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**Datasheet for the decision
of 18 July 2006**

Case Number: T 0496/04 - 3.2.02

Application Number: 93921213.0

Publication Number: 0656956

IPC: C22C 21/00

Language of the proceedings: EN

Title of invention:

Tough aluminum alloy containing copper and magnesium

Patentee:

Alcoa Inc.

Opponent:

PECHINEY

Headword:

-

Relevant legal provisions:

EPC Art. 123(2), (3), 56

Keyword:

"Inventive step (yes)"

"Reformatio in peius (no)"

"Technical expert - replacement (yes)"

Decisions cited:

G 0001/99, G 0004/95, T 0201/83

Catchword:

-



Case Number: T 0496/04 - 3.2.02

D E C I S I O N
of the Technical Board of Appeal 3.2.02
of 18 July 2006

Appellant: PECHINEY
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
6 February 2004 concerning maintenance of
European patent No. 0656956 in amended form.

Composition of the Board:

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

Summary of Facts and Submissions

I. Following the opposition filed against the grant of European patent No. 0 656 956, the opposition division decided by interlocutory decision posted 6 February 2004 to maintain the patent in an amended version (third auxiliary request).

II. On 7 April 2004 the opponent (appellant) lodged an appeal against this decision and paid the prescribed fee for appeal on the same day. A statement setting out the grounds of appeal was received on 14 June 2004.

Further arguments were submitted in the appellant's letters dated 12 June 2006 and 10 July 2006.

The appellant argued that the patent as maintained by the opposition division did not meet the requirements of Articles 83, 84, 123(2) and 56 EPC.

III. Of the documents relied upon in the opposition proceedings only the following have played any significant role on appeal:

D1: US-A-3 826 688
D2: US-A-3 414 406
D3: US-A-4 772 342

IV. Enclosed with its letter of 16 June 2006 in response to the board's provisional opinion given in the annex to the summons to oral proceedings, the patent proprietor (respondent) submitted revised claims according to a first and second auxiliary request and informed the

board that one of the inventors, Mr W. Cassada, will attend the oral proceeding.

In a further letter dated 13 July 2006, it was indicated that Mr Rioja would attend the oral proceedings as a technical expert replacing Mr Cassada.

V. Oral proceedings were held on 18 July 2006, at the end of which the following requests were made:

The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 0 656 956 be revoked.

The respondent (patent proprietor) requested that

- the appeal be dismissed (main request) or, in the alternative, that
- the patent be maintained on the basis of
 - the first auxiliary request (filed as 2nd auxiliary request with letter of 16 June 2006) or
 - the 2nd auxiliary request filed during the oral proceedings.

VI. Claim 1 of the main request (corresponding to the third auxiliary request which was considered patentable in the impugned decision) reads as follows:

"1. An aluminum-based heat treated and aged alloy comprising:

- 3.85 - 5.5% by weight of copper;
- 0.1 - 0.8% by weight of magnesium;
- 0.1 - 1.0% by weight of silver;
- up to 0.05% of titanium;

optionally, up to 0.20% by weight of zirconium, up to 0.20% by weight of vanadium, and up to 0.60% by weight of manganese;
optionally, up to 0.30% by weight of iron and up to 0.25% by weight of silicon as impurities;
and the balance aluminum;
wherein the alloy has an improved combination of high strength and high fracture toughness as a result of maintaining the amounts of copper and magnesium together less than the solid solubility limit of copper and magnesium in aluminium and maintaining the interrelationship specified in the following equations:

$$Cu_{\max} = -0.91 \text{ Mg} + 5.59$$

$$Cu_{\min} = -0.91 \text{ Mg} + 4.59, \text{ and}$$

wherein the volume percent second phase ranges between 1.42 and 1.81."

In claim 1 according to the first auxiliary request, the wording **... "and wherein the volume percent second phase ranges between 1.42 and 1.81."** has been deleted.

