

**Internal distribution code:**

- (A)  Publication in OJ  
(B)  To Chairmen and Members  
(C)  To Chairmen  
(D)  No distribution

**Datasheet for the decision  
of 16 December 2010**

**Case Number:** T 0788/09 - 3.2.06

**Application Number:** 01106890.5

**Publication Number:** 1128028

**IPC:** F01L 1/344

**Language of the proceedings:** EN

**Title of invention:**  
Valve timing control device

**Applicant:**  
AISIN SEIKI KABUSHIKI KAISHA

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 123(2)

**Relevant legal provisions (EPC 1973):**  
EPC Art. 76(1), 84, 56

**Keyword:**  
"Divisional application - amendments (allowable)"  
"Clarity (yes)"  
"Inventive step (yes)"

**Decisions cited:**  
T 0962/04

**Catchword:**  
-



Case Number: T 0788/09 - 3.2.06

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.06  
of 16 December 2010

**Appellant:** AISIN SEIKI KABUSHIKI KAISHA  
1, Asahi-machi 2-chome  
Kariya City, Aichi Pref. (JP)

**Representative:** Serjeants  
25 The Crescent  
King Street  
Leicester, LE1 6RX (GB)

**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 13 November 2008  
refusing European application No. 01106890.5  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** P. Alting van Geusau  
**Members:** G. Pricolo  
R. Menapace

## Summary of Facts and Submissions

- I. The appeal lies from the decision of the examining division, posted on 13 November 2008, refusing the European patent application 01 106 890.5, which had been filed as a divisional application of earlier European patent application No. 97 302 104.1.
- II. The Examining Division considered that claim 1 according to the main and auxiliary requests of the applicant contained subject-matter extending beyond the content of the earlier application as filed, contrary to the requirements of Article 76(1) EPC 1973. The Examining Division also considered that claim 1 of both request did not meet the requirements of Article 84 EPC 1973, and of Article 56 EPC 1973 because its subject-matter was obvious in the light of the prior art disclosed by documents
- D1 : US-A-4 858 572;
- D2 : DE-A-39 22 962;
- D3 : EP-A-590 696.
- III. The appellant (applicant) filed a notice of appeal on 19 January 2009 and paid the appeal fee on the same day. With the statement setting out the grounds of appeal, received at the European Patent Office on 18 March 2009, the appellant requested that the decision of the Examining Division be set aside and a patent be granted on the basis of the main request or the auxiliary request underlying the decision under appeal. The appellant further requested the reimbursement of the

appeal fee in view of an alleged substantial procedural violation.

- IV. In an annex to the summons for oral proceedings pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal, posted on 5 October 2010, the Board expressed the preliminary opinion that there was no objective deficiency affecting the entire proceedings (see e.g. J 7/83, OJ EPO 1984, 211) that would justify the reimbursement of the appeal fee in accordance with Rule 103(1)(a) EPC, and that the findings of the Examining Division in respect of Article 76(1) EPC 1973 were correct. The Board further objected to the main and auxiliary request under Article 123(2) EPC.
- V. With letter dated 30 November 2010, the appellant withdrew its request for reimbursement of the appeal fee.
- VI. Oral proceedings, at the end of which the decision of the Board was announced, took place on 16 December 2010.

The appellant requested that the decision under appeal be set aside and that a patent be granted in the following version: description and claims filed during the oral proceedings, Figures 1 to 8 as originally filed.

- VII. The independent claim under consideration reads as follows:

"1. A valve timing control device comprising: a rotor (30) fixed on a cam shaft (10) of an engine (E); a

housing member (50) rotatably mounted on the cam shaft (10) so as to surround the rotor (30); means for driving the housing member (50) from a rotational output of the engine; a chamber (R0) defined between the housing member (50) and the rotor (30) and having a pair of circumferentially opposed walls (55,56); a vane (40) mounted on the rotor (30) and extending outwardly therefrom in the radial direction into the chamber (R0) so as to divide the chamber into a first pressure chamber (R1) and a second pressure chamber (R2); and a fluid supplying means (100) for supplying fluid under pressure selectively to one of the first and second pressure chambers (R1 and R2) thereby establishing a pressure differential between said pressure chambers (R1 and R2) so as to effect relative rotation between the rotor (30) and the housing member (50); characterized in that a torsion spring (92,93) is provided, comprising a coil spring (92,93) coaxially surrounding the rotor (30) and having a first end portion anchored to the rotor (30) and a second end portion anchored to the housing member (50), the coil spring being under a sufficient pre-tension to bias the vane (40) in the advanced direction for the full range of relative movement of the rotor (30) and the housing member (50)."

