil reservoir.
(7) When the oil drain plug assembly is open, oil from the reservoir may flow through the holes and into the inner lumen of the hollow valve rod. From there, the oil may pass out of the proximal end of the hollow valve rod and thus drain the oil reservoir. In another embodiment, the proximal end of the threaded drive nut is threaded on its inner or outer surface to receive a plug or cap, respectively. In this other embodiment, draining the oil reservoir may be accomplished by removing the plug or cap and allowing the oil to flow from the inner lumen of the hollow valve rod through the threaded drive nut at its proximal end.
(8) Closing the oil drain plug assembly, then, can be achieved by rotating the drive nut in a second direction opposite the first direction, which causes the hollow valve rod to move proximately so that the holes move into the valve body. In an embodiment with a plug or cap, the plug or cap may be threaded into the proximal end of the threaded drive nut.
(9) Other benefits and advantages of the present disclosure will be appreciated from the following detailed description.

Description

DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is an exploded view of an exemplary oil drain plug assembly according to the description provided herein.
(2) FIG. **2** is a side view of an exemplary hollow valve rod as shown in FIG. **1**.
(3) FIG. **3**A is a cross-sectional view of an exemplary valve body as shown in FIG. **1**, including a push-lock assembly for removably mounting to an oil pan or other oil reservoir holding compartment.
(4) FIG. **3**B is a cross-sectional view of an exemplary valve body as shown in FIG. **1**, including a thread assembly for removably threadingly mounting to an oil pan or other oil reservoir holding compartment.
(5) FIG. **4** is a cross-sectional view of an exemplary threaded drive nut as shown in FIG. **1**.
(6) FIG. **5** is a perspective view of an exemplary plug as shown in FIG. **1**.
(7) FIG. **6** is a cross-sectional view of the exemplary oil drain plug assembly as shown in FIG. **1**.
DETAILED DESCRIPTION
(8) Embodiments of the invention and various alternatives are described. Those skilled in the art will recognize, given the teachings herein, that numerous alternatives and equivalents exist which do not depart from the invention. It is therefore intended that the invention not be limited by the description set forth herein or below.
(9) One or more specific embodiments of the system and method will be described below. These described embodiments are only exemplary of the present disclosure. Additionally, in an effort to provide a concise description of these exemplary embodiments, all features of an actual implementation may not be described in the specification. It should be appreciated that in the development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as

compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

(10) Further, for clarity and convenience only, and without limitation, the disclosure (including the drawings) sets forth exemplary representations of only certain aspects of events and/or circumstances related to this disclosure. Those skilled in the art will recognize, given the teachings herein, additional such aspects, events and/or circumstances related to this disclosure, e.g., additional elements of the devices described; events occurring related to draining oil; etc. Such aspects related to this disclosure do not depart from the invention, and it is therefore intended that the invention not be limited by the certain aspects set forth of the events and circumstances related to this disclosure.

(11) The present disclosure in one embodiment provides an oil drain plug assembly **10** including a threaded drive nut **15** rotatable to open and close a valve assembly controlling the flow of oil from an oil reservoir. The valve assembly includes a valve body **20** with a threaded hollow valve rod **25** extending therethrough. The distal end of the valve assembly is in fluid communication with the oil reservoir. The threads of the hollow valve rod **25** are positioned on the outer surface of the hollow valve rod **25** away from its distal end **30**. The threaded drive nut **15** is threaded onto the threads of the hollow valve rod **25**.

(12) The hollow valve rod **25** includes an inner lumen **35** extending along its length. The hollow valve rod **25** is open at its proximal end **40** and closed at its distal end **30**. However, a plurality of holes **45** through the wall of the hollow valve rod **25** are disposed proximate the distal end of the hollow valve rod **25**.

(13) When the oil drain plug assembly is closed, the holes **45** proximate the distal end **30** of the hollow valve rod **25** are fully disposed inside the distal end **50** of the valve body **20**, so that no oil from the oil reservoir may pass through the holes **45** and into the inner lumen **35** of the hollow valve rod **25**.

(14) Opening the oil drain plug assembly is accomplished by rotating the threaded drive nut **15** in a first direction, which causes the hollow valve rod **25** to move distally to move the holes **45** outside the valve body **20** and into fluid communication with the oil reservoir.