In addition to the first auxiliary request, claim 1 of the secondary auxiliary request comprises the further amendments:

"1. An aluminum... of manganese;
0.05 to 0.15% by weight of zirconium, **0.05 to 0.15%** by weight of vanadium, and **optionally** up to 0.60% by weight of manganese; optionally up to 0.30% by weight of iron and up to 0.25% by weight of silicon as impurities;
and the balance aluminum; ..."

VII. The appellant argued as follows:

Claim 1 according to the main request contravened the provisions of Article 123(2), (3) EPC for four reasons. Firstly, the volume percentage of secondary particles (VPSP) featuring in examples 2 and 4 of Table 2 had been determined on the cast material (see paragraph [0040]) and not after thermal treatment as claimed. Secondly, setting a minimum limit for the VPSP did not make sense given that the formation of secondary phases was undesirable and hence should be minimized or even avoided. Thirdly, the limits for the VPSP range were arbitrarily taken from the examples and did not represent a technical feature independent from the other components making up the alloy composition. Such a selection was not permitted with respect to the considerations given in decision T 201/83. Finally, claim 1 was based on the preferred alloy specified as "Range A" but without defining the lower limits for V and Zr set out in "Range A". Since vanadium and zirconium contributed to grain structure control and thus represented an essential feature, their lower limits could not be omitted. Claim 1 of the main request was, therefore, not allowable.

Moreover, the patent failed to give a method how the VPSP should be determined so that a person skilled in the art could not carry out the claimed subject matter. Objection therefore arose under Article 83 EPC.

The respondent's auxiliary requests should be rejected since they were late filed and the appellant was surprisingly confronted with a new situation reflected

by the amended claims. The opponent being the sole appellant against the interlocutory decision by the opposition division maintaining the patent in amended form, the patent proprietor was primarily restricted to defending the patent as thus maintained. Following the precepts of decision G 1/99 of the Enlarged Board of Appeal, amendments to the claims must in principle be rejected in this situation. Allowing modified amendments in lieu of those permitted by the opposition division would lead, in the absence of an appeal by the patent proprietor, to a *reformatio in peius* for the appellant. Going back to the subject matter of the granted claims was no longer possible because this would extend the scope of protection of the claims over that resulting from the claims as upheld in opposition which could not be allowed under the principle of *reformatio in peius*. The auxiliary requests should, therefore, not be admitted to the appeal proceedings.

Should the amended claims nevertheless be considered, the heat treated and aged Al-Cu-Mg alloy set out in the amended claims did not involve an inventive step. Document D1 as closest prior art disclosed an aluminium alloy comprising up to 5% Cu and up to 2% Mg but in amounts not exceeding their limit of solubility and having a VPSP not exceeding 1% as set out for instance in D1, claim 1 and column 2, lines 23 to 31. Thus, this document already addressed the basic concept referred to in the patent and it was doubtful which technical effect was actually provided by the copper and magnesium and silver contents specified by the alloy composition claimed in the patent.

As to the effect of silver, additions up to 0.5% or even up to 1.0 % were disclosed in documents D2 or D3, respectively, to increase the mechanical properties of the same type of alloy claimed in the patent. Adding 0.1 to 1.0% silver was, therefore, obvious to the skilled person. Besides, no beneficial effect of Ag was observed when comparing the alloy examples 3 (no Ag) and 4 (0.49% Ag) given in Tables 2 and 3 of the patent.

Documents D2 and D3 proposed magnesium contents in the range of 0.1 to 0.5 % (D2) or 0.3 to 0.8% for Al-Cu(5 to 7%) alloys (D3). Reducing the magnesium content disclosed in examples 25930 and 23095 of D1, which (although falling outside the claimed ranges) satisfied the claimed proviso of Cu_{max} and Cu_{min} , to 0.1 to 0.80% Mg was therefore close at hand. Consequently, the combined technical teaching given in documents D1 and D2 or D1 and D3 led in an obvious manner to the Al-Cu-Mg alloy claimed in the patent.

Finally, the technical expert accompanying the patent proprietor was not the inventor, Mr Cassada, as indicated in the patentee's letter of 16 June 2006. Informing the board and the appellant with letter of 13 July 2006 that Mr Rioja would attend the oral proceedings was belated and, therefore, Mr Rioja should not be allowed to speak at the oral proceedings.

