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Datasheet for the decision of 25 October 2018

Case Number: T 0037/16 - 3.2.08

Application Number: 03808403.4

Publication Number: 1543174

IPC: C22F1/053, C22C21/10

Language of the proceedings: EN

Title of invention:
ALUMINUM-ZINC-MAGNESIUM-COPPER ALLOY EXTRUSION

Patent Proprietor:
Universal Alloy Corporation

Opponent:
Constellium Issoire/C-TEC Constellium Technology Center

Headword:

Relevant legal provisions:
EPC Art. 100(a), 54, 56
RPBA Art. 12

Keyword:
Novelty
Inventive step

Decisions cited:

Catchword:

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Case Number: T 0037/16 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 25 October 2018

Appellant: (Patent Proprietor)	Universal Alloy Corporation 180 Lamar Haley Parkway Canton, GA 30113 (US)
Representative:	Richards, John Ladas & Parry LLP Temple Chambers 3-7 Temple Avenue London EC4Y 0DA (GB)
Respondent: (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)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 30 October 2015 revoking European patent No. 1543174 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairwoman	P. Acton
Members:	M. Alvazzi Delfrate
	J. Hoppe

Summary of Facts and Submissions

I. By its decision posted on 30 October 2015, the opposition division revoked European patent No. 1543174.

The opposition division found that the subject-matter of claim 1 as granted did not involve an inventive step starting from

D3: EP -A- 1 231 290.

II. The appellant (patent proprietor) lodged an appeal against this decision.

III. Oral proceedings before the Board of Appeal were held on 25 October 2018. At the end of the oral proceedings the requests were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or on the basis of one of auxiliary requests 1, 2 or 4, all filed with the statement of grounds of appeal.

The respondent (opponent) requested that the appeal be dismissed.

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

"1. A method of producing an aluminum alloy extrusion product having improved fracture toughness, the method comprising the steps of:

(a) providing a molten body of an aluminum base alloy comprised of 1.95 to 2.5 wt.% Cu, 1.9 to 2.5 wt.% Mg,

8.2 to 10 wt.% Zn, 0.05 to 0.25 wt.% Zr, max. 0.15 wt% Si, max 0.15 wt.% Fe, max. 0.1 wt% Mn, optionally 0.05 to 0.2 wt% Cr, optionally 0.01 to 0.1 wt.% Sc, the remainder aluminum and incidental elements and impurities;

(b) casting said molten body of said aluminum base alloy to provide a solidified body, said molten aluminum base alloy being cast at a rate in the range of 25.4 to 152.4 mm (1 to 6 inches) per minute;

(c) homogenizing said body by heating in a first temperature range of 448.9 to 460°C (840 to 860°F) followed by heating in a second temperature range of 460 to 471.1°C (860 to 880°F) to provide a homogenized body having uniform distribution of η precipitate and zirconium containing dispersoids;

(d) extruding said homogenized body to provide an extrusion, said extruding being carried out in a temperature range of 315.5 to 454.4°C (600° to 850°F) and at a rate sufficient to maintain at least 80% of the cross-sectional area of said extrusion in a non-recrystallized condition;

(e) solution heat treating said extrusion; and

(f) artificial aging said product to improve strength properties to provide an extrusion product having said improved facture toughness."

Claim 1 of **auxiliary request 1** differs from the main request in that step (c) reads as follows (emphasis added):

"homogenizing said body by heating in a first temperature range of 448.9 to 460°C (840 to 860°F) for 6 to 18 hours followed by heating in a second temperature range of 460 to 471.1°C (860 to 880°F) for 4-36 hours to provide a homogenized body having uniform distribution of η precipitate and zirconium containing dispersoids";

Claim 1 of **auxiliary request 2** differs from the main request in that the Zn content is restricted to

"8.45-9.4 wt.%".

