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

(11) **EP 1 891 304 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
04.08.2010 Bulletin 2010/31

(21) Application number: **06747849.5**

(22) Date of filing: **02.06.2006**

(51) Int Cl.:
F01L 1/18 *(2006.01)* ***F01L 1/26*** *(2006.01)*

(86) International application number:
PCT/SE2006/000655

(87) International publication number:
WO 2006/132580 (14.12.2006 Gazette 2006/50)

(54) **APPARATUS FOR TRANSFERRING A MOVEMENT FROM A ROCKER ARM TO A VALVE IN A COMBUSTION ENGINE AND A COMBUSTION ENGINE COMPRISING SUCH AN APPARATUS**

VORRICHTUNG ZUR ÜBERTRAGUNG EINER BEWEGUNG VON EINER SCHWINGE AUF EIN VENTIL IN EINEM VERBRENNUNGSMOTOR UND SOLCH EINE VORRICHTUNG UMFASSENDER VERBRENNUNGSMOTOR

DISPOSITIF DESTINE AU TRANSFERT D'UN MOUVEMENT ENTRE UN BRAS OSCILLANT ET UNE VALVE DANS UN MOTEUR A COMBUSTION ET MOTEUR A COMBUSTION COMPRENANT CE DISPOSITIF

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(30) Priority: **07.06.2005 SE 0501297**

(43) Date of publication of application:
27.02.2008 Bulletin 2008/09

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Description

FIELD OF THE INVENTION AND STATE OF THE ART

[0001] The present invention relates to a device according to the preamble of claim 1 for transfer of control motion from a rocker arm to a combustion engine valve arrangement controlled by the rocker arm. The invention also relates to a combustion engine comprising such a device.

[0002] A conventional combustion engine of piston type, a so-called piston engine, is provided with one or more cylinders. In each cylinder a piston is adapted to moving to and fro under the action of the pressure which occurs upon ignition of a fuel-air mixture introduced into the cylinder. In a piston engine of four-stroke type, each cylinder is provided with at least one inlet valve via which the fuel-air mixture is drawn into the cylinder, and at least one exhaust valve via which combustion gases are removed from the cylinder. The inlet valve and exhaust valve are each spring-loaded to a closed position and are each movable from closed to open position by the action of a control cam on a rotating camshaft. The control cam is normally adapted to acting upon the valve via a so-called rocker arm which may itself be connected to the valve via a motion transfer device comprising a so-called ball pin and a so-called elephant foot. In such cases the ball pin is fastened to one end of the rocker arm and is accommodated pivotably in a cup-shaped portion of the elephant foot, thereby constituting a ball joint. The elephant foot has a bottom surface via which the elephant foot abuts slidably against a support surface of a valve stem or valve yoke. A rocker arm provided with a motion transfer device of this type is referred to in, for example, US 2002/0139337 A1. Via the ball pin and the elephant foot, a pivoting motion of the rocker arm is converted to a linear motion of the valve stem/valve yoke. During the mutual movements between the rocker arm and the valve stem/valve yoke, the bottom surface of the elephant foot will slide a short distance to and fro on said support surface. To reduce the wear due to these sliding movements between the bottom surface of the elephant foot and said support surface, it is advantageous to introduce lubricating oil between the bottom surface of the elephant foot and the support surface. This may be effected, for example, via lubricant ducts extending through the ball pin and the elephant foot, as described in, for example, US 6 273 042 B1 and US 6 470 843 B2.

OBJECT OF THE INVENTION

[0003] The object of the present invention is to provide a device for transfer of control motion from a rocker arm to a combustion engine valve arrangement controlled by the rocker arm, which device has good lubrication characteristics.

SUMMARY OF THE INVENTION

[0004] According to the present invention, said object is achieved by means of a device exhibiting the features indicated in claim 1.

[0005] The device according to the invention comprises a first motion transfer means intended to be fastened to a rocker arm, and a second motion transfer means which in conjunction with the motion transfer means constitutes a ball joint and which has a bottom surface via which the second motion transfer means is intended to abut slidably against a support surface of a valve arrangement. The first motion transfer means may for example take the form of a ball pin and the second motion transfer means the form of an elephant foot. Said first and second motion transfer means have mutual contact surfaces so designed that the motion transfer means are in contact with one another, thereby delineating, via an annular contact line between said contact surfaces, a space between the first motion transfer means and the second motion transfer means, the second motion transfer means being provided with a lubricant duct which has an inlet aperture facing towards said space and an outlet aperture facing towards said bottom surface. According to the invention, the second motion transfer means is provided with one or more depressions which are set in said bottom surface and are connected to the outlet aperture of the lubricant duct, whereby said one or more depressions have a combined area in the propagation plane of the bottom surface which is larger than the area of the circle formed by the annular contact line which delineates the space between the first motion transfer means and the second motion transfer means.

[0006] The depression or depressions in the bottom surface is/are designed to receive lubricant from the lubricant duct which extends through the second motion transfer means. The lubricant pressure in the space between the motion transfer means acts against surfaces of the motion transfer means and thereby gives rise to hydraulic pressure forces which endeavour to push the motion transfer means apart from one another. These pressure forces will thus endeavour to push the second motion transfer means towards the support surface of the valve arrangement even when the rocker arm is relieved of load and moves away from the support surface, thereby counteracting the outflow of lubricant from the lubricant duct of the second motion transfer means and hence counteracting the effective lubrication of the slide surfaces between the second motion transfer means and the support surface. Providing the bottom surface of the second motion transfer means with one or more depressions which are set in the bottom surface and are connected to the lubricant duct's outlet aperture results in a hydraulic pressure force which endeavours to push the second motion transfer means away from the support surface in a direction perpendicular to the propagation plane of the support surface. The fact that the combined area of this depression or these depressions in the prop-

agation plane of the bottom surface is larger than the area of the circle formed by the annular contact line which delineates the space between the motion transfer means results in the last-mentioned pressure force being greater than the pressure force exerted in the opposite direction by the lubricant pressure in the space between the motion transfer means, thereby enabling the second motion transfer means to rise from the support surface and allow an effective outflow of lubricant between the bottom surface of the second motion transfer means and the support surface when the rocker arm is relieved of load. The solution according to the invention thus provides a simple way of ensuring effective lubrication of the slide surfaces between the second motion transfer means and the valve arrangement.