VIII. The respondent argued as follows:

Including upper and lower limits for the VPSP in claim 1 was held by the opposition division to satisfy the requirements of Article 123(2), (3) EPC because the amended range was based on the highest and lowest

values of examples in Table 2 which met the claimed composition. Consequently, the amendments to claim 1 according to the main request (third auxiliary request in the opposition proceedings) were allowable.

The auxiliary requests were admissible since they were submitted in due time to the board and to the opponent-appellant and aimed at overcoming the objections indicated in the board's communication annexed to the summons to oral proceedings. In the present case no exchange of the VPSP values by other limiting features reducing or, in the alternative, extending the scope of protection within Article 123(3) EPC was possible. Therefore, a claim no longer defining a range of VPSP was allowable within the limited exceptions *reformatio in peius* according to G 1/99.

The many examples disclosed in Table 1 of D1, including alloys 25930 and 23095 referred to by the opponent, lay outside the claimed composition and, in addition to the silver content, no disclosure on the ranges claimed in the patent was given or derivable from this document. The present patent aimed at improving the balance between strength and toughness, in particular after heat treatment, i.e. in the T651 and T87 tempers (cf. the patent specification, Table 3). In the past, increasing either the toughness or the strength of Al-Cu-Mg was possible, as was demonstrated in documents D2 and D3. The increase of both strength and toughness was, however, achieved by the alloy within the claimed ranges and this well-balanced alloy was highly appreciated by aircraft industry. The claimed alloy composition was also not derivable by combining the technical teaching disclosed in document D1 and D2 or

D1 and D3, as alleged by the opponent. While document D1 was concerned with Al-Cu-Mg alloy far below the solubility limits and below Cu_{min} , documents D2 and D3 related to supersaturated alloys above Cu_{max} , i.e. to a different type of alloy. The reasons why silver was added was reflected by paragraph [0029] of the specification. Hence, the claimed Al alloy was novel and inventive over the teaching disclosed in the prior art documents D1 to D3.

Moreover, the announcement of the technical expert who need not be the inventor was submitted in due time. Therefore, Mr Rioja who replaced the inventor, Mr Cassada, should be allowed to comment on technical questions arising at the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.
2. *Procedural matters*

At the oral proceedings, the appellant objected to the situation that the accompanying expert nominated by the patentee's representative in its letter of 16 June 2006 was not the inventor (Mr Cassada) as announced but was a different person (Mr Rioja) as announced by letter of 13 July 2006.

Relying on the principles referred to in G 4/95 (OJ 1996, 412), oral submissions by a technical expert are to be made under the continuing responsibility and control of the professional representative. Moreover,

the party wanting to make such submissions has to ask permission sufficiently in advance of the oral proceedings to give the other party time to prepare. In this respect, a deadline of one month before the oral proceedings is a minimum. These criteria were fulfilled by the patentee's representative with respect to the first announced technical expert, Mr Cassada. As to the announced replacement of Mr Cassada by Mr Rioja, the appellant had no personal objections to Mr Rioja. The board thus could not see any valid reason not to permit oral submissions to be made by Mr Rioja as a technical expert.

3. *Main request*

3.1 Claim 1 of the main request defines the volume percent second particles (VPSP) as ranging between 1.42 to 1.81. This range is based upon the highest and lowest values associated with the claimed alloy, as given in examples 2 and 4 in Table 1.

3.2 Nothing however could be found anywhere in the patent specification or the application documents as originally filed in support of this limitation of the VPSP range. In particular the lower limit of 1.42 does not make sense, and it is, even worse, contradictory to the description, given that the skilled reader is taught in paragraphs [0018] and [0020] of the patent that the formation of insoluble secondary phase is undesirable and should be minimized or even avoided by not exceeding the solubility limits for the solute elements Mg and Cu.

