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**Datasheet for the decision  
of 6 May 2013**

**Case Number:** T 1287/09 - 3.2.07

**Application Number:** 00105405.5

**Publication Number:** 1036857

**IPC:** C23C 4/12, C23C 4/06

**Language of the proceedings:** EN

**Title of invention:**  
Wear-resistant quasicrystalline coating

**Patent Proprietor:**  
Praxair S.T. Technology, Inc.

**Opponent:**  
SAINT-GOBAIN CENTRE DE RECHERCHES ET D'ETUDES EUROPEEN

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step - no (all requests)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1287/09 - 3.2.07

**DECISION**  
of the Technical Board of Appeal 3.2.07  
of 6 May 2013

**Appellant:** SAINT-GOBAIN CENTRE DE RECHERCHES ET D'ETUDES  
(Opponent) EUROPEEN  
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**Respondent:** Praxair S.T. Technology, Inc.  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
14 April 2009 concerning maintenance of  
European patent No. 1036857 in amended form.

**Composition of the Board:**

**Chairman:** H. Meinders  
**Members:** G. Patton  
E. Kossonakou

## Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the opposition division to maintain the European patent No. 1 036 857 in amended form, requesting that the decision under appeal be set aside and the patent be revoked.

Opposition had been filed against the patent as a whole and based on the grounds according to Article 100(a) EPC (novelty, inventive step and industrial applicability), Article 100(b) EPC (sufficiency of disclosure) and Article 100(c) EPC (extension beyond the content as originally filed).

II. The patentee (respondent) requests that the appeal be dismissed or that the patent be maintained on the basis of one of the auxiliary requests 1 to 4 filed with the letter of 19 January 2010.

The respondent auxiliarily requested oral proceedings.

III. The following documents of the opposition proceedings are relevant for the present decision:

D1 EP-B-0 521 138

D2 WO-A-99/00458

D22 Excerpt from standards JIS B 0601 and JIS B 0031, 1994, 1 page

D24 Hardness measurements dated 4 February 2009, 3 pages (i.e. not belonging to the prior art)

IV. The Board provided the parties with its preliminary non-binding opinion annexed to the summons for oral proceedings that the subject-matter of independent

claims 1 of the main request and auxiliary requests 1 to 4 was not considered to involve inventive step in view of D1 alone or combined with the teaching of D2.

With the letter of 25 March 2013, the respondent withdrew its request for oral proceedings, which were cancelled upon issuance of the present decision.

V. The wording of claim 1 of the **main request** reads as follows:

"A thermally sprayed coating formed with a quasicrystal-containing alloy, the alloy consisting essentially of, by weight percent, 15 to 20 Cu, 10 to 16 Fe, 10 to 20 Cr, 0 to 10 Co, 0 to 10 Ni, 0 to 5 Mo, 0 to 5 W and having balance aluminum with incidental impurities, the coating having at least about 60 weight percent  $\psi$  phase and a macrohardness of at least about HR15N 78."

The wording of claim 1 of **auxiliary request 1** reads as follows (in bold the amendments with respect to claim 1 of the main request; emphasis added by the Board):

"A thermally sprayed coating formed with a quasicrystal-containing alloy, the alloy consisting essentially of, by weight percent, 15 to 20 Cu, 10 to 16 Fe, 10 to 20 Cr, 0 to 10 Co, 0 to 10 Ni, 0 to 5 Mo, 0 to 5 W and having balance aluminum with incidental impurities, the coating having at least about ~~60~~ **70** weight percent  $\psi$  phase and a macrohardness of at least about HR15N 78, **wherein the coating has a porosity of less than about 5 percent and a roughness of less than about 240 Ra.**"

The wording of claim 1 of **auxiliary request 2** reads as follows (in bold the amendments with respect to claim 1 of auxiliary request 1; emphasis added by the Board):

"A thermally sprayed coating formed with a quasicrystal-containing alloy, the alloy consisting essentially of, by weight percent, 15 to 20 Cu, 10 to 16 Fe, 10 to 20 Cr, 0 to 10 Co, 0 to 10 Ni, 0 to 5 Mo, 0 to 5 W and having balance aluminum with incidental impurities, the coating having at least about 70 **to 90** weight percent  $\psi$  phase and a macrohardness of at least about HR15N 78, wherein the coating has a porosity of less than about 5 percent and a roughness of less than about 240 Ra."