[0007] Preferred embodiments of the device according to the invention are indicated by the dependent claims and the description set out below.

[0008] The invention also relates to a combustion engine comprising a device according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The invention is described below in more detail on the basis of examples of embodiments with reference to the attached drawings, in which:

- Fig. 1 depicts a schematic longitudinal section through a device according to a first embodiment of the invention, with parts connected thereto of a combustion engine depicted in partly cutaway sideview,
- Fig. 2 depicts the device according to Fig. 1 on a larger scale,
- Fig. 3 depicts a schematic partly cutaway side view of the device according to Fig. 1,
- Fig. 4 depicts a schematic partly cutaway side view of part of the device according to a second embodiment of the invention,
- Fig. 5 depicts a schematic partly cutaway side view of part of the device according to a third embodiment of the invention,
- Fig. 6 depicts a schematic plan view of the bottom surface of the device according to Fig. 5 as viewed in the direction of the arrow VI in Fig. 5, and
- Fig. 7 depicts a schematic plan view of the bottom surface of the device according to Figs. 1-3 as viewed in the direction of the arrow VII in Fig. 2.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0010] Fig. 1 illustrates schematically a valve arrangement 1 forming part of a combustion engine, and engine parts which are connected to, and intended to control, this valve arrangement. In the example illustrated, the valve arrangement comprises two valve means 2a, 2b which are connected by their respective valve stems 3a, 3b to a common valve yoke 4. The valve means 2a, 2b take the form of conventional inlet valves or exhaust valves of the combustion engine. The valve means 2a, 2b are spring-loaded to a closed position, upwards in Fig. 1, by the action of one or more undepicted spring means. The valve means 2a, 2b are jointly movable by the valve yoke 4 from closed to open position, downwards in Fig. 1, by the action of a control cam 5 which is connected to, for joint rotation with, a rotating camshaft 6 and therefore rotates together with the camshaft. The control cam 5 is adapted to acting upon the valve yoke 4 via a rocker arm 7 which is supported pivotably by a spindle 8. At its one end 7a, on one side of the spindle 8, the rocker arm is connected in a conventional manner to the control cam 5 by a pushrod 9. The rocker arm 7 might alternatively be arranged so that its end 7a abuts directly against the control cam 5. At its second end 7b, on the opposite side of the spindle 8, the rocker arm is connected to the valve yoke 4 via a device 10 which is adapted to transferring a control motion from the rocker arm 7 to the valve arrangement 1, more specifically by converting a pivoting motion of the rocker arm to a linear motion of the valve arrangement. In the example illustrated in Fig. 1, the device 10 converts a clockwise pivoting motion of the rocker arm 7 to a downward linear motion of the valve yoke 4 and the valve means 2a, 2b in order thereby to move the valve means 2a, 2b from closed to open position against the action of the abovementioned spring means when the pushrod 9, under the action of the control cam 5, moves upwards from the position depicted in Fig. 1.

[0011] The device 10 comprises a first motion transfer means 11 intended to be fastened to said second end 7b of the rocker arm, and a second motion transfer means 12 adapted, in conjunction with the first motion transfer means 11, to constituting a ball joint. In the example illustrated in Figs. 1-3, the first motion transfer means 11 has its one end 11a fitted in a recess 7c in the rocker arm and has its opposite second end 11b abutting against the second motion transfer means 12. The second motion transfer means 12 has a bottom surface 12a via which the second motion transfer means is intended to abut slidably against a support surface 4a of the valve arrangement 1. In the example illustrated, said support surface is arranged on the valve yoke 4.

[0012] The motion transfer means 11, 12 have mutual contact surfaces 11c, 12c (see Fig. 2) so designed that the motion transfer means are in contact with one another in such a way as to delineate, via an annular contact line 13 between said contact surfaces, a space 14 between the first motion transfer means 11 and the second motion transfer means 12. The motion transfer means 11, 12 are in contact with one another via a convex contact surface 11c of the one motion transfer means 11 and a corresponding concave contact surface 12c of the other motion transfer means 12. With advantage, the first motion transfer means 11 has the convex contact surface 11c and the second motion transfer means 12 has the con-

cave contact surface 12c, as illustrated in Figs. 1-5, but the opposite case would also be possible.

[0013] The convex contact surface 11c is with advantage spherical and the concave contact surface non-spherical, preferably ogival, as illustrated in Fig. 1-5. Alternatively, the convex contact surface might be non-spherical, preferably ogival, and the concave contact surface spherical.

[0014] In the examples illustrated in Figs. 1-5, the first motion transfer means 11 has a ball-shaped portion 11d which comprises said convex contact surface 11c. This ball-shaped portion 11d is accommodated pivotably in a cup-shaped portion 12d of the second motion transfer means 12. The cup-shaped portion 12d comprises said concave contact surface 12c. The ball-shaped portion 11d is insertable in the cup-shaped portion 12d via the upper aperture of the cup-shaped portion. The first motion transfer means 11 takes in this example the form of a ball pin, while the second motion transfer means 12 takes the form of a so-called elephant foot.

[0015] The first motion transfer means 11 is provided with a lubricant duct 15 which has an outlet aperture 15b facing towards the space 14 between the motion transfer means 11, 12, for introducing lubricant into that space. This lubricant duct 15 further has an inlet aperture 15a connected to a lubricant duct 16 extending through the rocker arm. The rocker arm's lubricant duct 16 may for example be adapted to being supplied with lubricant, e.g. lubricating oil, via the rocker arm's spindle 8, as illustrated in Fig. 1. The lubricant duct 15 of the first motion transfer means extends with advantage centrally through the first motion transfer means in the latter's longitudinal direction. The ball-shaped portion 11d of the first motion transfer means 11 has in the examples illustrated in Figs. 1-5 a flattened lower end surface in which the outlet aperture 15b of the lubricant duct 15 is arranged.

[0016] The second motion transfer means 12 is provided with a lubricant duct 17 which has an inlet aperture 17a facing towards the space 14 between the motion transfer means, and an outlet aperture 17b facing towards the bottom surface 12a of the second motion transfer means. This lubricant duct 17 is intended to convey lubricant from the space 14 between the motion transfer means to the bottom surface 12a of the second motion transfer means. The lubricant duct 17 extends with advantage centrally through the second motion transfer means 12. In the examples illustrated in Figs. 1-5, the inlet aperture 17a is arranged in the deepest part of the cup-shaped portion 12d, while the outlet aperture 17b is arranged in the centre of the bottom surface 12a.

[0017] The second motion transfer means 12 is provided with one or more depressions 18, 18' which are set in the bottom surface 12a and are connected to the outlet aperture 17b of the lubricant channel 17 extending through the second motion transfer means. A depression being described as set in the bottom surface 12a means here that the depression is surrounded by a portion of the bottom surface via which the bottom surface is intended to abut slidably against the support surface 4a of the valve arrangement 1 so that the depression's wall surfaces can act as pressure surfaces for the lubricant pressure in a manner which will be described in more detail below. Said one or more depressions 18, 18' have in the propagation plane of the bottom surface a combined area A1 (see Fig. 7) which is larger than the area A2 of the circle formed by the annular contact line 13 which delineates the space 14 between the motion transfer means 11, 12.

[0018] In the embodiments illustrated in Figs. 1-4, only one depression 18 of the type indicated above is arranged in the bottom surface 12a. In these cases the depression 18 is arranged centrally in the bottom surface 12a and concentrically with the outlet hole 17b of the lubricant duct 17. In the embodiment illustrated in Figs. 1-3, the depression 18 takes the form of a relatively shallow recess in the bottom surface with a substantially planar bottom 18a. This recess is with advantage circular with a diameter d1 which, as viewed in the propagation plane of the bottom surface, is larger than the diameter d2 of the circle formed by the aforesaid circular contact line 13, as illustrated in Fig. 7. In the embodiment illustrated in Fig. 4, the depression 18 takes the form of a recess in the bottom surface with the shape of a truncated cone which broadens towards the bottom surface 12a and which connects at its top to the outlet aperture 17b of the lubricant duct 17.

[0019] In the embodiment illustrated in Figs. 5 and 6, a plurality of depressions 18' of the type indicated above are arranged in the bottom surface 12a. In this case, each depression takes the form of an elongate groove 18' in the bottom surface. The respective grooves 18' extend with advantage in a radial direction from the outlet aperture 17b of the lubricant duct 17, as illustrated in Fig. 6, and may for example have a semi-circular cross-sectional shape. In the case of a plurality of depressions 18' in the bottom surface 12a, they should together comprise in the propagation plane of the bottom surface an area which is larger than the area of the circle formed by the aforesaid annular contact line 13.

[0020] In Figs. 6 and 7 the annular contact line 13 is represented by a broken line.

[0021] When the rocker arm 7, under the action of the control cam 5 and the pushrod 9, pivots from the position illustrated in Fig. 1 to the position illustrated in Fig. 3, the rocker arm's end 7b will, via the motion transfer means 11, 12, push the valve yoke 4 downwards. This pivoting movement of the rocker arm will cause the first motion transfer means 11 fastened to the rocker arm to be pushed downwards towards and pivot relative to the valve yoke's support surface 4a abutting against the second motion transfer means 12. The ball-shaped portion 11d of the first motion transfer means 11 thereupon pivots inside the cup-shaped portion 12d of the second motion transfer means from the position illustrated in Fig. 1 to the position illustrated in Fig. 3. When the first motion transfer means 11 is pushed downwards towards the

second motion transfer means 12, they are initially in contact with one another along an annular contact line. Increasing the application pressure between the first motion transfer means 11 and the second motion transfer means 12 will cause their mutual contact surfaces 11c, 12c to undergo a certain plastic deformation whereby the initial line contact between the motion transfer means changes to mutual contact via a contact surface with the shape of an annular band. In this position the lower edge of this annular band constitutes the annular contact line 13 which delineates this space 14 between the motion transfer means. The pivoting movement of the rocker arm 7 and the first motion transfer means 11 will result in the second motion transfer means 12 being pushed downward towards the support surface 4a and at the same time sliding somewhat sideways along this support surface. Owing to the difference between the aforesaid areas A1 and A2, the hydraulic pressure of the lubricant in the depression 18 or depressions 18' in the bottom surface 12a of the second motion transfer means will result in the second motion transfer means being subjected to an upward hydraulic pressure force which is greater than the downward hydraulic pressure force caused by the hydraulic pressure of the lubricant in the space 14 between the motion transfer means 11, 12. When the rocker arm 7 and the first motion transfer means 11 return from the position illustrated in Fig. 3 to the position illustrated in Fig. 1 and are thereby relieved of load, the second motion transfer means 12 will therefore be pushed upwards by the upward hydraulic pressure force, resulting in its bottom surface 12a rising somewhat from the support surface 4a so that lubricant via the outlet aperture 17b of the lubricant duct 17 can flow along the whole bottom surface 12a. Said depression 18 or depressions 18' thus ensure effective lubrication of the mutual slide surfaces between the second motion transfer means 12 and the valve arrangement 1.