### **Reasons for the Decision**

1. The appeal is admissible.

2. *Amendments*

2.1 *Article 123(2) EPC*

- 2.1.1 Claim 1 under consideration differs from claim 1 of the divisional application as filed only in that, in the characterizing portion, the term "*cam shaft (10)*", which is recited twice, has been replaced by "*housing member (50)*".

Claim 1 of the divisional application as filed recites, in the preamble, that the rotor (30) is fixed on the cam shaft (10), and, in the characterizing portion, that a first end portion of the coil spring (92, 93) is anchored to the rotor (30) and a second end portion is anchored to the cam shaft (10). There is clearly an inconsistency between the definition in the preamble and the definition in the characterizing portion, because if the rotor is fixed on the cam shaft and the coil spring end portions are anchored, respectively, to the rotor and the cam shaft, then the coil spring is anchored to parts which are fixed relative to each other, whereby the coil spring would serve no purpose. It is clear for the skilled reader that the coil spring can perform its function only if it is anchored to two relatively movable parts. This inconsistency is resolved by the description of the divisional application as filed, according to which (see par. [0016]) a first end portion of the coil spring is anchored to the rotor and a second end portion is anchored to the housing member, rather than to the cam shaft.

There is a further inconsistency in claim 1 of the divisional application as filed, namely between the definition in the preamble of claim 1 that the rotor is fixed on the cam shaft and the definition in the characterizing portion that there is a relative movement between the rotor and the cam shaft. Also this inconsistency is resolved by the description of the divisional application as filed, according to which (see in particular par. [0016]) a relative movement exists between the rotor and the housing member, not between the rotor and the cam shaft which are fixed to each other.

Therefore, the amendments made to claim 1 remove obvious inconsistencies in the wording of the claim and bring it into line with the disclosure in the description of the divisional application as filed.

In fact, the same claim was already filed with letter of 17 January 2005 during the proceedings before the Examining Division, which regarded the amendments as corrections (see point 2 of the communication dated 7 September 2007).

2.1.2 Claim 2 is identical to claim 2 of the divisional application as filed. The description has been amended to bring it into conformity with the new claim 1 and to better reflect the prior art disclosed by D1.

2.1.3 Accordingly, the amendments are not objectionable under Article 123(2) EPC.

2.2 Article 76(1) EPC 1973

2.2.1 In the decision under appeal, the Examining Division objected that the feature of claim 1 according to which "*the coil spring biases the vane in the advanced direction*" was disclosed in the earlier application as filed in combination with the following features:

- the camshaft is an exhaust camshaft;
- the coil spring is designed to urge the rotor to its locking position so as to fit a locking pin into a locking hole of the rotor, thereby fixing the rotor relative to the stator.

2.2.2 As explained by the appellant during the oral proceedings before the Board, on a proper reading of the earlier application as filed, it is clear that the technical problem underlying the earlier application as filed is solved by means of the spring only.

The description of the earlier application (reference is made to the published application EP-A-806 550), in the portion "Background of the invention", describes the valve timing control device according to D1. There (see in particular col. 1, line 52 to col. 2, line 4) it is explained that in the prior art device, when the combustion engine is stopped, the oil pump stops delivering the fluid under pressure, whereby "*the amount of fluid under pressure in the first pressure chamber and in the second pressure chamber is decreased with the lapse of time. Then, when the combustion engine is restarted, there is not enough fluid under pressure in the chambers. Therefore, each of the vanes rotates to retard the valve timing and crashes into the*



*opposed wall of its chamber. The sound of the crash is distressing for the driver and the passengers".*