The wording of claim 1 of **auxiliary request 3** reads as follows (in bold the amendments with respect to claim 1 of auxiliary request 2; emphasis added by the Board):

"A thermally sprayed coating formed with a quasicrystal-containing alloy, the alloy consisting essentially of, by weight percent, 15 to 20 Cu, 10 to 16 Fe, 10 to 20 Cr, 0 to 10 Co, 0 to 10 Ni, 0 to 5 Mo, 0 to 5 W and having balance aluminum with incidental impurities, the coating having at least about 70~~to~~~~90~~ weight percent  $\psi$  phase and a macrohardness of at least about HR15N 78, wherein the coating has a porosity of less than about 5 percent and a roughness of less than about 240 Ra, **and wherein the coating contains hard particles selected from the group consisting of carbides, metals, nanocarbides, nitrides, oxides and intermetallic compounds.**"

The wording of claim 1 of **auxiliary request 4** reads as follows (in bold the amendments with respect to claim 1 of auxiliary request 3; emphasis added by the Board):

"A thermally sprayed coating formed with a quasicrystal-containing alloy, the alloy consisting essentially of, by weight percent, 15 to 20 Cu, 10 to 16 Fe, 10 to 20 Cr, 0 to 10 Co, 0 to 10 Ni, 0 to 5 Mo, 0 to 5 W and having balance aluminum with incidental impurities, the coating having at least about 70 **to 90** weight percent  $\psi$  phase and a macrohardness of at least about HR15N 78, wherein the coating has a porosity of less than about 5 percent and a roughness of less than about 240 Ra, and wherein the coating contains hard particles selected from the group consisting of carbides, metals, nanocarbides, nitrides, oxides and intermetallic compounds."

- VI. In the statement of grounds of appeal the appellant argued with respect to the main request essentially that there is no technical effect of the only distinguishing feature of claim 1 over D1, i.e. the Fe content of the alloy, specified in the contested patent. The problem can be regarded as providing an alternative coating to the coating disclosed in D1 and the skilled person would find the solution in D2.
- VII. The respondent has not provided any arguments with respect to novelty or inventive step of the claimed subject-matter of its requests. In its reply to the appeal of 19 January 2010 it only discussed the basis for the amendments in the claims in the application as originally filed.

## Reasons for the Decision

1. Since the Board considers that the subject-matter of the independent claims 1 of the main request and the auxiliary requests 1 to 4 lack an inventive step in view of D1 alone or combined with the teaching of D2 (see below) there is no need to discuss in this decision the other grounds raised by the appellant.
  
2. Main request
  - 2.1 The features of claim 1 are as follows:
    - (a) A thermally sprayed coating
    - (b) formed with a quasicrystal-containing alloy
    - (c) the alloy consisting essentially of, by weight percent,
      - (c1) 15 to 20 Cu,
      - (c2) 10 to 16 Fe,
      - (c3) 10 to 20 Cr,
      - (c4) 0 to 10 Co,
      - (c5) 0 to 10 Ni,
      - (c6) 0 to 5 Mo,
      - (c7) 0 to 5 W
      - (c8) and having balance aluminum with incidental impurities,
    - (d) the coating having at least about 60 weight percent  $\psi$  phase and
    - (e) a macrohardness of at least about HR15N 78.
  
  - 2.2 D1, example 10, page 15, line 10 to page 16, line 20, discloses a thermally sprayed coating formed with a quasi-crystal-containing alloy, the alloy consisting of

$\text{Al}_{67}\text{Cu}_{9.5}\text{Fe}_{12}\text{Cr}_{11.5}$  (49.1% Al, 16.4% Cu, 18.2% Fe, 16.3% Cr by weight percent), the coating having 95% of icosahedral phase, i.e. more than 60 weight percent  $\psi$  phase, and a Vickers hardness of 525 and 510, i.e. a macrohardness higher than HR15N 78 according to the conversion table given in D24, page 2.

As a result, all features of claim 1 are known from D1, except the Fe content (feature c2) in the composition.

- 2.3 As mentioned by the appellant, from the whole application as originally filed (therefore also from the contested patent), no technical effect can be associated with this distinguishing feature. In addition, table 9 of the contested patent clearly shows that an alloy with a broader Fe content, i.e. a Fe content as disclosed in D1, is also suitable for obtaining a product with the desired properties.

Already for this reason, no inventive step can be recognized for the subject-matter of claim 1 (Article 56 EPC).

- 2.4 As additionally put forward by the appellant, the technical problem could be seen as to provide an alternative coating to the coating in example 10 of D1 (alloy 39).

In this respect, the skilled reader would first try the other alloys of D1, in particular those of table 1, including alloy 30:  $\text{Al}_{69.5}\text{Cu}_9\text{Fe}_{10.5}\text{Cr}_{10.5}\text{W}_{0.5}$  (51.1% Al, 15.6% Cu, 15.9% Fe, 14.9% Cr, 2.5% W, by weight percent) and, in doing so, would already arrive at the claimed subject-matter without any inventive step.



Indeed, the alloy 30 of D1 exhibits a composition falling completely within the claimed coating composition.

As also argued by the appellant, the skilled person starting from D1 would also consider D2 since, like D1, it relates to quasi-crystalline aluminium based alloys and aimed at providing a thermally sprayed coating suitable for cookware applications (D2, page 9, lines 20-35; "heating plates"). In doing so, the skilled person would consider using the alloy  $Al_{71}Cu_9Fe_{10}Cr_{10}$  (53.7% Al, 16.0% Cu, 15.7% Fe, 14.6% Cr, by weight percent) of said passage of D2, the composition of which falling completely within the claimed coating composition, thus arriving at the claimed subject-matter without the need of any inventive skills.

The subject-matter of claim 1 of the main request therefore lacks inventive step (Article 56 EPC).

3. Auxiliary requests 1-4

3.1 As mentioned by the appellant the unit "Ra" used in present contested patent has no meaning since surface roughness is expressed in microns (meters or inches) (see in particular D22 provided by the respondent during the opposition proceedings). The value of "240 Ra" can therefore not be used for distinguishing the claimed subject-matter from the prior art, such as D1.

3.2 D1, table 1, discloses  $\psi$  phase contents within the claimed range of 70-90 weight% so that the claimed limits cannot support inventive step.

3.3 It is not clear from the contested patent as a whole what would be the technical effect of the claimed porosity content. As a result, no problem to be solved can be associated with such a feature and, hence, no inventive step can be justified by it.

3.4 Finally, having hard particles of the types "carbides, metals, nanocarbides, nitrides, oxides and intermetallic compounds" cannot be avoided when thermally spraying alloys so that this feature is considered as being inherent to the coating as disclosed in D1 (see page 5, lines 34-35 where B and C are added).

3.5 Therefore, none of the added features to the claims 1 of auxiliary requests 1 to 4 can justify an inventive step.

As a result, none of the subject-matters of the claims 1 of the auxiliary requests 1 to 4 involves an inventive step (Article 56 EPC).

3.6 The above is identical to the provisional opinion as expressed by the Board in its annex to the summons to oral proceedings. The respondent has not filed any substantive reaction to this opinion of the Board. The Board sees no need to depart from it.

**Order**

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

The decision under appeal is set aside.

The patent is revoked.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders