

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO VALVES IN SUPERCHARGED INTERNAL COMBUSTION ENGINES

(71) We, ETAT FRANCAIS represented by le Délégué Ministériel pour l'Armement of 4, avenue de la Porte d'Issy, 75996-Paris, (France), do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to supercharged internal combustion engines comprising at least one valve (intake valve, exhaust valve, scavenging valve or the like) having a valve stem slidably mounted in a valve guide and projecting out of the valve guide into a casing which, in use of the engine, contains oil for lubricating the valve stem and valve actuating means (rocker, cam, or the like) located in the casing.

The valve actuating means are lubricated by oil splash and the sliding of the valve stem in the valve guide draws oil by a pumping effect from the interior of the casing into the clearance between the valve stem and the valve guide, thereby ensuring lubrication between the valve stem and the valve guide.

However, when the engine is supercharged with a high supercharging pressure (which is at present the object sought in supercharged Diesel engines), there exists in the manifold (intake manifold or exhaust manifold) with which the valves are associated a pressure greater than atmospheric pressure. On the other hand, in the casing protecting the valve actuating means, there exists a pressure equal to atmospheric pressure or in the neighbourhood of atmospheric pressure.

As a result of the pressure differential between the manifold and the interior of the casing, oil is forced back from the clearance between the valve stem and the valve guide towards the casing, causing rapid binding and deterioration of the valve stem and of the valve guide.

In order to counter this problem, the

present invention provides a supercharged internal combustion engine, for example a supercharged Diesel engine, comprising at least one valve having a valve stem slidably mounted in a valve guide and projecting out of the valve guide into a casing which, in use of the engine, contains oil for lubricating the valve stem and valve actuating means located in the casing, in which engine an annular cavity is formed in the valve guide in permanent communication with the interior of the valve guide in the vicinity of the end of the valve guide closest to a head of the valve, the said cavity being in permanent communication with a pressure equal or close to atmospheric pressure via a first passage and with an oil supply passage.

In order that the invention may be readily understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a diagrammatic cross-section showing a valve of one embodiment of an engine constructed in accordance with the invention; and

Figure 2 is a partial diagrammatic section illustrating a modification of the embodiment of Figure 1.

In Figure 1, there is shown an exhaust valve 1 of a supercharged Diesel internal combustion engine, the supercharging means of such an engine being constructed in a quite conventional manner, and for this reason not being shown.

The valve 1 is mounted in the cylinder head 2 of the engine and it comprises a valve stem 3 sliding in a valve guide 4 constituted by a sleeve driven into a bore 5 formed in the cylinder head 2.

The upper end of the valve stem 3 cooperates with actuating means, such as a rocker 6 and a spring 7, which are protected by a casing 8 and lubricated by oil splash due to a device not shown but which for example can be constituted by a

series of aspirating orifices arranged in a cam shaft actuating the rocker 6.

The sliding of the valve stem 3 in the valve guide 4 draws oil from the interior of the casing 8 by a pumping effect, which ensures the lubrication between the valve stem 3 and the valve guide 4; to facilitate this pumping effect, the end of the valve guide 4 which opens into the casing 8 has a chamfer 9 on its edge which surrounds the valve stem 3.

In the inner surface of the valve guide 4 (against which the valve stem 3 slides) there is provided at least one cavity 10 in permanent communication with atmospheric pressure (or with a pressure in the neighbourhood of atmospheric pressure). It is advantageous for this cavity 10 to be placed in communication with the inside of the casing 8, in which substantially atmospheric pressure exists.

The cavity 10 is situated in the neighbourhood of the end of the valve guide 4 which opens into the exhaust passage 11 with which the valve 1 is associated, the distance separating the cavity 10 from the said end of the valve guide 4 being approximately equal to the diameter of the valve stem 3.

The cavity 10 is placed in permanent communication with the inside of the casing 8 by at least one axial passage 12 (groove or flat) formed on the outer surface of the valve guide 4.

Such an axial passage 12 can hence be easily machined on the outer surface of the valve guide 4 before it is driven into the bore 5 of the cylinder head 2.

As regards the cavity 10, it can be constituted, as shown in Figure 1, by an annular groove 13 communicating with the axial passage 12 through a channel 14.

An oil supply passage (not shown) opens into the cavity 10.

Figure 2, in which the same reference numerals denote the same members as in Figure 1, illustrates a modification of the Figure 1 embodiment according to which the cavity 10 is constituted by several radial channels 15a, 15b, 15c, 15d, 15e etc. distributed regularly and ending at an annular groove 16 formed on the outside of the valve guide 4 (before it is driven into the bore 5 of the cylinder head 2), and in which the axial passage 12 ends.

WHAT WE CLAIM IS:—

1. A supercharged internal combustion engine, for example a supercharged Diesel engine, comprising at least one valve

having a valve stem slidably mounted in a valve guide and projecting out of the valve guide into a casing which, in use of the engine, contains oil for lubricating the valve stem and valve actuating means located in the casing, in which engine an annular cavity is formed in the valve guide in permanent communication with the interior of the valve guide in the vicinity of the end of the valve guide closest to a head of the valve, the said cavity being in permanent communication with a pressure equal or close to atmospheric pressure via a first passage and with an oil supply passage.

2. An engine according to Claim 1, wherein the first passage comprises an axial groove machined on the outside of the valve guide.

3. An engine according to Claim 1, wherein the first passage comprises a flat machined on the outside of the valve guide.

4. An engine according to any preceding claim, wherein the first passage places the cavity in communication with the inside of the casing.

5. An engine according to any preceding claim, wherein the cavity is situated at a distance approximately equal to the diameter of the valve stem from the end of the valve guide which is closest to the valve head.

6. An engine according to any preceding claim, wherein the cavity comprises an annular groove formed on the inside of the valve guide and communicating with the first passage through a channel.

7. An engine according to any one of claims 1 to 5, wherein the cavity comprises several radial channels distributed regularly and connecting the interior of the valve guide with an annular groove formed on the outside of the valve guide and in communication with the first passage.

8. A supercharged Diesel engine substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawing.

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series of aspirating orifices arranged in a cam shaft actuating the rocker 6.

The sliding of the valve stem 3 in the valve guide 4 draws oil from the interior of the casing 8 by a pumping effect, which ensures the lubrication between the valve stem 3 and the valve guide 4; to facilitate this pumping effect, the end of the valve guide 4 which opens into the casing 8 has a chamfer 9 on its edge which surrounds the valve stem 3.

In the inner surface of the valve guide 4 (against which the valve stem 3 slides) there is provided at least one cavity 10 in permanent communication with atmospheric pressure (or with a pressure in the neighbourhood of atmospheric pressure). It is advantageous for this cavity 10 to be placed in communication with the inside of the casing 8, in which substantially atmospheric pressure exists.

The cavity 10 is situated in the neighbourhood of the end of the valve guide 4 which opens into the exhaust passage 11 with which the valve 1 is associated, the distance separating the cavity 10 from the said end of the valve guide 4 being approximately equal to the diameter of the valve stem 3.

The cavity 10 is placed in permanent communication with the inside of the casing 8 by at least one axial passage 12 (groove or flat) formed on the outer surface of the valve guide 4.

Such an axial passage 12 can hence be easily machined on the outer surface of the valve guide 4 before it is driven into the bore 5 of the cylinder head 2.

As regards the cavity 10, it can be constituted, as shown in Figure 1, by an annular groove 13 communicating with the axial passage 12 through a channel 14.

An oil supply passage (not shown) opens into the cavity 10.

Figure 2, in which the same reference numerals denote the same members as in Figure 1, illustrates a modification of the Figure 1 embodiment according to which the cavity 10 is constituted by several radial channels 15a, 15b, 15c, 15d, 15e etc. distributed regularly and ending at an annular groove 16 formed on the outside of the valve guide 4 (before it is driven into the bore 5 of the cylinder head 2), and in which the axial passage 12 ends.

WHAT WE CLAIM IS:—

1. A supercharged internal combustion engine, for example a supercharged Diesel engine, comprising at least one valve

having a valve stem slidably mounted in a valve guide and projecting out of the valve guide into a casing which, in use of the engine, contains oil for lubricating the valve stem and valve actuating means located in the casing, in which engine an annular cavity is formed in the valve guide in permanent communication with the interior of the valve guide in the vicinity of the end of the valve guide closest to a head of the valve, the said cavity being in permanent communication with a pressure equal or close to atmospheric pressure via a first passage and with an oil supply passage.

2. An engine according to Claim 1, wherein the first passage comprises an axial groove machined on the outside of the valve guide.

3. An engine according to Claim 1, wherein the first passage comprises a flat machined on the outside of the valve guide.

4. An engine according to any preceding claim, wherein the first passage places the cavity in communication with the inside of the casing.

5. An engine according to any preceding claim, wherein the cavity is situated at a distance approximately equal to the diameter of the valve stem from the end of the valve guide which is closest to the valve head.

6. An engine according to any preceding claim, wherein the cavity comprises an annular groove formed on the inside of the valve guide and communicating with the first passage through a channel.

7. An engine according to any one of claims 1 to 5, wherein the cavity comprises several radial channels distributed regularly and connecting the interior of the valve guide with an annular groove formed on the outside of the valve guide and in communication with the first passage.

8. A supercharged Diesel engine substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawing.

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