Internal distribution code:

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

Datasheet for the decision of 13 April 2018

Case Number: T 1400/15 - 3.2.08

Application Number: 05771324.0

Publication Number: 1776486

IPC: C22C21/14, C22C21/16, C22C21/12, C22F1/057, C22C1/06

Language of the proceedings: EN

Title of invention:
2000 SERIES ALLOYS WITH ENHANCED DAMAGE TOLERANCE PERFORMANCE FOR AEROSPACE APPLICATIONS

Patent Proprietor:
Arconic Inc.

Opponent:
Constellium Issoire/C-TEC Constellium Technology Center

Headword:

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty
Inventive step

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1400/15 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 13 April 2018

Appellant: (Opponent)	Constellium Issoire/C-TEC Constellium Technology Center Rue Yves Lamourdedieu - ZI les Listes/ Parc Economique Centr' Alp 725 rue Aristide Bergès 63500 Issoire/CS10027 38341 Voreppe cedex (FR)
Representative:	Constellium - Propriété Industrielle C-TEC Constellium Technology Center Propriété Industrielle Parc Economique Centr'Alp 725, rue Aristide Bergès CS10027 38341 Voreppe (FR)
Respondent: (Patent Proprietor)	Arconic Inc. 201 Isabella Street Pittsburgh, PA 15212-5858 (US)
Representative:	Lenzing Gerber Stute PartG von Patentanwälten m.b.B. Bahnstraße 9 40212 Düsseldorf (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 12 May 2015 concerning maintenance of the European Patent No. 1776486 in amended form.**

Composition of the Board:

Chairwoman	P. Acton
Members:	M. Alvazzi Delfrate
	Y. Podbielski

Summary of Facts and Submissions

I. By its decision posted on 12 May 2015 the opposition division found that European patent No. 1 77 6486, in amended form according to the main request then on file, and the invention to which it related met the requirements of the EPC.

II. The appellant (opponent) lodged an appeal against that decision in the prescribed form and within the prescribed time limit.

III. Oral proceedings before the Board of appeal were held on 13 April 2018.

The appellant requested that the decision be set aside and the patent be revoked. It also requested that D3 be admitted into the proceedings.

The respondent (patent proprietor) requested that the appeal be dismissed and thus the patent be maintained as amended during the opposition proceedings or, in the alternative, that the patent be maintained on the basis of the claims of the auxiliary request filed on 1 February 2016 with the reply to the appeal. It also requested not to admit D3 into the proceedings.

IV. Claim 1 of the **main request** reads as follows:

"A 2000 series aluminum-based alloy consisting of:
3.0-4.0 wt% Cu;
0.6-1.1 wt% Mg;
0.2-0.7 wt% Ag;
up to 0.25 wt% of Fe and Si in total;
optionally up to 1.0 wt% Zn;
optionally up to 0.25 wt% Zr;

optionally up to 0.9 wt% Mn;
optionally up to 0.1 wt% Ti;
optionally up to 0.1 wt% V;
optionally up to 0.25 wt% Sc;
optionally trace elements used to control or limit oxidation of the molten aluminum;
the balance being aluminum and incidental impurities,
wherein Cu and Mg are present in a ratio of 3.6-4.5 parts Cu to 1 part Mg."

Claim 1 of the **auxiliary request** differs from the main request in that it is directed to a

"wrought or cast aerospace product" made from the alloy of claim 1 of the main request.

V. The following documents played a role for the present decision:

D1: R. J. Chester et al. "Precipitation in Al-Cu-Mg-Ag alloys"; The metallurgy of Light Alloys; Loughborough University England; 24-26 March 1983, pages 75-81;
D2: US -A- 5,376,192;
D3: I.J. Polmear et al. "After Concorde: evaluation of an Al-Cu-Mg-Ag alloy for use in the proposed European SST"; Materials Science Forum; Vols. 217-222, 1996, pages 1759-1764;
P2: Declaration of J.C. Lin dated 14.05.2008.

VI. The arguments of the appellant may be summarised as follows:

Admission of D3 into the proceedings

D3, which was not admitted into the opposition proceedings, was re-filed together with the statement

of grounds of appeal and was relevant, in combination with D1, to inventive step. Thus it should be admitted into the proceedings.

Main request - Novelty

It was true that the examples of compositions disclosed in D1 fell outside the ranges of present claim 1. However, said compositions were merely examples of the range studied in D1. Said range could be represented either by the line of compositions with 4% Cu in Figure 1 or by the triangle of Figure 1 defining the phases α + θ + S and having an upper limit at 4% Cu. The claimed composition was a selection within said range, which did not satisfy the criteria for the novelty of a numerical selection. Hence, the subject-matter of claim 1 lacked novelty in view of D1.

Main request - Inventive step

In any event, the subject-matter of claim 1 lacked at least an inventive step starting from the alloy 3 of D1, Table 1 on page 76, which comprised 4% Cu, 0.8% Mg and 0.4% Ag. This alloy was a suitable starting point. It formed a Ω phase and was thus to be considered an alloy with a "high" Cu/Mg ratio in the sense of D1.

The claimed alloy differed from alloy 3 by the Cu/Mg ratio, i.e. the Cu content or the Mg content. This feature was not associated with a technical effect. Moreover, even acknowledging, on the basis of P2, an increase of the toughness caused by this feature, this effect could not justify an inventive step. As to the fatigue resistance, there was no evidence of an effect of the differentiating feature on this property.

D3 taught namely to lower the Cu content to improve the toughness. There was no reason not to apply this teaching to the alloy 3 of D1, because both D1 and D3 related to alloys with Ω precipitates. It was true that the tensile strength was lowered by decreasing Cu. However, this was the same in the patent in suit. The person skilled in the art would thus have tried to lower Cu as taught by D3. Lowering the Cu content of alloy 3 of D1 to 3.5% as disclosed in D3 led to a composition in the claimed range. Therefore, the subject-matter of claim 1 did not involve an inventive step starting from D1 in view of D3.

Similar arguments applied starting from D1 in view of D2, which also taught that lowering the Cu content increased the toughness.

Auxiliary request - Inventive step

D1 represented also the closest prior art for an aerospace product made of an aluminium alloy, since aerospace products were commonly made of aluminium alloys. It was thus obvious to obtain an aerospace product starting from D1. Therefore, the subject-matter of claim 1 of the auxiliary request did not involve an inventive step.

VII. The arguments of the respondent may be summarised as follows:

Admission of D3 into the proceedings

D3 was not more relevant than the documents already in the proceedings because the examples of this document had Cu/Mg ratios higher than the patent in suit. Hence, D3 should not be admitted into the procedure.

Main request - Novelty

D1 did not disclose any composition range. Since all the examples of this document fell outside the claimed range D1 could not take away the novelty of claim 1.

Main request - Inventive step

It was questionable whether D1 could be regarded as the closest prior art, because it did not disclose any value of mechanical properties. In any event, only alloy 2 of D1, comprising 4% Cu, 0.3% Mg and 0.4% Ag, could be considered as a possible starting point for assessing inventive step. D1 was directed to alloys with high Cu/Mg ratios, such as the alloy 201, which had a ratio of 13:1 and taught that the Mg/Ag ratio had to be 3:1. Thus alloy 3, which did not satisfy these conditions, could not be considered as a suitable starting point.

Even if alloy 3 was considered as a starting point, it was not obvious to arrive at the subject-matter of claim 1. The claimed alloy was novel over alloy 3 of D1 by the Cu/Mg ratio. It provided improved toughness and fatigue resistance, as shown in P2 and in the patent in suit. The prior art, in particular D3, did not disclose the importance of the Cu/Mg ratio for improving toughness and fatigue resistance.

Moreover, the micrograph of Figure 2 of D3 showed only Ω and θ' phases. Thus it did not relate to the same microstructure as alloy 3, which comprised further phases, but rather to alloy 2 of D1. Hence, the person skilled in the art would not have applied the teaching of D3 to the alloy 3 of D1.

Additionally, he would not have expected a substantial increase in toughness with a small decrease in tensile strength, as shown in P2.

Therefore, the subject-matter of claim 1 involved an inventive step in view of D1 and D3.

The combination of D1 and D2 was even less relevant, because lowering the Cu content of alloy 3 of D1 to work in the claimed range would result in a composition contrary to the teaching of D2, as demonstrated in its Figure 2.

Auxiliary request - Inventive step

D1 was not closest prior art for an aerospace product. There was no indication that the alloys studied in this document were to be used for this application. Nor did D1 disclose values of the mechanical properties that could have rendered obvious such a use. Producing an aerospace product starting from this document could only be the result of hindsight. Therefore, the subject-matter of claim 1 of the auxiliary request involved an inventive step.

Reasons for the Decision

1. Admission of D3 into the proceedings

D3, which was not admitted into the opposition proceedings, has been re-filed together with the statement of grounds of appeal, i.e. at the earliest possible stage in appeal proceedings.

It is true that the examples of this document have Cu/Mg ratios higher than the claimed range in the patent in suit. However, D3 relates to the influence of Cu in alloys with Ω phase precipitates, i.e. the same alloys to which D1, disclosing different Cu contents than the patent in suit, relates. Thus it is relevant to the issue of inventive step starting from D1.

Under these circumstances, the Board decided to admit it into the appeal proceedings (Article 12 RPBA).

2. Main request - Novelty

D1 is a study of the mechanism of the Ω phase precipitation in Al-Cu-Mg alloys (abstract). It discloses four compositions of Al alloys comprising Cu and Mg, which are studied with and without an addition of 0.4% Ag (Table 1). None of these alloys falls within the claimed composition.

The appellant did not dispute this finding but argued that the alloy compositions disclosed in D1 were examples of a range disclosed in this document and that the claimed composition was a selection within said range, not satisfying the criteria for the novelty of a numerical selection. According to the appellant said range could be represented either by the line of compositions with 4% Cu in Figure 1 or by the triangle of Figure 1 defining the phases α + θ + S and having an upper limit at 4% Cu. However, D1 does not disclose that Cu content must be kept at 4% or at most at this level. Hence, it does not disclose the ranges indicated by the appellant. Indeed, it does not disclose any composition range at all. Therefore, the argument of the appellant is not convincing.

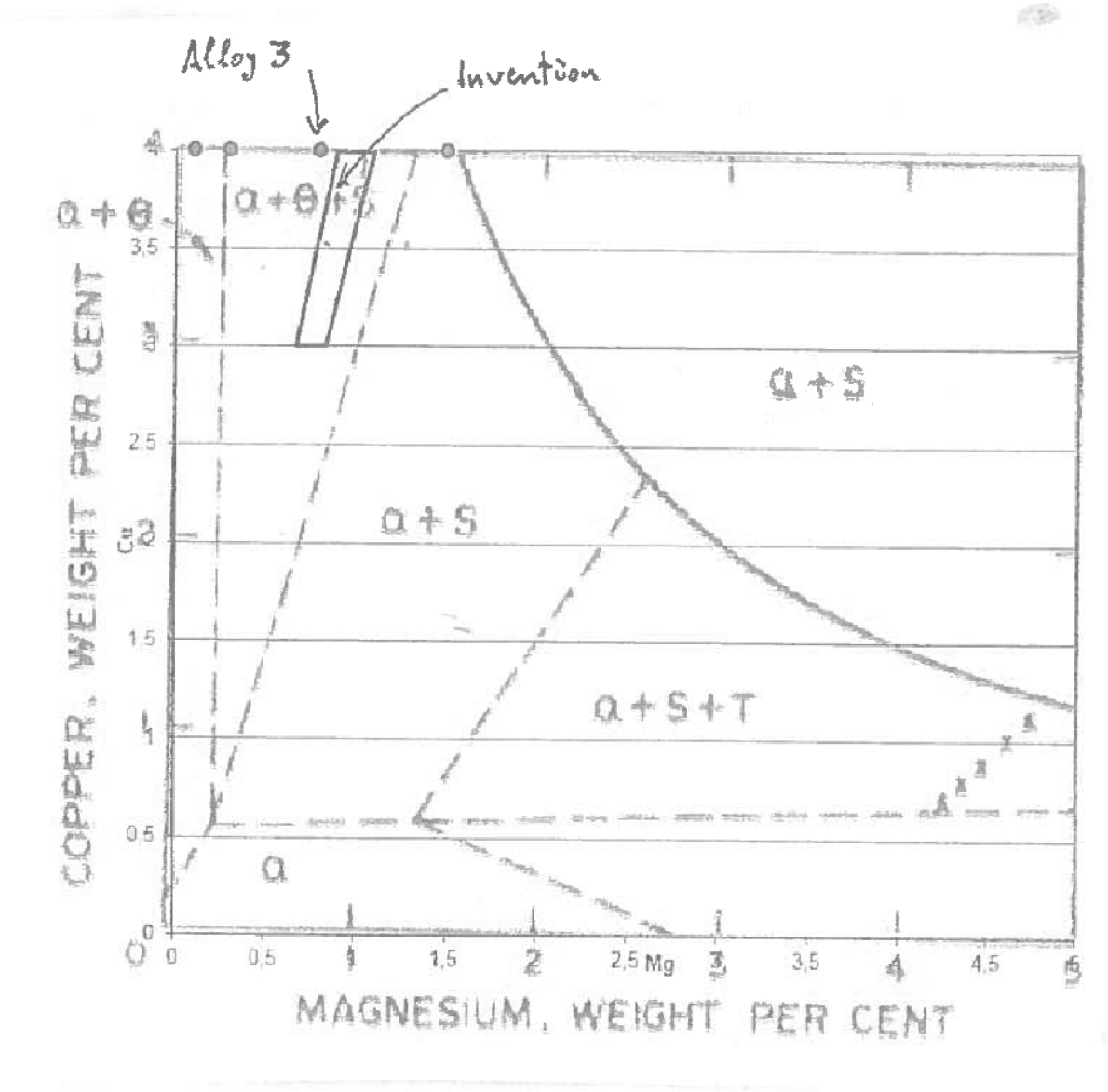
Hence, the subject-matter of claim 1 is novel.

3. Main request - Inventive step

3.1 D1 discloses Al alloys with compositions similar to the claimed one. Therefore, the closest prior art for claim 1 of the main request, which is directed to an alloy as such and does not define its mechanical properties, could be seen in one of the alloys disclosed in this document.

3.2 D1 discloses in Table 1 two compositions which form the Ω phase, one composition comprising 4% Cu, 0.3% Mg and 0.4% Ag (in the following the "alloy 2") and one composition comprising 4% Cu, 0.8% Mg and 0.4% Ag (in the following the "alloy 3"). It is true that D1 starts as a study of commercial alloys having a Cu/Mg ratio of 13.1, like alloy 2, and that it discloses that alloy 2, with a Mg/Ag ratio in terms of atoms of 3, precipitates the maximum amount of Ω phase (page 76, first paragraph; page 78, first full paragraph and point 2. of Conclusions). However, the Ω phase is to be found in both alloys 2 and 3 (Table 1). Both these alloys thus belong to the alloys with a "high" Cu/Mg ratio in the sense of D1 (first and fifth paragraph on page 77), which exhibit, due to the Ω phase and other precipitates, marked response to age hardening and improved strength properties (page 76, first paragraph and point 4 of Conclusions on page 78). Therefore, contrary to the respondent's view, each of the alloys 2 and 3 could be selected as starting point for developing the claimed composition, which has to exhibit favourable mechanical properties (paragraph [0007] of the patent in suit). Accordingly, alloy 3, with a composition that is nearer to the claimed one, is considered as the closest prior art.

3.3 The claimed alloy differs from alloy 3 by the Cu/Mg ratio. Since this ratio is determined by the contents of Cu and Mg it differs by a lower Cu content, or a higher Mg content or the combination of the two. This is apparent from the following Figure, which, on the basis of Figure 1 of D1, shows for the contents of Cu and Mg the composition range of the claimed invention and the punctual composition of alloy 3.



3.4 The respondent argued that said difference results in improved toughness and fatigue resistance. P2, in particular the comparison of alloys 6 (corresponding in essence to alloy 3 of D1) and 5 (an inventive alloy with a Cu content lower than alloy 6 of P2), provides evidence for an improvement of toughness associated with said difference. However, neither the patent nor P2 show that an improvement in fatigue resistance is also provided in this way. The examples of the patent show an improved fatigue resistance in comparison to the comparative examples but none of said comparative examples has a composition which could be considered as representative of the composition according to alloy 3 of D1.

Therefore, the problem solved starting from alloy 3 of D1 is considered to be the provision of an aluminium alloy with improved toughness.

3.5 D3 deals, like D1, with Al-Cu-Mg-Ag alloys hardened mainly by Ω phase (abstract), which is the dominant precipitate in all the three alloys studied in this document (page 1761, "Microstructure", first sentence). The alloys of D3 exhibit different Cu contents, namely 6.3%, 4.5% and 3.5% (Table 1). While it is true that the micrograph in Figure 2, relating to the alloy with 4.5% of Cu, shows only Ω and θ' phases (as opposed to alloy 3 of D1, which comprises according to Table 1 of this document Ω, S and a small amount of θ'), there is no indication that these phases are the same in all three alloys of D3 or that the teaching of D3 is applicable only in the presence of this particular combination of phases. On the contrary the person skilled in the art would consider, in view of the

abstract of D3, that its teachings are applicable to all Al-Cu-Mg-Ag alloy hardened mainly by Ω precipitates, and thus also to alloy 3 of D1.

3.6 D3 teaches that keeping the Cu content as low as 3.5% results in improved toughness (Table 3). It is true that this improvement comes at the cost of a decrease in tensile strength (Table 2). However, a reduction in the tensile strength values is also accepted in the patent in suit (see P2, Table 1). Thus the person skilled in the art would have tried to solve the problem above by reducing the Cu content of alloy 3 of D1 to 3.5% as taught by D3. Since a reduction of the Cu content of alloy 3 of D1 to 3.5% results in a Cu/Mg ratio according to claim 1 it was obvious to solve the given problem in accordance with claim 1.

It is true that the increase in toughness and the decrease in tensile strength do not appear to be respectively as big and as small as in the patent in suit (see P2, Table 1). However, the fact that the advantages are bigger than what could have been foreseen from the prior art can at most be considered a bonus effect of a *per se* obvious measure.

Therefore, the subject-matter of claim 1 does not involve an inventive step.

4. Auxiliary request - Inventive step

D1 does not disclose an aerospace product. Nor does this document disclose any value of mechanical properties which would indicate that the studied alloys would be suitable for this type of product. Also the references to the alloy 201 and Avoir (page 76, first paragraph) does not provide a pointer in this direction

since, on the basis of the evidence on file, there is no indication that the alloy 201 or the Avoir alloy were used for this type of application. Nor did the appellant submit that this was the case.

It is true that, as pointed out by the appellant, aerospace products were commonly made of aluminium alloys. However, this is not their sole application, since aluminium alloys find, depending on their properties, a number of other uses, such as for instance heat exchangers, pipes, containers for the food industry, industry, valve and engine parts.

In the absence of any indication that a use for an aerospace product was to be envisaged for the alloys of D1, this document cannot be considered as the closest prior art for the subject-matter of claim 1 of the auxiliary request. Indeed, starting from this document for producing an aerospace product could only be the result of hindsight.

Therefore, the subject-matter of claim 1 of the auxiliary request involves an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent on the basis of:

- claims 1-11 according to the auxiliary request

- figures 1-5 of the patent specification
and a description to be adapted.

The Registrar: The Chairwoman:

C. Moser P. Acton

Decision electronically authenticated