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**Datasheet for the decision
of 22 February 2010**

Case Number: T 0706/07 - 3.2.07

Application Number: 99300220.3

Publication Number: 0933448

IPC: C23C 28/00

Language of the proceedings: EN

Title of invention:

Improved diffusion aluminide bond coat for a thermal barrier coating system and a method therefor

Patent Proprietor:

GENERAL ELECTRIC COMPANY

Opponent:

SIEMENS AKTIENGESELLSCHAFT

Headword:

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Relevant legal provisions:

EPC Art. 123(2)

Relevant legal provisions (EPC 1973):

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Keyword:

"Oral proceedings: cancelled"

"Extension beyond the content of the application as originally filed (claim 1 - yes)"

Decisions cited:

T 0894/05, T 0801/02

Catchword:

-



Case Number: T 0706/07 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 22 February 2010

Appellant: SIEMENS AKTIENGESELLSCHAFT
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D-80506 München (DE)

Representative: -

Respondent: GENERAL ELECTRIC COMPANY
(Patent Proprietor) 1 River Road
Schenectady, NY 12345 (US)

Representative: Illingworth-Law, William Illingworth
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted
14 February 2007 concerning maintenance of
European patent No. 0933448 in amended form.**

Composition of the Board:

Chairman: H. Meinders
Members: H. Hahn
I. Beckedorf

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division to maintain the European patent EP-B-0 933 448 in amended form.

The Opposition Division held that the claims 1 to 15 of the single request as filed at the oral proceedings of 19 January 2007 met the requirements of Articles 123(2) and (3) EPC and of Article 100(b) EPC. The Opposition Division considered that the subject-matter of claims 1 and 7 of the main request was novel and involved an inventive step with respect to the closest prior art D17 (US-A-3 864 093).

- II. The appellant requested that the decision under appeal be set aside and that the patent be revoked. In case the Board should intend to confirm the impugned decision oral proceedings were requested.
- III. The respondent (patent proprietor) requested to dismiss the appeal. As an auxiliary request oral proceedings were requested.
- IV. Independent claims 1 and 7 under consideration in the decision under appeal read as follows:

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

a diffusion aluminide composite bond coat on the surface of the component, the bond coat containing a fine dispersion of fine oxides of aluminum, chromium,

and nickel and optionally oxides of cobalt and platinum group metals, the oxide dispersion being homogeneous and the oxides being distributed in the bond coat; and a ceramic layer overlying the bond coat."

"7. A method for forming a thermal barrier coating system on a surface of a component, the method comprising the steps of:

forming a diffusion aluminide bond composite coat on the surface of the component by initiating a vapor phase aluminizing process in the absence of an oxygen-containing gas, and then intermittently introducing an oxygen-containing gas into the vapor phase aluminizing process to form within the bond coat a fine dispersion of fine oxides selected from the group consisting of oxides of aluminum, chromium, nickel, cobalt and platinum group metals;

heat treating the component at a temperature of 1038°C (1900F) to 1066°C (1950F) for two to six hours to homogenize and ductilize the bond coat and its oxide dispersions and forming a ceramic layer on the bond coat."

V. With a communication dated 19 October 2009 and annexed to the summons to oral proceedings the Board presented its preliminary opinion with respect to claims 1 to 15 underlying the impugned decision, setting the ultimate date for filing submissions at one month before the oral proceedings, i.e. expiring 9 February 2010.

Amongst others the Board remarked that claim 1 appeared to contravene Article 123(2) EPC, in that:

"3.1 The application as originally filed discloses that "forming the bond coat **to include a dispersion of aluminum chromium, nickel, cobalt and/or platinum group metal oxides**" (see page 4, lines 14 to 16) and that "The bond coat may optionally overlie or underlie a layer formed of one or more of the same oxides as for the oxide dispersion, e.g. **aluminum, chromium, nickel, cobalt and platinum group metal oxides**" (see page 4, lines 21 to 24; claim 4). According to independent claims 1, 7 and 20 it is defined as "the bond coat containing a dispersion of **oxides chosen from the group consisting of aluminum, chromium, nickel, cobalt and platinum group metals**" (see claims 1, 7 and 20 as originally filed). Furthermore, the process yields "finely distributed primary and complex (i.e. compound) **oxides of aluminum, nickel, chromium and, if present, platinum group metals**" (see page 5, lines 3 to 6).

It further discloses that the diffusion platinum aluminide bond coat 16 according to the embodiment of figure 1 overlies the substrate 12 which can be made from nickel, iron and cobalt-base superalloys (see page 6, lines 7 to 14) and that said bond coat 16 is generally characterized by an additive layer - which contains an oxidation resistant MA1 intermetallic phase such as β -NiAl and also contains PtAl intermetallic phases such as PtAl₂ - which overlies a diffusion zone (see page 6, lines 14 to 27). Said dispersion of "oxides 20 are primary and complex oxides of those metals present at the surface of the substrate 12, such as aluminium, chromium, nickel and platinum.

Accordingly, the dispersion of oxides 20 is likely to **include alumina (Al₂O₃), chromia (Cr₂O₃), nickel oxide (NiO) and platinum dioxide (PtO₂)**, and compound oxides such as NiO-Cr₂O₃, Al₂O₃-NiO, etc." (see page 7, lines 16 to 27). Furthermore, it is disclosed that "another metal of the platinum metal group **instead of platinum**, which would result in the presence of oxides of that metal instead of platinum" (see page 7, lines 27 to 30).

The aluminum halide reacts at the substrate surface to form a MAI intermetallic, where M is iron, nickel or cobalt, depending on the substrate material, and PtAl intermetallics as a result of the presence of platinum on the substrate surface (see page 9, lines 4 to 9). Specimens of the nickel-base superalloy René N5 (in wt%: about 7.5 Co, 7.0 Cr, 1.5 Mo, 5.0 W, 3.0 Re, 6.5 Ta, 6.2 Al, 0.15 Hf, 0.05 C, 0.004 B, with the balance Ni and incidental impurities) were provided with bond coats of diffusion platinum aluminides, primarily **aluminum, nickel, chromium and platinum oxides** (see page 10, lines 13 to 22).

According to Römpps Chemie-Lexikon the definition "Pt-group metals" includes the six elements Ru, Rh, Pd, Os, Ir and Pt (see D20, page 3255, left hand column, "Platinmetalle"; annexed to the summons).

3.2 Thus taking account of the different embodiments of the application as originally filed the fine dispersion may contain:

a) oxides of aluminum, chromium, nickel, cobalt and/or platinum group metals (i.e. **without any preference:** aluminum or chromium or nickel or cobalt or platinum

- group metals, or any mixture of these metal oxides; derived from page 4);
- b) oxides chosen from the group consisting of aluminum, chromium, nickel, cobalt and platinum group metals (i.e. **without any preference**: e.g. alumina, or chromia; etc. or all of them; also derived from page 4 and claims 1, 7 and 20);
- c) oxides of aluminum, nickel, chromium and optionally platinum group metals (i.e. only three metal oxides and compounds thereof or optionally all four of them [i.e. cobalt **not** mentioned]; derived from page 5);
- d) alumina, chromia, nickel oxide and platinum dioxide (i.e. all four metal oxides and compound oxides thereof [i.e. cobalt not mentioned]; derived from page 7 and the examples of page 10);
- e) oxides of iron, aluminum and platinum, or nickel, aluminum and platinum, or cobalt, aluminum and platinum (i.e. only three metal oxides with cobalt being either not mentioned at all or not mentioned in combination with chromium; derived from the process description at page 9; and in the context of figure 1 and page 6).

Thus the application as originally filed:

- i) does **not** contain any explicit disclosure of the now claimed feature "oxides of aluminum, chromium, and nickel **and optionally** oxides of cobalt and platinum group metals" (the optional feature being interpreted that at least **cobalt oxide as well as at least one platinum group metal oxide** have to be comprised); and
- ii) this feature appears also not to be directly and unambiguously derivable from the whole disclosure as required according to the established Case Law (compare

Case Law of the Boards of Appeal of the European Patent Office, 5th edition 2006, chapter III-A, 2.1).

To the contrary it appears that by arbitrarily deleting other metal oxide combination possibilities (the application as originally filed is silent as to that the selected three metal oxides result in any improvement compared to e.g. only one metal oxide) from the generic disclosures of either "oxides of aluminum, chromium, nickel, cobalt and/or platinum group metals" or "oxides chosen from the group consisting of aluminum, chromium, nickel, cobalt and platinum group metals" the appellant selected the specific combination of these three compulsory metal oxides with the optional addition of "oxides of cobalt and platinum group metals" - which were not disclosed as specific embodiments in the application as originally filed - which results in singling out of a particular combination of metal oxides, leading to a hitherto not specifically disclosed group of compositions (see e.g. T 894/05, point 1.4 of the reasons; T 801/02, points 2.2.1. and 2.2.2 of the reasons). Thereby the teaching of the invention appears to have been changed.

Thus, claim 1 appears to have been amended in such a way that the subject-matter extends beyond the content of the application as originally filed, contrary to the requirements of Article 123(2) EPC. Hence claim 1 and the single request do not appear to be allowable for this reason."

VI. The parties were given the opportunity to file observations to this communication which should be filed well in advance, i.e. at least one month, before

the date of the oral proceedings in order to give sufficient time to the Board to prepare for the oral proceedings.

- VII. With fax of 28 October 2009 the respondent cancelled its request for oral proceedings and stated that it would not attend the oral proceedings.
- VIII. With letter dated 11 November 2009 the appellant reiterated its request to revoke the patent taking account of the Board's negative preliminary opinion given in its communication annexed to the summons. Furthermore, it remarked that from its point of view oral proceedings would no longer be necessary, only in case that the Board were to change its opinion, particularly with respect to point 3.2 of said communication.
- IX. With fax of 17 February 2010 the appellant cancelled its request for oral proceedings and stated that it would not attend the oral proceedings.

No further submissions have been filed by the respondent by the ultimate date indicated by the Board (see point V above).

Reasons for the Decision

1. Since no substantive submissions to the Board's preliminary opinion have been filed by the respondent, the Board considers the respondent to rely on its written case alone. In that case, having withdrawn its request for oral proceedings and indicating it would not attend them, a decision based on that opinion,

adverse to the respondent, can be reached in written proceedings. Accordingly the date for the oral proceedings to be held 9 March 2010 is cancelled.

2. In point 3.2 of the communication accompanying the summons for oral proceedings the Board raised an objection under Article 123(2) EPC, explaining why in the Board's opinion the subject-matter claimed in claim 1 of the single request was held to extend beyond the content of the application as originally filed.
3. The respondent did not reply in substance to these objections. Since there has been no attempt by the respondent to refute or overcome the objections raised in the above communication, the Board has no reason to depart from the preliminary opinion expressed therein.

With regard to the above, the Board concludes - for the reasons set out in the communication (compare point V and paragraphs 3.1 to 3.2 above) - that claim 1 as maintained by the impugned decision is not allowable under Article 123(2) EPC.

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