The patent proprietor itself has argued that in addition to Mg and Cu, the VPSP formation is also influenced by manganese (e.g. paragraph [0032]). Hence, the volume percent of secondary particles is tied to the individual amounts of the other components of the alloy described in example 2 or 4 and does not represent an independent constituent which has to be present in a minimum amount. Given this interrelationship, the individual amounts of VPSP of the exemplifying alloy 2 or 4 (or any other example) cannot be regarded in strict isolation and therefore could not be taken alone for the definition of a range. This may be done only in principle in very exceptional cases. Reference is made in this context to decision T 201/83 (OJ EPO, 1984, 481 lead alloy) where the Board first established that, for a given Pb-alloy, only a loose or no connection existed between the components Ca and Mg with regard to their effect and that the actual amount of Ca was not tied to a specific magnesium content. From the detailed considerations given in T 201/83 the conclusion must be drawn that in the present case because of the effects of interaction of the constituents making up the claimed Al-Cu-Mg alloy and its properties, it is not possible to make an arbitrary selection of individual features from the single examples for the definition of a range. To disregard the specific context would result in a new selection from the original range which was neither explicitly nor implicitly disclosed. This means that according to the above decision no arbitrary combination of values, isolated from the original text can be allowed.

3.3 The amendments to claim 1 made by the patent proprietor during the opposition proceedings according to the third auxiliary request (now main request on appeal), therefore, contravene the requirements of Article 123(2) EPC. Hence claim 1 according to the main request is not allowable.

4. *Admissibility of the auxiliary requests to the proceedings*

4.1 The aluminium alloy defined in claim 1 of the first auxiliary request no longer comprises the range of the VPSP. "Range A" disclosed in Table 1 of the patent supports the claimed composition except for the lower limits for V (0.05%) and Zr (0.05%) which have been omitted. In the appellant's view, this omission is not permitted under Article 123(2) EPC. Moreover, the legal issue of *reformatio in peius* arises from the amendments to the claims. Having regard to the complexity of this issue, the patentee's first and second auxiliary requests should, therefore, not be admitted to the proceedings.

4.2 In the board's view, the revised claims according to the first auxiliary request (which corresponds to the second auxiliary request submitted on 16 June 2006) was submitted in due time and attempted to overcome the objections indicated out in the official communication annexed to the summons to oral proceedings. Hence, the appellant (opponent) was given sufficient time to consider the amendments to the claims and to deal with the legal issues arising from these amendments. Given this situation, the board sees no reasons to disregard at least the first auxiliary request.

5. *Admissibility of the amendments*

5.1 Turning to the revised claim 1 of the first auxiliary request, reference is made to claim 1 as granted and the explanations given in paragraphs [0014] and [0016] of the patent specification. These parts of the patent make it clear that Cu, Mg and Ag are the compulsory components, but minor amounts of additional alloying elements including i.a. up to 0.20% Zr and up to 0.20% V may be independently added for grain structure control during hot working. The deletion of the lower limits for Zr and V is therefore admissible with respect to the requirements of Article 123(2)&(3) EPC.

5.2 *The issue of "reformatio in peius"*

The amendment to claim 1 of the first auxiliary request no longer defining a VPSP range lead to an extension of the scope of the patent as maintained by the opposition division. It, therefore, has to be scrutinized whether such an extension is acceptable in case the patent proprietor did not appeal the opposition division's interlocutory decision.

Following the decision G 1/99 (OJ EPO, 2001, 381) in circumstances where the patent as maintained in amended form would otherwise be revoked as a direct consequence of an inadmissible amendment held allowable by the opposition division in its interlocutory decision, the proprietor should be allowed to file requests in order to overcome this deficiency, as follows:

- in the first place, for an amendment introducing one or more originally disclosed features which limit the scope of the patent as amended;
- if such a limitation is not possible, for an amendment introducing one or more originally disclosed features which extend the scope of the patent as maintained, but within the limits of Article 123(3) EPC;
- if such amendments are not possible, for deletion of the inadmissible amendment but within the limits of Article 123(3) EPC, even if, as a result, the situation of the opponent/appellant is made worse (G 1/99, in particular Reasons and point 14).