Claim 1 of **auxiliary request 4** differs from the main request in that it comprises the additional features of auxiliary request 1 and 2 and in that step (f) reads as follows (emphasis added):

"artificial aging said product to improve strength properties to provide an extrusion product having said improved facture toughness, said aging being carried out by one of the following sequences:
i) aging in a temperature range of 79.4 to 148.9°C (175° to 300°F) for 3 to 30 hours followed by aging at 137.8 to 182.2°C (280° to 360°F) for 3 to 24 hours;
ii) aging in a temperature range of 98.9 to 137.8°C (210° to 280°F) for 4 to 24 hours followed by aging at 160 to 204.4°C (320° to 400°F) for 30-45 minutes to 14 hours; or
iii) aging in a temperature range of 65.5 to 162.8°C (150° to 325°F) for 2 to 30 hours followed by again a [sic] 148.9 to 260°C (300° to 500°F) for 5 minutes to 3 hours followed by aging at 79.4 to 162.8°C (175° to 325°F) for 2 to 30 hours."

V. In addition to D3, the following documents played a role for the present decision:

D2: ASM Specialty Handbook Aluminum and Aluminum Alloys, JR Davis Ed., pages 265-267 and 528-529, (1993);
D4: EP -A- 0 670 377;
D7: Extrusion of aluminium alloys, pages 166-169, 196 -199, 232-237, T. Sheppard, Kluwer Academic Publishers, (1999);
D7a: Extrusion of aluminium alloys, pages 112-115, T. Sheppard, Kluwer Academic Publishers, (1999);
D12: Aluminum Extrusion Technology, pages 187-190 Pradip K. Saha - ASM International, 2000;
D13: declaration of I. Gheorghe, dated 25 September 2009;
D14: G. Porro; "Studio sulla colata continua e calcoli empirici delle velocità di abbassamento nella colata di lingotti di leghe leggere", Società Metallurgica Italiana (1953), as well as English translation D14a.

VI. The arguments of the respondent as far as relevant for the decision can be summarised as follows:

Main request

D3, considering in particular the composition of example 2, disclosed step (a) of the claimed method.

Although D3 did not explicitly disclose the casting rate, a casting rate as in step (b) was implicit for the person skilled in the art. Figure 36 on page 529 of the handbook D2, which corresponded to Figure 6 of D14, showed that the casting rates used in the art fell

within the broad claimed range. Thus, this feature was known from D3 or at least obvious.

D3 also disclosed, in paragraph [0018], homogenising at a temperature near to the incipient melting temperature, as indicated in D4. The latter document described how homogenisation was carried out in a temperature range of less than 10°C from the melting temperature of the eutectic of the treated alloy and preferably at less than 5°C from this temperature by two isothermal treatments at increasing temperature. Considering D13, which stated that the alloy of the patent had an incipient melting temperature of about 474°C, homogenising treatment at the temperatures claimed in step (c) was likewise known from D3 or at least obvious starting from this document. Also in consideration of Figure 5.20 of D7 the person skilled in the art would have concluded that homogenisation had to be carried out at the claimed temperatures. As to the requirement that the homogenising was "to provide a homogenized body having uniform distribution of η precipitate and zirconium containing dispersoids", no limitation could be seen in it.

The claimed extrusion conditions were likewise known from D3, because this document had to be considered in view of D7a in combination with D12. The handbook D7a disclosed that extrusion should be controlled to obtain fibrous unrecrystallised structure. Hence, it was implicit for the person skilled in the art reading D3 that recrystallisation had to be controlled at a rate sufficient to maintain at least 80% of the cross-sectional area of said extrusion in a non-recrystallised condition. As to the extrusion temperature, D12, Table 3, disclosed typical extrusion conditions for some 7000 alloys falling within the

claimed range. Hence, the features of step (d) were implicitly known from D3 or at least obvious from said document.

Finally, D3 disclosed steps (e) and (f) of claim 1, so that the subject-matter of claim 1 lacked novelty over D3.

In the event that the Board were to acknowledge novelty over D3, no inventive step was present. As explained, all the possible distinguishing features were standard in the art and would be adopted in an obvious way to implement the process of D3. Thus, the subject-matter of claim 1 was at least not inventive.

Admission of the auxiliary requests into the proceedings

The auxiliary requests should have already been filed in opposition because the objections they were meant to address had already been filed in the notice of opposition. Moreover, they were diverging. Therefore, they should not be admitted into the proceedings.

Auxiliary request 1

There was no evidence that the durations for the homogenising treatments chosen in auxiliary request 1 led to improved properties because the examples of the patent in suit, from which the values of Table 1 were also obtained, fell outside the claimed scope. Thus, claim 1 of auxiliary request 1 did not involve an inventive step.

Auxiliary request 2

Example 2 was merely a preferred realisation of the more general disclosure of D3, which overlapped with the ranges claimed in auxiliary request 2. Since example 2 was not far removed from the claimed range, the composition of auxiliary request 2 was known from D3 or at least obvious from said document. Hence, the subject-matter of claim 1 of auxiliary request 2 was not inventive either.

Auxiliary request 4

Since the first of the alternative ageing treatments of claim 1 was disclosed in example 1 of D3, auxiliary request 4 did not involve an inventive step either.

VII. The arguments of the appellant as far as relevant for the decision can be summarised as follows:

Main request

The claimed invention resided in the combination of the different steps of claim 1. In particular, the choice of the starting composition together with the processing steps of casting, homogenising and extruding was important to avoid a high amount of recrystallisation and provide improved mechanical properties.

D3 did not disclose a casting rate according to step (b) of the claimed method. Also, considering D2 or D14 could not change this fact because D2 did not disclose to apply said conditions to the claimed composition and the casting rate depended on the solute content, which was not the same in D3 and in the older documents D2 and D14.

Nor were the homogenising temperatures of step (c) disclosed in D3. Even considering D4 or the handbook D7 did not change this assessment. Moreover, D3 did not disclose the functional limitation "to provide a homogenized body having uniform distribution of η precipitate and zirconium containing dispersoids", which limited the homogenising time.

D3 did not give any detail on the extrusion conditions. As to D7a, it disclosed extrusion conditions outside the claimed range and thus offered no evidence that the person skilled in the art would have implicitly worked in the claimed range. In summary, the claimed conditions were not known for an alloy like the present alloy.

Therefore, the subject-matter of claim 1 was novel.

The combination of the chosen composition together with the process features solved the problem of providing an alloy with improved strength properties, toughness and resistance to crack growth. The fact that no example fell in the claimed scope was not relevant because there was no obligation to have an example of the claimed object in the patent. Since the prior art did not render it obvious to solve said problem as claimed the subject-matter of claim 1 involved an inventive step.

Admission of the auxiliary requests into the proceedings

There was no reason to file the auxiliary requests in opposition because in the communication accompanying the summons the opposition division had expressed the view that the patent could be maintained as granted.

Moreover, the requests were all based on combinations of granted claims. Hence, they should be admitted into the proceedings.

Auxiliary request 1

The durations for the homogenising treatments according to auxiliary request 1 also served to improve the mechanical properties. This improvement could not be achieved by the treatments of D3. Indeed, Figure 4 of D3 showed yield values lower than those of the inventive alloys of Table 1 of the patent in suit. Thus, the claimed combination of homogenising conditions and alloy composition resulted in improved properties.

It was not obvious to choose durations as claimed because in example 1 of D4, to which D3 referred, the durations of the isothermal treatments were longer than in the claimed process. D7 could not point to the claimed invention either because it disclosed shorter treatments. The claimed treatment achieved just the right amount of homogenisation to provide the improved properties and was not rendered obvious by the prior art.

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

Auxiliary request 2

In auxiliary request 2, the Zn content was restricted to 8.45-9.4 wt.%, so that example 2 of D3 fell outside said range. The different composition was a further reason for acknowledging inventive step, since starting

from D3, which focused on the Cu/Mg ratio, there was no reason to choose the claimed composition.

Auxiliary request 4

Thanks to the combination of features of auxiliary request 4, improved mechanical properties were obtained in a non-obvious way.

Reasons for the Decision

1. Main request

1.1 D3 relates to the production of an Al alloy product by rolling, extrusion or forging (see, for instance claim 1 "laminage, filage ou forgeage"). Hence, it discloses a method of producing an aluminium alloy extrusion product having improved fracture toughness.

The alloy of D3 overlaps with the claimed one (paragraph [0017]), with at least example 2 falling in the claimed range. Hence, D3 discloses step (a) of the claimed method.

The alloy is cast, but D3 does not explicitly disclose the casting rate. Nor can this feature be considered as implicitly disclosed. Figure 36 on page 529 of the handbook D2, cited by the respondent in this respect, shows an upper limit for the casting rate, which, depending on the ingot diameter, falls within the claimed range. However, it is not clearly and directly derivable that the same conditions are to be applied to the alloy of D3 and that the lower limit of the casting rate would also be in accordance with present claim 1.

The same applies in view of D14, in particular Figure 6, whose disclosure is similar to that of D2. Therefore, the casting rate of step (b) of claim 1 is not known from D3.

D3, in paragraph [0018], teaches homogenising at a temperature near to the incipient melting temperature as indicated in D4. In D4 the homogenisation is carried out in a temperature range of less than 10°C from the melting temperature of the eutectic of the treated alloy and preferably at less than 5°C from this temperature, preferably by two isothermal treatments at increasing temperature (D4, page 2, line 57 to page 3, line 4). In view of D13, which discloses that the alloy of the patent has an incipient melting point of 885.5°F, i.e. about 474°C (see D13, point 4), D3 discloses homogenisation at two temperatures which are in the vicinity of the incipient melting point but not necessarily in the ranges stipulated by the claim in step (c). Nor can this feature be considered as implicit in view of D7, Figure 5.20, because said figure refers to the treatment of an alloy with a composition that may be different from the claimed one. Hence, this feature distinguishes the claimed process from the process of D3. By contrast, no further limitation can be seen in the wording that the homogenising is "to provide a homogenized body having uniform distribution of η precipitate and zirconium containing dispersoids" because no definition is given as to what is to be considered a uniform distribution.

D3 does not give any detail on the extrusion conditions. The opposition division was of the view that the claimed conditions were known in view of D7a in combination with D12. D7a, an extract from a handbook about the extrusion of aluminium, discloses

(point 3.5.2) that extrusion should be controlled to obtain fibrous unrecrystallised structure. Hence, it is implicit for the person skilled in the art reading D3 that recrystallisation should be controlled at a rate sufficient to maintain at least 80% of the cross-sectional area of said extrusion in a non-recrystallised condition as stipulated in step (d) of claim 1. The same is not true for the extrusion temperature. The respondent referred to D12 in this respect, which, in Table 3, discloses the typical extrusion conditions for some 7000 alloys (the claimed alloy is a 7000 alloy). However, not all the temperatures of Table 3 are within the claimed range. Even more importantly, D12 states that other temperatures are also possible (passage following Table 3). Hence, the claimed extrusion temperatures of step (d) cannot be considered as implicit in D3.

D3 undisputedly discloses the solution heat treating of the extrusion (see, for instance, paragraph [0018]) and the artificial ageing (page 3, line 45) required by steps (e) and (f) of claim 1.

Summarising, the subject-matter of claim 1 is novel, being distinguished over D3 by the following features:

(i) casting rate;
(ii) homogenisation temperatures;
(iii) extrusion temperature.

1.2 The appellant argued that the claimed parameters and, in particular, the homogenising temperatures were critical to providing the desired mechanical properties because they provided the correct balance between the amount of solute and strength.

However, both the examples of the patent in suit are carried out at homogenising temperatures outside the scope of claim 1. The same applies to the preferred treatment described in paragraph [0038]. Hence, there is no evidence rendering the alleged advantages of the claimed selection of temperatures plausible. The problem to be solved by the claimed process is thus considered the less ambitious problem of how to implement the process described in D3.

The casting rate and extrusion temperature chosen in claim 1 are standard (see D2, Figure 36 on page 529 and D12, Table 3). Since D3 does not provide specific instructions for these parameters, the choice of standard values would be, although not implicit, an obvious one for putting the process of D3 into practice.

As explained above, D3, by its reference to D4, discloses homogenising at a temperature near to the incipient melting temperature, preferably by two isothermal treatments at increasing temperature (see D3, page 3, lines 38-40 and D4, page 2, line 57 to page 3, line 4). In view of the problem to be solved and taking into account that the incipient melting point temperature is about 474°C, the choice of a first temperature range of 448.9 to 460°C followed by heating in a second temperature range of 460 to 471.1°C, both temperatures in the vicinity of the incipient melting temperature, would be one of the several possible obvious choices for carrying out the process of D3.

Accordingly, the subject-matter of claim 1 of the main request does not involve an inventive step.

2. Admission of the auxiliary requests into the proceedings

The auxiliary requests were submitted at the earliest possible stage in appeal proceedings, namely with the statement of grounds of appeal. Their admittance thus has to be assessed under Article 12(4) RPBA, which indicates the power of the Board to hold inadmissible requests that could have been presented at first instance.

The respondent argued that the new auxiliary requests should have already been filed in the opposition proceedings, because the objections which they were meant to address were already filed in the notice of opposition.

However, the Board also takes into account that in the communication accompanying the summons the opposition division had expressed the view that the patent could be maintained as granted.

Moreover, all the auxiliary requests are based on combinations of granted claims, so that the added features had already been considered in opposition.

Under these circumstances, the Board decided to admit the auxiliary requests into the proceedings.

3. Auxiliary request 1

In auxiliary request 1, the durations for the homogenising treatments are defined: 6 to 18 hours at the first temperature and 4 to 36 hours at the second temperature.

The appellant referred to Figure 4 of D3 showing yield values lower than those of the inventive alloys of table 1 of the patent in suit. Thus, according to the appellant, the claimed combination of homogenising conditions and alloy composition results in improved properties.

However, the results of the inventive alloy (M703) of Table 1 of the patent in suit are obtained by a process with a homogenising treatment according to example 1 (see last sentence of paragraph [0052]), i.e. outside the scope of present claim 1. Since there is no evidence that the treatment of example 1 is equivalent to the claimed treatment, the results of Table 1 cannot be considered as representative of the properties obtained by the claimed process.

Therefore, in this case too, there is no evidence of improved properties being obtained by the claimed process, so that the problem to be solved by the treatment times is considered to be the choice of appropriate conditions for the treatment of D3.

It is true that in example 1 of D4, to which D3 refers, the durations of the isothermal treatments (48 hours for each of the treatments) is longer than in the claimed process. However, these are only exemplary values and neither D4 nor D3 teaches away from shorter treatments. Indeed, the person skilled in the art would consider shorter treatments, since they were common in the art: this is shown, for instance, in D7, which teaches that the general practice for Al-Zn-Mg-Cu type alloys (AA7XXX alloys) is to hold them between 450°C and 480°C for up to 24 hours (page 232, last paragraph) and shows in Figure 5.20 a commercial treatment of a AA7XXX alloy, involving a first homogenisation (at

460°C) for 4 hours and a second one (at 475°C) for 12 hours. The handbook D7 further describes which factors are to be considered in the choice of the durations of the homogenising treatment and how this can be done with the help of differential scanning calorimetry (pages 233 and 234). Hence, the person skilled in the art could, on the basis of their common general knowledge, choose the appropriate conditions for the treatment of D3 and thus arrive at the claimed durations in an obvious way.

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

4. Auxiliary request 2

In auxiliary request 2 the Zn content is restricted to 8.45-9.4 wt%. It is true that the composition of example 2 of D3 has a Zn content (8.38%) which falls outside said range. However, the disclosure of D3 is not limited to example 2, which is merely a preferred realisation of the more general disclosure of this document. In particular, the broad composition disclosed in paragraph [0017] comprises a Zn content of 7-11%, overlapping with the claimed composition.

In order to assess whether the Zn content represents a distinguishing feature over D3, the criteria on novelty of the selection of numerical ranges are thus to be considered. Since the composition of example 2 is not far removed from the lower limit of the claimed range for Zn (and falls within the claimed ranges for the other alloying elements), the person skilled in the art would seriously contemplate carrying out the teaching of D3 within the claimed range. Therefore, the Zn

content of auxiliary request 2 does not represent a further distinguishing feature.

As a consequence, the subject-matter of claim 1 of auxiliary request 2 does not involve an inventive step.

5. Auxiliary request 4

In auxiliary request 4, the additional features of auxiliary request 1 and 2 are combined and three alternative possibilities for the ageing treatment are defined. The first of the alternatives comprises ageing in a temperature range of 79.4 to 148.9°C (175° to 300°F) for 3 to 30 hours followed by ageing at 137.8 to 182.2°C (280° to 360°F) for 3 to 24 hours.

Treatments satisfying this definition are disclosed as exemplary treatments in example 2 of D3 (ageing treatments F and G of table 2). Thus, this feature does not represent a distinguishing feature over D3 either.

Thus, the claimed subject-matter is distinguished over D3 by the same features as claim 1 of auxiliary request 1. Accordingly, the subject-matter of claim 1 of auxiliary request 4 does not involve an inventive step for the same reasons explained for auxiliary request 1.

6. Since none of the requests are allowable, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

C. Moser P. Acton

Decision electronically authenticated