(15) When the oil drain plug assembly is open, oil from the reservoir may flow through the holes **45** and into the inner lumen **35** of the hollow valve rod **25**. From there, the oil may pass out of the proximal end **40** of the hollow valve rod **25** and thus drain the oil reservoir. In another embodiment, the proximal end **55** of the threaded drive nut **15** is threaded on its inner or outer surface to receive a plug **60** or cap, respectively. In this other embodiment, draining the oil reservoir may be accomplished by removing the plug **60** or cap.

(16) Closing the oil drain plug assembly, then, can be achieved by rotating the drive nut **15** in a second direction opposite the first direction, which causes the hollow valve rod **25** to move proximately so that the holes **45** move into the valve body **20**. In an embodiment with a plug **60** or cap, the plug **60** or cap may be threaded into or onto the proximal end **55** of the drive nut **15**.

(17) An o-ring **65** may be positioned between the plug **60** or cap and the drive nut **15** to prevent the unwanted escape of oil. A ring **70** may promote the mounting of the valve body **20** in the bottom of an oil pan or other similar location. The valve body **20** may be adapted with a push-locking arrangement that mates with the oil pan or other device for holding oil. See FIG. **3**A. Alternately, the valve body **20** may be threaded on its outside surface proximate distal end **50** for threaded engagement with the oil pan or other device for holding oil. See FIG. **3**B. An o-ring **75** may be disposed between the valve body **20** and the oil pan or other device for holding oil.

(18) An o-ring **80** may be disposed between the inner wall of the valve body **20** and the outer wall of hollow valve rod **25** to prevent the unwanted escape of oil. Similarly, an o-ring **85** may be positioned at the distal end **30** of hollow valve rod **25**, to form a seal between the distal end **50** of

valve body **20** and the distal end **30** of hollow valve rod **25**. Finally, a magnet **90** may be positioned at the distal end **30** of hollow valve rod **25** to attract and hold any metal pieces present in the oil reservoir.

(19) It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art having the benefit of this disclosure, without departing from the invention. Accordingly, the invention is intended to embrace all such alternatives, modifications, and variances.

(20) Certain exemplary embodiments of the disclosure may be described. Of course, the embodiments may be modified in form and content, and are not exhaustive, i.e., additional aspects of the disclosure, as well as additional embodiments, will be understood and may be set forth in view of the description herein. Further, while the invention may be susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the invention.

Claims

1. An oil drain plug assembly including: a valve body including a valve body proximal end, a valve body distal end, and a valve body lumen extending therethrough between the valve body proximal end and the valve body distal end; a drive nut disposed within the valve body proximal end, the drive nut including a drive nut lumen extending the length of the drive nut from a drive nut proximal end to a drive nut distal end, a wall of the drive nut lumen proximate the drive nut distal end including threads; a threaded valve rod including valve rod threads along the length of the threaded valve rod, the valve rod threads on an outer surface of the threaded valve rod and spaced from a threaded valve rod distal end and spaced from a threaded valve rod proximal end; wherein the threaded valve rod includes an threaded valve rod inner lumen extending between the threaded valve rod proximal end to the threaded valve rod distal end; wherein the threaded valve rod inner lumen is open at the threaded valve rod proximal end and is closed at the threaded valve rod distal end; and wherein at least one hole extends from the outer surface of the threaded valve rod to the threaded valve rod lumen proximate the threaded valve rod distal end; wherein the threaded valve rod extends through the valve body lumen; wherein the drive nut distal end is threadingly engaged with the valve rod threads; wherein rotation of the drive nut in a first direction causes the threaded valve rod to move distally within the valve body; wherein rotation of the drive nut in a second direction opposite the first direction causes the threaded valve rod to move proximally within the valve body; and wherein a continuous fluid lumen extends from the at least one hole through the threaded valve rod inner lumen and through at least a portion of the drive nut lumen.

2. The oil drain plug assembly of claim 1, wherein rotation of the drive nut in the second direction causes the at least one hole to move fully inside the valve body lumen to prevent fluid from passing through the at least one hole.

3. The oil drain plug assembly of claim 2, wherein rotation of the drive nut in the first direction causes the at least one hole to move fully outside the valve body lumen to permit fluid to pass through the at least one hole.