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Datasheet for the decision of 12 July 2021

Case Number: T 1920/18 - 3.3.05

Application Number: 10717607.5

Publication Number: 2563944

IPC: C22C21/00, C22C21/08, C22F1/04, C22F1/05

Language of the proceedings: EN

Title of invention:
DAMAGE TOLERANT ALUMINIUM MATERIAL HAVING A LAYERED MICROSTRUCTURE

Patent Proprietor:
Hydro Extruded Solutions AB

Opponents:
1. C-TEC Constellium Technology Center / Constellium Valais SA
2. ST Extruded Products Germany GmbH

Headword:
Casting methods/Hydro Extruded Solutions

Relevant legal provisions:
EPC Art. 84
EPC R. 139, 151(1)

Keyword:
Appeal admissible (yes)
Claims - clarity (no)

Decisions cited:
G 0003/99, G 0001/12, T 0562/13, T 1366/04, T 0012/10, G 0003/14

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1920/18 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 12 July 2021

Appellant: (Joint Opponents 1)	C-TEC Constellium Technology Center / Constellium Valais SA Parc Economique Centr'Alp 725 Rue Aristide Bergès CS10027 38341 Voreppe / 3960 Sierre SUISSE (FR)
Representative:	C-TEC Constellium Technology Center Constellium Propriété Industrielle 725, rue Aristide Berges Boîte Postale CS 10027 38341 Voreppe (FR)
Respondent: (Patent Proprietor)	Hydro Extruded Solutions AB Kanalgatan 1 612 31 Finspång (SE)
Representative:	Zacco Sweden AB P.O. Box 5581 114 85 Stockholm (SE)
Party as of right: (Opponent 2)	ST Extruded Products Germany GmbH Friedrich-Wöhler-Str. 2 53117 Bonn (DE)
Representative:	Müller Schupfner & Partner Patent- und Rechtsanwaltspartnerschaft mbB Bavariaring 11 80336 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 1 June 2018 concerning maintenance of the European Patent No. 2563944 in amended form.**

Composition of the Board:

Chairman	E. Bendl
Members:	S. Besselmann
	O. Loizou

Summary of Facts and Submissions

I. The appeal in this case lies from the opposition division's interlocutory decision to maintain European patent EP 2 563 944 B1 in amended form on the basis of the then pending second auxiliary request. The patent in suit concerns a damage-tolerant aluminium material having a layered microstructure.

II. The joint opponents 1 (appellant) appealed against this decision. In the statement of grounds of appeal, they raised an objection of, *inter alia*, lack of clarity against the claims upheld by the opposition division. They also filed document D35 in support of other objections:

D35 P. N. Anyalebechi, "*Comparative Study Of The Effects Of Solidification Rate On The Cast Microstructures Of Aluminum Alloys 6016 And 6009*", EPD Congress 2006, pages 733-744, TMS (The Minerals, Metals & Materials Society), 2006

III. The board issued a communication on 7 February 2019, pointing out an apparent deficiency regarding the address of C-TEC Constellium Technology Center in the notice of appeal and an apparent inconsistency concerning the names of the (joint) appellants in the statement of grounds of appeal dated 2 October 2018, which was filed in the names of Constellium Singen GmbH and Constellium Technology Center. The board requested the appellant to remedy these deficiencies. Originally the joint opponents 1 were the companies C-TEC Constellium Technology Center and Constellium Valais SA; both companies were represented by C-TEC Constellium Technology Center.

IV. The patent proprietor (respondent) replied to the statement of grounds of appeal and asserted that the appeal should be rejected as inadmissible. They submitted auxiliary requests 1-6, refuted the appellant's objections and requested, *inter alia*, that D35 not be taken into account.

V. On 2 April 2019, the appellant filed a corrected version of the first page of their statement of grounds of appeal, citing "C-TEC Constellium Technology Center" as the opponent. In the accompanying letter, they explained that the intention had been to file the statement of grounds of appeal on behalf of the same name stated in the notice of appeal, the other opponent being Constellium Valais SA.

