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**Datasheet for the decision
of 7 February 2012**

Case Number: T 2292/09 - 3.2.08
Application Number: 02258710.9
Publication Number: 1329527
IPC: C22C 19/03, C22C 19/05,
C22F 1/10
Language of the proceedings: EN

Title of invention:

High strength hot corrosion and oxidation resistant,
directionally solidified nickel base superalloy and articles

Patent Proprietor:

United Technologies Corporation

Opponent:

SIEMENS AKTIENGESELLSCHAFT

Headword:

-

Relevant legal provisions:

EPC Art. 56, 104(1)

Keyword:

"Inventive step (no)"
"Apportionment of costs (no)"

Decisions cited:

-

Catchword:

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Case Number: T 2292/09 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 7 February 2012

Appellant: United Technologies Corporation
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 25 September 2009
revoking European patent No. 1329527 pursuant
to Article 101(3)(b) EPC.

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
A. Pignatelli

Summary of Facts and Submissions

I. By its decision posted on 25 September 2009 the opposition division revoked European patent No. 1 329 527. The opposition division held that claim 1 as granted (main request) contravened the requirement of Article 123(2) EPC and that claim 1 of the auxiliary request then on file was not allowable for lack of novelty in view of document

D5: WO-A-99/67435.

II. The appellant (patent proprietor) lodged an appeal against this decision on 1 December 2009, paying the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 5 February 2010.

III. Oral proceedings took place before the Board on 7 February 2012. The following requests were made:

The appellant requested that the decision under appeal be set aside and the patent be maintained as granted or, alternatively, on the basis of the auxiliary request filed on 30 December 2011.

The respondent requested that the appeal be dismissed, that the auxiliary request be not admitted into the proceedings and that the costs be apportioned in the event that this request was allowed.

IV. Claim 1 as granted (main request) reads as follows:

"A directionally solidified article comprising a high strength, corrosion and oxidation resistant nickel base

superalloy which comprises a matrix and from about 0.4 to 1.5 vol.% of a phase based on tantalum carbide, the alloy consisting of, in weight percent: 11.94 Cr, 4.03 Ti, 1.84 Mo, 3.75 W, 5.15 Ta, 3.55 Al, 8.93 Co, 0.008 B, 0.02 Zr, 0.06 C and 0.01 Hf, balance nickel."

Claim 1 of the auxiliary request differs from claim 1 of the main request by the additional feature (in bold):

"A directionally solidified **columnar grain** article comprising...nickel."

V. The appellant's arguments relevant to the present decision can be summarized as follows:

Document D5 as the closest prior art did not disclose the presence of zirconium and hafnium at levels as high as 0.02% and 0.01%, but instead D5 was concerned with an alloy in which zirconium and hafnium were preferably eliminated. At best Zr and Hf could be present at impurity levels, which meant preferably at a maximum of about 0.0075% (75 ppm). The example compositions of D5 in Table 1 on page 7 of D5 were measured to a high degree of accuracy and with percentages shown to at least two decimal places. Thus, if zirconium and hafnium were present in any measurable amount, then this would undoubtedly have been explicitly disclosed in D5. Novelty arose for these reasons alone.

There were also further differences between claim 1 and the disclosure of D5. In particular, D5 failed to disclose the levels of boron and carbon required in claim 1 of the patent. Claim 7 of D5 set out a point composition with some values that were comparable to

the claim 1 composition. However, this prior art composition required significantly more boron and carbon than the alloy featuring in claim 1, in fact 50% more, the required values being 0.0125 wt% boron and 0.09% carbon. The point composition defined in claim 1 of the patent therefore differed significantly from the example compositions of D5, in addition to zirconium and hafnium, at least in relation to boron and carbon.

Starting from D5, the objective technical problem underlying the patent could be considered as how to improve certain properties of the alloy without compromising other desirable properties. The solution to this problem arose from the non-obvious realisation that a combination of the minor elements zirconium and hafnium, which were previously eliminated from the IN 792 alloy composition discussed at pages 1 and 3 of the application as filed, could be reintroduced in small controlled amounts.

The technical effect of allowing the presence of zirconium and hafnium in small controlled amounts was an improved hot corrosion resistance and oxidation life, as depicted in Figures 2 and 3 of the patent specification, while maintaining rupture life and ductility in the transverse direction at a level seen in typical single crystal alloys.

Hence, the present invention arose from the non-obvious use of a composition in which, *inter alia*, small but significant amounts of zirconium and hafnium were permitted, as non-intentional but controlled additions. This was set out in lines 15 to 19 on page 12 of the application as filed, "*using the prior art single crystal article, the present invention includes among*

other things discreet amounts of boron and carbon while controlling the presence of zirconium (each of which are kept out of the prior art alloy)". In that respect the Mod4 point alloy composition featuring in claim 1 of the patent was a "lucky strike". D5 did not teach or suggest the solution of the present patent and therefore, the nickel base alloy set out in claim 1 of the main and auxiliary requests also involved an inventive step.

VI. The respondent's arguments relevant to the present decision can be summarized as follows:

The appellant's auxiliary request was not enclosed with the grounds of appeal filed on 1 December 2009. Rather, it was submitted on 29 December 2011, i.e. two years later and shortly before the oral proceedings. Hence, the representative had not enough time to consider the amended claims and to confer with the respondent. The auxiliary request was, therefore, late filed and should not be admitted into the appeal proceedings. Should the Board be minded to admit the auxiliary request, an apportionment of costs was requested.

Claim 1 of document D5 as the closest prior art disclosed a directionally solidified columnar grain nickel base alloy with narrowly defined elemental ranges for Cr, Co, Mo, W, Ta, Al, Ti, C and B, the balance essentially being nickel. The amounts of the corresponding elements making up the claimed nickel base alloy were situated about in the middle of the known ranges. Moreover specifically, claim 7 of D5 disclosed the preferred punctual composition of the alloy set out in claim 5, which came close to the

claimed alloy. Although not specifically mentioned, the term "the balance essentially nickel" in claims 5 and 7 of D5 implied that the known alloy included residual elements, such as Zr and Hf, as impurities. A difference between the claimed alloy and D5 could be seen in the fact that the claimed alloy comprised 0.02% Zr and 0.01% Hf. However, the originally filed application made it clear that the claimed alloy included no intentional additions of zirconium and hafnium since these elements adversely affect rather than improve the alloy's properties (the application as filed, page 8, last paragraph to page 10, line 2; claim 1). No technical problem was solved by the presence of Zr and Hf in the claimed amounts.

Hence the claimed alloy composition of both requests had no inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. Admissibility of the auxiliary request
 - 2.1 The respondent objected to the admission of the appellant's auxiliary request into the appeal proceedings because this request was not enclosed with the grounds of appeal but filed only one month before the oral proceedings. The auxiliary request was therefore late filed and the respondent did not have adequate time to consider it.

2.2 For the following reasons, the Board cannot agree. According to Article 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA; Supplement to OJ EPO 1/2011, page 38), any amendment to a party's case after it has filed its grounds of appeal or reply may be admitted and considered at the Board's discretion. That discretion shall be exercised in view of inter alia the complexity of the new subject matter submitted, the current state of the proceedings and the need for procedural economy.

In the present case, independent claim 1 of the auxiliary request results from a combination of claims 1 and 2 as granted. The only amendment constitutes the term "columnar grain", which was inserted into claim 1 as granted in order to meet the objection raised under Article 123(2) EPC in the impugned decision and addressed in the Board's provisional opinion annexed to the summons to oral proceedings. Moreover, the amended claims had already been submitted as an auxiliary request in the opposition proceedings and were dealt with under points 2.2 and 5 of the impugned decision. Hence the amendment was neither complex nor surprising for the respondent.

Moreover, the appellant's auxiliary request was submitted one month in advance of the oral proceedings. Given the previously mentioned simplicity of the amendment, which was already known to the respondent, there was sufficient time to consider it.

2.3 Under these circumstances, claims 1 to 3 according to the appellant's auxiliary request, submitted with

letter dated 30 December 2011, were admitted into the appeal proceedings.

3. Problem to be solved; inventive step

3.1 Like the patent at issue, document D5 discloses a directionally solidified columnar grain nickel base superalloy composition which is compared with that featuring the claim 1 in the following table:

wt%	claim 1; (main and auxiliary request)	most preferred alloy page 9, lines 7 - 14 of the application as filed	Document D5 claim 5	Document D5 claim 7
Cr	11.94	12	11.6-12.70	12.00
Ti	4.03	4.1	3.9 -4.25	4.00
Mo	1.84	1.9	1.65-2.15	1.85
W	3.75	3.8	3.5 -4.10	3.70
Ta	5.15	5	4.80-5.20	5.10
Al	3.55	3.6	3.40-3.80	3.60
Co	8.93	9	8.50-9.00	9.00
B	0.008	0.015	0.003-0.015	0.0125
C	0.06	0.10	0.05-0.11	0.09
Zr	0.02	<0.02	-	-
Hf	0.01	-	-	-
Ni	balance	balance	balance	balance
TaC	0.4-1.5			
vol%				

The comparison shows that, except for Zr and Hf, the contents of the remaining constituents of the claimed nickel base alloy and that disclosed in D5 are almost identical. Starting from a nominal value of 5.10% Ta and 0.09% C in D5, it can be assumed that the alloy defined in claim 7 in D5 exhibits a TaC level falling

within the range of 0.4 to 1.5 vol. % TaC claimed in the patent. This assessment was not disputed by the appellant.

- 3.2 The appellant argued that the claimed alloy differed from the alloy described in D5 by the 0.06% carbon and 0.008% boron contents.

However, the levels claimed in the patent at issue for C and B fall within the respective elemental ranges defined in claim 5 of D5. It is also noted that both values (and also the contents for B and C of the most preferred alloy described in the application as originally filed on page 9, lines 5 to 14) come very close to the point composition given in D5, claim 7. In addition thereto, the application as filed teaches on page 10, lines 8 to 23 that for optimized castability and in order to eliminate the tearing problem without debiting other properties of the claimed alloy, carbon should be at least 0.08% and boron be increased to about 0.015%. Since both values essentially correspond to the carbon and boron levels of the alloy known from claim 7 of D5, no fundamental difference between the claimed alloy composition and that known from D5 can be identified in that respect.

- 3.3 Thus, the only differences between the claimed composition and D5 reside in the levels of zirconium and hafnium. The appellant argued that the technical effect of allowing the presence of zirconium and hafnium in small controlled amounts was an improved hot corrosion resistance and oxidation life, as depicted in Figures 2 and 3 of the patent specification, while maintaining rupture life and ductility in the

transverse direction at a level seen in typical single crystal alloys.

However, there is no proof or basis in the application as filed for the appellant's allegation. On the contrary, the originally filed application underlying the patent at issue states on page 9, line 7 to page 10, line 2 and also in claim 1 as originally filed that the alloy includes no intentional additions of Zr and Hf because these elements impair the castability and promote "tearing". It may be true, as alleged by the appellant by its reference to page 8, lines 11 to 13 of the application as filed, that a maximum of zirconium of about 0.02% was actually allowed for the claimed alloy. More specifically, however, the application states on page 9, lines 24 to 27 that "*the inventive composition includes no intentional additions of zirconium, whether or not it is practical to tolerate about up to 0.02% Zr, we prefer less.*"

Hence it is clearly emphasized on page 9 of the application as filed that zirconium was not intentionally added and, in any event, should preferably be less than 0.02% or even kept at very low levels. The same statement is true for hafnium, which is found to decrease the incipient melting temperature and to restrict the available temperature window for solution heat treatment. Hence no hafnium is intentionally added (the application as filed, page 9, line 27 to page 10, line 2).

It is therefore unambiguously clear from the application as filed that Zr and Hf are undesirable residual constituents which adversely affect rather than improve the properties of the claimed alloy and,

therefore, should be kept as low as possible. For the same reasons Zr and Hf are absent (or present only in residual amounts) in the alloy of D5. There is no basis in the originally filed application for concluding that the presence of Zr and Hf actually contributes to improving the hot corrosion resistance or the oxidation life, as alleged by the appellant.

- 3.4 In conclusion, there is no indication in the patent at issue implying that the presence of 0.02% Zr and 0.01% Hf solves a specific technical problem with respect to the nickel base alloy described in the prior art D5.

Consequently, the subject matter of claim 1 of the main and the auxiliary requests does not comprise technical features which involve an inventive step.

4. Apportionment of costs

According to Article 104(1) EPC a deviation from the rule that each party of the proceedings shall meet its own costs is only possible for reasons of equity. According to the established jurisprudence of the Boards of Appeal (Case Law of the Boards of Appeal, 6th edition 2010, VII C 7.2.1), an apportionment of costs is generally justified if the conduct of one party is not in keeping with the care required, that is if a party behaves or acts in the proceedings in breach of its equitable obligations and costs arise from culpable actions of an irresponsible or even malicious nature.

However, no such culpable action can be recognized in the present case. The appellant's filing of the auxiliary request did not in any way amount to unfair

conduct towards the party of the respondents. Rather, the claims of the auxiliary request, which were already decided upon by the opposition division in the impugned decision and which were known to the respondent, were submitted in response to the Board's provisional opinion annexed to the summons to oral proceedings. The auxiliary request was also submitted in due time so that the Board and the respondent were given adequate time to consider it before the oral proceedings. The filing of the auxiliary request was thus a means available to the appellant in its endeavour to defend its position.

The Board thus cannot see any reasons of an equitable nature which could justify an apportionment of costs, nor did the respondent bring forward any arguments to support its request in that respect. Hence there is no ground for awarding costs in favour of the respondent.

Order

For these reasons it is decided that:

1. The appeal is dismissed.
2. The request for apportionment of costs is refused.

The Registrar:

The Chairman:

V. Commare

T. Kriner