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(54) **Adjustable valve spring retainer for internal combustion engine.**

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Description

This invention relates to valve adjustment means for internal combustion engines having overhead cams or rocker arms and more particularly relates to means for adjustment or compensation for any unwanted gaps arising between the cam shaft and/or rocker arm and the valve stem.

In typical overhead cam engines the valves are operated by a rocker arm pushing on the valve stem or cam shaft pushing on bucket tappets. The rocker arm is usually actuated by a cam located in association herewith. In order to provide for the thermal expansion of the valve stem due to heat created by the fuel combustion within the engine, gaps are usually provided between the valve stem and rocker arm. Hydraulic arrangements for adjusting or compensating for unwanted gaps or gap variations are disclosed in Swiss Patent No. 322762, French Patent Publication FR-A-2476740, and French Patent Publication FR-A-2370858. This last, for example, suggests an hydraulically operable adjuster in the rocker arm (i.e. in the valve stem operating means) to engage directly upon the valve stem, the valve spring being of necessity retained in a wholly separate body. None of these prior art suggestions is considered to provide a wholly appropriate solution.

According to one aspect of this invention there is provided apparatus to compensate for thermal expansion between the stem of a spring-urged valve and the valve stem operation means within an internal combustion engine, said apparatus comprising a retainer for the valve spring and an adjuster to effect said compensation, the adjuster comprising a body serving as part of, or a container for, hydraulically operable adjustment means that in use effect said compensation, **characterised in that**

the adjuster body serves additionally as the said retainer for the valve spring,

one end of this combined body and valve spring retainer body has a valve stem receipt aperture therein whereby the body is to be removably retained upon the valve stem by a keeper key,

the other, opposite end of the combined body and valve spring retainer is closed by a cap member that is longitudinally adjustable in position with respect to the adjustment means and in use is closely adjacent the valve stem operation means to be urged thereby towards the valve stem,

and in that

said hydraulically operable adjustment means permits restoration of the desired positional relationship between said cap member and said operation means.

Preferably a seal member is positioned in said valve spring retainer between said cap member

and said valve stem receipt aperture, and said combined body and valve spring retainer, cap member and seal member form an hydraulic pressure chamber within said combined body and valve spring retainer, said pressure chamber having an open communication into said valve stem receipt aperture which in normal operation is closed by said seal member so as to retain hydraulic fluid under pressure within said hydraulic pressure chamber.

In a preferred embodiment, the cap member is mounted on the open top of said valve spring retainer member, a seal member is positioned in said valve spring retainer between said cap member and said valve stem receipt bore, and said valve spring retainer, cap member and seal member form an hydraulic pressure chamber within said valve spring retainer, said pressure chamber having an open communication into said valve stem receipt bore which in normal operation is closed by said seal member so as to retain hydraulic fluid under pressure within said hydraulic pressure chamber.

Advantageously, said seal member is adapted to be removable from said valve spring retainer member.

Preferably, hydraulic pressure means are provided in said hydraulic pressure chamber for adjustment of the spatial relation of said cap member to said seal member to adjust for said thermal expansion. Preferably said hydraulic pressure means comprises a plunger disposed between said cap member and said seal member in said hydraulic pressure chamber and adapted to increase the fluid pressure within said chamber when said cap member is depressed by said operation means; and further comprises an hydraulic fluid reservoir adapted to supply hydraulic fluid to said chamber.

Advantageously said hydraulic fluid reservoir is located within said plunger and said valve spring retainer further includes a secondary fluid reservoir interconnected to the first-mentioned hydraulic fluid reservoir by at least one aperture in said cap member.

Conveniently said secondary fluid reservoir is provided with an inlet aperture for the entry therein of hydraulic fluid under pressure from the lubricating system of an internal combustion engine.

Preferably said cap member is provided with at least one aperture for passage of lubricating system fluid out of either the first-mentioned hydraulic fluid reservoir or said secondary fluid reservoir, and further means are provided to supply said lubricating system's fluid under pressure through said aperture(s) to lubricate the upper surface of said cap member.

Advantageously the said inlet aperture or each of said apertures permits fluid entry into said sec-

ondary fluid reservoir and its supply therefrom via the first-mentioned aperture(s) into said first-mentioned hydraulic fluid reservoir by splashing of said fluid into said first-mentioned aperture(s) by reciprocating motion due to operation of the hydraulic adjustor.

