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# Datasheet for the decision of 21 April 2009

**Case Number:** T 0778/07 - 3.2.06

**Application Number:** 99970148.5

**Publication Number:** 1119689

**IPC:** F01L 1/24

**Language of the proceedings:** EN

**Title of invention:**
Valve train assembly

**Patentee:**
Eaton S.r.l.

**Former Opponent**
INA-Schaeffler KG

**Opponent:**
Ford-Werke GmbH

**Headword:**
-

**Relevant legal provisions:**
-

**Relevant legal provisions (EPC 1973):**
EPC Art. 56

**Keyword:**
"Inventive step - yes (after amendment)"

**Decisions cited:**
-

**Catchword:**
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 0778/07 - 3.2.06

# D E C I S I O N
**of the Technical Board of Appeal 3.2.06**
**of 21 April 2009**

**Appellant I:** (Patent Proprietor)
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**Decision under appeal:** **Interlocutory decision of the Opposition Division of the European Patent Office posted 12 March 2007 concerning maintenance of European patent No. 1119689 in amended form.**

**Composition of the Board:**

**Chairman:** P. Alting Van Geusau
**Members:** G. Pricolo
K. Garnett

## Summary of Facts and Submissions

I. The appeal stems from the interlocutory decision of the Opposition Division posted on 12 March 2007 maintaining European patent No. 1 119 689 in amended form on the basis of the second auxiliary request filed at the oral proceedings. The main request was rejected for lack of novelty over document

D1 : Abstract of JP-A-58-88412 (Patent Abstracts of Japan) and translations into English and German;

and the first auxiliary request for lack of inventive step over the teaching of D1 combined with

D4 : US-A-4 762 099; or

D8 : DE-A-196 17 523.

As regards the claims of the second auxiliary request, the opposition division came to the conclusion that the subject-matter claimed therein met the requirements of Articles 123(2), 54 and 56 EPC.

II. The patent proprietor (appellant I) and the opponent (appellant II, being the sole opponent left after the withdrawal of the opposition of the other opponent during the proceedings before the opposition division) each lodged an appeal against this decision. The notices of appeal were received at the EPO on 22 and 11 May 2007, respectively, and the payments of the appeal fee were recorded on these same days. The statements setting out the grounds of appeal were received at the EPO on 20 and 12 July 2007 respectively.

With its statement of grounds of appeal, the appellant (patent proprietor) requested maintenance of the patent as amended according to the enclosed main, first, second, or third auxiliary requests. The second auxiliary request corresponded to the request as allowed by the opposition division.

III. In the communication accompanying the summons to oral proceedings dated 1 February 2008, the Board gave a preliminary opinion in which objections under Article 123(2) EPC in respect of all the requests were raised.

IV. Oral proceedings, at the end of which the decision of the Board was announced, took place on 21 April 2009.

The appellant I (patentee) requested that the decision under appeal be set aside and the patent be maintained on the basis of the request filed during the oral proceedings.

The appellant II (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

V. The independent claims 1 and 13 according to the sole request of the appellant I read as follows:

"1. A valve train assembly comprising a valve train carrier having a plurality of individual rocker arm fulcra each of which forms part of a hydraulic lash adjuster; and a plurality of rocker arms, each rocker arm being attached to a respective fulcrum, and being

pivotable about the fulcrum, the attachment being arranged not to inhibit pivoting reciprocation about a first axis to enable valve operation or rotation about a second axis along the length of the rocker arm to permit self-adjustment, wherein each rocker arm has a part-spherical surface for mating with a corresponding surface of the fulcrum to which it is attached by means of an apertured resilient sheet which is snap-fitted over the fulcrum to form a self-supporting assembly, wherein the assembly has been manufactured and then pre-assembled separately from, but is operatively attachable to, an internal combustion engine having a camshaft such that the rocker arms are movable by cams of the camshaft in order to operate valves of the engine."

"13. A method of assembling an internal combustion engine, the method comprising:
(a) providing a valve train assembly which has been manufactured and pre-assembled separately from the internal combustion engine, the providing step comprising:
(i) providing a valve train carrier having a plurality of individual rocker arm fulcra each of which forms part of a hydraulic lash adjuster;
(ii) attaching a rocker arm to each fulcrum by means of an apertured resilient sheet which is snap-fitted over the fulcrum to obtain a self-supporting assembly, the attachment being arranged not to inhibit pivoting reciprocation about a first axis to enable valve operation or rotation about a second axis along the length of the rocker arm to permit self-adjustment and wherein each rocker arm has a part-spherical surface

for mating with a corresponding surface of the fulcrum to which it is attached; and
(b) subsequently mounting the carrier with the attached rocker arm on a cylinder head of the internal combustion engine such that each rocker arm is brought into functional relationship with a respective engine valve."

VI. The arguments of the appellant II can be summarized as follows:

The subject-matter of claim 1 differed from the valve train assembly disclosed by D1 only in that each rocker arm was attached to the respective fulcrum by means of an apertured resilient sheet which was snap-fitted over the fulcrum. According to D1, each rocker arm was attached to its respective fulcrum by means of a presser plate, which was affixed to the cylinder head cover and engaged protrusions of the rocker arm. The skilled person faced with the problem of simplifying the assembly would consider the teaching of D8, consisting of the attaching of the rocker arm to the fulcrum by means of an apertured resilient sheet. D8 did not mention that the apertured resilient sheet was snap-fitted over the fulcrum, but, for an embodiment using a wire retention clamp instead of an apertured sheet, disclosed that the fulcrum could be hooked to the clamp from below, i.e. that the clamp could be snap-fitted over the fulcrum. Accordingly, the skilled person would obviously consider using an apertured resilient sheet which could be snap-fitted over the fulcrum, thereby arriving at the subject-matter of claim 1 in an obvious manner. The subject-matter of claim 1 was moreover obvious in the light of D1 and D4.

The latter document disclosed the use of a snap ring for attaching the fulcrum to the rocker arm. Since it was flat, the snap ring could be regarded as an apertured sheet.

Alternatively, the subject-matter of claim 1 was obvious when taking D4 as the closest prior art. D4 did not disclose hydraulic lash adjusters. However, the use of hydraulic lash adjusters was obvious in view of D8. When introducing hydraulic lash adjusters in the valve train assembly according to D4, the skilled person would obviously consider using the same means for attaching the fulcra to the rocker arms as disclosed by D8, namely an apertured resilient sheet which was snap-fitted over the fulcrum.

VII. The appellant I's arguments, as far as they are relevant to this decision, may be summarized as follows:

Neither D8 nor D4 disclosed attaching each rocker arm to the respective fulcrum by means of an apertured sheet snap-fitted over the fulcrum. D8 disclosed several embodiments. In the embodiments described with respect to Figures 1 to 3, the rocker arm was attached to the fulcrum by means of a generally U-shaped sheet metal retention clip. The presence of a clip required that the fulcrum engaged the rocker arm prior to the attachment of the clip; the clip was then attached to the assembly of fulcrum and rocker arm by sliding it over these elements. In the embodiment described with respect to Figures 7 and 8, the rocker arm was attached to the fulcrum by means of a wire retention clamp. D8 did not disclose that the fulcrum was attached to the rocker arm from below after the clamp had been attached

to the rocker arm. D4 disclosed rocker arms attached to respective fulcra in a suspended fashion by means of a snap ring. However, the snap ring was not snap-fitted over the fulcrum; snap fitting only took place in connection with the snap ring being fitted into its seat in the rocker arm. Accordingly, none of the prior art combinations suggested by the appellant I could render obvious the claimed subject-matter.

## Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

2.1 The patent as granted includes two set of claims: a first set of claims for the Contracting States GB, DE, FR and IT, and a second set of claims for the Contracting States AT, BE, CH, CY, DK, ES, FI, GR, IE, LU, MC, NL, PT, SE. Claim 1 is identical in both sets of claims, whilst the independent method claim 17 of the first set is more limited than the independent method claim 18 of the second set, because it specifies that each individual rocker arm fulcrum forms part of a lash adjuster.

The claims according to request under consideration are for all Contracting States.

2.2 Claim 1 is amended over granted claim 1, which is undisputedly based upon the disclosure of the application as filed, by including the following features:

(1) the lash adjuster is hydraulic;
(2) the attachment is arranged not to inhibit pivoting reciprocation about a first axis to enable valve operation or rotation about a second axis along the length of the rocker arm to permit self-adjustment;
(3) each rocker arm has a part-spherical surface for mating with a corresponding surface of the fulcrum to which it is attached;
(4) each rocker arm is attached to a respective fulcrum by means of an apertured resilient sheet which is snap-fitted over the fulcrum,
(5) to form a self-supporting assembly.

Features (1), (3) and (4) are, respectively, the additional features of dependent claims 3, 5 and 18 of the application as filed. Feature (2) is taken from the description of the application as filed (see page 2, lines 16 to 20), where it is disclosed in a general context. Feature (5) is also taken from the description of the application as filed (see page 9, lines 5 to 8), where it is clearly disclosed as being a consequence of the attachment of the rocker arms to their respective fulcra in accordance with feature (4).

2.3 Method claim 13 is amended over granted claim 17 according to the first set of claims, which is undisputedly based upon the disclosure of the application as filed and which, as explained above, is more limited than granted claim 18 according to the second set of claims, by including features corresponding to the above-mentioned features (1) to (5), and further by specifying that step (b) is carried out "subsequently". The latter feature is clearly disclosed, in a general context, in the description of

the application as filed (see page 9, first full paragraph).

2.4 Dependent claims 2 to 12 and 14 to 16 correspond to granted dependent claims 3, 5 to 8, 11 to 16, 18, 20 and 21, respectively, of the first set of claims.

2.5 The description has been adapted to the amended claims and to mention the prior art known from document D1.

2.6 Therefore, the amendments made do not give rise to objections under Article 123(2) and (3) EPC.

3. *Novelty*

After examination of the cited prior art, the Board is satisfied that the subject-matter of Claim 1 is novel. Since novelty has not been in dispute there is no need to expand on this matter.

4. *Inventive step*

4.1 In the Board's view, the closest prior art in respect of the subject-matter of claim 1 is represented by a valve train assembly according to document D1 (reference is made to the English translation). Using the wording of claim 1 of the patent in suit, this document undisputedly discloses (see Figs. 1 and 3) a valve train assembly comprising: a valve train carrier (8) having a plurality of individual rocker arm fulcra (11, 12) each of which forms part of a hydraulic lash adjuster (see page 4, l. 21 ff); and a plurality of rocker arms (29, 30), each rocker arm being attached to a respective fulcrum, and being pivotable about the

fulcrum, the attachment being arranged not to inhibit pivoting reciprocation about a first axis to enable valve operation, wherein each rocker arm has a part-spherical surface for mating with a corresponding surface of the fulcrum (see Fig. 2) to which it is attached.

D1 undisputedly does not disclose the feature of claim 1 according to which each rocker arm is attached to the respective fulcrum by means of an apertured resilient sheet which is snap-fitted over the fulcrum to form a self-supporting assembly. In fact, according to D1 (see Figs. 3 to 5 and the paragraph bridging pages 5 and 6), the rocker arm is attached to the respective fulcrum by means of a presser plate (33), which, on the one hand, has a central portion affixed to the cylinder head cover (8) by a bolt (35) and, on the other hand, has projecting pieces (34) that engage lateral protrusions (31, 32) of the rocker arms (29, 30) and press the rocker arms against the fulcra (11, 12).

Appellant I disputed that in D1 the attachment was arranged not to inhibit rotation about a second axis along the length of the rocker arm to permit self-adjustment. In the Board's view this feature is inherent to the assembly of D1, due to the presence of a spherical joint between the fulcrum (12) and the rocker arm (30, see Fig. 2), the resilience of the above-mentioned projecting pieces (34) of the presser plate (33), and the necessary play existing between mating parts: these features inevitably allow a certain degree of rotation about an axis along the length of the rocker arm.

Appellant I further disputed that in D1 the assembly was manufactured and then pre-assembled separately from, but was operatively attachable to, an internal combustion engine having a camshaft such that the rocker arms were movable by cams of the camshaft in order to operate valves of the engine. However, this feature is explicitly disclosed by D1, because it is stated therein (see page 6, lines 9 to 17) that when the cylinder head cover (8) is mounted in the cylinder head (1), in a state in which the rocker arms are supported by the cylinder head cover (see page 6, lines 5 to 8), the rocker arms engage the cam (7). Accordingly, D1 discloses that the assembly consisting of cylinder head cover, fulcra and rocker arms, is attached to an engine on which a camshaft is already mounted.

Therefore, the subject-matter of claim 1 differs from D1 only in that each rocker arm is attached to the respective fulcrum by means of an apertured resilient sheet which is snap-fitted over the fulcrum to form a self-supporting assembly.

4.2 As explained above, the attachment means disclosed by D1 comprise a presser plate (33) affixed to the cylinder head cover and projecting pieces (34) engaging lateral protrusions (31, 32) of the rocker arms (29, 30) that press the rocker arms against the fulcra (11, 12). Assembling these different parts is clearly more laborious than assembling the rocker arm by snap-fitting an apertured sheet over the fulcrum, even though the apertured resilient sheet must clearly be fastened to the rocker arm.

Accordingly, the objective technical problem underlying the subject-matter of claim 1 is to facilitate attachment of the fulcrum to the rocker arm.

4.3 D8 discloses (see Fig. 1) a valve train assembly with a plurality of rocker arms (1), each rocker arm being attached to a respective fulcrum. According to the teaching of D8, the attachment is made by means of a metal sheet retention clip (*Blechhaltekammer* 8), as shown in the embodiment according to Figs. 1 and 2, or by means of a wire retention clamp (*Drahthaltebügel* 9) as shown in the embodiment of Figs. 7 to 10. However, there is no disclosure in D8 of snap-fitting an apertured resilient sheet over the fulcrum. In this respect, it is noted that by reciting that the apertured sheet is snap-fitted over the fulcrum, claim 1 implies that the fulcrum is inserted into the aperture of the resilient sheet, whereby the aperture flexes on insertion and then un-flexes when the fulcrum is fully inserted, to retain the fulcrum. As regards the metal sheet retention clip (8), which can be regarded as an apertured resilient sheet, there is no indication in D8 that it provides or is even suitable for snap-fitting. The fact that the aperture of the clip is U-shaped (see Fig. 3) rather suggests that the clip is slid in a lateral direction (from left to right as looked at in Fig. 3) onto the fulcrum and rocker arm when these two components are engaged, such that the U-shaped aperture engages an undercut (7) of the fulcrum. As regards the wire retention clamp, which cannot be regarded as an apertured resilient sheet, the appellant II referred to the disclosure on col. 8, lines 23 to 28 of D8, where it is stated that one advantage of a wire retention clamp (*Drahthaltebügel*), as compared to the

metal sheet retention clip, is that the fulcrum (*Abstützelement*) can be hooked (*eingehängt*) into the clamp (*Bügel,* i.e. the wire retention clamp) from below without any problem. This disclosure corroborates the above interpretation of how the attachment with the metal sheet retention clip is made because it suggests that if the metal sheet retention clip is used, then the fulcrum cannot be inserted from below. Further, it is noted that this disclosure does not specify whether the fulcrum is hooked into the clamp after the clamp is mounted to the rocker arm, as argued by appellant II, or whether the fulcrum is hooked into the clamp from below and then these two components are brought into engagement with the rocker arm. Accordingly, D8 does not suggest the claimed solution to the above-mentioned technical problem, but rather teaches away by suggesting that insertion of the fulcrum from below (i.e. with the clip or clamp being fitted over the fulcrum) requires a wire element.

4.4 D4 discloses (see Fig. 1) a valve train assembly comprising a valve train carrier (15) having a plurality of adjusting bolts (24) with lower spherical pivot portions (25) forming individual rocker arm fulcra (25), and a plurality of rocker arms (28). Each rocker arm (28) is attached to a respective fulcrum (25) in a suspended fashion by means of a snap ring (27, in Figs. 4 and 5, or 27' in Figs. 6 and 7). In the embodiment shown in Figs. 4 and 5, the snap ring 27 is formed by winding a wire material into a shape consisting of a coil part ($27_1$) and a pair of hook parts ($27_2$) projecting from opposite sides of the coil part (see col. 4, lines 6 to 10). In assembly, the fulcrum (25) of the bolt (24) is first fitted into a supporting

hole (29) of the rocker arm, then the coil part ($27_1$) of the snap ring is fitted over the cylindrical portion of the bolt (24) and the hook parts ($27_2$) are inserted at their tip ends into retaining holes (31) of the rocker arm. Accordingly, in this embodiment the snap ring is neither an apertured sheet nor it is snap-fitted over the fulcrum. Snap-fitting only takes place in connection with the hook parts of the ring when they are inserted at their tip ends into the retaining holes of the rocker arm.

In the embodiment of Figs. 6 and 7, the snap ring (27') has a different shape: it is a flat ring having a notch (51). The snap ring is received in an annular groove (50) in the supporting hole (29) of the rocker arm (28). Snap-fitting takes place on insertion of the snap ring into the annular groove (the ring, which is compressed when inserted into the hole, expands to its original configuration when engaging the annular groove). Since in the assembled state the snap ring cannot expand to allow the snap ring to be snap-fitted over the fulcrum (25, which is the spherical portion of the bolt 24) because it is in the annular groove, it is clear for the skilled person that in this embodiment the snap ring must first be fitted over the cylindrical portion of the bolt (24), then the fulcrum (25) fitted into the supporting hole (29) of the rocker arm, and finally the snap ring fitted into the annular groove (50).

Accordingly, also in this embodiment, there is no disclosure of the snap ring (which even if flat cannot be regarded as an apertured sheet) being snap-fitted over the fulcrum. From the above it follows that snap-fitting has, in the context of D4, very different technical implications than snap-fitting in the context of claim 1 of the patent in suit. Therefore D4 cannot

suggest an attachment by means of an apertured sheet which is snap-fitted over the fulcrum.

4.5 Thus, the Board concludes that starting from D1 the teachings of D4 and D8 do not render obvious the subject matter of claim 1.

4.6 The appellant II alternatively argued that the subject-matter of claim 1 was obvious when taking document D4 as the closest prior art. In the Board's view, however, document D4 represents a less appropriate starting point than D1. D4 does not disclose the feature distinguishing the subject-matter of claim 1 from D1 and additionally, it does not disclose that the lash adjuster is hydraulic (in D4 adjustment is made by means of adjusting bolt 24 and lock nut 26; see col. 5, lines 1 to 12). In any case, since the cited prior art does not suggest an attachment by means of an apertured sheet which is snap-fitted over the fulcrum, as explained above, it follows that a conclusion different from the above cannot be reached even if D4 is taken as the starting point.

4.7 The same conclusion is reached in respect of the method of claim 13, since the latter includes the feature of attaching a rocker arm to each fulcrum by means of an apertured resilient sheet which is snap-fitted over the fulcrum to obtain a self-supporting assembly, which feature, for the reasons set out hereinabove, is not rendered obvious by the cited prior art.

4.8 It follows that claims 1 and 13, together with dependent claims 2 to 12 and 14 to 16, the amended description filed at the oral proceedings, and the

drawings as granted, form a suitable basis for maintenance of the patent in amended form.

## Order

## For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of:

   (a) Claims 1 to 16 according to the request filed during the oral proceedings;
   (b) Description consisting of columns 1 to 5 together with the additional sheet setting out insertion "X" in column 1, all as filed during the oral proceedings;
   (c) Figures 1 and 11 as granted.

The Registrar: The Chairman:

M. Patin P. Alting van Geusau