The device according to D1 (see Fig. 2) is provided with spring-biased locking pins 37 and 47 for maintaining the vanes 30 to 35, which are mounted on rotor (hub) 18, in the advanced or in the retarded position (see col. 3, lines 15 to 25 and 36 to 41). A spring-biased locking pin 60 is provided for the same purpose of maintaining the vanes in the advanced position in the preferred embodiment described in the present application (see Figs. 4 to 7). As was pointed out by the appellant, the skilled person would understand that the problem of the vanes crashing on restarting of the engine mentioned in the description of the earlier application as filed can only be a problem that arises in a situation in which the pins 37 and 47 of D1 are not in the locking condition (i.e. the pins 37 and 47 do not engage the corresponding bores 39, 40 in Fig. 2 of D1, or the pin 60 does not engage one of the corresponding bores). Indeed, in D1 locking pins are provided to lock the vanes in one of the two possible conditions, namely the advanced or the retarded condition. Thus the skilled person would assume that, when stopping the engine, the vanes are locked in one of these conditions. Accordingly, it is clear that the solution to this problem cannot be the provision of locking pins, but the provision of the coil spring, which is the sole means disclosed in the earlier application as filed that opposes the rotation of the vanes in the retarded direction by biasing them in the advanced direction when the pins are not in the locking condition (see col. 6, lines 4 to 6, referring

to the counterclockwise direction which is the advanced direction, see col. 5, lines 27, 28).

In the earlier application as filed there is further disclosed (see col. 5, last line to col. 6, line 6) that when the engine is stopped and the fluid pressure in the chambers is drained, then the coil-spring urges the rotor in the counterclockwise direction, so as to fit the pin 60 into the hole 32 of the rotor 30. Having regard to the above, it is clear that the function of the coil spring, consisting in bringing the pin to the locking condition in the absence of fluid pressure, is merely an ancillary function, which is not inextricably linked to the primary function of opposing the movement of the vanes in the retarded direction when the pin is not engaged.

2.2.3 In the decision under appeal (see page 7), the Examining Division stated that the skilled person could not be sure that *under the single action of a spring* the vane would stay immobile and would not strike repeatedly against the circumferential opposed walls of the valve timing mechanism, whereby it was clear that the feature of the locking pin was essential to the definition of the invention, i.e. for the solution of the problem.

In the device of D1, as explained above, locking pins are provided to lock the vanes in one of the two possible conditions, namely the advanced or the retarded condition. When stopping the engine, the vanes are in one of these conditions. With the fluid pressure decreasing, thus also on restarting the engine, the vanes would still be maintained in the condition in

which they were when the engine was stopped, due to the fact that the locking pins are spring biased. However, it is clear from the earlier application as filed that the problem of the vanes crashing into the opposed walls of the chambers on restarting the engine arises specifically with the device according to D1, i.e. even in the presence of locking pins. In fact, as explained by the appellant during the oral proceedings before the Board, this problem only became apparent after the valve timing control device according to D1 was put in operation in an automobile. Under normal automobile use conditions, a crashing noise was produced on starting the engine, but only every now and then, without apparent reason. Thus, the Board agrees with the appellant that it is clear for the skilled reader that the function of the spring is not that of maintaining the vanes immobile, this being the function of the locking pin, but that of opposing the vane movement in the retarded direction when there is not enough pressure in the chambers and when, for whatever reason, the pins are not in their locking position, so as to avoid crashing of the vanes against the opposed walls of the chambers.

From the above it also follows that it is not necessary, contrary to the Examining Division's assertion, to provide a spring which is such as to ensure that the vanes remain immobile also in the absence of a locking caused by the locking pin.

2.2.4 Thus the Board agrees with the appellant that in the earlier application as filed the feature of claim 1 according to which the coil spring biases the vane in

the advanced direction is not necessarily linked to the feature concerning the presence of a locking pin.

2.2.5 Furthermore, as pointed out by the appellant:

i) it is common general knowledge that a valve timing control device can either be used on one of the exhaust and inlet cam shafts, or that each of them can be provided with a valve timing control device, and  
ii) the above-mentioned problem of the vanes crashing on restarting of the engine is acknowledged in the introductory portion of the description ("Background of the invention") of the earlier application as filed without reference to a specific cam shaft, and  
iii) it is clear that the above-mentioned problem of the vanes crashing on restarting of the engine is irrespective of whether the cam shaft is an exhaust or an inlet cam shaft, since in any case the vanes of the valve timing device would rotate in the retarding direction on restarting the engine if they are not restrained by means of a locking mechanism such as a locking pin.