One herein-disclosed embodiment of this invention provides a valve adjustor base and cap member which can be used with hydraulic lifters (for which, since no adjustments are needed, there are no threaded parts between the cap member and the valve spring retainer base). In this embodiment a chamber is provided within the cap member which, when positioned within the valve spring retainer base, is held in position by a semi-circular clip which fits within a groove provided in the upper outer portion of the valve spring retainer base. An hydraulic piston is positioned above a valve stem bushing and has provided therebetween a pre-loaded spring and ball combination for the capture of hydraulic fluid therein upon the downward thrust of the cam or the rocker arm. The piston may be hollowed in its upper portion and have an aperture in its bottom aligned with the ball. The ball operates as an hydraulic valve for the piston, the piston being just above the ball, riding in the bore just above the pressure chamber. When the cap member is depressed, it moves the piston inward toward the centre of its chamber, thereby compressing oil within the pressure chamber which action provides the means for transferring the movement of the cap member to the valve spring retainer base due to the minimal compressibility of the oil therein. Upon the increase of pressure on the device of this embodiment, some oil will leak backwards out of the pressure chamber formed by the hollow in the retainer and the corresponding piston past the piston wall. Back flow through the centre hole of the piston is controlled by the ball which closes off the oil return when the piston compresses the oil, while - at the times when there is no force thereupon - the ball allows oil to enter the pressure chamber below. This hydraulic embodiment has advantages over the current art which incorporates an hydraulic lifter within a separate housing bored into the top of the cylinder head in that it allows a large percentage of this housing or tappet guide to be eliminated except for a small percentage located on opposite sides of the retainer in line with the cam's direction of rotation. This design lessens the cylinder head weight and the friction between the tappet and the tappet guide. The hydraulic embodiment of this invention is held in position by the keeper key on the valve stem and the pressure of the valve spring upwards against the valve spring retainer base. This embodiment simplifies substantially the construction of hydraulic lifters and lessens significantly their

weight. A valve stem bushing acts as a seal and prevents the escape of oil fluid from the pressure chamber down along the valve stem. In some embodiments the valve stem bushing can be threaded into its position to prevent its movement out of its seat or can be sealed in position by a circlip or be an inserted cup. In this embodiment a hole can be provided within the valve spring retainer or cap member which would allow oil to circulate therein which would lessen the noise from resonance and act as a reservoir of oil from which the pressure chamber would draw for its proper operation. It should be noted that in this embodiment this is an additional reservoir if the engine should run low on oil, oil would still be provided within the pressure chamber due to its being trapped between the valve spring retainer base and the cap member.

An alternative embodiment of the hydraulic version of this invention utilizes a hardened steel upper cap member with a lower cap member made of aluminium, aluminium-like material or lightweight material having a reservoir defined therein. Below the reservoir is a hardened inverted cup member with an aperture defined therein. A second hardened cup member is placed in the valve spring retainer base and contains a hollow piston member. Within the upwardly facing hollow is the spring cage and ball which control entry of fluid from the reservoir.

By way of non-limiting example, embodiments of this invention will now be described in greater detail with reference to the accompanying drawings of which:

Figure 1 is a perspective cross-sectional view of an exemplary device according to this invention utilising hydraulic lifters; and

Figure 2 is a cross-sectional view of an alternate embodiment of a hydraulically operable device.

In the embodiment of Fig 1 the valve spring retainer base 60 has on its bottom portion a downwardly protruding outer valve spring retaining lip (into which the outer valve spring is engaged), an inner valve spring retainer lip (into which the inner valve spring is engaged), and a valve stem receipt aperture 76 into which the valve stem passes. Aperture 76 is somewhat narrower at its base than at its top and acts to engage the valve stem due to a keeper key inserted into a groove at the top of the valve stem. A central portion 62 of the valve spring retainer base is provided with a valve stem bushing receipt ledge, and with an upwardly directed non-threaded projection 80,82. The valve spring retainer base 60 has an upwardly extending peripheral portion 64 that too is non-threaded. A retainer cap 66 is positioned within the valve spring retainer base and is held in place by retainer clip

68 which fits within groove 70 within the valve spring retainer base 60.

In this first embodiment of Fig 1, a valve stem bushing 72 is located at position 74 above the valve stem receipt bore 76 above which is positioned piston or plunger 78 which rides within pressure chamber 80 formed by projections 82 extending from valve spring retainer base 60. Below the piston or plunger 78 is located ball member 84 and cage 86 with spring member 88 positioned therebelow. At least one aperture 90 can be provided to allow for the entrance of oil into reservoir 81 for the hydraulic action as described above and one or more apertures 92,93 may be positioned within the valve spring retainer base 60 or cap 66 to allow for the entrance of oil therein.

Illustrated in Figure 2 is a second embodiment of an hydraulic version utilizing hardened cap 191 above lower cap 192 which has a reservoir 94 defined therein with oil entrance aperture 96 to allow oil into the reservoir. This embodiment has adjustment means 106 comprising an inverted hardened cap 100 with an aperture defined therein positioned below the reservoir and an opposed hardened cup 102 positioned above the valve stem receipt bore 101. Within cup 102 is a hollow piston or plunger 104. Within the upward facing hollow portion is a ball 108 aligned with the aperture in the upper cap 100. Below ball 108 is a cage member 110 and a spring 112 which extends to the inside hollow of piston or plunger 104.

It should be noted that there are many advantages to the utilisation of adjustable valve spring retainers embodying this invention beside their being compact and lighter in weight than the structures that accomplish similar functions in the prior art. In the situation where the seal is constructed of a material of a predetermined strength and the bore in which it rests is of the same dimensions as the valve stem receipt bore, the valve stem retainer embodying this invention will advantageously provide a place of movement by its deformation when struck by the valve stem in situations where the engine is over-revved and the valve head is hit by the piston. This destruction or deformation of the bushing dissipates the destructive force, minimizing damage to the valve so that repairs may be made easily to the device embodying this invention without having to pull the head off the engine to reach a damaged valve.

Claims

1. Apparatus to compensate for thermal expansion between the stem of a spring-urged valve and the valve stem operation means within an internal combustion engine, said apparatus comprising a retainer for the valve spring and

an adjustor to effect said compensation, the adjustor comprising a body serving as part of, or a container for, hydraulically operable adjustment means that in use effect said compensation, **characterised in that**

the adjustor body (60; Fig 2) serves additionally as the said retainer for the valve spring,

one end of this combined body and valve spring retainer (60; Fig 2) body has a valve stem receipt aperture (76;101) therein whereby the body is to be removably retained upon the valve stem by a keeper key,

the other, opposite end of the combined body and valve spring retainer is closed by a cap member (66;191) that is longitudinally adjustable in position with respect to the adjustment means (78,84;

100,102,104,106,108,110,112) and in use is closely adjacent the valve stem operation means to be urged thereby towards the valve stem,

and in that

said hydraulically operable adjustment means (78,84; 100,102,104,106,108,110,112) permits restoration of the desired positional relationship between said cap member (66;191) and said operation means.

2. Apparatus according to Claim 1, characterised in that a seal member (72; 102) is positioned in said valve spring retainer (60; Fig 2) between said cap member (66;191,192) and said valve stem receipt aperture (76;101), and in that said combined body and valve spring retainer (60; Fig 2), cap member (66; 191,192) and seal member (72;102) form an hydraulic pressure chamber (80; 94) within said combined body and valve spring retainer (60; Fig 2), said pressure chamber (80; Fig 2) having an open communication (74) into said valve stem receipt aperture (76;101) which in normal operation is closed by said seal member (72;102) so as to retain hydraulic fluid under pressure within said hydraulic pressure chamber (80; Fig 2).
3. Apparatus according to Claim 1 or Claim 2, characterised in that the cap member (66;191,192) is mounted on the open top of said valve spring retainer member (60; Fig 2), a seal member (72; 102) is positioned in said valve spring retainer (60; Fig 2) between said cap member (66;191,192) and said valve stem receipt bore (76;101), and in that said valve spring retainer (60; Fig 2), cap member (66; 191,192) and seal member (72;102) form an hydraulic pressure chamber (80; 94) within said valve spring retainer (60; Fig 2), said