As regards the first and second possibilities referred to in G 1/99, the board could not discern a feasible way of introducing one or more originally disclosed features which either limit or, alternatively, extend the scope of the patent as maintained within the limits of Article 123(3) EPC and by which feature(s) the inadmissible amendment held allowable by the opposition division could be successfully overcome. Hence, the first and second solution referred to in G 1/99 cannot be applied.

However, the third possibility referred to in G 1/99 applies to the present case. This means the provision of a claim 1 which no longer defines the range of VPSP i.e. in which the inadmissible amendment has been deleted. In so doing, the requirements of Articles 123(2)&(3) EPC are met and also those of 84 EPC since the claims are no longer contradictory to the description (see point 2.2).

At the oral proceedings, the appellant acknowledged that the situation fits in the present case with the third exception referred to in G 1/99.

6. *Novelty*

Novelty was not contested by the appellant in the opposition and appeal proceedings. Having considered the technical content of the prior art documents, the board sees no reason to put this assessment in doubt.

7. *Inventive step*

- 7.1.1 In its broadest aspect, document D1 discloses a heat treated and aged Al-alloy comprising up to 5% Cu, 0.3 to 2.0% Mg and at least 3% (Cu + Mg), with copper and magnesium not exceeding their solubility limits, up to 0.4% Mn and/or Cr, Zr and incidental amounts Si, Fe, Zn and Ti, and a volume percent secondary particles (VPSP) not exceeding 1% (cf. D1, claim 1; column 2, lines 13 to 19; 23 to 31; lines 37 to 49; column 2, line 57 to column 3 line 6). Documents D2 and D3 fail to mention the technical features of not exceeding (i) the limits of solubility for Mg and Cu and (ii) the maximum of 1% VPSP. Hence document D1 qualifies as closest prior art.

Starting from the alloy given in document D1, the problem underlying the patent at issue resides in providing an Al-Cu-Mg alloy which exhibits an excellent balance between high strength and high toughness (cf. the patent specification [0001], [0010]). This object is achieved by narrowly restricting the elemental ranges of the Al-Cu-Mg-Ag alloy composition as set out in claim 1. In particular the examples 2 and 4 show

that such a combination of high strength - high toughness is actually obtained.

The overlap existing between the claimed alloy ranges and those disclosed in document D1, which both aim at providing an alloy composition which in the T8XX temper exhibits a superior combination of a short transverse yield strength S-T-YS of at least 55 ksi and an L-T plane strain fracture toughness value of at least 35 ksi√in, is not disputed (see e.g. D1, column 3, lines 2 to 7; column 9, lines 64 to 75; claim 22). However, the passage given in document D1, column 3, lines 7 to 25 reflects the fact that for providing adequate strength, the Al alloy should comprise at least 0.6% Mg, and when maximum strength is desired, Cu should be in the range of 3 to 4.5%. Document D1 states that optimum alloys are those containing at least 1.2% Mg and less than 3.8% Cu, preferably 2.9 to 3.7% Cu and 1.3 to 1.7% Mg. This statement is further confirmed by the conclusion given in column 9, lines 64 to 75 (alloy MD-148) and by product claims 10, 19, 21 and 22. Considering the technical information in document D1 as a whole and acting upon it, the skilled metallurgist would in his search for an Al-Cu-Mg alloy having an excellent match in high yield strength and high toughness therefore be prompted to turn to an alloy composition comprising 2.9 to 3.7% Cu and 1.3 to 1.7% Mg in the T8xx temper. He would not be motivated to go in the opposite direction, namely designing the claimed alloy composition comprising 3.85 to 5.5% Cu and 0.1 to 0.8% Mg. It is therefore considered that the overall technical teaching given in document D1 clearly leads away from the narrowly limited Al-Cu-Mg alloy composition claimed in the patent at issue.

7.1.2 In the appellant's view, the selection of the claimed Al alloy is not associated with a particular effect.

Although a direct comparison between D1 and the claimed Al-alloy is difficult due a different thickness of the plates, the mechanical properties of examples 2 and 4 of the patent nevertheless show that the claimed balance of YS/fracture toughness is close to or even above the upper T-L and L-T borderlines which define the corridor displayed in Figure 1 of D1. Thus, even if the effect is rated as being "small", a somewhat better combination of strength - toughness could nevertheless be achieved by the claimed composition.

7.1.3 A small and partial overlap of the claimed composition also exists with the elemental ranges of the heat treated and aged aluminium alloys given in documents D2: (5-7)Cu - (0.1-0.5)Mg - (0-0.5)Ag and D3: (5-7)Cu - (0.3-0.8)Mg - (0.2-1.0)Ag. The skilled reader is, however, taught by document D2 that the best balance of properties in all wrought forms is achieved with an aluminium alloy containing 5.7 to 6.3% Cu and 0.15 to 0.30% Mg (cf. D2, column 2, line 62 to column 3, line 5). This statement is corroborated by the exemplifying alloys A to M given in D2, Table 1. The same finding is true for document D3 which discloses a preferred Al-Cu-Mg alloy comprising 5.5 to 6.5% Cu and 0.4 to 0.6% Mg (cf. D3, claim 2), the most preferred embodiment including 6.0% Cu and 0.5% Mg as set out in document D3, claim 3. All examples disclosed in documents D2 and D3 are above the proviso of $Cu_{max} = - 0.91 Mg + 5.59$ and therefore relate to supersaturated AlCuMg alloys having a higher volume percent of

secondary particles (VPSP) than claimed. Documents D2 and D3 do not disclose exact values for the longitudinal/transverse yield strength and T-L or L-T toughness, but due to the super-saturation with Cu and Mg, it can be assumed that the excellent match in high yield strength and high toughness of the AlCuMg alloy claimed in the patent is not obtained by the alloys of the prior art.

7.1.4 The appellant argued that the skilled metallurgist would select the composition of samples 25930 (4.15%Cu-1.09%Mg) and 23905 (3.92%Cu/1.10%Mg) from Table 1 of D1 as a starting point since they satisfied the Cu_{min} / Cu_{max} proviso featuring the claims of the patent. Following the teaching of D2 and D3 it would have been obvious to reduce the magnesium content and increase the Cu content of these exemplifying alloys to fall within the ranges claimed in the patent.

In the board's view, however, the selection of 2 out of 25 examples given in D1, Table 1 as a starting point is nowhere suggested by any reference in that document and is therefore based on hindsight. No motivation whatsoever could be deduced from documents D2 or D3 to reduce the Mg content given in D1 since all three documents relate to a specifically balanced alloy and teach the skilled practitioner designing an AlCuMg alloy to go in a direction opposite to that chosen in the patent.

7.2 Consequently, the Al-Cu-Mg-Ag alloy composition set out in claim 1 of the first auxiliary request is neither obvious from document D1 alone nor derivable from the combination of the technical teaching given in D1 with

that of any of D2 or D3 irrespective of which effect is associated with the addition of silver to the claimed alloy.

7.3 The dependent claims 2 to 5 relate to preferred embodiments of the Al-alloy set out in claim 1. Independent claims 6 to 8 are concerned with products produced from the claimed aluminium alloy. Hence, these claims are also allowable.

7.4 As to the method for determining the VPSP, reference is made to document D1, column 2, lines 26 to 31 reflecting such a method. Following these explanations, a person skilled in the field of metallurgy is able to determine the VPSP and to carry out the claimed subject matter. The requirements of Article 83 EPC are, therefore, satisfied.

8. Given that the claims according to the first auxiliary request are allowable, there is no need to deal with the second auxiliary request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:
 - claim 1 according to the first auxiliary request, filed as second auxiliary request with letter of 16 June 2006, and claims 2 to 8 filed during the oral proceedings;
 - description: pages 2 to 7 as filed on 4 December 2003 and pages 8 and 9 of the patent specification as granted;
 - drawings: Figures 1 to 3b of the specification as granted.

The Registrar:

The Chairman:

V. Commare

T. K. H. Kriner