VI. The respondent submitted further arguments to support their view that the appeal was inadmissible (8 April 2019).

VII. The appellant requested that a change of address of "C-TEC Constellium Technology Center" be recorded (17 April 2019).

VIII. The board issued a communication under Article 15(1) RPBA 2020, setting out its preliminary opinion that the appeal was admissible and that it appeared that the patent was to be revoked (26 August 2020).

IX. The respondent made further submissions defending the patent and filed a new auxiliary request 5, replacing the previous auxiliary request 5, and an auxiliary request 7 (2 October 2020).

X. The appellant made further submissions on 7 May 2021. In their view, the new auxiliary requests 5 and 7 should not be admitted into the proceedings.

XI. The respondent filed further observations on 28 June 2021 and submitted, *inter alia*, document D41:

D41 D. G. Eskin, Physical Metallurgy of Direct Chill Casting of Aluminum Alloys, 2008, Chapter 3, "*Solidification Patterns and Structure Formation during Direct Chill Casting*", pages 79-124

XII. During the oral proceedings on 12 July 2021, the respondent withdrew the then pending main request (i.e. the version upheld by the opposition division) and auxiliary request 6; the previous auxiliary request 2 submitted with the reply to the statement of grounds of appeal became the new main request. Auxiliary request 1 kept its number, and the remaining auxiliary requests 3, 4, 5 and 7 were renumbered to become auxiliary requests 2-5. In addition, the request to disregard D35 was explicitly withdrawn.

XIII. Opponent 2 (party as of right) did not make any submissions regarding the substance of the case or attend the oral proceedings.

XIV. Claim 1 of the main request reads as follows:

"*A method for producing a cast aluminium material of a precipitation hardenable aluminium alloy, wherein the aluminium alloy comprises in wt%:*
0.3-1.5 Si, preferably 0.5-1.1 Si,
0.3-1.5 Mg, preferably 0.5 to 1.5 Mg, and most preferably 0.65-1.2 Mg,
<0.6 Mn, preferably 0.05 to 0.3, most preferably 0.08 to 0.15 Mn,
<0.5 Cu, preferably <0.4, most preferably 0.05-0.2 Cu,

<0.5 Fe, preferably <0.3 Fe,
<0.3 Nb,
<0.3 V, preferably 0.01-0.1 V,
<0.3 Cr,
<0.2 Zn, preferably <0.1 Zn,
<0.2 Ti, preferably 0.01-0.1 Ti,
<0.2 Mo,
< 0.2 Zr
and unavoidable each 0.05 wt.% maximum and the total of impurities 0.15 wt.% maximum, balance aluminium characterized in comprising grains, dendrites or cells having two distinct zones with a first centre zone enriched in elements capable of reacting peritectically with aluminium and a second zone, surrounding the first zone, enriched in elements capable of reacting eutectically with aluminium, the first zone occupying 1-85%, preferably 10-70%, most preferably 20-50% of the total volume measured on the cross section as peritectic hills in the interference contrast in LOM, and wherein the precipitation hardenable aluminium alloy comprises peritectic alloying elements with a combined partition coefficient ∑k of above 3, preferentially above 5 and most preferentially above 8 and a proportion of peritectic elements of more than 0.02 x [wt% eutectic alloying elements] able to suppress the local eutectic element content in the peritectic zone to <0.8 x [the average eutectic alloying elements content of the alloy in wt%], wherein the solidification time during casting is controlled to at least 75 seconds, and
wherein the casting is performed while controlling the casting speed so as to produce the two-zone structure, and
wherein the Mg/Si ratio of the aluminium alloy is >1."

XV. Claim 1 of the first auxiliary request differs from the main request in that the Mg content is 0.65-1.2 wt% Mg, and in that the last feature "*and wherein the Mg/Si ratio of the aluminium alloy is >1*" is not present.

Claim 1 of the second auxiliary request differs from the main request in that the Cu content is 0.05-0.2 wt% Cu, and in that the last feature "*and wherein the Mg/Si ratio of the aluminium alloy is >1*" is not present.

