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

Datasheet for the decision of 10 September 2013

Case Number: T 0923/11 - 3.2.08

Application Number: 03015053.6

Publication Number: 1359232

IPC: C22C 21/00, C22C 21/12, C22F 1/057

Language of the proceedings: EN

Title of invention:
Method of improving fracture toughness in aluminium-lithium alloys

Patent Proprietor:
Constellium Rolled Products Ravenswood, LLC

Opponent:
Aleris Rolled Products Germany GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 100(a),(b),(c)

Keyword:
"Main request: Novelty (no)"
"First Auxiliary Request: Novelty, inventive step (yes)"
"Sufficiency of disclosure (yes)"
"Added subject-matter (no)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0923/11 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 10 September 2013

Appellant I: (Patent Proprietor)
Constellium Rolled Products Ravenswood, LLC
Route 2 South
Ravenswood, WV 26164 (US)

Representative:
Butruille, Jean-Remi Pierre Marie
Constellium CRV
Service Propriété Industrielle
Parc Economique Centr'Alp
725, rue Aristide Bergès, BP 27
F-38341 Voreppe Cedex (FR)

Appellant II: (Opponent)
Aleris Rolled Products Germany GmbH
Carl-Spaeter-Strasse 10
D-56070 Koblenz (DE)

Representative:
Bauer, Clemens
Müller Schupfner & Partner
Patentanwälte
Bavariaring 11
D-80336 München (DE)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 23 Febuary 2011 concerning maintenance of European patent No. 1359232 in amended form.**

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
D. T. Keeling

Summary of Facts and Submissions

I. By its interlocutory decision dispatched on 23 February 2011, the opposition division held that the subject matter of the claims according to the first auxiliary request then on file met the requirements of the EPC and that the patent could be maintained in amended form on the basis of this request.

II. Appellant I (the patent proprietor) lodged an appeal against this decision on 22 April 2011, paying the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 29 June 2011.

On 28 April 2011, appellant II (the opponent) lodged an appeal against this decision, paying the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 22 June 2011.

III. On appeal, the parties essentially referred to the following documents:

D1: WO-A-92/14855;

D11: Teal Sheets, Registration Record Series, International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys, The Aluminum Association, April 2004, pages 3 and 13;

D11b: Registration Record Series, International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought

Aluminum Alloys, The Aluminum Association, July 1998, pages 3 and 10;

D11c: Registration request for alloy 2297 by letter dated 18 August 1997 of Reynolds Metals Company to The Aluminum Association Inc.; 2 pages;

D12: Rules for registering international alloy designations; letter of the Aluminum Association dated 14 January 2005 in response to the enquiry of appellant II;

D14: Affidavit of Michael Niedzinski, dated 10 October 2010, 4 pages.

IV. Oral proceedings took place before the Board on 10 September 2013. The following requests were made:

- Appellant I requested that the decision under appeal be set aside and
the patent be maintained as granted (main request)
or, alternatively,
in the form in which the patent was maintained by the opposition division (first auxiliary request)
or in the form set out in the second or third auxiliary requests, respectively, both submitted to the opposition division by letter of 15 October 2010.

- Appellant II requested that the decision under appeal be set aside and the European patent No. 1359232 be revoked.

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

"A method of making an aluminum-lithium alloy article comprising the steps of:

a) providing an aluminum alloy consisting of, in weight percent:

2.7 to 3.0% copper,
0.8 to less than 1.3% lithium,
0.05 to 0.8% manganese,
up to 0.25% magnesium,
0.04 to 0.18% zirconium,
optionally one or more grain refining elements selected from the group consisting of up to 0.2% titanium, up to 0.2% boron, up to 0.2% vanadium, up to 0.2% hafnium, up to 0.5% scandium, and up to 0.3% chromium,
the balance aluminum and inevitable impurities;

b) casting the aluminum alloy into an ingot;

c) homogenizing the ingot between 940°F and 975°F (505°C to 524°C);

d) hot working the homogenized ingot into a hot worked shape;

e) solution heat treating the hot worked shape at between 975°F and 1000°F (534 to 538°C);

f) quenching the solution heat treated shape; and

g) cold working and aging the quenched shape."

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the lithium range is restricted to "0.8 to less than **1.2**% Li".

VI. The arguments of appellant I relevant to the present decision can be summarized as follows:

Main request

Novelty

The method of granted claim 1 differed from the technical disclosure of document D1 essentially by a) the lithium content of 0.8 to less than 1.3% and b) by the specific homogenization treatment, in particular by the maximum homogenization temperature of 975°F and was therefore novel.

As to difference a), a small overlap of 0.1% Li existed between the Al-Li alloy used in the claimed method and the alloy of D1 which disclosed a Li-range of 1.2 to 1.60% (D1, claim 8). None of the examples given in D1 fell within or came close to the elemental ranges of the Al-Li alloy used in the claimed process. The majority of the examples S-1 to S-5 given in D1, Tables 2 and 3 comprised Li contents of 1.3% or higher. The examples further showed that lower contents of lithium were related with higher Mg contents. Consequently, the skilled person would not seriously contemplate combining low lithium with low magnesium contents, as specified in the patent. Moreover, the range of 0 to 1.5% for the grain refining elements Zr, Cr and Ti was very broad compared with the narrow ranges of 0.04 to 0.18% Zr, up to 0.2% Ti and up to 0.3% Cr set out in claim 1 of the patent.

Turning to the second difference b), D1 taught a homogenization temperature ranging from 900°F to 1060°F with a preferred temperature of 1000°F disclosed in all examples (D1, Table on page 14). In the claimed process, however, the maximum homogenization

temperature was restricted to 975°F. The selected composition of the Al-Li alloy in combination with the selected temperature ranges for heat treating as set out in claim 1 was not an arbitrary selection since the claimed process resulted in a higher fracture toughness in the short longitudinal (S-L) direction while an acceptable strength in the short-transverse (S-T) direction was maintained (the patent specification paragraph [0020]; Figures 2, 3). The criteria for a novel selection were therefore met by the claimed process.

The subject matter of claim as granted was therefore novel over D1.

First auxiliary request

Admission of documents D11, D11b and D11c

D11 disclosing the composition of Al-Li alloy AA2297 was dated April 2004 which was after the filing date of the patent. Contrary to the position of the opposition division, it was incorrect to assume that the chemical composition and also the alloy registration number of AA2297 were actually available to the public at the registration date of 18 August 1997. According to D11c, the request for alloy 2297 was faxed on 21 August 1997 to the Aluminum Association (AA) and did not provide any teaching about the properties and the steps for processing alloy AA2297. D11b proved that the composition of AA2297 was first published by the Aluminum Association in July 1998 which was after the filing date of the patent. Hence D11, D11b and D11c should not be admitted to the appeal proceedings.

Sufficiency of disclosure; Article 100(b) EPC

The claimed method described all the compulsory and optional elements making up the Al-Li alloy composition and the process steps for producing it into an article, including the temperature ranges for the heat treatment and working steps. Additional working examples exhibiting Li contents of less than 1.2 and the mechanical properties obtained by the claimed process were enclosed with the Affidavit of M. Niedzinski (D14). Hence the patent disclosed the claimed method in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

Extension beyond the application as filed; Article 100(c) EPC

Claim 1 as granted resulted from claims 1, 4 and 13 of the parent application WO 98/33947 (corresponding to the technical disclosure on page 3, lines 1 to 9) in combination with the statement on page 3, lines 10 and 11. Hence the subject matter of claim 1 had a clear basis in the application as originally filed and did not extend beyond it.

Novelty and inventive step; Article 100(a) EPC

The claimed process differed from D1 by restricting the lithium content to less than 1.2%. By contrast, the alloy of D1 comprised lithium in the range of 1.2 to 1.8%. In addition, the maximum homogenization temperature was limited to 975°F to ensure the alloy's

favourable balance between strength and fracture toughness.

D11, if admitted, did not provide any process steps at all and was silent on which improvement to the physical and chemical properties was achieved by the elemental restrictions of AA2297. The claimed subject matter was therefore novel over D1 and D11, respectively.

As to inventive step, the combination of the closest prior art D1 with D11 describing the composition of alloy 2297 would mean an ex-post facto analysis since D1 led away from selecting lithium contents lower than 1.2% and D11 failed to provide any information on strength and toughness and the process steps.

The subject matter of claim 1 of the first auxiliary request was therefore novel and inventive.

VII. The arguments of appellant II relevant to the present decision can be summarized as follows:

Main request

Novelty; Article 100(a) EPC

In view of the Mg-free aluminium alloy disclosed in claims 7 and 8 of D1, the composition of the Al-Li alloy used in the claimed process was already known. Nothing in D1 would dissuade the skilled person form working within the whole range of 1.2 to 1.8% Li and to try Al-Li alloys having "low" Li and "low" Mg contents since there was no general teaching in D1 that the magnesium content should be increased if the Li content

was reduced. D1 further taught on page 1, lines 14 to 16 that lowering the Li content in Al-Li alloys resulted in improved fracture toughness, an object also aimed at by the patent.

Moreover, the temperature ranges for the homogenizing, solution heat treating and aging the alloy according to claims 1 and 2 of the patent fell within the broader ranges disclosed in document D1. No particular technical effect on the alloy's properties was associated with restricting the homogenization temperature to 975°F compared with 1000°F used in the process of D1. The technical features selected from D1 making up the alloy composition and the process steps set out in claim 1 thus did not meet the criteria for a "novel selection".

The subject matter of claim 1 of the main request therefore lacked novelty.

First auxiliary request

Admission of documents D11, D11b and D11c

The patent proprietor's request for registration of alloy 2297 had to be regarded as making its composition available to the public. The Aluminum Association had no obligation to confidentiality and, more importantly, the precondition had to be met that prior to registration the aluminium alloy must have been offered in commercial quantities in the previous twelve months by the applicant. Documents D11, D11b and D11c therefore should be admitted into the appeal proceedings.

Sufficiency of disclosure; Article 100(b) EPC

The patent at issue did not provide any example in accordance with claim 1 since none of the working examples referred to a Li-content of less than 1.2%. Hence it was not proven that the claimed object, i.e. the improved fracture toughness was actually achieved by the technical features of the process set out in claim 1.

Extension beyond the application as filed; Article 100(c) EPC

The range of 0.8 to less than 1.2% Li in combination with 2.7 to 3.0% Cu was not disclosed in the parent application as filed (WO-A-98/33947). Rather, lithium of less than 1.2% was linked with copper ranging from 2.8 to 4%, as set out on page 3, lines 19 to 22 and claims 1 and 7 of the application as filed. Objection therefore arose under the ground of Article 100(c) EPC.

Novelty and inventive step; Article 100(a) EPC

Having regard to the accuracy of the chemical analysis, the range for Li of the alloy used in the claimed process showed a point-like overlap at 1.2% Li with the alloy known from D1. As to the novelty of a selection, at least the criterion of "sufficiently far removed" from the prior art was not met by the claimed alloy composition. Moreover and based on the explanation given on page 1, lines 14 to 16, D1 did not teach away from using Li-contents lower than 1.2%. As to the heat treatment steps, the arguments brought forward with

respect claim 1 of the main request applied also to claim 1 of the first auxiliary request. The subject matter of claim 1 of the first auxiliary request thus lacked novelty with respect to D1.

Starting from D1, the object to be achieved by the claimed process was to improve the fracture toughness of the Al-Li alloys. Since D1 disclosed on page 1 that the fracture toughness was adversely affected by the presence of Li, it was close at hand for the skilled person to restrict Li to amounts below 1.2%, as was also proposed by D11 which disclosed Li-contents down to 1.1%.

Also when starting from D11 and having regard to the skilled person's general technical knowledge, it was obvious to use "low" lithium contents in combination with "low" magnesium contents in order to improve the alloy's fracture toughness. The temperature ranges for homogenizing and heat treating described in document D1 was typical for the group of Al-Li alloys and thus did not justify an inventive step.

The subject matter of claim 1 of the first auxiliary request thus lacked an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 Novelty; Article 100 (a) EPC

In the following Table the process set out in claim 1 as granted is compared with that disclosed in documents D1 and D11. (Abbreviations: HW = hot working; SHT = solution heat treating; WQ = water quenching; CW = cold working).

alloy elements	claim 1 of the patent; wt%	document D1 (wt%) claim 8; pages 7, 40	Sample S1; p. 9; (Tables 2, 3) nominal	real	sample S4	D11 alloy AA2297
Cu	2.7 - 3.0	2.80 - 3.20	3.0	(2.99)	2.75	2.5-3.1
Li	0.8 - 1.3	1.20- 1.60	1.6	(1.61)	1.28	1.1-1.7
Mn	0.05 - 0.8	0.1 - 0.80	0.3	(0.26)	<0.01	0.1-0.5
Mg	up to 0.25	up to 0.25	0	(0.005)	1.47	≤0.25
Zr	0.04 - 0.18	0.05 - 0.30 optional		(0.11)	0.12	0.8-0.15
Ti	≤ 0.2	0.001- 0.50 optional				≤0.12
Cr	≤ 0.3	0.05 - 0.50 optional Zr+Ti+Cr: 0.05-0.6%				-
Al	balance	balance	balance		balance	balance
steps:						
casting	ingot	ingot (D1, p. 10, 11)	ingot			-
homog.	940-975°F	900-1060°F	910°F, 970°F; 1000°F			-
HW	into shape	pages 10, 13 to 15;	Hot rolling			-
SHT	975-1000°F	930-1030°F / 1h to several hours	1000°F/1h			-
Quench	yes	WQ to 200°F	WQ 200°F			-
CW	yes	stretching, extrusion	stretching 4-6%			-
aging	yes (pref. at 150-400°F)	yes 150 - 400°F	yes 325°F, 350°F			-

The comparative Table reveals an overlap between the technical features defining the claimed method and the method known from document D1. Hence, the alloy composition and the process steps set out in claim 1 are considered as being a selection from the method disclosed in document D1. It therefore has to be examined whether the claimed method satisfies the three criteria for a "novel selection", i.e. (i) the overlap must be small; (ii) the examples disclosed in the prior art must be sufficiently far removed from the claimed range; (iii) there must a be technical effect obtained by the selected range, i.e. the selection is not arbitrary. Moreover, it has to be examined whether the skilled person, taking into account the technical disclosure of document D1, would seriously contemplate working in the range of overlap.

As to the alloy composition, a broad overlap exists for the elemental ranges of Cu, Mn, Mg and the grain refining element Zr. For lithium, the overlapping area (1.2-1.3% Li) of 0.1% is not regarded as being "small". Hence, at least criterion (i) is not met. In addition, example S-4 discloses a lithium content of 1.28% which is within the claimed range, although the content of 1.47% Mg falls outside the range claimed for magnesium. Contrary to the position of appellant I, no basis is found anywhere in document D1 disclosing a compositional link between "high" lithium and "low" magnesium contents or vice versa, which would dissuade the skilled person from combining "low" Li-contents such as 1.28% with "low" Mg contents (in D1 called the Mg-free alloys comprising 0 to 0.25% Mg). Having regard to the grain refining element zirconium, examples S-1

to S-5 exhibit contents of 0.12% or 0.11% Zr, respectively, which are within the Zr range specified in claim 1. It is therefore concluded that the skilled person would seriously contemplate selecting Al-Li alloy compositions within the range of overlap since there is no teaching in D1 dissuading him from doing so.

Turning to the process steps, in the view of appellant I an essential difference existed between the temperature of 1000°F (538°C) used for homogenizing the exemplifying alloys S-1 to S-5 of D1 and the maximum value of 975°F (524°C) specified in claim 1 of the patent.

The Board does not agree. Firstly, the homogenization temperature of 1000°F selected in D1 is not regarded as being sufficiently far removed from the claimed upper limit of 975°F, as required by criterion ii) for justifying a novel selection. Secondly, the description of the patent at issue fails to comprise any particular reason or effect as to why the threshold of 975°F during homogenizing is important on the overall properties of the alloy and therefore should be adhered to. It is mentioned in this context that the homogenization treatment according to the claimed process and D1 aims at the same result, i.e. at dissolving the soluble elements and homogenizing the internal structure of the metal (D1, page 9, line 32 to page 10, line 3; the patent paragraph [0028]). Moreover, as can be seen in the comparative Table above, the range of overlap for the temperature ranges for heat treating the alloy is not "small", as required by criterion a).

Given this situation, the technical features defining the method of claim 1 do not satisfy the criteria for a novel selection. Consequently, the subject matter of claim 1 of the main request lacks novelty.

3. First auxiliary request

3.1 Admission of documents D11, D11b; D11c

For the following reasons, the Board concurs with the position of the opposition division with respect to the publication date of D11.

It is evident from document D11c that, in a letter dated 18 August 1997 to the Aluminum Associating (AA), the patent proprietor (appellant I) applied for the registration of alloy 2297 and disclosed the alloy's chemical composition (see also D14, page 3/4, last paragraph). The request was sent by fax and confirmed by the AA on 22 August 1997. In its request appellant I confirmed that this alloy had been previously sold in commercial quantities under an internal designation for aerospace applications. As mentioned in D12, point 3-4, the pre-sale is required by the AA as a precondition for registration. D12 further mentions under point 2 that the AA does not assume any confidentiality obligations during the registration period. There is no reason for assuming or implying that the rules for registering international alloy designations at the AA have been changed and were different in 1997. Consequently, the alloy chemistry of AA2297 is considered to have been available to the public at least at the date when the AA confirmed the receipt of the request.

Consequently D11, D11b and D11c are admitted into the appeal proceedings.

3.2 Sufficiency of disclosure; Article 100(b) EPC

In the Board's assessment, already the wording of claim 1 provides the skilled person with all the technical information which is needed for carrying out the claimed process. The dependent claims and the description include further preferred embodiments relating to the alloy composition and the parameters for processing it, including the temperature ranges for heat treating and for hot and cold working steps (e.g. paragraphs [0016], [0017], [0025] to [0032] of the patent specification). Enclosed with document D14, appellant I provided further working examples showing that the claimed process could be put into practice and the alloy resulting from the process exhibited the desired combination of properties. Appellant II did not provide any evidence in support of its contrary position that the object aimed at by the claimed process, i.e. improving the fracture toughness in the S-L direction while maintaining acceptable strength in the ST direction, was not achieved.

In conclusion, the objections raised on the ground of Article 100(b) EPC are not justified.

3.3 Extension beyond the application as filed; Article 100(c) EPC

Claim 1 of the first auxiliary request results from a combination of original claims 1, 4 and 13 and the

technical information given on page 3, lines 10, 11 of the parent application WO-A-98/01584. In particular, claims 1, 4 and 13 of the parent application show that the contents of Li and Mg can be selected independently from the remaining components. Likewise, the reference on page 3, lines 10 and 11 of the parent application shows that the preferred copper content has to be read together with page 1, lines 1 to 9 and that copper can be also selected independently from the contents of the other elements. Although, as pointed out by appellant II, further preferred elemental ranges for Cu, Mn and Zr of the Al-(0.8 to less than 1.2% Li) alloy are also referred to in the parent application, there is no need for confining the alloy composition set out in claim 1 exclusively to these more preferred embodiments.

The objections raised by appellant II on the ground of Article 100(c) EPC are therefore unfounded.

3.4 Novelty; Article 100(a) EPC

As to the issue of novelty, document D1 discloses an Al-Li alloy comprising 1.2% Li or more, whereas in the alloy used in the claimed process lithium is limited to less than 1.2%. Due to the compositional restriction, the claimed alloy is clearly distinguished from that of D1. Contrary to the position of appellant II and having regard to the clear technical teaching in D1, there is no point-like overlap at 1.2% Li.

Document D11 fails to provide any process steps.

Consequently, the claimed process according to claim 1 of the first auxiliary request is novel over D1 or D11, respectively.

3.5 Inventive step; Article 100(a) EPC

Turning to inventive step, D1 qualifies as representing the closest prior art since this document (as claim 1) is concerned with a method of making an aluminium-lithium alloy, in particular a process of heat treating and working Al-Li alloys of the claimed type. Having regard to the distinguishing Li-contents mentioned above, the issue is to examine whether, in view of the statement given in D1, page 1, lines 10 to 16, the person skilled in the art was prompted to try Li-contents lower than 1.2% in order to improve the alloy's fracture toughness.

As described in D1 on page 4, lines 22 to 26, the object of this document is to provide a low-density Al-Li alloy exhibiting an improved combination properties which make the alloy useful for producing aerospace and aircraft components. These properties include a high strength and fracture toughness and a sufficient resistance to corrosion and fatigue. In satisfaction of this object, the inventors of D1 arrived - according to claim 8 - at an Al-Li alloy comprising 1.2 to 1.6 Li, 2.8 to 3.2% Cu, 0.10 to 0.80% Mn, up to 0.25% Mg and a grain refining element. Having regard to the sophisticated balance of elements making up the known alloy, the skilled person had no reason to deviate from the selected elemental ranges since, by changing the alloy chemistry, he would run the risk of adversely affecting the alloy's overall performance. Consequently,

reducing the Li-content to lower than 1.2 would mean to act against the technical teaching of D1.

Given this situation, the skilled person would not turn to the alloy composition given in document D11, and even if he did, he would not arrive at the claimed alloy composition for the previously mentioned reasons. Hence, the combination of the technical teaching given in D1 with that of D11 would not lead in an obvious way to the alloy composition used in the claimed process.

Contrary to the position of appellant II, D11 does not qualify as representing the closest prior art because it merely discloses the chemistry of alloy AA2297 but it is not concerned with a process for producing this alloy. Only on the basis of hindsight one would start from the alloy composition given in D11 and select an alloy composition comprising less than 1.2% Li, as required by the claimed process and even if this were done, document D11 still keeps the skilled person guessing as to how the alloy should be processed successfully into an article which exhibits the improved balance of properties aimed at by the claimed process.

The subject matter of claim 1 of the first auxiliary request therefore involves an inventive step.

Order

For these reasons it is decided that:

The appeals are dismissed.

The Registrar: The Chairman:

V. Commare T. Kriner