- pressure chamber (80; Fig 2) having an open communication (74) into said valve stem receipt bore (76;101) which in normal operation is closed by said seal member (72;102) so as to retain hydraulic fluid under pressure within said hydraulic pressure chamber (80; Fig 2). 5
4. Apparatus according to Claim 3, characterised in that said seal member (72;102) is adapted to be removable from said valve spring retainer member (60; Fig 2). 10
5. Apparatus according to Claim 3 or 4, characterised by hydraulic pressure means (78; 100,104,106,108,110, 112) in said hydraulic pressure chamber (80;94) for adjustment of the spatial relation of said cap member (66;191,192) to said seal member (72;102) to adjust for said thermal expansion. 15
6. Apparatus according to Claim 3 or 4, characterised in that said hydraulic pressure means comprises a plunger (78) disposed between said cap member (66) and said seal member (72) in said hydraulic pressure chamber (80) and adapted to increase the fluid pressure within said chamber (80) when said cap member (66) is depressed by said operation means; and further characterised by an hydraulic fluid reservoir (81) adapted to supply hydraulic fluid to said chamber (80). 20
7. Apparatus according to Claim 6 characterised in that said hydraulic fluid reservoir (81) is located within said plunger (78) and said valve spring retainer (60) further includes a secondary fluid reservoir inter-connected to the first-mentioned hydraulic fluid reservoir (81) by at least one aperture (90) in said cap member (66). 25
8. Apparatus according to Claim 7 characterised in that said secondary fluid reservoir is provided with an inlet aperture (92) for the entry therein of hydraulic fluid under pressure from the lubricating system of an internal combustion engine. 30
9. Apparatus according to Claim 8 characterised in that said cap member (66) is provided with at least one aperture (93) for passage of lubricating system fluid out of either the first-mentioned hydraulic fluid reservoir (81) or said secondary fluid reservoir, and further characterised by means to supply said lubricating system's fluid under pressure through said aperture(s) (92 and/or 93) to lubricate the upper surface of said cap member (66). 35
10. Apparatus according to Claim 8 or Claim 9, characterised in that the said inlet aperture (92) or each of said apertures (92,93) permits fluid entry into said secondary fluid reservoir and its supply therefrom via the first-mentioned aperture(s) (90) into said first-mentioned hydraulic fluid reservoir (81) by splashing of said fluid into said first mentioned aperture(s) (90) by reciprocating motion due to operation of the hydraulic adjuster. 40
11. Apparatus according to any one of Claims 6 to 10, characterised in that:
 said cap member(66) is retained by a circlip (68) within an upper portion (70) of said valve spring retainer member (60),
 the plunger member (78) has a hollow region in its upper portion to define said first-mentioned reservoir (81) and has an aperture therein below said hollow region,
 a ball member (84) is located below said aperture in said plunger member (78),
 a cage member (86) is located below said ball member (84), and
 a spring member (88) is disposed between the cage member (86) and the seal member (72). 45
12. Apparatus according to Claim 1 or Claim 2, characterised in that:
 a circlip (68) retains said cap member (66;191,192) within an upper portion (70) of said valve spring retainer member (60; Fig 3),
 said cap member (66; 191,192) includes an upper portion (191) of hardened steel-like material and a lower portion (192) of lightweight aluminium-like material and further has a reservoir (94) defined therein with access apertures (96) in said cap member (66; 191,192) to permit entry of oil into said reservoir (94),
 the said lower portion (192) of said cap member(66; 191,192) is positioned above said valve stem receipt aperture,
 a plunger member (100) of hollow inverted cup-like shape is located within said cap member's lower portion (192), this plunger member having an aperture (106) in its bight wall,
 a ball member (108), located by a cage member (110), is disposed below and in alignment with said aperture (106),
 a hollow plunger (102) is located below said cage member and in opposing relation to the said plunger member (100) thereabove and such as to provide a seal member, and
 a spring member (112) is located between the plunger member (100) and the hollow plunger (102) to act on said cage member 50

(110) and urge the ball member (108) towards said aperture (106).

13. Apparatus according to Claim 1, characterised by hydraulic plunger means (78; 104) disposed internally of the body member (60; Fig 2) adjacent the cap means (66; 191) to define an hydraulic fluid reservoir (81; 94) between the plunger means (78;104) and the cap means (66;191) such that, in use, depression of the cap means (66;191) by the operation means moves the plunger means (78;104) inwardly to compress fluid held within said reservoir (81;94) and transfer the movement of the cap means (66;191) to the said combined body and valve spring retainer (60; Fig 2) and through the combined body and valve spring retainer (60; Fig 2) to the valve stem.

