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**Datasheet for the decision  
of 11 October 2013**

**Case Number:** T 0514/10 - 3.2.07

**Application Number:** 98307244.8

**Publication Number:** 985745

**IPC:** C23C 28/00

**Language of the proceedings:** EN

**Title of invention:**

Bond coat for a thermal barrier coating system

**Patent Proprietor:**

GENERAL ELECTRIC COMPANY

**Opponent:**

Siemens Aktiengesellschaft

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 100(c), 123(2), 123(3)

**Keyword:**

"Extension beyond the content of the application as filed  
(main request - yes)"

"Broadening of claim (auxiliary request - yes)"

"Inescapable trap (yes)"

**Decisions cited:**

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**Catchword:**

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Case Number: T 0514/10 - 3.2.07

**DECISION**  
of the Technical Board of Appeal 3.2.07  
of 11 October 2013

**Appellant:** Siemens Aktiengesellschaft  
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**Representative:** Kaiser, Axel  
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**Respondent:** GENERAL ELECTRIC COMPANY  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 5 February 2010  
rejecting the opposition filed against European  
patent No. 985745 pursuant to Article 101(2)  
EPC.

**Composition of the Board:**

**Chairman:** H. Meinders  
**Members:** H. Hahn  
E. Kossonakou

## Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division to reject the opposition against European patent No. 0 985 745.
- II. Insofar as relevant to the present decision, the opposition had been filed against the patent under Article 100(c) EPC for extending beyond the content of the application as originally filed.

In respect of this ground of opposition, the Opposition Division considered that claim 1 of the patent as granted complies with the requirements of Article 123(2) EPC. As the other grounds could not hold either against the patent as granted the opposition was rejected.

- III. With a communication dated 22 May 2013 and annexed to the summons to oral proceedings the Board presented its preliminary opinion with respect to claim 1 of the main request as filed by the respondent (patent proprietor) with its reply to the statement of grounds of appeal of 21 October 2010 and claim 1 of the patent as granted, being the auxiliary request (corresponding to the single request underlying the impugned decision), as formulated in that same letter.

The Board remarked amongst others that claim 1 of the main request appeared to contravene Article 123(3) EPC. Claim 1 of the auxiliary request, due to the - one point - definition of the thickness value of the diffusion zone of "**about** five micrometers", appeared to contravene Article 123(2) EPC since it seemed to add

new information to the teaching of the application as originally filed.

- IV. Neither party made any further submissions as a response to the Board's communication.
- V. Oral proceedings before the Board were held on 11 October 2013. To start, the respondent made a switch in the order of its two requests, so that the auxiliary request filed with its letter of 21 October 2010 should be the main request and the main request filed with said submission should become the auxiliary request. The (new) main request was then discussed for compliance with the requirements of Article 123(2) EPC. Thereafter the (new) auxiliary request was discussed for compliance with the requirements of Article 123(3) EPC.
- (a) The appellant requested that the decision under appeal be set aside and that the patent be revoked.
- (b) The respondent requested that the appeal be dismissed and the patent be maintained as granted, or alternatively that the decision under appeal be set aside and the patent be maintained on the basis of the auxiliary request, originally filed as main request with the submissions dated 21 October 2010.

At the end of the oral proceedings the Board announced its decision.

- VI. Claim 1 of the (new) main request (corresponding to claim 1 of the patent as granted) reads as follows:

"1. A component (10) having a thermal barrier coating system (20) on a surface thereof, the thermal barrier coating system (20) comprising:

a bond coat (24) deposited by physical vapor deposition on the surface of the component (10) by a physical vapor deposition technique, the bond coat (24) being a binary NiAl alloy of predominantly the beta phase and containing about 0.1 atomic percent zirconium; and a thermal-insulating ceramic layer (26) overlying the bond coat (24);

wherein the component has a diffusion zone (30) between the bond coat (24) and the component (10), the diffusion zone (30) having a reduced thickness of about five micrometers."

VII. Claim 1 of the (new) auxiliary request reads as follows (amendments as compared to claim 1 of the patent as granted are in bold with deletions in brackets; emphasis added by the Board):

"1. A component (10) having a thermal barrier coating system (20) on a surface thereof, the thermal barrier coating system (20) comprising:

a bond coat (24) deposited by physical vapor deposition on the surface of the component (10) by a physical vapor deposition technique, the bond coat (24) being a binary NiAl alloy of predominantly the beta phase and containing about 0.1 atomic percent zirconium; and a thermal-insulating ceramic layer (26) overlying the bond coat (24);

wherein the component has a diffusion zone (30) between the bond coat (24) and the component (10), the

diffusion zone (30) having a reduced thickness of **[about] up to** five micrometers."

