A valve stem oil seal and lubricator for an internal combustion engine intake or exhaust valve comprising a capillary member surrounding and slidably engaging the valve stem. The capillary member is enclosed and retained by a seal or scraper member positioned over and about the valve guide boss. The seal member has an orifice which strips oil from the reciprocating valve stem and directs it toward the periphery of the seal member. Limited portions of the capillary member are exposed to this oil flow and carry a regulated portion of the oil back to the valve stem for its lubrication.

8 Claims, 3 Drawing Figures
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VALVE STEM OIL SEAL AND LUBRICATOR

BACKGROUND AND SUMMARY OF THE INVENTION

Lubrication is generally provided to the valves of a typical internal combustion engine by means of a spray within the valve cover or by means of gravity flow from the corresponding rocker arm. Oil applied to and adjacent the free end of the valve stem flows along the stem toward the valve head. Passage of oil from the free end of the valve stem toward the valve head is permitted by the required tolerance between the valve stem and the valve guide bore and is essential to reduce friction between the valve stem and the valve guide bore. Excessive oil flow along the valve stem through the valve guide bore enters the combustion chamber, is burned and causes poor oil economy and increased exhaust emissions. Too little oil between the valve stem and the guide bore may cause valve sticking, burning or excessive wear resulting in reduced engine service.

This invention provides a combustion oil seal and lubricator which strips and directs the oil flowing along the valve stem and redirects a portion of that oil back to the valve stem in a controlled and regulated flow. This invention also provides an oil seal and lubricator assembly having a simple two-element construction which is reliable in operation, economical to produce and easy to install or to replace. Furthermore, this invention provides a combination oil seal and lubricator which may be adapted to a typical present day internal combustion engine without the necessity of modification to the structure of the engine.

An oil seal and lubricator assembly constructed in accordance with this invention comprises a capillary member surrounding and slidably engaging the valve stem. The capillary member is enclosed and retained by a scraper member positioned over and about the valve guide boss. The scraper or seal member has an orifice formed therein which strips oil from the reciprocating valve stem and directs it toward the periphery of the seal member. Limited portions of the capillary member are exposed to the oil flow and carry a regulated portion of the oil back to the valve stem for its controlled lubrication.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a transverse cross sectional view of a portion of an internal combustion engine constructed in accordance with this invention.

FIG. 2 is an enlarged cross sectional view of a portion of FIG. 1 showing the oil seal and lubricator assembly 47 and adjacent parts.

FIG. 3 is a cross sectional view taken along line 3—3 of FIG. 2.

DETAILED DESCRIPTION

A portion 11 of a V-type internal combustion engine is shown in FIG. 1 of the drawings. An engine block 13 having a cylinder 15 formed therein slidably receives a piston 17. A cylinder head 19 is attached to the engine block and includes a valve guide portion 21 having a bore 23 which reciprocably receives intake valve 25. A spring retainer 27 is attached to the free end of the valve stem 29 and confines a compression spring 31 between it and portion 33 of the cylinder head 19 surrounding the valve guide boss 35.

Rotation of cam shaft 37 provides a reciprocating motion to tappet 39. Rocker arm 41 secured to the cylinder head 19 is interconnected by push rod 43 with the tappet 39. Movement of the tappet imparts a pivotal movement to the rocker arm which, in turn, opens and closes the valve 25.

An intake manifold 45 provides an interconnecting passage 46 from a carburetor (not shown) to the intake passage 48 of the cylinder head.

The oil seal and lubricator assembly 47 consists of two parts. The first part is the oil seal or scraper 49 which is generally cup-shaped and fits over and about the valve guide boss 35. An orifice 51 formed in the base 53 of the seal member slidingly and sealingly engages the valve stem 29. The inner surfaces of the generally cylindrical wall portion 55 of the scraper member frictionally engage the generally cylindrical outer wall of the boss 35 to retain the assembly 47 in position. Fitted into an annular recess 57 formed within the seal member is capillary member 59, the second part of the assembly 47. The capillary member is generally circular and includes an orifice 61 through which the valve stem 29 extends. It may be seen from FIG. 2 of the drawings that the capillary member is sandwiched between the base 53 of the seal member and the end portion 63 of the valve guide boss 35. A plurality of circumferentially disposed openings 65 are formed in the scraper member at the circular juncture of the base 53 and the cylindrical wall portion 55. These openings are radially spaced from the orifice 51 and expose limited portions of the outer circumference of the capillary member.