Patentansprüche

1. Vorrichtung zum Ausgleich der Wärmeausdehnung zwischen dem Schaft eines federgetriebenen Ventils und dem Ventilschaftbetätigungsmittel innerhalb eines Verbrennungsmotors, wobei die Vorrichtung einen Teller für die Ventildfeder und einen Regler zur Herbeiführung des Ausgleichs und der Regler ein Gehäuse aufweist, das als Teil von oder ein Behälter für ein hydraulisch betriebenes Einstellmittel, das in Benutzung den Ausgleich herbeiführt, dient, dadurch gekennzeichnet, daß das Reglergehäuse (60; Fig. 2) zusätzlich wie der Teller für die Ventildfeder dient, ein Ende dieser Kombination aus Gehäuse und Ventildfederteller (60; Fig. 2) eine Ventilschaftaufnahmeöffnung (76; 101) hat, wobei das Gehäuse durch einen Halterungssplint abnehmbar am Ventilschaft befestigt ist, das andere, entgegengesetzte Ende der Kombination aus Gehäuse und Ventildfederteller durch ein Kappenglied (66;191) geschlossen wird, dessen Lage in Bezug auf das Einstellmittel (78,84;100,102,104,106,108,110,112) in Längsrichtung einstellbar ist und das sich in Benutzung in unmittelbarer Nähe des Ventilschaftbetätigungsmittels befindet, um somit in Richtung des Ventilschaftes getrieben zu werden, und daß das hydraulisch betriebene Einstellmittel (78, 84; 100,102,104,106,108,110,112) die Wiederherstellung der gewünschten Lagebeziehung zwischen dem Kappenglied (66;191) und dem Betätigungsmittel erlaubt.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß sich in dem Ventildfederteller (60; Fig. 2) ein Dichtungsglied (72;102) zwischen dem Kappenglied (66;191,192) und der Ventilschaftaufnahmeöffnung (76;101) befindet, und daß die Kombination aus Gehäuse und Ventildfederteller (60; Fig. 2), das Kappenglied (66;191,192) und das Dichtungsglied (72;102) eine hydraulische Druckkammer (80;94) innerhalb der Kombination aus Gehäuse und Ventildfederteller (60; Fig. 2) bilden, wobei die Druckkammer (80; Fig. 2) eine offene Verbindung (74) zu der Ventilschaftaufnahmeöffnung (76;101) hat, die bei Normalbetrieb durch das Dichtungsglied (72;102) geschlossen wird, so daß die hydraulische Flüssigkeit innerhalb der hydraulischen Druckkammer (80; Fig.2) unter Druck gehalten wird.
3. Vorrichtung nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß das Kappenglied (66;191,192) auf das offene obere Ende des Ventildfedertellergliedes (60; Fig. 2) montiert ist, sich in dem Ventildfederteller (60; Fig. 2) ein Dichtungsglied (72;102) zwischen dem Kappenglied (66;191,192) und der Ventilschaftaufnahmebohrung (76;101) befindet, und daß der Ventildfederteller (60; Fig. 2), das Kappenglied (66;191,192) und das Dichtungsglied (72;102) eine hydraulische Druckkammer (80;94) innerhalb des Ventildfedertellers (60; Fig. 2) bilden, wobei die Druckkammer (80; Fig.2) eine offene Verbindung (74) zu der Ventilschaftaufnahmebohrung (76;101) hat, die bei Normalbetrieb durch das Dichtungsglied (72;102) geschlossen wird, so daß die hydraulische Flüssigkeit innerhalb der hydraulischen Druckkammer (80; Fig. 2) unter Druck gehalten wird.
4. Vorrichtung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß das Dichtungsglied (72;102) von dem Ventildfedertellerglied (60; Fig. 2) abnehmbar ist.
5. Vorrichtung nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß sich zur Einstellung auf die Wärmeausdehnung in der hydraulischen Druckkammer (80;94) ein hydraulisches Druckmittel (78;100,104,106,108,110, 112) zur Einstellung des räumlichen Verhältnisses zwischen dem Kappenglied (66;191,192) und dem Dichtungsglied (72;102) befindet.
6. Vorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß das hydraulische Druckmittel einen Kolben (78) aufweist, der sich in der hydraulischen Druckkammer (80) zwischen dem Kappenglied (66) und dem Dichtungsglied (72) befindet und so gestaltet

ist, daß er den Flüssigkeitsdruck innerhalb der Kammer (80) erhöht, wenn durch das Betätigungsmittel Druck auf das Kappenglied (66) ausgeübt wird, und weiterhin gekennzeichnet durch einen hydraulischen Ausgleichbehälter (81), der so gestaltet ist, daß er der Kammer (80) hydraulische Flüssigkeit zuführt.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß sich der hydraulische Ausgleichbehälter (81) in dem Kolben (78) befindet und der Ventiltfederteller (60) außerdem einen Zweitausgleichbehälter einschließt, der mit dem hydraulischen Ausgleichbehälter (81) durch mindestens eine Öffnung (90) in dem Kappenglied (66) verbunden ist. 10
8. Vorrichtung nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß der Zweitausgleichbehälter mit einer Einlaßöffnung (92) für den Eintritt von unter Druck stehender hydraulischer Flüssigkeit aus dem Schmiersystem eines Verbrennungsmotors versehen ist. 15
9. Vorrichtung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß das Kappenglied (66) mit mindestens einer Öffnung (93) zur Einleitung von Schmiersystemflüssigkeit aus dem Ausgleichbehälter (81) oder dem Zweitausgleichbehälter versehen ist, und weiterhin gekennzeichnet durch ein Mittel für die Zufuhr der unter Druck stehenden Schmiersystemflüssigkeit durch die Öffnung(en) (92 und/oder 93) zum Schmieren der oberen Oberfläche des Kappengliedes (66). 20
10. Vorrichtung nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß die Einlaßöffnung (92) oder jede der Öffnungen (92,93) den Eintritt von Flüssigkeit in den Zweitausgleichbehälter und die Zufuhr der Flüssigkeit von dort über die Öffnung(en) (90) in den hydraulischen Ausgleichbehälter (81) erlaubt, indem die Flüssigkeit in die Öffnung(en) (90) durch die im Zusammenhang mit dem Betrieb des hydraulischen Reglers stehende hin- und hergehende Bewegung gespritzt wird. 25
11. Vorrichtung nach einem der Ansprüche 1 bis 10, dadurch gekennzeichnet, daß das Kappenglied (66) durch einen Nutring (68) innerhalb des oberen Teiles (70) des Ventiltfedertellergliedes (60) befestigt ist, das obere Teil des Kolbengliedes (78) zur Kennzeichnung des Ausgleichbehälters (81) einen Hohlraum und unter diesem eine Öffnung hat, 30

dem Kolbenglied (78) befindet, sich ein Käfigglied (86) unter dem Kugelglied (84) befindet, und ein Federglied (88) zwischen dem Käfigglied (86) und dem Dichtungsglied (72) angebracht ist.

12. Vorrichtung nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, daß ein Nutring (68) das Kappenglied (66;191,192) innerhalb des oberen Teiles (70) des Ventiltfedertellergliedes (60; Fig. 3) befestigt, das Kappenglied (66;191,192) einen oberen Teil (191) aus gehärtetem Stahl oder einem ähnlichen Material und einen unteren Teil (192) aus Leichtaluminium oder einem ähnlichen Material einschließt und weiterhin einen Behälter (94) mit Zugangsöffnungen (96) in dem Kappenglied (66;191,192) hat, um den Eintritt von Öl in den Behälter (94) zu erlauben, sich der untere Teil (192) des Kappengliedes (66;191,192) über der Ventilschaftaufnahmeöffnung befindet, 35
- sich ein Kolbenglied (100) in Form eines hohlen, um 180 ° gedrehten Bechers innerhalb des unteren Teils des Kappengliedes (192) befindet, wobei dieses Kolbenglied in seiner eingebuchteten Wand eine Öffnung (106) hat, sich ein Kugelglied (108) neben einem Käfigglied (110) sowie unter und ausgerichtet auf die Öffnung (106) befindet, sich ein hohler Kolben (102) unter dem Käfigglied und entgegengesetzt zum Kolbenglied (100) befindet, um als ein Dichtungsglied zu funktionieren, und sich ein Federglied (112) zwischen dem Kolbenglied (100) und dem hohlen Kolben (102) befindet, um auf das Käfigglied (110) einzuwirken und das Kugelglied (108) in Richtung auf die Öffnung (106) zu treiben. 40
13. Vorrichtung nach einem der Ansprüche 1 bis 12, gekennzeichnet durch ein hydraulisches Kolbenmittel (78;104) im Innern des Gehäusegliedes (60; Fig. 2) neben dem Kappenmittel (66;191), um einen hydraulischen Ausgleichbehälter (81;94) zwischen dem Kolbenmittel (78;104) und dem Kappenmittel (66;191) zu kennzeichnen, so daß in Benutzung die Druckausübung auf das Kappenglied (66;191) durch das Betätigungsmittel das Kolbenmittel (78;104) nach innen bewegt, um die Flüssigkeit innerhalb des Behälters (81;94) zu komprimieren und die Bewegung des Kappenmittels (66;191) auf die Kombination aus Gehäuse und Ventiltfederteller (60; Fig. 2) und über die Kombination aus Gehäuse und Ventiltfederteller (60; Fig.2) auf den Ventilschaft zu übertragen. 45

Revendications

1. Appareil pour compenser la dilatation thermique entre la tige d'une soupape sous pression de ressort et le moyen d'actionnement de la tige de soupape à l'intérieur d'un moteur à combustion interne, ledit appareil comprenant un organe de retenue pour le ressort de soupape et un organe d'ajustage pour effectuer ladite compensation, l'organe d'ajustage comprenant un corps servant de partie de, ou de conteneur pour, un moyen d'ajustage actionnable hydrauliquement, lequel, lors de l'utilisation, effectue ladite compensation, caractérisé par le fait que :