It is therefore clear for the skilled reader that the problem of the vanes crashing on restarting of the engine is not linked to a specific cam shaft, but might occur on either one of the exhaust cam shaft or the inlet cam shaft. Since, as discussed above, the solution to this problem resides in the provision of a coil spring, which would perform the identical function of biasing the vane in the advanced direction irrespective of whether it is associated to an exhaust cam shaft or an inlet cam shaft, it is clear for a skilled person that the feature of claim 1 that the coil spring biases the vane in the advanced direction, even if specifically disclosed in connection with an

exhaust cam shaft in the preferred embodiment, is not inextricably linked to the feature that the camshaft is an exhaust camshaft.

2.2.6 Thus the Board agrees with the appellant that in the earlier application as filed the feature of claim 1 according to which the coil spring biases the vane in the advanced direction is not necessarily linked to the feature that the cam shaft is an exhaust cam shaft.

2.2.7 This Board is aware that Board 3.2.04, in the appeal proceedings following opposition proceedings in respect of the patent granted on the earlier application, came to the conclusion (see point 5.1 of decision T 0962/04) that there was no basis in the application as filed (which is the *earlier* application as filed in the present case) for introducing in claim 1 the feature "*wherein the action of the spring element on the rotor is such as to bias the rotor to an advanced locked timing condition*" without specifying that the cam shaft was an exhaust cam shaft. However, in coming to its decision, which is anyway not binding for the present appeal, Board 3.2.04 was not confronted with the detailed analysis of the technical context in which said feature is disclosed, as made by the appellant in the present proceedings, which allows to come to a different conclusion.

2.2.8 In the communication dated 7 September 2009 the Examining Division found that even if the term "torsion spring" was not disclosed in the earlier application as filed, it was clear for the skilled person that the disclosed coil spring was indeed a torsion spring. It further found that there was no basis in the earlier

application as filed for the feature of claim 1 that the coil spring was "under a sufficient pre-tension to bias the vane".

The Board agrees with the former finding but disagrees with the latter. As a matter of fact, the feature that the coil spring is under a sufficient pre-tension to bias the vane is implicitly disclosed in the earlier application as filed. A sufficient pre-tension is indeed necessary to provide the required function of biasing the vane in the advanced direction for the full range of relative movement of the rotor and the housing member. As already explained above (cf. point 2.2.3), this feature does not imply that the pre-tension is such as to ensure that the vanes remain immobile in any circumstances also in the absence of a locking caused by the locking pin. Simply, the pre-tension must be such to oppose the movement of the vanes in the retarded direction when the pin is not engaged.

2.2.9 Therefore, the subject-matter of claim 1 does not extend beyond the content of the earlier application as filed. Accordingly, claim 1 is not objectionable under Article 76(1) EPC 1973.

2.3 *Article 84 EPC 1973 - clarity*

In the decision under appeal, the Examining Division objected that claim 1 did not meet the requirements of Article 84 because it did not include the feature that the coil spring urged the rotor in the counterclockwise direction so as to fit the pin into the hole of the rotor. However, as explained above (points 2.2.2 and 2.2.3), the function of the coil spring to fit the pin

into the hole of the rotor is an ancillary function which is not inextricably linked to the primary function of urging the rotor in the counterclockwise direction, i.e. the advanced direction, when the pin is not engaged. Therefore, the objection of the Examining Divisions under Article 84 fails.

3. *Novelty*

Novelty was never questioned by the Examining Division and the Board sees no reason for a different finding.

4. *Inventive step*

- 4.1 The Board agrees with the Examining Division and with the appellant that document D1 represent the closest prior art and that it discloses a device in accordance with the preamble of claim 1, namely a valve timing control device comprising: a rotor (18) fixed on a cam shaft (11) of an engine; a housing member (drive member 15, see Fig. 1) rotatably mounted on the cam shaft (11) so as to surround the rotor (18); means (including teeth 15a) for driving the housing member from a rotational output of the engine; a chamber (20-25) defined between the housing member and the rotor and having a pair of circumferentially opposed walls (20a, 20b, ..., 25a, 25b); a vane (30-35) mounted on the rotor and extending outwardly therefrom in the radial direction into the chamber so as to divide the chamber into a first pressure chamber (20c-25c) and a second pressure chamber (20d-25d); and a fluid supplying means (60) for supplying fluid under pressure selectively to one of the first and second pressure chambers thereby establishing a pressure differential between said

pressure chambers so as to effect relative rotation between the rotor and the housing member (see col. 4, line 33 ff.).