[0022] The device according to the invention can of course be adapted to transfering control motion from a rocker arm to a valve arrangement which comprises only one valve means. In such a case, the aforesaid support surface is with advantage arranged directly on the valve stem connected to the valve means. The device according to the invention may further be adapted to transfering control motion from a rocker arm to a valve arrangement which takes the form of a conventional fuel injection valve for a combustion engine.

[0023] The device according to the invention is particularly intended to form part of a combustion engine of piston type, e.g. for a vehicle such as a passenger car, a truck, a bus or the like.

[0024] The invention is of course no way limited to the embodiments described above, as a large number of possibilities for modifications thereof are likely to be obvious to a specialist in the area without thereby having to deviate from the basic concept of the invention as defined in the attached claims.

Claims

1. A device for transfer of control motion from a rocker arm to a valve arrangement of a combustion engine, which device comprises

   - a first motion transfer means (11) intended to be fastened to the rocker arm, and
   - a second motion transfer means (12) which in conjunction with the first motion transfer means constitutes a ball joint and which has a bottom surface (12a) via which the second motion transfer means is intended to abut slidably against a support surface of the valve arrangement,

   whereby said first and second motion transfer means (11, 12) have mutual contact surfaces (11c, 12c) so designed that the motion transfer means (11, 12) are in contact with one another in such a way as to delineate, via an annular contact line (13) between said contact surfaces, a space (14) between the first motion transfer means (11) and the second motion transfer means (12), the second motion transfer means (12) being provided with a lubricant duct (17) which has an inlet aperture (17a) facing towards said space (14) and an outlet aperture (17b) facing towards said bottom surface (12a), and the first motion transfer means (11) being provided with a lubricant duct (15) which has an outlet aperture (15b) facing towards the space (14) between the first motion transfer means (11) and the second motion transfer means (12) for introducing lubricant into that space,
   characterised in that the second motion transfer means (12) is provided with one or more depressions (18; 18') which are set in said bottom surface (12a) and are connected to the lubricant duct's outlet aperture (17b), and that said one or more depressions (18; 18') have in the propagation plane of the bottom surface a combined area (A1) which is greater than the area (A2) of the circle formed by the annular contact line (13) which delineates the space (14) between the first motion transfer means and the second motion transfer means.

2. A device according to claim 1, **characterised in that** said one or more depressions take the form of a depression (18) arranged centrally in the bottom surface (12a).

3. A device according to claim 2, **characterised in that** the depression (18) arranged centrally in the bottom surface (12a), as viewed in the propagation plane of the bottom surface, is circular with a diameter (d1) which is larger than the diameter (d2) of the circle formed by said annular contact line (13).

4. A device according to claim 1, **characterised in that** said one or more depressions take the form of a plurality of elongate grooves (18') in the bottom surface (12a).

5. A device according to claim 4, **characterised in that** the respective grooves (18') extend in a radial direction from the outlet aperture (17b) of the lubricant duct (17).

6. A device according to any one of claims 1-5, **characterised in that** the motion transfer means (11, 12) are in contact with one another via a convex contact surface (11c) of the one motion transfer means and a corresponding concave contact surface (12c) of the other motion transfer means.

7. A device according to claim 6, **characterised in that** the first motion transfer means (11) comprises said convex contact surface (11c) and that the second motion transfer means (12) comprises said concave contact surface (12c).

8. A device according to claim 7, **characterised in that** the first motion transfer means (11) comprises a ball-shaped portion (11d) which is accommodated pivotably in a cup-shaped portion (12d) of the second motion transfer means (12).

9. A combustion engine, **characterised in that** it comprises a rocker arm (7) and a valve arrangement (1) which is controlled by the rocker arm via a device (10) according to any one of claims 1-8.

Patentansprüche

1. Vorrichtung zum Übertragen einer Steuerbewegung von einem Kipphebel auf eine Ventilanordnung eines Verbrennungsmotors, umfassend:

- eine erste Bewegungsübertragungseinrichtung (11), die dazu vorgesehen ist, an dem Kipphebel befestigt zu werden, und
- eine zweite Bewegungsübertragungseinrichtung (12), die gemeinsam mit der ersten Bewegungsübertragungseinrichtung (11) als ein Kugelgelenk ausgebildet ist, und die eine Bodenoberfläche (12a) aufweist, mit der die zweite Bewegungsübertragungseinrichtung dazu vorgesehen ist, verschiebbar an einer Unterstützungsfläche der Ventilanordnung anzugreifen,

wobei die erste und zweite Bewegungsübertragungseinrichtung (11, 12) jeweils Kontaktoberflächen (11c, 12c) aufweisen, die derart ausgebildet sind, dass die Bewegungsübertragungseinrichtungen (11, 12) derart miteinander in Kontakt stehen, dass anhand einer kreisförmigen Kontaktlinie (13) zwischen den Kontaktoberflächen (11c, 12c) ein Raum (14) zwischen der ersten Bewegungsübertragungseinrichtung (11) und der zweiten Bewegungsübertragungseinrichtung (12) gebildet wird, wobei die zweite Bewegungsübertragungseinrichtung (12) ferner eine Schmiermittelleitung (17) umfasst, welche eine dem Raum (14) zugewandte Einlassöffnung (17a) sowie eine der Bodenoberfläche (12a) zugewandte Auslassöffnung (15b) aufweist, und wobei die erste Bewegungsübertragungseinrichtung (11) ferner eine Schmiermittelleitung (15) umfasst, welche eine dem Raum (14) zwischen der ersten Bewegungsübertragungseinrichtung (11) und der zweiten Bewegungsübertragungseinrichtung (12) zugewandten Auslassöffnung (15b) für das Zuführen von Schmiermittel in den Raum (14) aufweist,
dadurch gekennzeichnet, dass die zweite Bewegungsübertragungseinrichtung (12) eine oder mehrere Vertiefung(en) (18; 18') umfasst, die in der Bodenoberfläche (12a) ausgebildet ist/sind und mit der Auslassöffnung (17b) der Schmiermittelleitung (17) verbunden ist/sind, und dass die eine oder mehreren Vertiefung(en) (18; 18') in der Ausbreitungsebene der Bodenoberfläche (12a) eine Gesamtfläche (A1) aufweist/aufweisen, die größer ist als eine Fläche (A2) eines Kreises, der durch die ringförmige, den Raum (14) zwischen der ersten Bewegungsübertragungseinrichtung (11) und der zweiten Bewegungsübertragungseinrichtung (12) bildende Kontaktlinie (13) beschrieben wird.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, dass die eine oder mehreren Vertiefung(en) in Form einer mittig in der Bodenoberfläche (12a) angeordneten Vertiefung (18) ausgebildet ist/sind.

3. Vorrichtung nach Anspruch 2,
dadurch gekennzeichnet, dass die mittig in der Bodenoberfläche (12a) angeordnete Vertiefung (18) in der Ausbreitungsebene der Bodenoberfläche (12a) betrachtet als ein Kreis mit einem Durchmesser (d1) ausgebildet ist, wobei der Durchmesser (d1) größer ist als ein Durchmesser (d2) des Kreises, welcher durch die ringförmige Kontaktlinie (13) beschrieben wird.

4. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, dass die eine oder mehreren Vertiefung(en) in Form einer Mehrzahl von länglichen Einkerbungen (18') in der Bodenoberfläche (12a) ausgebildet ist/sind.

5. Vorrichtung nach Anspruch 4,

dadurch gekennzeichnet, dass sich die Einkerbungen (18') ausgehend von der Auslassöffnung (17b) der Schmiermittelleitung (17) in einer radialen Richtung erstrecken.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Bewegungsübertragungseinrichtungen (11, 12) über eine konvexe Kontaktoberfläche (11c) der einen Bewegungsübertragungseinrichtung und eine entsprechende konkave Kontaktoberfläche (12c) der anderen Bewegungsübertragungseinrichtung untereinander in Kontakt stehen.

7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** die erste Bewegungsübertragungseinrichtung (11) die konvexe Kontaktoberfläche (11c) umfasst und dass die zweite Bewegungsübertragungseinrichtung (12) die konkave Kontaktoberfläche (12c) umfasst.

8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** die erste Bewegungsübertragungseinrichtung (11) einen kugelförmigen Abschnitt (11d) umfasst, der drehbar in einem kelchförmigen Abschnitt (12d) der zweiten Bewegungsübertragungseinrichtung (12) aufgenommen ist.

9. Verbrennungsmotor, **dadurch gekennzeichnet, dass** er einen Kipphebel (7) und eine Ventilanordnung (1) umfasst, die durch den Kipphebel anhand einer Vorrichtung (10) gemäß einem der Ansprüche 1 bis 8 gesteuert wird.

Revendications

1. Dispositif pour la transmission d'un mouvement de commande d'un culbuteur à un ensemble de soupape d'un moteur à combustion, ledit dispositif comprenant :

- un premier moyen de transmission de mouvement (11) destiné à être fixé sur le culbuteur, et
- un deuxième moyen de transmission de mouvement (12) qui, conjointement avec le premier moyen de transmission de mouvement, constitue un joint à rotule, et qui a une surface inférieure (12a) par laquelle le deuxième moyen de transmission de mouvement est destiné à venir en butée coulissante contre une surface de support de l'ensemble de soupape, lesdits premier et deuxième moyens de transmission de mouvement (11, 12) ayant des surfaces de contact mutuel (11c, 12c) conçues de façon que les moyens de transmission de mouvement (11, 12) soient en contact l'un avec l'autre de manière à délimiter, via une ligne de contact annulaire (13) entre lesdites surfaces de contact, un espace (14) entre le premier moyen de transmission de mouvement (11) et le deuxième moyen de transmission de mouvement (12), le deuxième moyen de transmission de mouvement (12) étant pourvu d'une conduite de lubrifiant (17) qui a une ouverture d'entrée (17a) dirigée vers ledit espace (14) et une ouverture de sortie (17b) dirigée vers ladite surface inférieure (12a), et le premier moyen de transmission de mouvement (11) étant pourvu d'une conduite de lubrifiant (15) qui a une ouverture de sortie (15b) dirigée vers l'espace (14) entre le premier moyen de transmission de mouvement (11) et le deuxième moyen de transmission de mouvement (12), pour l'introduction de lubrifiant dans ledit espace,

caractérisé en ce que le deuxième moyen de transmission de mouvement (12) est pourvu d'un ou plusieurs creux (18 ; 18') qui sont formés dans ladite surface inférieure (12a) et qui sont reliés à l'ouverture de sortie (17b) de la conduite de lubrifiant, et lesdits un ou plusieurs creux (18 ; 18') ont, dans le plan dans lequel s'étend la surface inférieure, une aire combinée (A1) qui est plus grande que l'aire (A2) du cercle formé par la ligne de contact annulaire (13) qui délimite l'espace (14) entre le premier moyen de transmission de mouvement et le deuxième moyen de transmission de mouvement.

2. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits un ou plusieurs creux se présentent sous la forme d'un creux (18) disposé au centre de la surface inférieure (12a).

3. Dispositif selon la revendication 2, **caractérisé en ce que** le creux (18) disposé au centre de la surface inférieure (12a) est circulaire lorsqu'il est regardé dans le plan dans lequel s'étend la surface inférieure, avec un diamètre (d1) qui est supérieur au diamètre (d2) du cercle formé par ladite ligne de contact annulaire (13).

4. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits un ou plusieurs creux se présentent sous la forme d'une pluralité de longues rainures (18') dans la surface inférieure (12a).

5. Dispositif selon la revendication 4, **caractérisé en ce que** les gorges (18') respectives s'étendent dans une direction radiale par rapport à l'ouverture de sortie (17b) de la conduite de lubrifiant (17).

6. Dispositif selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** les moyens de transmission de mouvement (11, 12) sont en contact l'un

avec l'autre par l'intermédiaire d'une surface de contact convexe (11c) de l'un des moyens de transmission de mouvement et d'une surface de contact concave correspondante (12c) de l'autre moyen de transmission de mouvement.

7. Dispositif selon la revendication 6, **caractérisé en ce que** le premier moyen de transmission de mouvement (11) comprend ladite surface de contact convexe (11c) et **en ce que** le deuxième moyen de transmission de mouvement (12) comprend ladite surface de contact concave (12c).

8. Dispositif selon la revendication 7, **caractérisé en ce que** le premier moyen de transmission de mouvement (11) comprend une partie en forme de bille (11b) qui est reçue de manière pivotante dans une partie en forme de coupelle (12d) du deuxième moyen de transmission de mouvement (12).

9. Moteur à combustion, **caractérisé en ce qu'**il comprend un culbuteur (7) et un ensemble de soupape (1) qui est commandé par le culbuteur par l'intermédiaire d'un dispositif (10) selon l'une quelconque des revendications 1 à 8.

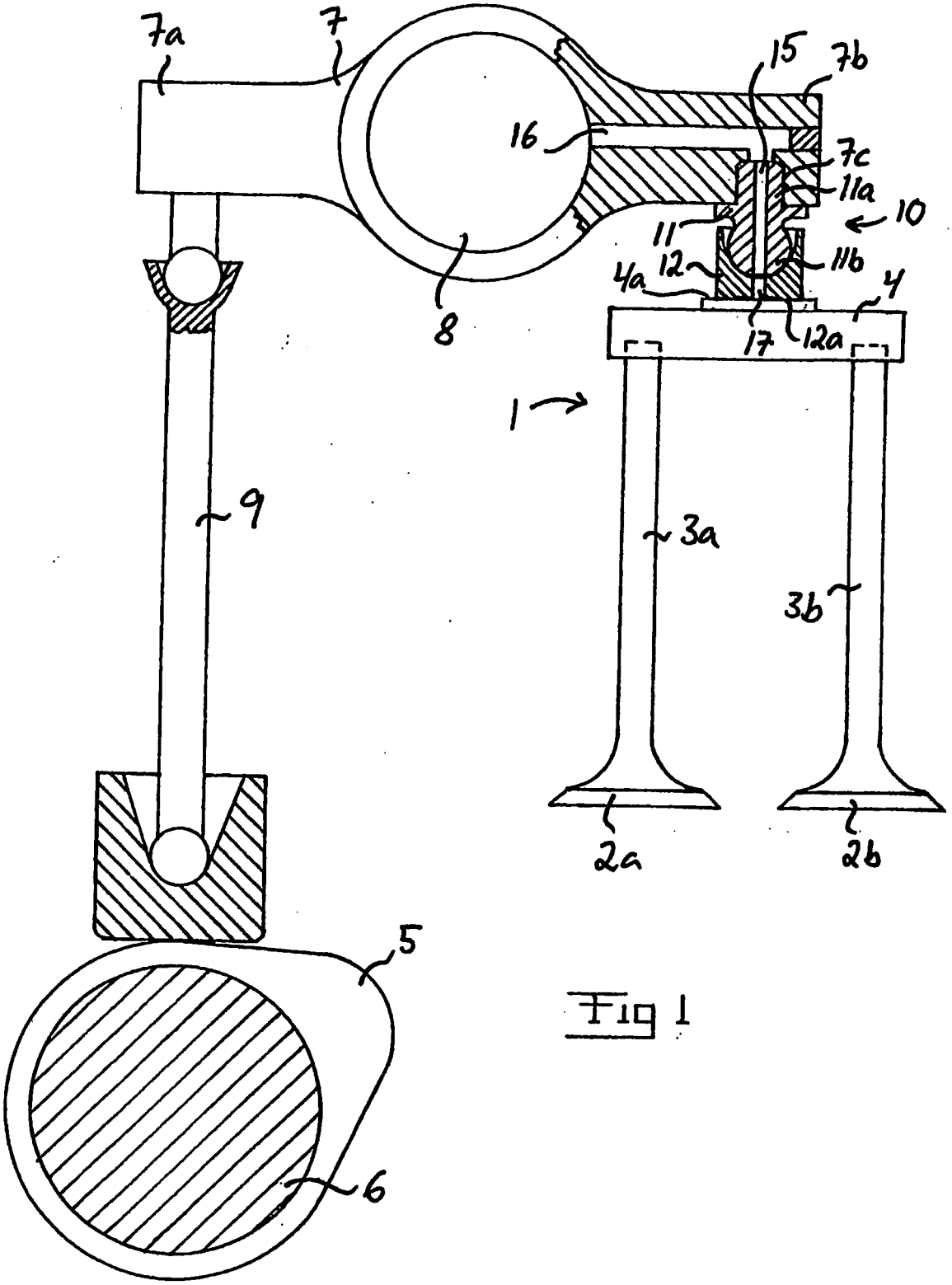


Fig 1

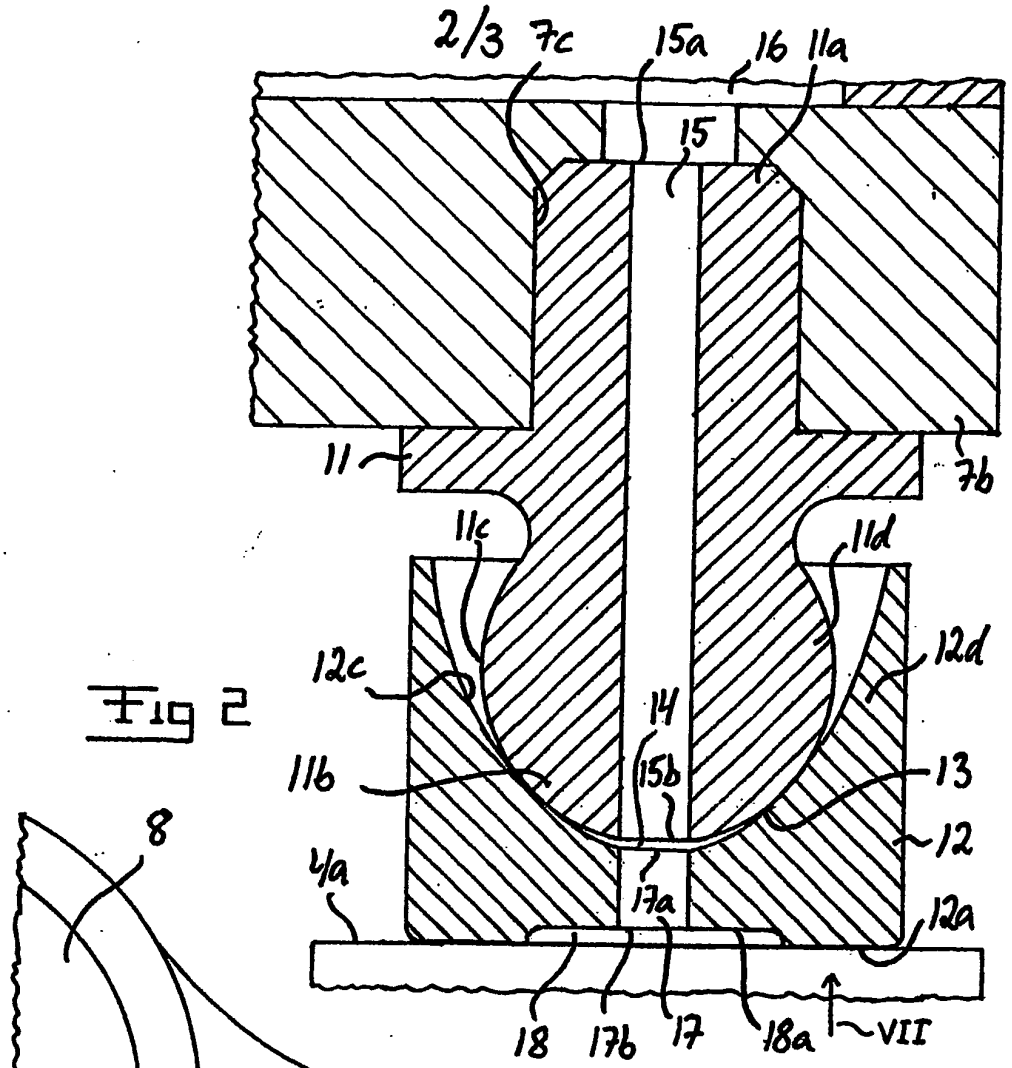

2/3
7c
15a
16
11a
15
11
7b
11c
11d
12c
12d
14
15b
13
11b
12
4a
17a
12a
18
17b
17
18a
VII