- le corps (60 ; Figure 2) de l'organe d'ajustage sert additionnellement comme étant ledit organe de retenue pour le ressort de soupape ;
- dans l'une des extrémités de ces corps et organe de retenue du ressort de soupape combinés (60 ; Figure 2), est pratiquée une ouverture (76 ; 101) de réception de la tige de soupape, ce par quoi le corps doit être retenu de façon amovible sur la tige de soupape par une clé de maintien ;
- l'autre extrémité, opposée, du corps et organe de retenue du ressort de soupape combinés est fermée par un couvercle (66 ; 191) qui est ajustable longitudinalement en position par rapport au moyen d'ajustage (78, 84 ; 100, 102, 104, 106, 108, 110, 112) et, lors de l'utilisation, est étroitement adjacent au moyen d'actionnement de la tige de soupape devant être rappelé de cette façon vers la tige de soupape ;

et par le fait que ledit moyen d'ajustage actionnable hydrauliquement (78, 84 ; 100, 102, 104, 106, 108, 110, 112) permet une restauration de la relation de position désirée entre ledit couvercle (66 ; 191) et ledit moyen d'actionnement.

2. Appareil selon la revendication 1, caractérisé par le fait qu'un élément d'étanchéité (72 ; 102) est positionné dans ledit organe de retenue de ressort de soupape (60 ; Figure 2) entre ledit couvercle (66 ; 191, 192) et ladite ouverture (76 ; 101) de réception de la tige de soupape, et par le fait que lesdits corps et organe de retenue du ressort de soupape combinés (60 ; Figure 2), couvercle (66 ; 191, 192) et élément d'étanchéité (72 ; 102) forment une chambre de pression hydraulique (80 ; 94) à l'intérieur desdits corps et organe de retenue du ressort de soupape combinés (60 ; Figure

2), ladite chambre de pression (80 ; Figure 2) ayant une communication ouverte (74) dans ladite ouverture (76 ; 101) de réception de la tige de soupape, qui, en fonctionnement normal, est fermée par ledit élément d'étanchéité (72 ; 102) de façon à retenir le fluide hydraulique sous pression à l'intérieur de ladite chambre de pression hydraulique (80 ; Figure 2).

3. Appareil selon la revendication 1 ou la revendication 2, caractérisé par le fait que le couvercle (66 ; 191, 192) est monté sur la partie supérieure ouverte dudit organe (60 ; Figure 2) de retenue du ressort de soupape, un élément d'étanchéité (72 ; 102) est positionné dans ledit organe (60 ; Figure 2) de retenue du ressort de soupape entre ledit couvercle (66 ; 191, 192) et ledit alésage (76 ; 101) de réception de la tige de soupape, et par le fait que lesdits organe (60 ; Figure 2) de retenue du ressort de soupape, couvercle (66 ; 191, 192) et élément d'étanchéité (72 ; 102) forment une chambre de pression hydraulique (80 ; 94) à l'intérieur dudit organe (60 ; Figure 2) de retenue du ressort de soupape, ladite chambre de pression (80 ; Figure 2) ayant une communication ouverte (74) dans ledit alésage (76 ; 101) de réception de la tige de soupape, qui, en fonctionnement normal, est fermée par ledit élément d'étanchéité (72 ; 102) de façon à retenir le fluide hydraulique sous pression à l'intérieur de ladite chambre de pression hydraulique (80 ; Figure 2).

4. Appareil selon la revendication 3, caractérisé par le fait que ledit élément d'étanchéité (72 ; 102) est adapté pour pouvoir être retiré dudit organe (60 ; Figure 2) de retenue du ressort de soupape.

5. Appareil selon la revendication 3 ou 4, caractérisé par un moyen de pression hydraulique (78 ; 100, 104, 106, 108, 110, 112) dans ladite chambre de pression hydraulique (80 ; 94) pour l'ajustage de la relation spatiale dudit couvercle (66 ; 191, 192) par rapport audit élément d'étanchéité (72 ; 102), afin d'ajuster ladite dilatation thermique.

6. Appareil selon la revendication 3 ou 4, caractérisé par le fait que ledit moyen de pression hydraulique comprend un piston (78) disposé entre ledit couvercle (66) et ledit élément d'étanchéité (72) dans ladite chambre de pression hydraulique (80) et adapté pour augmenter la pression de fluide à l'intérieur de ladite chambre (80) lorsque ledit couvercle (66) est enfoncé par ledit moyen d'actionnement ; et

en outre caractérisé par un réservoir (81) de fluide hydraulique adapté pour adresser du fluide hydraulique à ladite chambre (80).

7. Appareil selon la revendication 6, caractérisé par le fait que ledit réservoir (81) de fluide hydraulique est situé à l'intérieur dudit piston (78) et ledit organe (60) de retenue du ressort de soupape comprend en outre un réservoir de fluide secondaire inter-connecté au réservoir (81) de fluide hydraulique mentionné en premier, par au moins une ouverture (90) dans ledit couvercle (66). 5 10
8. Appareil selon la revendication 7, caractérisé par le fait que ledit réservoir de fluide secondaire est doté d'une ouverture d'entrée (92) pour l'entrée dans celui-ci du fluide hydraulique sous pression en provenance du système de lubrification d'un moteur à combustion interne. 15 20
9. Appareil selon la revendication 8, caractérisé par le fait que ledit couvercle (66) est doté d'au moins une ouverture (93) pour le passage du fluide du système de lubrification en dehors soit du réservoir (81) de fluide hydraulique mentionné en premier, soit dudit réservoir de fluide secondaire, et en outre caractérisé par un moyen pour adresser ledit fluide sous pression du système de lubrification à travers ladite (ou lesdites) ouverture(s) (92 et/ou 93) afin de lubrifier la surface supérieure dudit couvercle (66). 25 30
10. Appareil selon la revendication 8 ou la revendication 9, caractérisé par le fait que ladite ouverture d'entrée (92) ou chacune desdites ouvertures (92, 93) permet une entrée de fluide dans ledit réservoir de fluide secondaire et son introduction à partir de celui-ci, par l'intermédiaire de la (ou des) ouverture(s) (90) mentionnée(s) en premier, dans ledit réservoir (81) de fluide hydraulique mentionné en premier, par projection dudit fluide dans ladite (ou lesdites) ouverture(s) (90) mentionnée(s) en premier par un mouvement de va-et-vient dû à l'actionnement de l'organe d'ajustage hydraulique. 35 40 45 50
11. Appareil selon l'une des revendications 6 à 10, caractérisé par le fait que : 55
 - ledit couvercle (66) est retenu par un circlip (68) à l'intérieur d'une partie supérieure (70) dudit organe (60) de retenue du ressort de soupape ;
 - le piston (78) à une région creuse dans sa partie supérieure pour définir ledit ré-

servoir (81) mentionné en premier et une ouverture est pratiquée dans ledit piston au-dessous de ladite région creuse ;

- une bille (84) est située au-dessous de ladite ouverture dans ledit piston (78) ;
- une cage (86) est située au-dessous de ladite bille (84) ; et
- un ressort (68) est disposé entre la cage (86) et l'élément d'étanchéité (72).

12. Appareil selon la revendication 1 ou la revendication 2, caractérisé par le fait que :
 - un circlip (68) retient ledit couvercle (66 ; 191, 192) à l'intérieur d'une partie supérieure (70) dudit organe (60 ; Figure 2) de retenue du ressort de soupape ;
 - ledit couvercle (66 ; 191, 192) comprend une partie supérieure (191) en un matériau de type acier trempé et une partie inférieure (192) en un matériau de type aluminium léger et, en outre, un réservoir (94) y est défini avec des ouvertures d'accès (96) dans ledit couvercle (66 ; 191, 192) pour permettre une entrée d'huile dans ledit réservoir (94) ;
 - ladite partie inférieure (192) dudit couvercle (66 ; 191, 192) est positionnée au-dessus de ladite ouverture de réception de la tige de soupape ;
 - un piston (100) de forme creuse, de type coupelle inversée, est situé à l'intérieur de ladite partie inférieure (192) du couvercle, ce piston ayant une ouverture (106) dans sa paroi droite ;
 - une bille (108), localisée par une cage (110), est disposée au-dessous et en alignement avec ladite ouverture (106) ;
 - un piston creux (104) est situé au-dessous de ladite cage et en relation d'opposition par rapport audit piston (100) au-dessus de lui et de façon à procurer un élément d'étanchéité ; et
 - un ressort (112) est situé entre le piston (100) et le piston creux (104), pour agir sur ladite cage (110) et rappeler la bille (108) vers ladite ouverture (106).

13. Appareil selon la revendication 1, caractérisé par un piston hydraulique (78 ; 104) disposé à l'intérieur du corps (60 ; Figure 2) au voisinage du couvercle (66 ; 191) pour définir un réservoir (81 ; 94) de fluide hydraulique entre le piston (78 ; 104) et le couvercle (66 ; 191), de telle sorte que, lors de l'utilisation, un enfoncement du couvercle (66 ; 191) par le moyen d'actionnement déplace le piston (78 ; 104) vers l'intérieur pour comprimer le fluide maintenu à l'intérieur dudit réservoir (81 ; 94) et

transférer le mouvement du couvercle (66 ;
191) auxdits corps et organe de retenue du
ressort de soupape combinés (60 ; Figure 2)
et, par l'intermédiaire des corps et organe de
retenue du ressort de soupape combinés (60 ; 5
Figure 2), à la tige de soupape.

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