(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 317 086 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
04.05.2011 Bulletin 2011/18

(21) Application number: **08809512.0**

(22) Date of filing: **28.08.2008**

(51) Int Cl.:
F01L 1/24 *(2006.01)*

(86) International application number:
PCT/JP2008/065437

(87) International publication number:
WO 2010/023748 (04.03.2010 Gazette 2010/09)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

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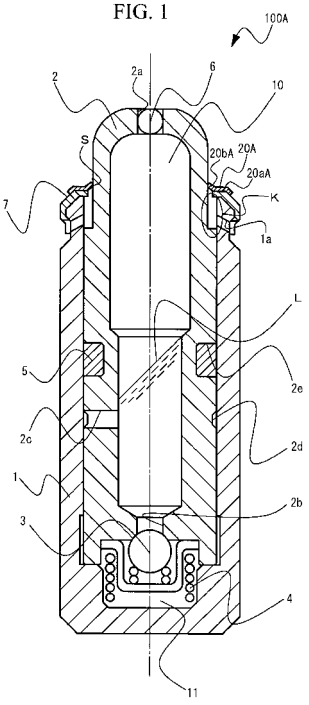
(54) HERMETICALLY SEALED RUSH ADJUSTER

(57) A lash adjuster 100A includes a plunger 2, a body 1 in which the plunger 2 is inserted in a fitting manner, a first sealing member 5 provided between the plunger 2 and the body 1, and a second sealing member 20A that slidably seals a portion of the plunger 2 exposed out of the body 1, and that is arranged in a manner covering a clearance K provided between an open end portion of the body 1 and the plunger 2 in a state of being directly or indirectly fixed in close contact to the body 1, and a portion of the body 1 located on the side nearer to the open end portion thereof than the first sealing member 5 is provided with a communication hole 1a that communicates an inner wall surface of the body 1 with an outer wall surface thereof.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a sealed-type lash adjuster, and particularly to a sealed-type lash adjuster equipped with sealing means between a plunger and a body.

BACKGROUND ART

[0002] Conventionally, there has been practically used a lash adjuster that automatically adjusts a valve clearance provided between an intake or exhaust valve and a cylinder head of an internal combustion engine to substantially zero. With such a sealed-type lash adjuster, in the aspect of function, knocking noise generated by interference between the intake or exhaust valve and the cylinder head is eliminated by means of this lash adjuster. Moreover, in the aspect of maintenance, it becomes unnecessary to perform operation for periodically checking and adjusting the valve clearance. The lash adjuster includes, for example, an external oil feed type lash adjuster that utilizes engine oil. In the case of this external oil feed type lash adjuster, if a filled quantity of the engine oil is inappropriate or if degraded oil continues to be used, a risk that air or foreign substance is mixed into the oil increases. Therefore, as a result of these factors, the function of the lash adjuster can be impaired. That is, in the external oil feed type lash adjuster, the function of the lash adjuster depends on whether the engine oil is well maintained or not. On the other hand, the lash adjuster includes a sealed-type lash adjuster in which a liquid such as oil is hermetically enclosed. With such a sealed-type lash adjuster as just described, the above-described factors impairing the function thereof can be eliminated.

[0003] With regard to the sealed-type lash adjuster, a sealed-type lash adjuster such as shown below has been proposed, for example, in Patent Document 1. The sealed-type lash adjuster proposed by Patent Document 1 is equipped with an oil seal having two lips in an X-letter shaped cross section (hereinafter simply called X-seal) between a body and a plunger. This X-seal can seal two liquids on both sides of the seal at the same time. Consequently, this sealed-type lash adjuster has a structure to simultaneously prevent outflow of the oil sealed by the X-seal to the outside and intrusion of the engine oil from the outside.

[Patent Document 1]

[0004] Japanese Examined Patent Publication No. JP-B-62-029605

DISCLOSURE OF THE INVENTION

[Problem to be Solved by the Invention]

[0005] Now, in order to prevent the engine oil from being mixed into the oil sealed by the X-seal described above, it is necessary to prevent mixture of the two liquids (engine oil and sealed oil). Moreover, for this purpose, it is necessary to make the X-seal also function as a seal for reciprocating motion. On the other hand, a seal for reciprocating motion generally requires a lubricant film on the sliding surface to reduce abrasion, and as a function, prevents external leakage by taking back the oil film pushed out during a push stage to the inside during a pull stage. However, there is a conflict in making the X-seal described above function as a seal for reciprocating motion.

[0006] Here, the operating stroke of the plunger required for a lash adjuster is normally in the approximate range of 2 to 2.5 mm. In addition, the plunger rests at the bottom of the body while the engine is stopped. Therefore, after the engine is cracked up from this state, if the plunger is most extended during the stage in which a cam is on the base circle, the sliding width (stroke) between the plunger and the body can exceed the approximate range of 2 to 2.5 mm. In this regard, the X-seal is normally going to maintain the sealing function thereof by deforming without sliding relative to the body when the plunger makes the reciprocating motion. However, for example, during the engine start-up operation described above, the plunger can slide relative to the body by rapidly extending up. Consequently, in such a situation as this, it is necessary to make the X-seal function as a seal for reciprocating motion to prevent mixture of the two liquids due to movement of the oil film.

[0007] On the other hand, the mixture of the two liquids due to movement of the oil film essentially occurs when the stroke of the plunger exceeds the width along which the X-seal contacts the sliding surface of the body. Therefore, in order to prevent the mixture of the two liquids, it is required to provide an X-seal of a size consistent with the stroke of the plunger. On the other hand, it is preferable to have a sealed-type lash adjuster that is as compact as possible from viewpoints such as providing a large degree of freedom of design of the internal combustion engine. However, when the stroke of the plunger described above is taken into account, it is considered to be inevitable that the sealed-type lash adjuster becomes larger in size with the X-seal that can prevent the mixture of the two liquids. Also, by contrast, it is considered to be difficult to prevent the mixture of the two liquids with an X-seal that can be applied without causing an increase in size. That is, there is a conflict in making the X-seal function as a seal for reciprocating motion. Then, for the reason described above, it has been found difficult to simultaneously prevent not only outflow of the sealed oil to the outside, but also intrusion of the engine oil from the outside with one piece of sealing means provided

between the body and the plunger.

[0008] Therefore, in view of the problem described above, it is an object of the present invention to provide a sealed-type lash adjuster that is capable of preventing or suppressing a liquid from intruding from the outside and also the liquid that has intruded from the outside from being mixed into a liquid sealed inside.

[Means for Solving the Problem]

[0009] The present invention for solving the problem described above is a sealed-type lash adjuster being characterized in that the adjuster includes a plunger, a body in which the plunger is inserted in a fitting manner, a first sealing means provided between the plunger and the body, and a second sealing means that slidably seals a portion of the plunger exposed out of the body, and that is arranged in a manner covering a clearance provided between an open end portion of the body and the plunger in a state of being directly or indirectly fixed in close contact to the body, and also being characterized in that a portion of the body located on the side nearer to the open end portion thereof than the first sealing means is provided with a communication hole that communicates an inner wall surface of the body with an outer wall surface thereof.

[0010] Here, the second sealing means has a structure to prevent or suppress intrusion of a liquid from the outside. According to the present invention that provides the second sealing means as described above, sealing can be more reliably achieved because a functional part for preventing outflow of a sealed liquid and a functional part for preventing intrusion of a liquid from the outside are separately provided. Therefore, according to the present invention, it is possible to prevent or suppress a liquid from intruding from the outside and being mixed into a liquid sealed inside. In addition, according to the present invention, it is possible to effectively prevent or suppress not only the intrusion of the liquid from the outside, but also intrusion of fine chips and so forth by arranging the second sealing means so as to cover the clearance described above.

[0011] Moreover, when a force is applied by a cam through a rocker arm to the sealed-type lash adjuster, a force having a component in the lateral direction (direction perpendicular to the sliding direction of the plunger) can act to produce lateral motion (sway) of the plunger. In this regard, according to the present invention, the lateral motion can also be suppressed by the second sealing means. Therefore, according to the present invention, it is possible not only to prevent or suppress the intrusion of the liquid and chips from the outside, but also to suppress abrasion of a sliding portion between the plunger and the body. Moreover, at the same time, it can be noted that the effect of suppressing the lateral motion is also high because the second sealing means is arranged in a position distant from a bottom of the sealed-type lash adjuster.

[0012] As a sealed-type lash adjuster, a predefined effect can be achieved as described above by providing the second sealing means shown in the present invention. In this regard, according to the present invention in which the communication hole is provided in addition to the second sealing means, even if a liquid has intruded from the outside into the clearance, the liquid that has intruded can be drained through the communication hole. Therefore, according to the present invention, it is possible to more appropriately prevent or suppress the liquid that has intruded from being mixed into the liquid sealed inside. Also, according to the present invention, as a result of application of the second sealing means described above, it is also possible to reduce an increase in internal pressure of the clearance by using the communication hole.

[0013] In addition, it is preferable that the present invention has a structure in which the communication hole is inclined upward from the outer wall surface of the body toward the inner wall surface thereof in a state in which a central axis line of the body is parallel to the vertical line with the open end portion of the body pointed upward.

[0014] Moreover, the present invention may have a structure in which the communication hole is inclined upward from the outer wall surface of the body toward the inner wall surface thereof in an in-use state. Also, in the case of draining the liquid that has intruded from the outside, it is more preferable that the communication hole is inclined as in the present invention. According to the present invention, a risk that a fluid reversely intrudes through the communication hole into the clearance can also be appropriately reduced. Note that the expression "in an in-use state" refers specifically to "in a state in which an internal combustion engine assembled with the sealed-type lash adjuster is operated."

[0015] Furthermore, the present invention may have a structure that further includes, in the communication hole, one-way flow allowing means that prevents flow of the fluid from the outer wall surface of the body toward the inner wall surface thereof. According to the present invention, it can be completely prevented that the fluid intrudes from the outside through the communication hole.

[Effect of the Invention]

[0016] The present invention can provide a sealed-type lash adjuster that is capable of preventing or suppressing a liquid from intruding from the outside and also the liquid that has intruded from the outside from being mixed into a liquid sealed inside.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a diagram schematically showing a structure of a lash adjuster 100A.

FIG. 2 is a diagram partially showing an enlarged

view of the structure of the lash adjuster 100A shown in FIG. 1, with a second sealing member 20A and a communication hole 1a as essential parts.

FIG. 3 is a diagram schematically showing, in a cross section, the state of a cap retainer 7 before being assembled to which the second sealing member 20A is bonded through vulcanization.

FIGs. 4A and 4B show diagrams partially schematically illustrating the lash adjuster 100A, with relief portions J and the communication holes 1a as essential parts, and more specifically, FIG. 4A partially shows the lash adjuster 100A in a cross section, with the relief portions J and the communication holes 1a as essential parts, and FIG. 4B partially shows an external view of the lash adjuster 100A, with the relief portions J and the communication holes 1a as essential parts.