Fig 2

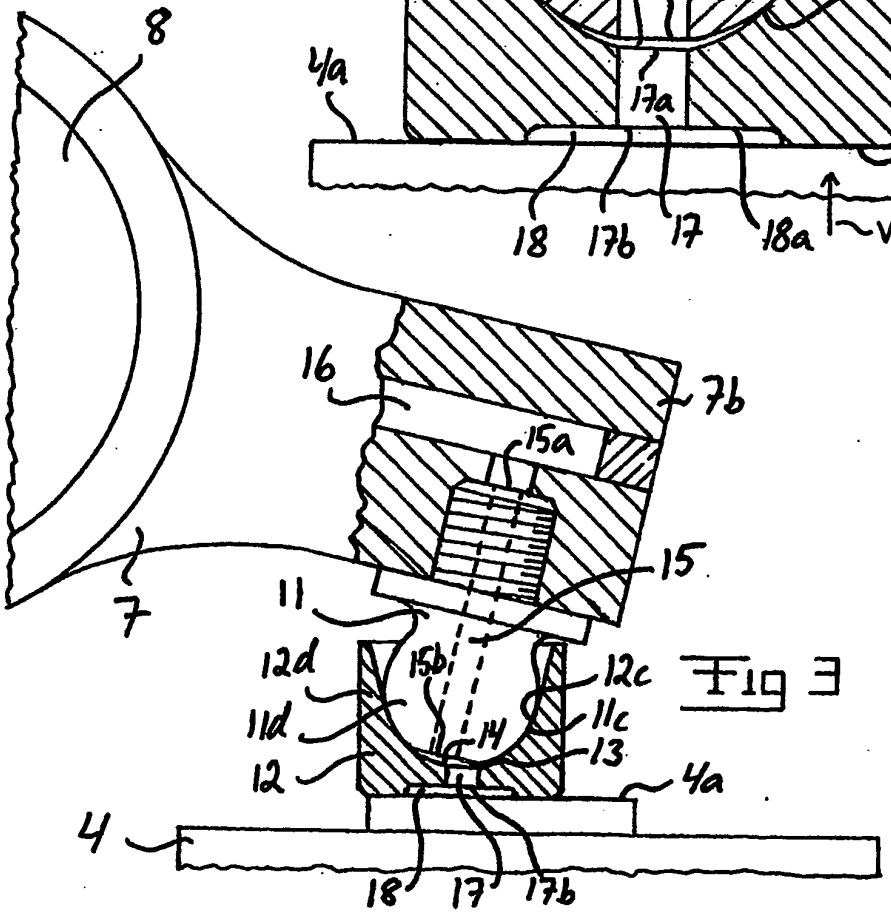

8
16
7b
15a
15
7
11
12d
15b
12c
11d
14
11c
13
12
4a
4
18
17
17b

Fig 3

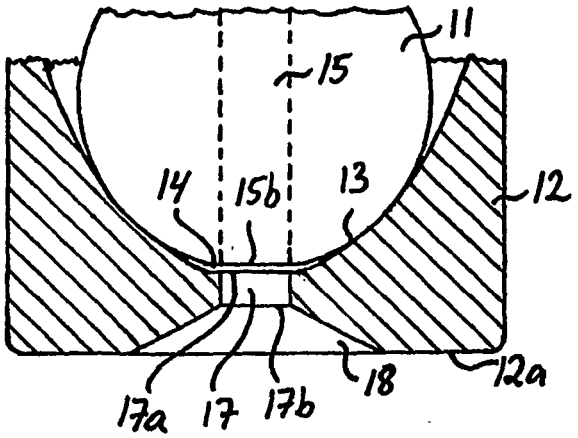


Fig 4

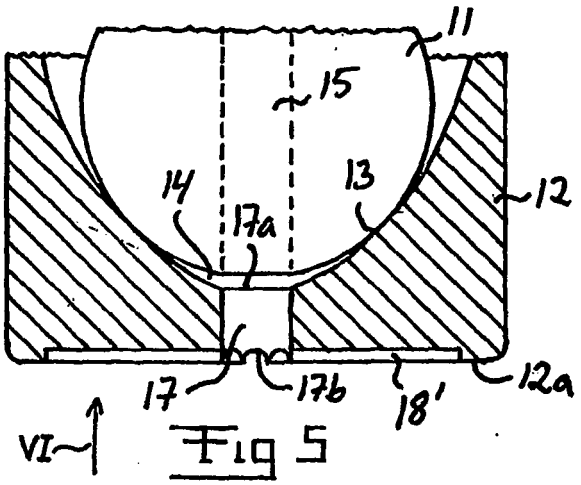


Fig 5

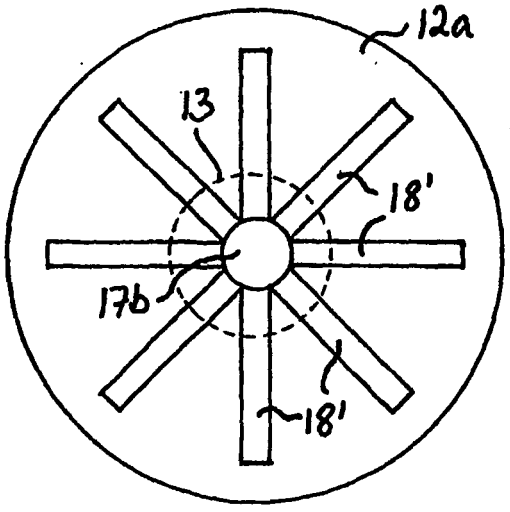


Fig 6

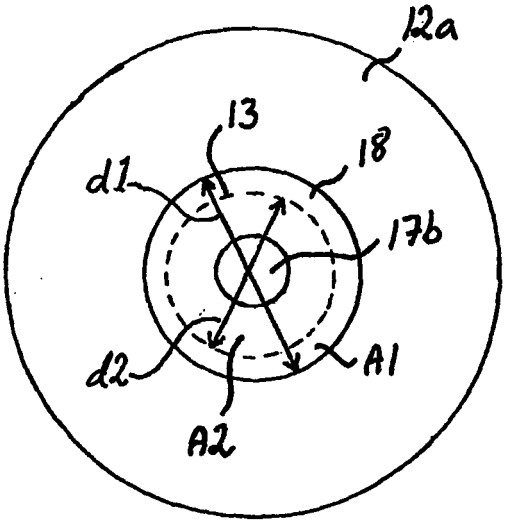


Fig 7

REFERENCES CITED IN THE DESCRIPTION

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