FIG. 1 of the drawings shows the seal and lubricator assembly 47 used with an intake valve. It is equally suitable for use with the exhaust valve (not shown) of an engine. It may also be noted that the retention of the scraper or seal member 49 about the valve boss 35 may be strengthened by well-known retention means such as an annular bead and groove combination formed in mating cylindrical surfaces of the scraper or seal member and the valve boss.

Oil traveling from the free end of the valve stem 29 toward the seal and lubricator assembly 47 is stripped by the leading edge of the orifice 51. Oil is thus directed away from the valve stem along the base of the seal member toward the openings 65. Some of the oil entering the openings is absorbed by the exposed portions of the capillary member 59 and is drawn radially inwardly through the capillary member and applied in a limited and regulated manner to the valve stem 29. The remainder of the oil not absorbed by the capillary member passes down the outer wall 55 of the seal assembly and enters another portion of the engine lubricating system. A quantity of oil delivered to the valve stem by the capillary member may be varied by several means, e.g., varying the number or the size of the openings in the seal assembly or, further, by varying the thickness or the absorbency or capillarity of the member 59.

The scraper or seal member 49 is constructed of a suitable seal material such as a synthetic rubber or nylon. The capillary member may be fabricated from many materials having suitable capillary properties, such as felt or sintered metal.

If the material chosen for the capillary member 59 is significantly compressible, the movement of the valve stem will impart a corresponding movement to the base
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53 of the scraper member and set up a pumping action as the capillary member is alternately compressed and released. Consequently, it can be seen that a significantly compressible capillary material would provide an increased oil flow to the valve stem as compared to a less compressible or incompressible capillary member. Modifications and alterations will occur to those skilled in the art which are included within the following claims.

I claim:

1. A valve stem seal and lubricator for an internal combustion engine having a valve stem axially reciprocable relative to a valve guide, said seal and lubricator comprising
   a capillary member positioned about the valve stem and having an orifice slidably engaging the valve stem,
   a seal member positioned about the valve stem and enclosing said capillary member, said seal member having an orifice slidingly and sealingly engageable with the valve stem, said seal member including means engaging the valve guide for retention of said seal member to the valve guide, said capillary member interposing portions of said seal member and valve guide adjacent the valve stem, at least one opening formed in said seal member spaced from the valve stem exposing a portion of said capillary member.

2. A valve stem seal and lubricator for an internal combustion engine having a valve stem axially reciprocable relative to a valve guide, said seal and lubricator comprising
   a seal member being generally cup-shaped and positioned over and about the valve guide, said seal member having an orifice slidingly and sealingly engaging the valve stem and having an axially extending portion engaging the valve guide, a capillary member having an orifice slidingly engaging the valve stem and an outer periphery spaced from said just mentioned orifice, said capillary member being positioned between portions of said seal member and the valve guide, passage means formed within said seal member being radially spaced from said valve and exposing at least one segment of the outer periphery of said capillary member.

3. A valve stem seal and lubricator according to claim 2,
   said seal member having a generally cylindrical wall portion and a base portion extending radially inwardly from one end of said wall portion, a radially inwardly opening annular groove formed in said seal member at the junction of said cylindrical wall portion and said base portion, said passage means opening into said groove, said capillary member being received in said groove.

4. A valve stem seal and lubricator according to claim 2,
   said passage means comprising a plurality of openings exposing a plurality of segments of the outer peripheral of said capillary member.

5. A valve stem seal and lubricator according to claim 2,
   said capillary material comprising an incompressible material such as sintered metal.

6. A valve stem seal and lubricator according to claim 2,
   said capillary material comprising a compressible material.

7. A valve stem seal and lubricator according to claim 3,
   said passage means comprising a plurality of openings exposing a plurality of segments of the outer periphery of said capillary member.

8. A valve stem seal and lubricator for an internal combustion engine having a valve stem axially reciprocable relative to a valve guide, said seal and lubricator comprising a seal member being generally cup-shaped and positioned over and about the valve guide, said seal member having an orifice slidingly and sealingly engaging the valve stem to strip oil therefrom and to direct it away from the valve stem, said seal member including means engaging the valve guide for retention of said scraper member over and about the valve guide, a capillary member interposing portions of said seal member and the valve guide and having an orifice slidingly engaging the valve stem, at least one opening formed in said seal member radially spaced from the valve stem exposing a limited portion of said capillary member to the oil flow stripped from the valve stem.

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