

BESCHWERDEKAMMERN
DES EUROPÄISCHEN
PATENTAMTS

BOARDS OF APPEAL OF
THE EUROPEAN PATENT
OFFICE

CHAMBRES DE RECOURS
DE L'OFFICE EUROPEEN
DES BREVETS

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

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

Case Number: T 1891/08 - 3.2.08

Application Number: 04252649.1

Publication Number: 1475447

IPC: C22C 19/05

Language of the proceedings: EN

Title of invention:

Nickel-base alloy

Applicant:

GENERAL ELECTRIC COMPANY

Headword:

-

Relevant legal provisions:

EPC Art. 56

Relevant legal provisions (EPC 1973):

-

Keyword:

"Inventive step (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 1891/08 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 22 July 2010

Appellant: GENERAL ELECTRIC COMPANY
1 River Road
Schenectady, NY 12345 (US)

Representative: Pedder, James Cuthbert
London Patent Operation
General Electric International, Inc.,
14 John Adam Street
London WC2N 6LU (GB)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 26 March 2008
refusing European patent application
No. 04252649.1 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
E. Dufrasne

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division dated 26 March 2008 to refuse European patent application No. 04252649.1.

The appeal was received at the European Patent Office on 29 May 2008 and the appeal fee was paid on the same date. The statement setting out the grounds of appeal was received on 5 August 2008.

II. In an official communication, the Board gave its provisional view on the case in particular with respect to the document

D2: Davis, J.R. "Heat Resistant Materials, Metallurgy, Processing, and Properties of Superalloys", ASM International, Ohio, USA, 1997, pages 221 to 227.

III. Oral proceeding took place on 22 July 2010.

The appellant (applicant) requested that

- the decision under appeal be set aside and
- a patent be granted on the basis of the request filed with letter dated 22 January 2007.

Independent claim 1 read as follows:

"1. A castable weldable nickel-base alloy in the form of a gas turbine engine component selected from the group consisting of shrouds, nozzles and buckets, the alloy consisting of, by weight, 15.0 to 17.0% chromium, 7.0 to 10.0% cobalt, 1.0 to 2.5% molybdenum, 2.0 to 3.2% tungsten, 0.6 to 2.5% columbium, less than 1.0%

tantalum, 3.0 to 3.9% aluminum, 3.0 to 3.9% titanium, 0.005 to 0.060% zirconium, 0.005 to 0.030% boron, 0.07 to 0.15% carbon, the balance nickel and impurities, wherein the columbium content in the alloy is, by weight, greater than the tantalum content in the alloy."

IV. The appellant's arguments are summarized as follows:

Compared to the nickel-base alloy set out in claim 1, the nominal composition of superalloy designation IN-738 disclosed in document D2, page 224, Table 2, comprised 0.1% zirconium and 0.17% carbon which both fell outside the ranges claimed from these elements. Hence document D2 related to a different Ni-base alloy. Moreover, document D2 remained silent on the physical and mechanical properties of the known alloy IN-738. Figure 2 on page 225 of D2 indicated that Ta acted as a precipitate former and a solid-solution strengthener increasing the creep strength, whereas Nb was not indicated as having these properties. This taught a skilled person away from the substitution of Ta by Nb. Contrary thereto, the interaction of all elements making up the composition of the claimed nickel-base alloy resulted in a very good overall performance, i.e. physical and mechanical properties that were comparable to and, in some instances, superior to those of IN-738. The claimed Ni-base alloy which represented a lower-cost alternative to IN-738 as a result of reducing the requirement for tantalum was therefore novel and inventive with respect to document D2.

Reasons for the Decision

1. The appeal is admissible.

2. *Inventive step:*

2.1 The present application aims at providing a lower-cost alternative to IN-738 or IN-738LC, respectively, which exhibits the desirable balance of high-temperature strength, good castability and weldability and a high resistance to oxidation, corrosion, creep and low cycle fatigue (see the A2 publication of the application, paragraphs [0003], [0004]). The solution to this problem is achieved with a nickel-base superalloy having a significantly reduced tantalum content and replacing the Ta with a relatively high level of niobium (columbium) (see paragraphs [0005], [0006], [0008], [0011] of the A2 publication). In the following Table, the composition of the claimed Ni-base alloy is compared with one embodiment of alloy designation IN-738 which is disclosed in document D2, Table 2. This alloy is weldable and exhibits high strength, good resistance to creep and fatigue, good corrosion resistance and the ability to be operated continuously at elevated temperatures in the form of turbine blades ("buckets" in land based power turbines), turbine disks, burner cans and vanes (see D2, page 221, first column, paragraphs 2 and 3):

Element (wt %)	claim 1	D2, Table 2, IN-738 (nominal)
Cr	15 to 17	16
Co	7 to 10	8.5
Mo	1 to 2.5	1.75

W	2 to 3.2	2.6
Nb	0.6 to 2.5	2
Ta	less than 1.0	...
Al	3.0 to 3.9	3.4
Ti	3.0 to 3.9	3.4
Zr	0.005 to 0.06	0.1 (↑)
B	0.005 to 0.030	0.01
C	0.07 to 0.15	0.17 (↑)
Ni	balance	61.5 (balance)
Nb > Ta	yes	yes

The nominal composition of IN-738 given in D2 and referred to in the comparative Table does not contain significant amounts of tantalum and includes niobium (columbium) in an increased amount of 2 wt% as does the claimed Ni-base alloy. Hence it is justified to conclude that niobium has been added to substitute for the absence of tantalum. Given that the amounts of the other components Cr, Co, Mo, W, Nb, Al, Ti and B completely fall within the ranges claimed for these elements and since the overall performance of the alloy results from its composition, the Ni-base alloy of D2 is expected to exhibit the same mechanical properties as the Ni-base alloy claimed in the present application.

2.2 The appellant correctly noted that the nominal amounts of carbon and zirconium of IN-738 known from D2 are outside the claimed ranges. Nevertheless, the values for Zr and carbon come close to the upper limits for C and Zr of the claimed composition, all the more so since the skilled person is aware of the fact that the "nominal" value of an element is meant to describe a certain range around that value. It is noted in this context that the application does not comprise any hint

or technical information for concluding or implying that the above mentioned combination of properties is significantly influenced by a low difference in carbon and zirconium. Hence no technical effect can be attributed to the somewhat lower amounts of zirconium and carbon specified for the Ni-base alloy claimed in the present application. This finding was not challenged by the appellant at the oral proceedings. Therefore, the selection of the claimed amounts of carbon and zirconium has to be regarded as an arbitrary selection which does not require an inventive activity.

2.3 The applicant's argument that D2 did not disclose Nb as an alternative to Ta, acting as a solid solution strengthener and increasing the creep properties, and thus taught away from the replacement of Ta with Nb has no bearing on the matter. Notwithstanding the specific effects which are attributed to the presence of niobium and tantalum on the properties of Ni-base alloys, as depicted in D2, Figure 1 and Table 3, this document actually discloses in Table 2 the composition of a Ta-free alloy IN-738 which comprises an amount of 2% Nb. Consequently, document D2 provides a strong indication that the concept of replacing Ta with Nb underlying the present application has been already put into practice.

2.4 Consequently, the subject matter of claim 1 does not comprise technical features which involve an inventive step vis-à-vis the disclosure of document D2.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

V. Commare

T. Kriner