FIGs. 5A through 5C show diagrams schematically illustrating, in a cross section A-A shown in FIG. 4A, examples of shapes of a body 1 in which a plurality of the communication holes 1a are provided, and more specifically, FIGS. 5A, 5B, and 5C show examples in the case that three, four, and six, respectively, of the communication holes 1a are provided.

FIGs. 6A and 6B show diagrams schematically illustrating an in-use state of the lash adjuster 100A, and more specifically, FIG. 6A shows the lash adjuster 100A together with an essential part of an internal combustion engine 50, and FIG. 6B partially shows, in a cross section, an enlarged view of the lash adjuster 100A in the in-use state, with the communication hole 1a as an essential part.

FIG. 7 is a diagram schematically showing a part of a structure of a lash adjuster 100B, with a second sealing member 20B as an essential part.

FIG. 8 is a diagram schematically showing a part of a structure of a lash adjuster 100C, with the communication hole 1a as an essential part.

FIG. 9 is a diagram schematically showing a part of a structure of a lash adjuster 100D, with the communication hole 1a as an essential part.

BEST MODES FOR CARRYING OUT THE INVENTION

[0018] Best modes for carrying out the present invention will be described below in detail in conjunction with the drawings.

[First Embodiment]

[0019] FIG. 1 is a diagram schematically showing a structure of a sealed-type lash adjuster (hereinafter also called simply a lash adjuster) 100A according to the present embodiment. As a basic structure, the lash adjuster 100A is structured to include a body 1, a plunger 2, a check valve 3, a plunger spring 4, a first sealing member (first sealing means) 5, a ball plug 6, and a cap retainer 7.

[0020] The body 1 is a member having a cylindrical shape with a bottom, and the plunger 2 is slidably inserted in the cylinder in the direction parallel to a central axis line thereof. This cap retainer 7 for restricting protrusion of the plunger 2 is arranged at an end portion of the body 1. The cap retainer 7 is structured to function as a retainer for the plunger 2 but not to function to seal a liquid that is going to intrude from the outside. The plunger 2 is a circular column-shaped member, inside which is provided with a reservoir chamber 10. Note that the reservoir chamber 10 may be provided in an appropriate shape. A filling hole 2a for filling oil (liquid) is provided on the end side of the plunger 2. In addition, the ball plug 6 for sealing the filled oil and gas is pressed into this filling hole 2a. A specified quantity of oil is filled, and the remaining space of the reservoir chamber 10 is taken up by gas (for example, air obtained from manufacturing atmosphere). Silicone oil, for example, can be applied as a sealed oil.

[0021] A communication hole 2b communicating with a high-pressure chamber 11 is provided at the rear end portion of the plunger 2. In addition, the check valve 3 is arranged at this communication hole 2b. The high-pressure chamber 11 is provided on the rear end side of the plunger 2, and the plunger spring 4 is arranged in this high-pressure chamber 11. The check valve 3 opens to allow only the movement of the oil from the reservoir chamber 10 to the high-pressure chamber 11 when the plunger spring 4 urges the plunger 2 so as to protrude toward the front end side, and shuts off the movement reverse thereto.

[0022] In addition, in the plunger 2, a recycling hole 2c communicating from a sliding surface to the reservoir chamber 10 is provided so that an open portion on the side of the reservoir chamber 10 is always located on the side nearer to the high-pressure chamber 11 than an oil surface L of the oil, in the in-use state. Note that the oil surface L is shown in a state inclined by a mounting angle θ in FIG. 1 because the lash adjuster 100A according to the present embodiment is assembled to the internal combustion engine 50 in a state inclined by the mounting angle θ relative to the vertical direction (refer to FIG. 6A). This mounting angle θ is an angle formed by the central axis line of the lash adjuster 100A and the vertical line on the plane including these two lines. Moreover, in the present embodiment, the state in which the lash adjuster 100A has been assembled at an inclination of the mounting angle θ as described above corresponds to the in-use state.

[0023] The recycling hole 2c is provided toward the central axis line in a manner orthogonal to the central axis line. On the sliding surface of the plunger 2, a groove portion 2d is provided around a full circumference at the same height (in the same position in the sliding direction) as that of the recycling hole 2c. In addition, on the sliding surface of the plunger 2, a groove portion 2e is provided around a full circumference on the side nearer to the front end in the sliding direction than the groove portion 2d. A

first sealing member 5 for preventing external oil leakage is arranged in this groove portion 2e. This first sealing member 5 seals a small clearance between the body 1 and the plunger 2 on the side nearer to the front end than the recycling hole 2c. An X-seal, for example, can be applied as the first sealing member 5. However, not limited to this application, any appropriate sealing means such as other parts for sealing purposes may be applied.

[0024] With the structure described above as a basic structure of the lash adjuster 100A, the lash adjuster 100A also has a second sealing member 20A in the present embodiment. This second sealing member 20A has a structure to prevent or suppress intrusion of engine oil (liquid) from the outside. More specifically, the second sealing member 20A is provided so as to be capable of preventing or suppressing the engine oil from intruding into a clearance K that is provided between an open end portion of the body 1 and the plunger 2. The second sealing member 20A is formed and arranged so as to slidably seal a portion of the plunger 2 exposed out of the body 1 (more specifically, a portion exposed out of the body 1, or further exposed out of the cap retainer 7 in the state in which the plunger 2 is most depressed, which is hereinafter simply called an exposed portion) and to cover the clearance K.

[0025] The second sealing member 20A is provided with a one-end portion 20aA and an other-end portion 20bA, specifically as sealing parts having a function to prevent or suppress the intrusion of the engine oil from the outside. In the present embodiment, rubber is applied as a material of the second sealing member 20A. However, not limited to this application, any appropriate material may be applied to the second sealing member 20A. More specifically, in the present embodiment, the second sealing member 20A is formed and arranged as described below. Note that, as a reference, FIG. 2 partially shows an enlarged view of the structure of the lash adjuster 100A shown in FIG. 1, with the second sealing member 20A and a communication hole 1a to be described later as essential parts.

[0026] The second sealing member 20A is formed in a ring shape, and bonded through vulcanization to the upper surface of the cap retainer 7 around the full circumference thereof. In the present embodiment, this bonded portion through vulcanization corresponds to the one-end portion 20aA. Therefore, by assembling the cap retainer 7 to the body 1, the second sealing member 20A is indirectly fixed in close contact to the body 1 through the cap retainer 7. Consequently, the one-end portion 20aA functions as a sealing part to prevent the intrusion of the engine oil. Note that, as a reference, FIG. 3 schematically shows, in a cross section, the state of the cap retainer 7 before being assembled to which the second sealing member 20A is bonded through vulcanization.

[0027] On the other hand, the second sealing member 20A is formed in a lip shape at the other-end portion 20bA located on the inner circumferential side. The other-end portion 20bA further provides an insert hole S for passing the exposed portion of the plunger 2 through itself. Therefore, by assembling the cap retainer 7 to the body 1 after fitting this insert hole S to the exposed portion of the plunger 2, the other-end portion 20bA closely contacts the exposed portion. Consequently, the other-end portion 20bA functions as a sealing part to prevent the intrusion of the engine oil, thereby slidably sealing the exposed portion. Accordingly, as a result of the above, the one-end portion 20aA and the other-end portion 20bA of the second sealing member 20A can prevent or suppress the engine oil from being mixed from the outside into the oil sealed inside.

[0028] In addition, by assembling the cap retainer 7 to the body 1, the second sealing member 20A is arranged so as to cover the clearance K at the same time. Therefore, it is also possible to effectively prevent or suppress intrusion of fine chips and so forth. Moreover, because lateral motion of the plunger 2 can be suppressed by the second sealing member 20A, it is also possible to suppress abrasion of the sliding portion between the plunger 2 and the body 1. Furthermore, by providing the second sealing member 20A, it becomes also possible to simplify the structure of the first sealing member 5. Specifically, it is also possible to apply, for example, a seal with a single lip instead of the X-seal, as the first sealing member 5.

[0029] Note that, although it is understood that the second sealing means is achieved by the second sealing member 20A in the present embodiment, it can also be understood that the second sealing means is achieved by the cap retainer 7 serving as means for preventing the plunger from coming off and the second sealing member 20A. That is, the second sealing means may be composed of a plurality of components as just described. In this case, the second sealing means results to be directly fixed in close contact to the body 1. In addition, a one-end portion provided by the second sealing means may be directly or indirectly fixed in close contact to the body 1 in an appropriate manner such as by swaging, by welding, or by tightening of rubber itself, and an other-end portion provided by the second sealing means may be formed not only into a lip shape but also into any other appropriate shape, as far as the exposed portion can be slidably sealed.

[0030] As described above, the lash adjuster 100A provided with the second sealing member 20A can prevent or suppress the engine oil from intruding from the outside and being mixed into the oil sealed inside. In addition to this, the lash adjuster 100A is further provided with the communication hole 1a for draining the engine oil that has intruded into the clearance K to the outside. Therefore, this communication hole 1a will next be described in detail.

[0031] The communication hole 1a has not only a function to drain the engine oil that has intruded into the clearance K to the outside, but also a function to suppress an increase in internal pressure of the clearance K closed by the second sealing member 20A. Specifically, the

communication hole 1a is provided in a portion of the body 1 located on the side nearer to the open end portion than the first sealing member 5 (more specifically, a portion providing the clearance K), in a manner communicating an inner wall surface of the body 1 with an outer wall surface thereof. In addition, the communication hole 1a is achieved as a small hole of a circular opening. However, not limited to this shape, any appropriate shape such as a slit can be applied to the communication hole 1a. Moreover, the cap retainer 7 is provided with a relief portion J of a notch shape for avoiding the communication hole 1a from being clogged, as shown in FIG. 4. Note that the relief portion J may be formed into any appropriate shape.

[0032] Here, the lash adjuster 100A rotates around the central axis thereof in the state of having been assembled to the internal combustion engine 50 (more specifically, a cylinder head 30), that is, in the in-use state. In addition, the lash adjuster 100A is assembled to the cylinder head 30 at an inclination of the mounting angle θ relative to the vertical line. In this regard, when the conditions just described are taken into account in order to appropriately drain the engine oil through the communication hole 1a, it is preferable to always have the communication hole 1a located at the lower side than the central axis line of the body 1 in the in-use state. For this purpose, in the present embodiment, the body 1 is provided with four of the communication holes 1a, as shown in FIG. 5B. However, not limited to this example, any appropriate number of the communication holes 1a may be provided, and it is also preferable to provide, for example, three as shown in FIG. 5A, or six as shown in FIG. 5C, of the communication holes 1a. As a result, it is possible to appropriately drain the engine oil that has intruded into the clearance K through the communication hole 1a even if the lush adjuster 100A rotates in the in-use state.

[0033] In addition, the communication hole 1a is inclined upward from the outer wall surface of the body 1 toward the inner wall surface thereof in a state in which the central axis line of the body 1 is parallel to the vertical line with the open end portion of the body 1 pointed upward. Specifically, as shown in FIG. 6A, the communication hole 1a is provided so that the central axis line of the communication hole 1a is inclined by an inclination angle α relative to a plane orthogonal to the central axis line of the body 1 on a plane that includes the central axis line of the communication hole 1a and that is parallel to the central axis line of the body 1. Consequently, the engine oil that has intruded into the clearance K results to be easily drained through the communication hole 1a.

[0034] Moreover, in the present embodiment, this inclination angle α is set so as to be larger than the mounting angle θ, as shown in FIG. 6B. As a result, also in the in-use state, it is possible not only to appropriately drain the engine oil that has intruded into the clearance K through the communication hole 1a, but also to reduce a risk that the engine oil reversely intrudes through the communication hole 1a into the clearance K. Therefore, it is possible to appropriately prevent or suppress the engine oil from being mixed into the oil sealed inside.

[0035] Note that, even in a lash adjuster that is not provided with the second sealing member 20A or in a lash adjuster that is provided with other second sealing means instead of the second sealing member 20A, it is similarly possible to prevent or suppress the engine oil that has intruded into the clearance K from being mixed into the oil sealed inside by providing the communication hole 1a. As described above, the lash adjuster 100A can prevent or suppress the engine oil from intruding from the outside and also the engine oil that has intruded from the outside from being mixed into the oil sealed inside.

[Second Embodiment]

[0036] FIG. 7 is a diagram schematically showing a part of a structure of a lash adjuster 100B according to the present embodiment, with a second sealing member 20B as an essential part. The lash adjuster 100B is the same as the lash adjuster 100A except that the former is provided with the second sealing member 20B instead of the cap retainer 7 and the second sealing member 20A. This second sealing member 20B is made of rubber, and functions not only as sealing means but also as means for preventing the plunger from coming off. Note that the material of the second sealing member 20B is not limited to rubber, but any appropriate material such as other elastic material may be applied. The second sealing member 20B slidably seals the exposed portion of the plunger 2 with an other-end portion 20bB that is formed into a lip shape. In addition, the second sealing member 20B is arranged so as to cover the clearance K in the state in which a one-end portion 20aB is directly fixed in close contact to the body 1 by tightening of the rubber itself.

[0037] Similarly to the first embodiment, it is also possible to prevent or suppress the engine oil from intruding from the outside and being mixed into the oil sealed inside by achieving the second sealing means by the second sealing member 20B as described above. In this manner, the lash adjuster 100B can prevent or suppress the engine oil from intruding from the outside and also the engine oil that has intruded from the outside from being mixed into the oil sealed inside.

[Third Embodiment]

[0038] FIG. 8 is a diagram schematically showing a part of a structure of a lash adjuster 100C according to the present embodiment, with the communication hole 1a as an essential part. The lash adjuster 100C is the same as the lash adjuster 100B except that the communication hole 1a is provided in a manner further shown below. Note that it is also possible to provide the communication hole 1a of the lash adjuster 100A in a manner further shown below. In the present embodiment, the communication hole 1a is provided so that a lowest point

P of the communication hole 1a is located, further in the in-use state, higher than an open end position F of a mounting hole 30a provided in the cylinder head 30 in a direction Y in which the central axis line of the body 1 extends. Note that this mounting hole 30a may not be necessarily provided in the cylinder head 30, but may be provided in other part in order to mount the lash adjuster 100C.

[0039] Hereby, it is possible not only to further appropriately drain the engine oil that has intruded into the clearance K in the in-use state through the communication hole 1a, but also to further appropriately reduce the risk that the engine oil intrudes through the communication hole 1a into the clearance K. Therefore, it is possible to further appropriately prevent or suppress the engine oil from being mixed into the oil sealed inside. In this manner, the lash adjuster 100C can prevent or suppress the engine oil from intruding from the outside and also the engine oil that has intruded from the outside from being mixed into the oil sealed inside.

[Fourth Embodiment]

[0040] FIG. 9 is a diagram schematically showing a part of a structure of a lash adjuster 100D according to the present embodiment, with the communication hole 1a as an essential part. The lash adjuster 100D is the same as the lash adjuster 100A according to the first embodiment except that the communication hole 1a is further provided with a check valve (one-way flow allowing means) 25 that prevents flow of the engine oil from the outer wall surface of the body 1 toward the inner wall surface thereof. With the lash adjuster 100D provided with the check valve 25 such as described above, it can be completely prevented that the engine oil intrudes through the communication hole 1a into the clearance K in the in-use state. In this manner, the lash adjuster 100D can prevent or suppress the engine oil from intruding from the outside and also the engine oil that has intruded from the outside from being mixed into the oil sealed inside.

[0041] The embodiments described above are examples of preferred embodiments according to the present invention. However, the invention is not limited to these embodiments, but various modifications can be made within the scope that does not depart from the gist of the present invention.

Claims

1. A sealed-type lash adjuster being **characterized by** comprising:

a plunger;
a body in which the plunger is inserted in a fitting manner;
a first sealing means provided between the plunger and the body; and
a second sealing means that slidably seals a portion of the plunger exposed out of the body, and that is arranged in a manner covering a clearance provided between an open end portion of the body and the plunger in a state of being directly or indirectly fixed in close contact to the body, wherein
a portion of the body located on the side nearer to the open end portion thereof than the first sealing means is provided with a communication hole that communicates an inner wall surface of the body with an outer wall surface thereof.