VIII. The appellant argued, insofar as relevant for the present decision, essentially as follows:

The punctual definition of the diffusion zone thickness of **"about** five micrometers" of claim 1 of the patent as granted (main request) covers measuring accuracy tolerances but as such has no basis in the application as originally filed, let alone in an example in combination with a specific advantage. According to the constant jurisprudence this value of **"about** five micrometers" although representing a restriction compared to the range "up to about five micrometers" of dependent claim 6 as originally filed is not directly and unambiguously derivable from the application as originally filed. The description of the application as originally filed further discloses ranges of "not more than five micrometers" (see page 6, lines 3 and 4), "not more than above [*sic*] five micrometers" and "about 2.5 to 5 micrometers" (see page 9, lines 2 to 4). Thus the selection of the value "about five micrometers" from these original ranges represents an intermediate generalisation having no basis in the application as originally filed, contrary to Article 123(2) EPC.

A diffusion zone thickness value "five micrometers" as such was nowhere disclosed in this isolated form and it is the least preferred value of said ranges since it is the worst one. This is due to the fact that the diffusion zone should be as thin as possible, i.e. most preferably it should be zero which, however, is impossible in reality. Consequently, this specific

value as such was not derivable for the person skilled in the art from the teaching of the application as originally filed, let alone in a direct and unambiguous manner. Furthermore, the term "about" extends the scope of the value of "five micrometers" which is likewise not directly and unambiguously derivable from said range "about 2.5 to 5 micrometers". This definition can be interpreted such that the term "about" only refers to the value "2.5 micrometers" but could also be interpreted as referring to either endpoint of this range. In any case it is not clearly derivable from said range "about 2.5 to 5 micrometers" wherein the value "5 micrometers" actually represents a clear and sharp limit.

Consequently, this amendment of claim 1 during the examination proceedings: "the diffusion zone (3) having a reduced thickness of **about** 5 micrometers" contravenes Article 123(2) EPC.

According to claim 1 of the auxiliary request the objected definition "**about** five micrometers" of claim 1 of the patent as granted has been amended to the new definition "**up to** five micrometers" which represents an extension of the scope of claim 1 of the patent as granted. By this amended definition a new range is created which starts at about zero and extends to the uppermost value of five micrometers. This new definition is totally different from that of claim 1 as granted and it cannot be subsumed under its scope. Claim 1 of the auxiliary request thus clearly contravenes Article 123(3) EPC.

IX. The respondent argued, insofar as relevant for the present decision, essentially as follows:

As regards the main request it is maintained that the value of five micrometers for the thickness of the diffusion zone is clearly within the range disclosed in the application as originally filed, being the upper limit of either of the disclosed ranges of "up to about 5 micrometers" (claim 6) or "typically about 2.5 to 5 micrometers" (page 9, lines 2 to 5).

The thickness of the diffusion zone should be as small as possible, the intention is not to have any diffusion zone at all but a very thin diffusion zone up to about five micrometers may develop (see page 8, line 29 to page 9, line 4). Thus the upper limit of "about five micrometers" is disclosed in the application as originally filed. Therefore claim 1 of the patent as granted according to the main request complies with Article 123(2) EPC.

The word "about" in the final line of claim 1 of the auxiliary request has been replaced by the words "up to" taken from claim 6 as originally filed. A claim in accordance with this wording was suggested by the Examining Division, and in its letter of 21 September 2005 it stated that the claim had been amended accordingly. The wording now proposed does not amend the claim in such a way that it contains subject-matter which extends beyond the content of the application as filed, and therefore does not violate Art 123(2) EPC. Since the definition "about five micrometers" of claim 1 of the patent as granted includes the new definition "up to 5 micrometers" the



new wording does not violate Article 123(3) EPC either. By the amendment proposed the ground under Article 100(c) EPC is overcome, since the claim contains wording based on the application as filed, in particular the wording of originally filed claim 6, which was added to claim 1 during examination.

### **Reasons for the Decision**

1. *Admissibility of amendments made in claim 1 of the patent as granted (Articles 100(c) and 123(2) EPC)*
- 1.1 Claim 1 of the patent as granted ((new) main request) contains the feature "the diffusion zone (30) having a reduced thickness of **about five** micrometers" (see point VII above) which originates from an amendment made by the applicant/respondent during the examination proceedings of the patent in suit.
  - 1.1.1 The Opposition Division based its - for the respondent favourable - conclusion with respect to this amendment made in claim 1 of the patent as granted and the fulfilment of the requirements of Article 123(2) EPC on the fact that "the value 5 microns [*sic*] is originally disclosed as upper limit of the thickness of the diffusion layer (see claim 6 of the originally filed documents), and to limit a range to a single value, being that value one of the extreme [*sic*] does not infringe Art. 123(2)" (see point 2 of the reasons of the impugned decision).
  - 1.1.2 The Board reaches, however, the opposite conclusion for the following reasons.

- 1.2 Dependent claim 6 of the application as originally filed discloses the feature "the diffusion zone (30) having a thickness of **up to about five** micrometers" while the description thereof discloses "a diffusion zone of **not more than five** micrometers" (see page 6, lines 3 to 5; emphasis added by the Board) and "During subsequent heat treatment ... a very thin diffusion zone 30 of **not more than above** [*sic*] **five** micrometers, typically **about 2.5 to 5** micrometers, may develop" (see page 8, line 31 to page 9, line 4; emphasis added by the Board).
- 1.2.1 The aforementioned wording "not more than above five micrometers" appears to be erroneous and most presumably, in order to be consistent with the definition given in dependent claim 6, should actually read "not more than **about** five micrometers".
- 1.2.2 The application as originally filed discloses in general only open ranges of "**not more than five** micrometers", "**up to about five** micrometers" (or "**not more than about five** micrometers", see point 1.2.1 above) and the restricted range of "**about 2.5 to 5** micrometers" but the description contains no example with the single value "**about five** micrometers", let alone any statement that this value would represent a preferred (single) value of the thickness of the diffusion zone.
- 1.2.3 To the contrary, in the description it is stated that "The preferred PVD techniques are preferably carried out **to reduce the diffusion of the bond coat** 24 into the substrate. Preferably, deposition of the bond coat

24 results in virtually no diffusion between the bond coat 24 and the substrate 22" (see page 8, lines 27 to 31) and further "Importantly, **the minimal thickness of the diffusion zone** 30 promotes the initial formation of the oxide layer 28 as essentially pure aluminium oxide ... and reduces the amount of substrate material that must be removed during refurbishment of the thermal barrier coating system 20. Accordingly, articles such as the blade 10 shown in Figure 1 can be refurbished more times than would be possible if a traditional bond coat were used" (see page 9, lines 7 to 17; emphasis added by the Board).

Thus the teaching derived by the person skilled in the art from the application as originally filed is to minimize the thickness of the diffusion zone by selecting a suitable method for depositing the bond coat so that virtually no diffusion takes place and then to apply a heat treatment so that only a diffusion zone of minimal thickness may develop.

The respondent confirmed at the oral proceedings that it is actually the intention of the application underlying the patent in suit **not** to have any diffusion zone at all.

This teaching further implies to the person skilled in the art that the upper value of all these different disclosed ranges is actually less preferred and from its effect worse than the lower values thereof since the latter - the minimal one - is more advantageous with respect to the formation of a pure aluminium oxide layer and also with respect to the refurbishment of the components claimed in claim 1.

When asked by the Board at the oral proceedings the respondent further admitted that the thickness value "about five micrometers" is not presented as critical in the application as originally filed since the thickness of the diffusion zone should be as small as possible.

- 1.2.4 Consequently, this punctual value is not derivable for the person skilled in the art from the teaching of the application as originally filed, let alone in a direct and unambiguous manner as required by the longstanding jurisprudence (see Case Law of the Boards of Appeal of the European Patent Office, 7<sup>th</sup> edition 2013, section II.E.1.7.1).
- 1.2.5 Hence it is evident that the selection of the thickness value of the diffusion zone of "**about five** micrometers" adds information to the teaching of the application as originally filed by shifting the originally intended minimal thickness of the diffusion zone to a certain maximum limit thereof. Claim 1 of the patent as granted therefore contravenes Article 123(2) EPC. The main request is therefore not allowable.
2. *Admissibility of the amendment made in claim 1 of the (new) auxiliary request (Articles 123(2) and (3) EPC)*
  - 2.1 Claim 1 of the auxiliary request contains the amended feature "... the diffusion zone (30) having a reduced thickness of **up to** five micrometers" (see point VIII above). This feature can in principle be derived from e.g. claim 6 of the application as originally filed which says: not more than 5 micrometers, which means

≤5 micrometers so that the requirements of Article 123(2) EPC would be complied with.

- 2.1.1 As already stated in point 1.1 above, claim 1 of the patent as granted contains the punctual definition "**about** five micrometers".

This - imprecise - one point definition thus may encompass a thickness of the diffusion zone of say 4,5 to 5,4 micrometers, wherein the term "about" relates to the normal rounding off of numbers.

- 2.1.2 By replacing this previous definition "**about** five micrometers" by the new definition "**up to** five micrometers" according to claim 1 of the auxiliary request it is evident that a range with the upper limit of 5 micrometers is created which extends on its undefined lower limit side beyond the scope of claim 1 of the patent as granted and as interpreted above in point 2.1.1, contrary to Article 123(3) EPC.

This is due to the fact that the thickness could now start at a minimum thickness value of the diffusion zone of for example one micrometer (but it could also be almost zero micrometers) and extend **up to** five micrometers. This newly created range thus extends the scope of protection of claim 1 of the auxiliary request on the lower side ("up to") between e.g. 1 and 4.5 micrometers compared to the said range of 4.5 to 5.4 micrometers according to the definition "about five micrometers" of claim 1 of the patent as granted. The respondent's arguments to the contrary thus cannot hold.

2.1.3 Consequently, claim 1 of the auxiliary request contravenes Article 123(3) EPC. The auxiliary request is therefore not allowable.

## **Order**

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

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders