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**Datasheet for the decision  
of 17 August 2010**

**Case Number:** T 0801/09 - 3.2.06

**Application Number:** 98309624.9

**Publication Number:** 0919699

**IPC:** F01D 5/28

**Language of the proceedings:** EN

**Title of invention:**

Columnar zirconium oxide abrasive coating for a gas turbine engine seal system

**Patentee:**

United Technologies Corporation

**Opponent:**

SIEMENS AKTIENGESELLSCHAFT

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 113, 123(2), 54(2), 112(1)(a)

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Right to be heard - alleged procedural violation"

"Amendments - allowable"

"Novelty - yes"

"Request of a referral to the Enlarged Board of Appeal - refused"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0801/09 - 3.2.06

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.06  
of 17 August 2010

**Appellant:** SIEMENS AKTIENGESELLSCHAFT  
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**Representative:** -

**Respondent:** United Technologies Corporation  
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**Representative:** Leckey, David Herbert  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
13 March 2009 concerning maintenance of  
European patent No. 0919699 in amended form.

**Composition of the Board:**

**Chairman:** K. Garnett  
**Members:** G. Pricolo  
G. de Crignis

## Summary of Facts and Submissions

I. The appeal lies against the interlocutory decision of the Opposition Division posted on 13 March 2009 maintaining European patent No. 0 919 699 in amended form on the basis of the patent proprietor's main request.

II. The independent claim 1 according to the main request allowed by the Opposition Division reads as follows:

"A gas turbine engine seal system, comprising a rotary member (20;34) having an abrasive tip (28;32) disposed in rub relationship to a stationary, abradable seal surface (30;36), wherein the abrasive tip (28;32) comprises a material harder than the abradable seal surface (30;36) such that the abrasive tip can cut the abradable seal surface (30;36), characterized in that: the abrasive tip (28;32) comprises a zirconium oxide abrasive coat (44) having a columnar structure, wherein the zirconium oxide abrasive coat comprises zirconium oxide and about 11 wt% to about 13 wt% of yttrium oxide.

The main request further included independent claim 2 directed to a gas turbine engine rotary member having an abrasive tip.

III. The Opposition Division considered that the amendments made, consisting in restricting claims 1 and 2 as granted to the range of about 11 to about 13 wt% of yttrium oxide (the claims as granted recited "about 3 wt% to about 25 wt% of a stabilizer selected from the group consisting of yttrium oxide, magnesium oxide, calcium oxide and mixtures thereof), could reasonably

have been expected, because the range was disclosed in the description as one of the two most preferred ranges for the amount of yttrium oxide. Furthermore, the amended claims were filed one month in advance of the oral proceedings and therefore the opponent had had sufficient time to carry out an additional search. Accordingly, the opponent's right to be heard was respected.

The Opposition Division came to the conclusion that the amended claims did not contain subject-matter extending beyond the content of the application as filed, and that the claimed subject-matter was novel and involved an inventive step over the cited prior art, including:

D2 : EP-A-366 924;

D3 : EP-A-707 091;

E1 : "Characterization of yttria and rare earth-oxide doped zirconia materials for high temperature applications", J.F. Jue, R. Nageswaran and A. Virkar, in "Elevated temperature Coatings Science and Technology", pp. 124-134, 1994.

IV. The opponent lodged an appeal against this decision. The notice of appeal was received at the EPO on 31 March 2009 together with a statement of grounds and the appeal fee was duly paid.

With its statement of grounds of appeal, the appellant (opponent) submitted that the Opposition Division committed a substantial procedural violation in admitting the patent proprietor's main request. The

claimed range for yttrium oxide was mentioned in the description, not in the granted claims. Therefore, a corresponding limitation of the claims could not have been reasonably expected. Moreover, the period of one month between the filing of the amendments and the date of the oral proceedings was insufficient for carrying out an additional search. An additional search required at least three months. Furthermore, the amendments did not meet the requirements of Article 123(2) EPC because the disclosure of the claimed range in the application as filed referred to an "intended temperature range" which was not recited in claim 1.

The appellant further submitted that the claimed subject-matter was not novel over D2. Although D2 did not explicitly mention that the thermal barrier coating was applied to the blade tip, this was a necessary result of the coating process used in D2. Also the claimed range of 11 to 13 wt% for yttrium oxide was not novel over D2: it was not sufficiently small as compared to the range disclosed by D2, it was close to the disclosed value of 8 wt%, and it did not provide any particular advantages.

- V. With its reply dated 29 October 2009, the respondent (patent proprietor) criticized the appellant's submissions concerning novelty. It stated that there was no disclosure or suggestion in D2 that the thermal barrier coating had, or should have, any abrasive properties, whereas the person skilled in the art would clearly not view the disclosed coating as an abrasive coating. Thus, when, for example, a blade was produced with an abrasive tip coating for use in a seal system,

it would be understood that the tip must, in use, be abrasive. There was no explicit disclosure in D2 of the coating being applied to the tip of the turbine component. It was well known in the art, e.g. from

D10 : US-A-5 603 603,

that the tip of a turbine component was often treated differently from the rest of the component. In particular, D10 disclosed applying the abrasive coating material only to the tip of a blade by carefully controlling the plating area, e.g. by masking. Furthermore, the purpose of the 11-13 wt% yttria range claimed was to provide an abrasive tip coating that had satisfactory abrasive properties and better durability. There was nothing in D2 which would lead the skilled person to the claimed range for this purpose, as it dealt with providing a thermal barrier coating which was not abrasive. Moreover, as shown by document

E2 : results of rub rig abrasability tests conducted by the respondent on 10 November 1994,

filed with the reply to the statement of grounds of appeal, the claimed abrasive tip coatings provided for improved cutting efficiency. Therefore, the selected sub-range of 11-13 wt% was not an arbitrary selection but a purposive one.

The respondent requested as an auxiliary measure that the claims of the patent be amended by deleting independent claim 2 and renumbering and amending the dependent claims accordingly.

VI. In the communication accompanying the summons to oral proceedings the Board expressed the preliminary opinion that the Opposition Division did not commit the alleged procedural violations and that the amendments appeared to meet the requirements of Article 123(2) EPC. The Board moreover expressed doubts in respect of the novelty of the subject-matter of claims 1 and 2 over the disclosure of document D2.

VII. With letter dated 8 July 2010, the appellant informed the Board that it would not attend the oral proceedings. As regards the Board's preliminary opinion set out in the communication, the appellant requested that the case law be indicated according to which features from the description can be introduced into the claims one month before the oral proceedings. It further submitted that even if no new documents were filed by the opponent after the Opposition Division took its decision, this could not repair *a posteriori* the violation of its right to be heard. It further pointed out that no particular advantages could be recognized for the ranges of yttria disclosed in the application as filed of 6-8 wt% and 11-13 wt%.

VIII. Oral proceedings, at the end of which the decision of the Board was announced, took place on 17 August 2010.

As announced in its letter, the appellant did not attend the oral proceedings. Since it had been duly summoned, however, the oral proceedings were continued in its absence in accordance with Rule 115(2) EPC and Article 15(3) Rules of Procedure of the Boards of Appeal. The appellant had previously requested that the decision under appeal be set aside and the patent be



revoked, alternatively that a question referred to in its letter dated 8 July 2010 be referred to the Enlarged Board of Appeal.

During the oral proceedings the respondent withdrew its previous main request (dismissal of the appeal).

Instead it requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request filed during the oral proceedings, this request corresponding to its auxiliary request contained in its letter of 29 October 2009. The respondent essentially repeated the arguments in support of novelty presented in writing, in particular the argument that D2 did not disclose a rotary member having an abrasive tip forming part of a seal system, in which, as required by claim 1, the abrasive tip is disposed in rub relationship to a stationary member and thus, in use, cuts the abradable surface of the stationary member.

## **Reasons for the Decision**

1. The appeal is admissible.
2. *The alleged procedural violation*
  - 2.1 During the oral proceedings before the Opposition Division, the opponent raised the issue of the additional search in respect of the amendments which had been filed by the patentee on 12 September 2008, one month before the date of the oral proceedings (13 October 2008). The minutes (see point 8) mention that the opponent submitted that "*the burden of the*

*search for a specific search was too high to be mastered within the 1 month delay before oral proceedings, so that the opponent's right to be heard was not warranted".* It was only after deliberation (points 12 and 13 of the minutes) that the Opposition Division announced the conclusion that the amendments "were filed in due time". Therefore, the opponent was given the opportunity to present its view before the decision on the admissibility of the request was taken. Accordingly, its right to be heard was not violated in that respect.