2. The sealed-type lash adjuster according to claim 1, **characterized in that** the communication hole is inclined upward from the outer wall surface of the body toward the inner wall surface thereof in a state in which a central axis line of the body is parallel to the vertical line with the open end portion of the body pointed upward.

3. The sealed-type lash adjuster according to claim 2, further **characterized in that** the communication hole is inclined upward from the outer wall surface of the body toward the inner wall surface thereof in an in-use state.

4. The sealed-type lash adjuster according to any one of claims 1 to 3, **characterized in that** the adjuster further comprises, in the communication hole, one-way flow allowing means that prevents flow of a fluid from the outer wall surface of the body toward the inner wall surface thereof.

FIG. 1

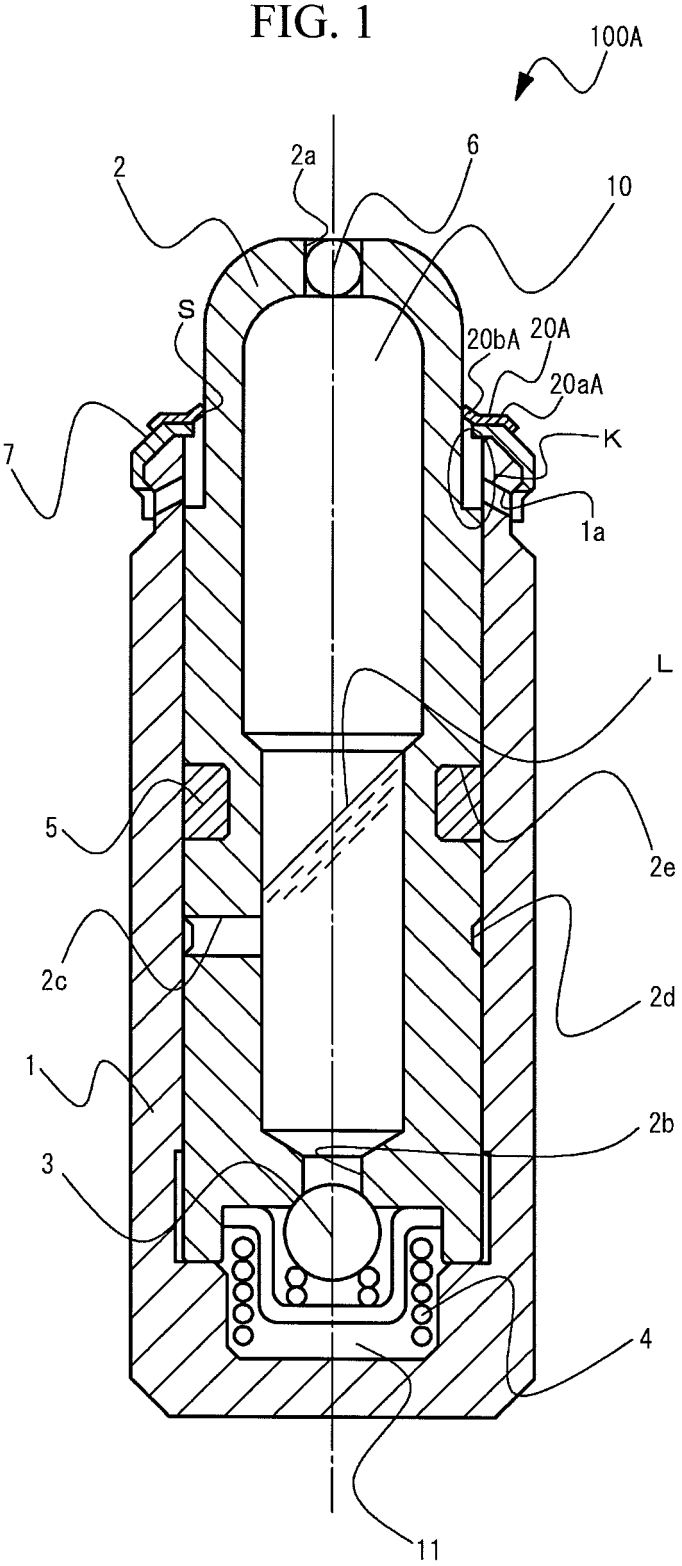


FIG. 2

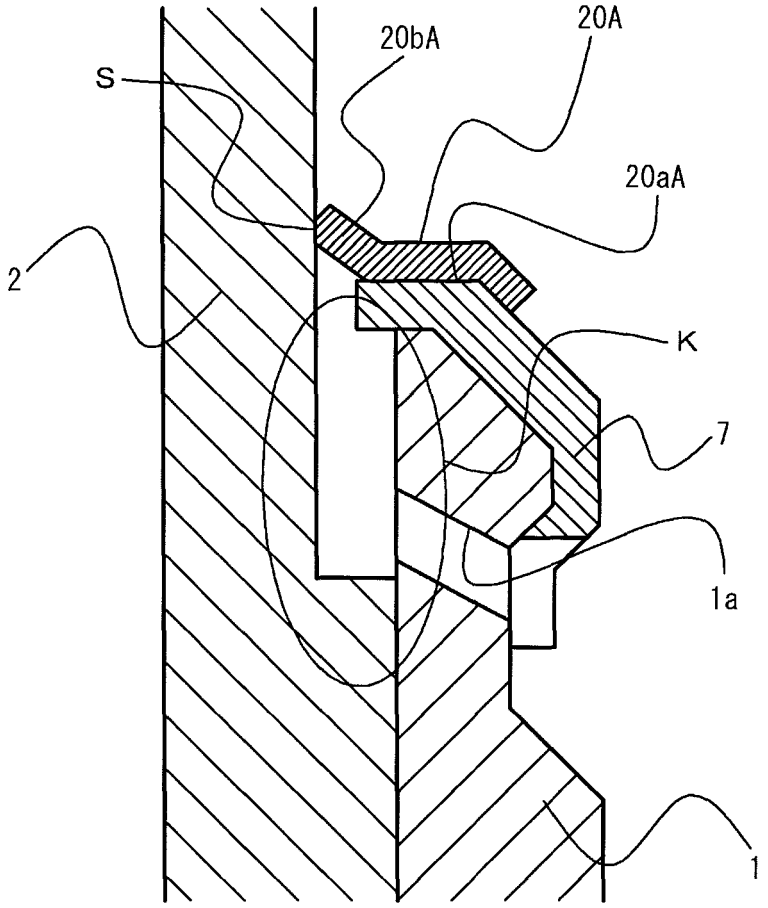


FIG. 3

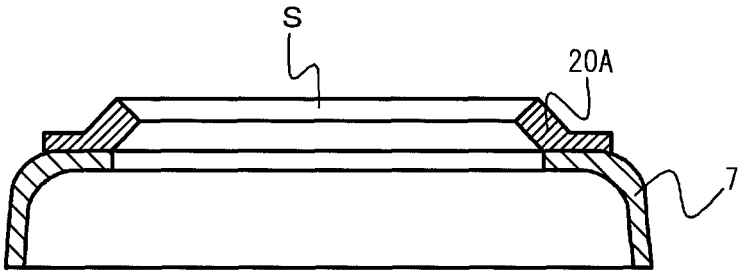


FIG. 4A

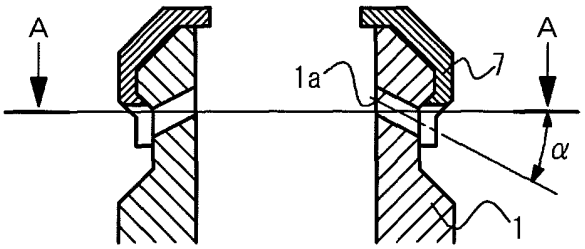


FIG. 4B

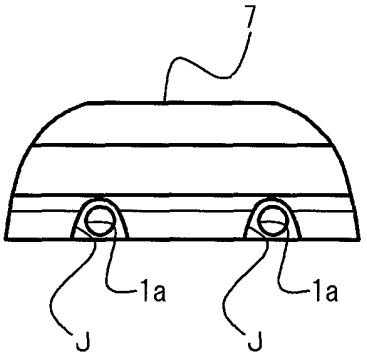


FIG. 5A

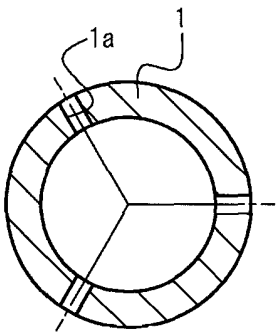


FIG. 5B

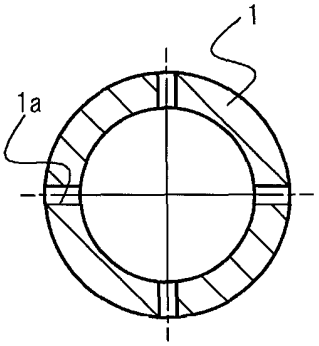


FIG. 5C

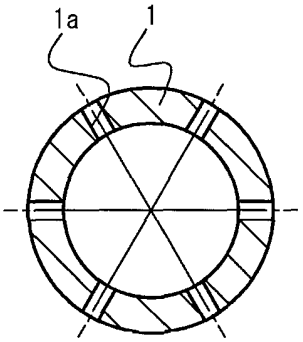


FIG. 6A

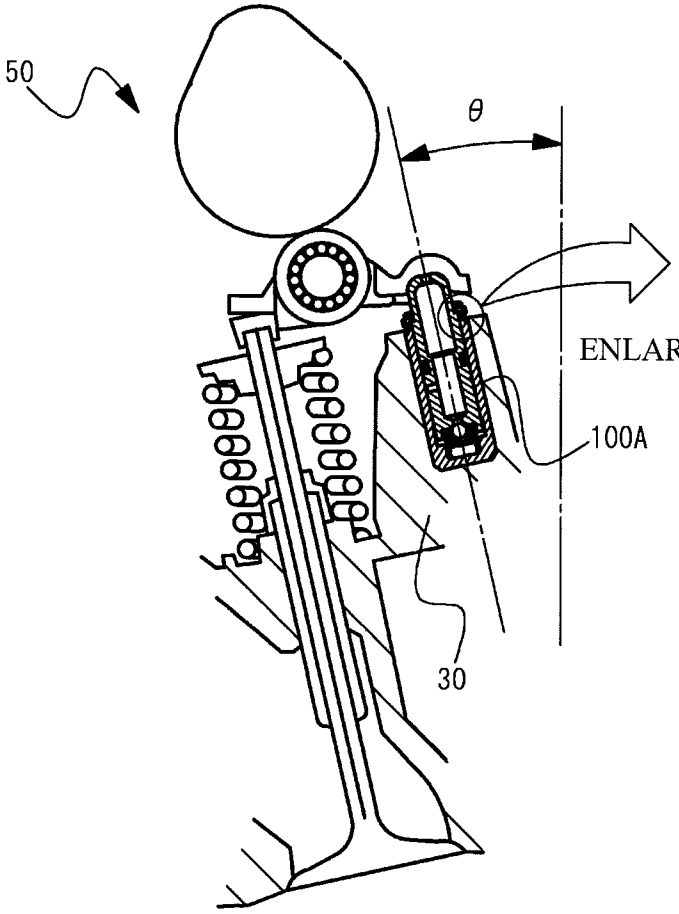


FIG. 6B

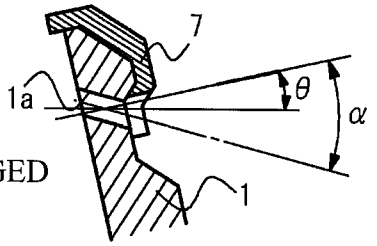


FIG. 7

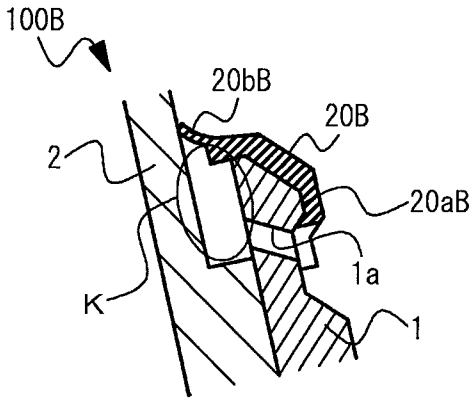


FIG. 8

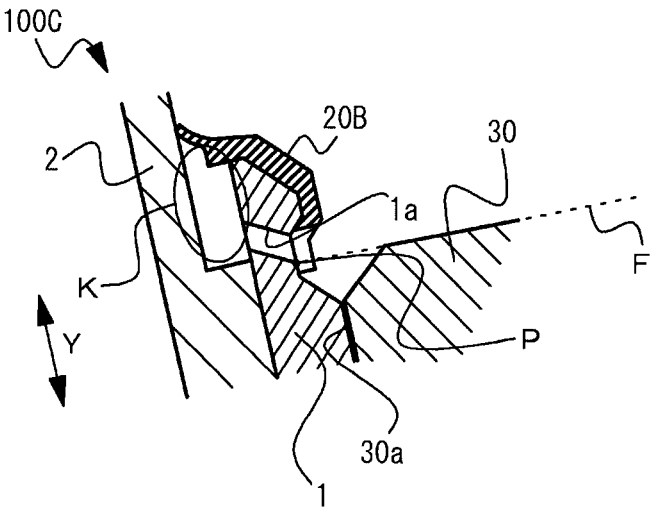
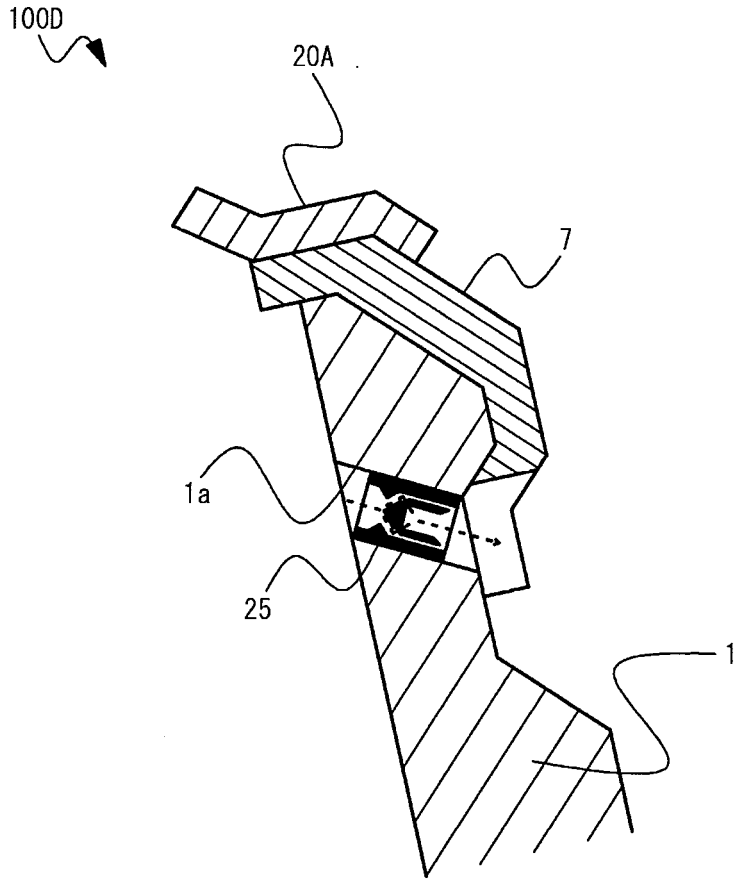


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/065437

A. CLASSIFICATION OF SUBJECT MATTER
F01L1/24(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F01L1/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 62-29605 B2 (Aisin Seiki Co., Ltd.), 26 June, 1987 (26.06.87), Full text; all drawings & US 004402285 A	1-4
A	JP 2002-285807 A (NTN Corp.), 03 October, 2002 (03.10.02), Full text; all drawings (Family: none)	1-4

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 November, 2008 (07.11.08)	18 November, 2008 (18.11.08)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/065437

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 25909/1988(Laid-open No. 131805/1989) (NSK Ltd.), 07 September, 1989 (07.09.89), Full text; all drawings (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 62029605 B **[0004]**