Claim 1 of the third auxiliary request differs from the main request in that the first zone occupies 20-50% of the total volume, and in that the last feature "*and wherein the Mg/Si ratio of the aluminium alloy is >1*" is not present.

Claim 1 of the fourth auxiliary request differs from the main request in that the first part is amended to read "*A method for producing a cast aluminium material of a precipitation hardenable AlMgSi aluminium alloy*", in that the expression "*enriched in elements capable of reacting eutectically with aluminium*" is amended to read "*enriched in the elements Mg and Si capable of reacting eutectically with aluminium*", and in that the last feature "*and wherein the Mg/Si ratio of the aluminium alloy is >1*" is not present.

Claim 1 of the fifth auxiliary request reads as follows:
"*A method of producing a wrought aluminium material with a layered structure, the method comprising producing a cast aluminium material of a precipitation hardenable aluminium alloy, and deforming the as cast aluminium material to produce a material having a layered structure comprising alternate layers of different mechanical properties,*

wherein the aluminium alloy comprises in wt%:
0.3-1.5 Si, preferably 0.5-1.1 Si,
0.3-1.5 Mg, preferably 0.5 to 1.5 Mg, and most preferably 0.65-1.2 Mg,
<0.6 Mn, preferably 0.05 to 0.3, most preferably 0.08 to 0.15 Mn,
<0.5 Cu, preferably <0.4, most preferably 0.05-0.2 Cu,
<0.5 Fe, preferably <0.3 Fe,
<0.3 Nb,
<0.3 V, preferably 0.01-0.1 V,
<0.3 Cr,
<0.2 Zn, preferably <0.1 Zn,
<0.2 Ti, preferably 0.01-0.1 Ti,
<0.2 Mo,
< 0.2 Zr
and unavoidable each 0.05 wt.% maximum and the total of impurities 0.15 wt.% maximum, balance aluminium,
wherein the as cast material comprises grains, dendrites or cells having two distinct zones with a first centre zone enriched in elements capable of reacting peritectically with aluminium and a second zone, surrounding the first zone, enriched in elements capable of reacting eutectically with aluminium, the first zone occupying 20-50% of the total volume measured on the cross section as peritectic hills in the interference contrast in LOM, wherein the precipitation hardenable aluminium alloy comprises peritectic alloying elements with a combined partition coefficient ∑k of above 3, preferentially above 5 and most preferentially above 8 and a proportion of peritectic elements of more than 0.02 x [wt% eutectic alloying elements] able to suppress the local eutectic element content in the peritectic zone to <0.8 x [the average eutectic alloying elements content of the alloy in wt%],

and wherein the Mg/Si ratio of the aluminium alloy is >1,
wherein the solidification time during casting is controlled to at least 75 seconds, and wherein the casting is performed while controlling the casting speed so as to produce the two-zone structure."

XVI. The respondent's arguments where relevant to the present decision can be summarised as follows.

Admissibility of the appeal

The appeal did not fulfil the requirements of Articles 107 and 108 EPC. The joint opponents 1, namely i) C-TEC Constellium Technology Center and ii) Constellium Valais SA, would have been entitled to appeal. However, though filed by the common representative of joint opponents 1, the notice of appeal and the statement of grounds of appeal were filed for other legal entities. The notice of appeal indicated "C-TEC Constellium Technology Center", the statement of grounds of appeal "Constellium Singen GmbH, Constellium Technology Center". The common representative's subsequent explanations did not clarify if Constellium Valais SA still belonged to the appealing party either. It had to be clear throughout the proceedings who belonged to the group of common appellants (G 3/99, Reasons 19 and Headnote 3). This requirement was not fulfilled.

Clarity

It was common general knowledge that the "solidification time" could be determined by means of thermal analysis. The skilled person would have known that what was meant was the local solidification time,

i.e. the time between the liquidus temperature and the solidus temperature.