- 2.2 It has however to be assessed whether the Opposition Division acted in a reasonable manner by continuing the oral proceedings after having admitted the request, instead of adjourning the oral proceedings to give the opponent time for carrying out an additional search.

The appellant argued that the time necessary for carrying out a search was at least 3 months. However, the appellant has not submitted any evidence or arguments which would corroborate, on an objective basis, this submission. Furthermore, the claims have been restricted to a specific range (11 to 13 wt%) of a specific stabilizer (yttrium oxide) selected from the group mentioned in claims 1 and 2 as granted. Under these circumstances the Board considers that the Opposition Division's view that "*the opponent had one month time before oral proceedings to limit his original search including the range from 3 wt% - 25 wt% of yttrium oxide to the range from 11 wt% - 13 wt%*" (point 2 of the decision under appeal) was reasonable. Therefore, irrespective of whether the amendment could have been expected or not, the Opposition Division did

not act unreasonably in continuing the oral proceedings after having admitted the request, because the opponent had had sufficient time before the oral proceedings to carry out any additional search.

2.3 From the above it follows that the alleged procedural violation under Article 113 EPC did not take place.

2.4 The appellant requested that the case law be indicated according to which features from the description can be introduced into the claims one month before the oral proceedings. This question is irrelevant for deciding the present case as the Opposition Division had a discretion to refuse the amendments, or to subsequently adjourn the oral proceedings, even if the amendments were filed before the final date for making written submissions in accordance with Rule 116(1) EPC (in the present case, the final date set by the Opposition Division in its summons was 12 September 2008, i.e. 1 month before the date of oral proceedings).

2.5 The appellant further submitted that the fact that it had not filed any new documents after the Opposition Division took its decision could not repair the violation of its right to be heard. However, a procedural violation did not take place, for the reasons given above, these reasons being independent of the possible filing of any new documents.

### 3. *Referral of a question to the Enlarged Board*

In its letter dated 8 July 2010 the appellant states under section 1, that "as an auxiliary measure, this question should be referred to the Enlarged Board". The

Board notes that it is not clear whether the question referred to concerns the issue of case law according to which features from the description can be introduced into the claims one month before the oral proceedings (see point 2.5 above) or the argument that the substantial procedural violation could not be repaired by the fact that no new documents were filed by the opponent (see point 2.6 above).

However, it follows from the above that both issues are irrelevant for deciding the present case. Since the admissibility of a referral under Article 112(1)(a) EPC presupposes that an answer to the question is necessary for the referring Board to be able to decide the appeal (cf. G 3/98, point 1 of the reasons), the appellant's request to refer a question to the Enlarged Board must be refused.

#### 4. *Amendments*

4.1 The claims according to the request filed during the oral proceedings correspond to the claims according to the auxiliary request filed by the respondent with letter dated 29 October 2009, i.e. they correspond to the claims according to the request maintained by the Opposition Division but in which independent claim 2 is deleted and the dependent claims 3 to 14 are renumbered and amended accordingly (in particular by excising the reference to the rotary member of claim 2).

4.2 The appellant contested the introduction of the range of about 11 wt% to about 13 wt% yttrium oxide in claim 1 of the patent as maintained by the Opposition Division, which is identical to claim 1 of the request

under consideration, because the application as filed disclosed that the range was advantageous at a temperature range whilst the claim was not so limited. The application as originally filed discloses that the zirconium oxide abrasive coat comprises "about 6 wt% to about 8 wt% yttrium oxide or about 11 wt% to about 13 wt% yttrium oxide, depending on the intended temperature range" (see the corresponding passage in paragraph [0023] of the patent as granted). This passage conveys the information that one of the yttrium oxide ranges is preferred, depending on the intended temperature range. As correctly pointed out by the Opposition Division in the decision under appeal, this information relates to the intended use of the claimed product. As such, it does not constitute a technical feature of the product itself (the information may however play a role in assessing the technical effect obtainable with the claimed product). Accordingly, as already stated in the communication accompanying the summons to oral proceedings, the fact that claim 1 defines the range of 11 to 13 wt% yttrium oxide without specifying a temperature range does not constitute an infringement of Article 123(2) EPC.