- 4.2 The subject-matter of claim 1 differs from this prior art device by the features of the characterizing portion according to which a torsion spring is provided, comprising a coil spring coaxially surrounding the rotor and having a first end portion anchored to the rotor and a second end portion anchored to the housing member, the coil spring being under a sufficient pre-tension to bias the vane in the advanced direction for the full range of relative movement of the rotor and the housing member.

As explained above (see point 2.2.2), the distinguishing features solve the technical problem of opposing the crashing of the vanes on restarting of the engine.

- 4.3 In the decision under appeal, the Examining Division held that the skilled person would consider providing the springs 21 described by D2 in the device according to D1 because these springs provided the same advantage as the coil spring according to the present application, that is to return the vanes to a preferential position which is towards advanced timing.

D2 relates to a valve timing control device in which hydraulic fluid is supplied for biasing the vanes 16, which are directly formed on the cam shaft 2, in the clockwise direction (as viewed in Fig. 2) against the force of return springs 21. If no hydraulic fluid is supplied, then the return springs 21 bias the vanes in



the counterclockwise direction (see col. 3, lines 6-32). Thus, depending on the presence or absence of hydraulic fluid pressure, the cam shaft 2 can be maintained at two different angular positions relative to the drive means 5, which is connected to the engine crank shaft. The disclosure of D2 relative to the springs 21 is not related to the problem of avoiding that the vanes crash on restarting of the engine. In fact, the return springs 21 provide the same function performed by hydraulic means in the device according to D1, where the angular position of the cam shaft relative to the drive means is determined by hydraulic fluid pressure, depending on whether the pressure is in the first pressure chambers (20c-25c) or in the second pressure chambers (20d-25d). Accordingly, there is no indication in D2 that would lead a skilled person to provide the return springs 21 of the device according to D2 in the device according to D1 in order to solve the above-mentioned technical problem. Furthermore, the springs of the device according to D2 are disposed generally on a circumference about the axis of the cam shaft 2, whereby each spring 21 acts on the side of a corresponding vane 16. There is no spring coaxially surrounding the rotor as required by claim 1 of the present application. Thus, even if the skilled person would think of providing springs 21 in accordance with the disclosure of D2 in the device according to D1, he would still not arrive at the claimed subject-matter.

- 4.3.1 The Examining Division further considered that the skilled person would combine the teachings of documents D1 and D3.

However, D3 discloses a different type of valve timing control device which does not employ rotary vanes but a pair of oppositely acting, single acting hydraulic cylinders 54 and 56 (see col. 7, lines 16 to 55) for advancing or retarding the position of the camshaft relative to the crankshaft (see also claim 1). The Examining Division referred in particular to the coil spring 670 (see Figs. 26 and 27) which imposes a countertorque on the camshaft 626 (see col. 14, lines 51-58) for neutralizing the effects of unidirectionally acting torque on the rotating camshaft, for example, when the cams of the camshaft are followed by sliding followers (see col. 15, lines 21-30). Hence, the coil spring 670 is disclosed in D3 a different context and provides a different function than the coil spring in accordance with claim 1.

- 4.4 The other documents cited in the European search report being less relevant than D1-D3, it is concluded that the solution to the above-mentioned technical problem in accordance with claim 1 is not rendered obvious by the available prior art. The subject-matter of claim 1, and likewise of dependent claim 2, involves therefore an inventive step (Article 56 EPC 1973).

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
  
2. The case is remitted to the Examining Division with the order to grant a patent on the basis of the following documents:
  - Description (pages 1-7) and claims 1 and 2, both filed during the oral proceedings before the Board;
  - Figures 1 to 8 as originally filed.

The Registry

The Chairman

M. Patin

P. Alting van Geusau