As shown by D41, it was common general knowledge to use thermal analysis in direct chill (DC) casting. The thermocouples were dipped into the liquid pool, moved at the casting rate and allowed to freeze into the solid part of the billet. A plurality of thermocouples was commonly used, and it was known where the highest solidification rate was to be expected.

The skilled person would readily have understood from the disclosure of the patent that the solidification time of at least 75 seconds applied to the material that was to be used later. Except for the usual wall effects, the solidification time should be complied with irrespective of where the thermocouple was placed.

D35 also mentioned the solidification time, showing that it was a usual parameter.

XVII. The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be rejected as inadmissible, or that the patent be maintained in the form of the main request (submitted as auxiliary request 2 with the reply to the statement of grounds of appeal), or alternatively that the patent be maintained in amended form on the basis of one of auxiliary requests 1-3 (filed as auxiliary requests 1, 3 and 4 with the reply to the statement of grounds of appeal) or one of auxiliary requests 4 and 5 (filed as auxiliary requests 5 and 7 with the letter dated 2 October 2020).

Reasons for the Decision

1. Admissibility of the appeal

1.1 The notice of appeal was filed by the company C-TEC Constellium Technology Center. It was not under debate that C-TEC Constellium Technology Center was the common representative of joint opponents 1. Joint opponents (joint appellants) are required to act through a common representative (Rule 151(1) EPC and G 3/99, Headnote 2).

1.2 In reply to the board's communication dated 7 February 2019, the common representative corrected an erroneous indication of the appellant's name in the statement of grounds of appeal (2 April 2019). It also requested the EPO to record the change of address (17 April 2019).

1.3 These corrections are permitted under Rule 139 EPC and G 1/12 (Catchword). The board is satisfied that they reflect what was originally intended, namely to file the statement of grounds of appeal in the same name as the notice of appeal and to notify the change of address. The deficiencies identified by the board were thus remedied within the set time limit.

1.4 C-TEC Constellium Technology Center did not explicitly indicate in either the notice of appeal or the statement of grounds of appeal that the appeal was also filed on behalf of Constellium Valais SA, i.e. the other joint opponent.

1.5 As it pointed out during the oral proceedings, by acting as the common representative within the meaning of Rule 151(1) EPC, C-TEC Constellium Technology Center filed the appeal on behalf of both joint opponents.

1.6 In the aforementioned submissions (2 April 2019), the common representative furthermore clarified that C-TEC Constellium Technology Center was one of the joint opponents, the other being Constellium Valais SA.

1.7 In view of these indications, and in particular in the absence of any statement that Constellium Valais SA had withdrawn from the joint opponents, as required by G 3/99, Headnote 3, the board has no doubt that the appellant's true intention was for the appeal to be filed jointly by the joint opponents, i.e. i) C-TEC Constellium Technology Center and ii) Constellium Valais SA. The board therefore does not share the respondent's view that the identity of the appellant was not clear.

1.8 Following the approach set out in T 562/13 (Reasons 1), and in line with T 1366/04 and T 12/10 (Reasons 1 in both), the board therefore concludes that the appeal is admissible.

Main Request

2. Clarity

2.1 Claim 1 at issue relates to a method for producing a cast aluminium material. The method is defined by reference to, *inter alia*, the "solidification time".

2.2 The feature relating to the solidification time was added to claim 1 (which is based on claim 8 as granted) by amendment during the opposition proceedings. Under G 3/14 (Order), it may be examined whether the amendment results in a lack of clarity.

2.3 It was under debate whether the solidification time could be clearly determined and whether the skilled person could verify whether they were working inside or outside the scope of the claim.

2.4 The claim encompasses DC casting, in line with both the requirement in the claim to control the casting speed, and the examples (paragraph [0038] of the impugned patent). There is no indication that there is a standard method for measuring the solidification time during DC casting. In particular, there is no indication that a DC casting method is usually characterised by a solidification time.

2.5 Document D35 mentions a local solidification time but does not relate to DC casting.

2.6 The patent is silent as to how the solidification time is to be measured, merely stating that the solidification time is "the time between completely liquid and completely solidified material" (paragraph [0021]). The examples do not mention a solidification time.

2.7 The general reference to the time between completely liquid and completely solidified material does not necessarily imply – as the only possible interpretation – that a local solidification time as the time between the liquidus temperature and the solidus temperature is what is meant. For instance, it could relate to the

melt pouring temperature instead of the liquidus temperature, considering that the temperature of the melt is associated with the development of the desired two-zone structure (paragraph [0016]).

2.8 Even if the skilled person were to interpret the solidification time as a local solidification time, and more specifically as the time between the liquidus temperature and the solidus temperature, they would need to provide a measuring method, for instance a thermal analysis method.

2.9 It was not disputed that thermal analysis methods are generally known for solidification in a crucible or mould.

2.10 It is also known to perform a thermal analysis method during DC casting. In DC casting, a plurality of thermocouples may be implanted in the melt and moved at a rate equal to the casting speed, with these eventually freezing into the cast material (D41, showing a "typical set-up for measuring cooling rate during DC casting"; see the paragraph bridging pages 93 and 94 and Figure 3.13).

2.11 However, the precise location where the thermocouple is to be placed would still have to be chosen. In a DC casting process, the solidification rate - and thus the solidification time - varies in the radial direction of the billet (D41, Figures 3.1, 3.11), even with a steady state and a constant casting speed.

2.12 This difference in the solidification rate decreases with decreasing casting speed (D41, Figure 3.11b). However, the claim is not limited to any specific casting speed (other than being implied by the result

to be achieved), or to any specific billet dimensions or geometry. There is no basis to conclude that the effect of the thermocouple location could be neglected in the claimed casting method.

2.13 According to the respondent, the claim had to be construed as requiring a solidification time of at least 75 seconds throughout the material intended to be used later for producing a damage-tolerant component, and thus "everywhere" in the billet, except for the usual surface effects.

2.14 Even if this interpretation is reasonable in view of the teaching to observe a minimum solidification time, it is not specified in the claim, so other interpretations remain possible. For instance, an arbitrary point along the radius of a billet could be predetermined as being the representative location for the casting method under consideration.

Furthermore, the presence of surface effects is undisputed. This raises the question of whether it is possible to clearly differentiate between the part of the material of interest where the solidification time needs to be at least 75 seconds, and the remainder, where shorter times are possible. Depending on which part of the material is intended for later use, a given method thus may or may not be within the scope of the claim.

2.15 In addition, it is not known if the solidification time is to be measured experimentally at all, or if it is to be determined from a simulation of the DC casting or by FEM modelling (page 8, last paragraph - page 9, first full paragraph of the respondent's letter of 12 February 2019).

This question is particularly relevant because the measured value cannot always be related to the formed structure, as follows from D41.

According to D41, when measuring the cooling curve during DC casting, it needs to be assumed that the solid phase follows the tip of the thermocouple, i.e. travels from the liquidus to the solidus at the casting speed (D41, sentence bridging pages 97 and 98). However, there are complex flow patterns in the liquid and slurry zones of the billet, which cause scatter in the solidification times (D41, page 98, middle of the last full paragraph). It is not always correct to attribute the cooling rates experimentally measured by a thermocouple moving with a billet to the structure found at the position of that thermocouple (D41, page 101, last paragraph).

2.16 In light of the above, the feature of controlling the solidification time to at least 75 seconds does not allow the skilled person to unambiguously verify whether a given DC casting method is inside or outside the scope of the claim.

The requirements of Article 84 EPC are therefore not met.

Auxiliary requests 1-5

3. Clarity

3.1 Claim 1 of each of auxiliary requests 1-5 includes the same feature of controlling the solidification time during casting to at least 75 seconds.

The question of the admissibility of auxiliary requests 4 and 5 notwithstanding, claim 1 of each of auxiliary requests 1-5 therefore lacks clarity for the same reasons as claim 1 of the main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

A. Voyé E. Bendl

Decision electronically authenticated