4.3 The further amendments concern the description. These amendments were made without going beyond those necessary to adapt the description to the amended set of claims.

4.4 Therefore, the amendments comply with the provisions of Article 123(2) EPC.

5. *Novelty*

5.1 The appellant contested novelty of the subject-matter of claim 1 over D2 only.

5.2 D2 relates to ceramic thermal barrier coating systems for metallic components of gas turbine engines, such as superalloy blades and vanes (see col. 1, lines 11-16). The object of D2 is to provide an improved ceramic coating that resists the oxidation and corrosion effects of the hot combustion gas stream (see col. 1, lines 39 to 41; col. 2, lines 35 to 41). In a particular embodiment, D2 discloses (see Fig. 2) a blade (10) having (see col. 3, last line and col. 7, lines 10 to 12) a ceramic coat which is zirconia stabilized with from 6% to 30%, more preferably from 8% to 20%, yttria. In the Board's view, in the context of D2 it would not make sense to apply the coat only to some parts of the blade, excluding the tip. The respondent's reference to D10 (col. 4, lines 10 to 16), disclosing the controlling of the plating area, does not justify a different conclusion, because the abrasive coat according to D10 is useful for limited, specific portions of the blade only. The coat according to D2 is abrasive because of the intrinsic abrasive properties of the coat material: according to the patent in suit as granted, a coat comprising zirconium oxide and about 3 wt% to about 25 wt% of yttrium oxide is an abrasive coat, and therefore the same is true for the coat of D2 which comprises 8% to 20% yttria. Accordingly, D2 discloses a rotary member having a tip with an abrasive coat.

5.3 D2 however does not disclose a seal system comprising a rotary member having an abrasive tip in which, as required by claim 1, the abrasive tip of the rotary member is disposed in rub relationship to a stationary, abradable seal surface, wherein the abrasive tip comprises a material harder than the abradable seal surface such that the abrasive tip cuts the abradable seal surface (as a consequence of the presence of a rub relationship). In fact, D2 is silent about the relative arrangement of the rotary member and the stationary member, which is not necessarily one in which a rub relationship is present and in which the abrasive tip, in use, cuts the seal surface. A turbine may well be designed with a sufficient gap between the rotary member and the stationary member such that no rub occurs (see e.g. D3, page 2, lines 23 to 45).

Therefore, the subject-matter of claim 1 is novel over D2.

5.4 In its statement of grounds of appeal, the appellant further referred to documents D1 and D3, but only in respect of specific features of claim 1. These documents are not prejudicial to the novelty of the claimed subject-matter. D3 discloses a range of 6.5 to 9 % for yttria (see col. 3, line 31), which is distinct from the claimed range, and E1 does not specifically relate to a gas turbine engine seal system but to zirconia coatings in general.

5.5 It follows from the above that the appellant's arguments do not succeed in persuading the Board that the Opposition Division's conclusion in respect of the

subject-matter of claim 1 as regards novelty (Article 52(1) and 54(2) EPC) was incorrect.

6. *Inventive step*

In its appeal grounds (last page) the appellant submitted that, since novelty was not given, the claimed subject-matter was also not inventive. It did not, however, submit any reasoned statement on inventive step. In the absence of any arguments to the contrary, the Board of its own motion sees no reason to deviate from the Opposition Division's finding that the subject-matter of claim 1 involves an inventive step (Article 56 EPC).

7. Therefore claim 1, together with dependent claims 2 to 13, the amended description filed at the oral proceedings, and the figures 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 1-13 according to the main request filed during the oral proceedings;
  - (b) The amended description pages numbered 2 to 6 as filed during the oral proceedings;
  - (c) Figures 1-4 as granted.
3. The appellant's request for referral of a question to the Enlarged Board of Appeal is refused.

The Registrar:

The Chairman:

M. Patin

K. Garnett