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Datasheet for the decision of 18 October 2019

Case Number: T 1051/17 - 3.3.05

Application Number: 10382360.5

Publication Number: 2471967

IPC: C22C21/04, C22F1/043, C22C1/02, C22C1/03

Language of the proceedings: EN

Title of invention:
Method for obtaining improved mechanical properties in recycled aluminium castings free of platelet-shaped beta-phases

Patent Proprietors:
Casa Maristas Azterlan
Befesa Aluminio, S.L.

Opponents:
TRIMET Aluminium SE
BorgWarner, Inc.

Headword:
Recycled aluminium casting/Casa Maristas Azterlan

Relevant legal provisions:
EPC Art. 123, 84, 83, 54, 56
RPBA Art. 13(1), 13(3)

Keyword:
Late-filed request - admitted (yes)
Claims - lack of clarity no ground for opposition
Inventive step - (yes)

Decisions cited:
G 0003/14

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1051/17 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 18 October 2019

Appellant: (Opponent 1)	TRIMET Aluminium SE Aluminiumallee 1 45356 Essen (DE)
Representative:	Flaccus, Rolf-Dieter Flaccus · Müller-Wolff Patentanwälte Bussardweg 10 50389 Wesseling (DE)
Appellant: (Opponent 2)	BorgWarner, Inc. 3850 Hamlin Road Auburn Hills, MI 48326 (US)
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Respondent: (Patent Proprietor 1)	Casa Maristas Azterlan C/ Aliendalde, 6 48200 Durango (Vizcaya) (ES)
Respondent: (Patent Proprietor 2)	Befesa Aluminio, S.L. Carretera Luchana Asúa n°13 48950 Erandio, BIZKAIA (ES)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 12 April 2017 rejecting the oppositions filed against European patent No. 2471967 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman G. Glod
Members: S. Besselmann
S. Fernández de Córdoba

Summary of Facts and Submissions

I. The present appeal lies from the decision of the opposition division to reject the oppositions against European patent No. 2471967. The patent in suit concerns a method for obtaining improved mechanical properties in recycled aluminium castings free of platelet-shaped beta-phases.

II. The opposition division dealt with the grounds for opposition pursuant to Article 100(a) EPC in conjunction with Articles 54 and 56 EPC, Article 100(b) and Article 100(c) EPC.

III. In the decision under appeal the following documents, *inter alia*, are referred to:

D1	US 6,267,829 B1 (31 July 2001)
D1a	WO 97/13882 (17 April 1997)
D4	DE 10 2008 055 928 A1 (27 August 2009)
D4a	Aluminium Laufen AG: Legierungen für Kokillenguss und Niederdruckguss (14 March 2006)
D5	EP 1 715 084 A1 (25 October 2006)
D20	US 2005/0199318 A1 (15 September 2005)
D25	Sreeja Kumari S. S. et al., Materials Science and Engineering A, 460-461, 2007, 561-573
D28	DE 10 2005 010 626 A1 (6 October 2005)

IV. Both opponent I (appellant I) and opponent II (appellant II) appealed this decision.

V. With its reply to the appeals, the patent proprietors (respondents) submitted an amended description page as the first auxiliary request, and two sets of claims as

the second and third auxiliary requests. In reply to the preliminary opinion of the board, the second and third auxiliary requests were replaced by modified versions on 15 October 2019.

VI. During oral proceedings of 18 October 2019, the respondents withdrew the higher ranking requests and maintained the third auxiliary request of 15 October 2019 as their sole final request.

VII. Claim 1 of this final request reads:

"1. A process for the preparation of an iron containing aluminium alloy casting free of primary platelet-shaped beta-phase of the Al_5FeSi-type in the solidified structure presenting the following composition (amounts expressed in % by weight in respect to the total weight of the alloy):

Si	*6.00 - 9.50*
Fe	*0.15 - 0.60*
Mn	*0.04 - 0.60*
Mg	*0.20 - 0.70*
Cr	*0.01 - 0.60*
Ti	*0.05 - 0.30*
Sr and/or Na	*0.001 - 0.25*
V	*0.00 - 0.60*
Cu	*0.01 - 0.25*
Ni	*0.01-0.1*
Zn	*0.01-0.1*

balance being Al and incidental impurities, wherein the iron-containing aluminium alloy casting presents a composition characterized in that the total amount of Mn and Cr in weight percentage (wt.%) is equal or larger than 50 % of the Fe amount, or wherein the iron-containing aluminium alloy casting presents a composition characterized in that the total

amount of Mn, Cr and V in weight percentage (wt.%) is equal or larger than 50 % of the Fe amount comprising:
a) melting a secondary AlSi7Mg ingot of second fusion,
b) adding either Mn and Cr, or Mn and Cr and V, to the base composition of the secondary AlSi7Mg ingot of second fusion,
c) adding a grain refiner and a eutectic silicon modification agent,
d) submitting the molten alloy obtained in step c) to a degassing process,
e) introducing the degassed molten alloy in a mould,
f) casting solidification inside the mould,
g) casting extraction from the mould, and
submitting the solidified casting of step g) to a T6 heat treatment h)
wherein the casting obtained in step h) presents a tensile strength between 250-300 MPa, a yield strength between 190-230 MPa and elongation values between 4,5-9%."

Independent claim 4 reads:
"4. An aluminium alloy casting presenting the composition as defined in any of claims 1 to 3 and presenting a tensile strength between 250-300 MPa, a yield strength between 190-230 MPa and elongation values between 4,5-9% which is obtainable by the process of any one of claims 1 to 3."

Claims 2 and 3 define preferred embodiments of the process of claim 1. Claim 5 defines a use of the aluminium alloy casting of claim 4, and claim 6 defines a component made from this aluminium alloy casting.

VIII. Appellant I requested that the now sole request of 15 October 2019 not be admitted and raised objections

of lack of clarity (Article 84 EPC) and lack of inventive step (Article 56 EPC). The objection of lack of inventive step of claim 1 was based in particular on D2 as the closest prior art. An independent objection of lack of inventive step concerned claim 4 and was based on D20.

IX. Appellant II raised objections under Article 100(a) EPC in conjunction with Articles 54 and 56 EPC, and under Articles 100(b) and 100(c) EPC in its statement of grounds of appeal, concerning the patent as granted.

The objections of lack of inventive step were based on D1 and D2 as the closest prior art. The appellant made further submissions on 2 September 2019, maintaining the objections of lack of inventive step against the then pending version of the second and third auxiliary requests. These then pending requests were additionally objected to under Articles 123(2) and (3) EPC.

Appellant II did not detail to what extent its objections applied to the claims of the now sole request.

X. The appellants' principal arguments, as far as relevant for the present decision, may be summarised as follows:

The now sole request should not be admitted into the proceedings because it had been filed late and was not *prima facie* allowable.

This request was unclear because the claimed process was defined by reference to characteristics of the desired product, amounting to a definition in terms of the result to be achieved. An objection under Article

84 EPC was possible, following G 3/14, because the clarity issue had been introduced by amendment.

The subject-matter of claim 1 lacked inventive step in view of D2, the indicated process steps being conventional. The claimed mechanical properties were merely the result of these process steps.

Claim 4 was a product-by-process claim and thus related to the claimed alloy as such. The claimed mechanical properties were conventional as was evident from D4 and D4a. The subject-matter of claim 4 therefore lacked an inventive step in view of D20 in combination with D2.

XI. The respondents' principal arguments may be summarised as follows:

The patent in suit taught for the first time that the mechanical properties of a recycled aluminium alloy could be brought close to those of a primary alloy by adding both manganese and chromium in the given proportion in relation to iron. D2 did not teach the claimed mechanical properties, and D20 did not achieve the claimed elongation value.

XII. The appellants requested that the decision under appeal be set aside and that the European patent be revoked.

The respondents requested that the patent be maintained in amended form on the basis of the sole request filed as auxiliary request III on 15 October 2019.

Reasons for the Decision

1. Admissibility

1.1 This request was filed only three days before the oral proceedings. However, it is similar to the previous second auxiliary request, filed with the statement of grounds of appeal. It also relates to a process for the preparation of an aluminium alloy casting presenting the indicated parameter values of tensile strength, yield strength and elongation value, and it comprises the additional steps of granted claims 4 and 5. The difference is that several features and method steps in claim 1 of the previous request have been re-arranged to address objections under Articles 123(2) and (3) EPC. As such the request does not include any new features taken from the description or the claims compared to the previous second auxiliary request.

1.2 The board does not agree with appellant I that the claims would *prima facie* not be allowable because they were unclear and lacked an inventive step. As is evident from the considerations below, this request is clearly allowable.

1.3 This request is therefore admitted into the proceedings (Article 13(1) and (3) RPBA).

2. Article 123 EPC

2.1 Claim 1 corresponds to granted claim 1, further limited by the features of claims 5, 7 and 8 as originally filed, corresponding to granted claims 4, 5 and 6. The appellants' initial objection under Article 100(c) EPC against the patent as granted concerned the absence of

the process steps of original claim 5 in claim 1. This objection has consequently become irrelevant.

2.2 The scope of the claims has thus been limited in comparison to granted claim 1.

2.3 The requirements of Article 123(2) and (3) EPC are met.

3. Clarity

3.1 According to appellant I, clarity within the meaning of Article 84 EPC was lacking because claim 1 related to a process but attempted to define this process by reference to the result to be achieved, namely, the desired properties of the resulting product.

3.2 Claim 6 of the granted patent already defined the aluminium alloy casting by reference to the desired properties, namely, the indicated parameter values of tensile strength, yield strength and elongation value. This claim was a product-by-process claim, meaning that the process according to claim 1 had to be executed for the product to be produced with the specific properties. Hence, the process steps of the product-by-process definition were indirectly limited by the properties of the resulting product, namely, the indicated parameters. Consequently, the alleged lack of clarity was already present in the product-by-process definition in the granted claims. Following G 3/14 (Order), this alleged lack of clarity may therefore not be examined in the present opposition appeal proceedings.

4. Sufficiency of disclosure (Article 100(b) EPC)

4.1 Even assuming that appellant II maintained the objection of lack of sufficiency of disclosure raised against the granted patent, the board has no reason to deviate from its preliminary opinion that this objection is not convincing. Specifically, the alleged discrepancy between the usual range of the silicon content of "AlSi7Mg" alloy and the range of the silicon content stipulated in claim 1 would not have prevented the skilled person from carrying out the invention. The "secondary AlSi7Mg ingot" is merely the starting material, and the skilled person would have been able to adjust the silicon content in accordance with the desired final silicon content of from 6.00 to 9.50 weight%.

5. Novelty (Article 100(a) EPC in conjunction with Article 54 EPC)

5.1 Even assuming that the objection of lack of novelty in view of D2, raised by appellant II against granted claim 1, is maintained against the current claims, this objection is not convincing, at least because D2 does not disclose the indicated parameter values of tensile strength, yield strength and elongation value (see also point 6.3 below).

6. Inventive step

Claim 1

6.1 The present invention relates to a process for the preparation of an aluminium alloy casting from recycled aluminium.

6.2 Document D2 is considered the closest prior art since it relates to the preparation of an aluminium alloy casting from recycled aluminium containing iron impurities (see paragraphs [0001], [0004] and [0010]). D2 consequently relates to a similar purpose to the patent in suit (see paragraphs [0001] and [0011]).

6.3 The alloys known from D2 contain manganese, the ratio of iron to manganese being preferably < 3:1, and may contain chromium (see paragraphs [0010] and [0011]). According to one alternative of D2, a T6 heat treatment may be performed (see paragraph [0018]).

However, D2 is silent as to the mechanical properties of the cast alloy. Even if these are commonly known properties of primary alloys (see D4 and D4a), this does not show that they are inevitably obtained in D2, independent of, for instance, the chosen amounts of manganese and chromium. The claimed combination of values of tensile strength, yield strength and elongation value is therefore neither explicitly nor implicitly disclosed in D2.

6.4 The problem to be solved is to provide a method for obtaining a recycled aluminium casting having mechanical properties close to those obtained in primary alloys (paragraph [0011] of the patent in suit).

6.5 The problem is solved by a process according to claim 1 characterised in that Mn and Cr, or Mn and Cr and V, are added to the base composition, and the obtained casting presents a tensile strength between 250-300 MPa, a yield strength between 190-230 MPa and elongation values between 4,5-9%.

6.6 The board is satisfied that this technical problem is solved, considering that the claimed process is restricted to the preparation of aluminium alloy castings having the specific mechanical properties, and having regard to example 3 of the patent in suit.

6.7 The skilled person would have found no instructions in the available prior art that the casting of secondary aluminium alloys might be steered towards the claimed mechanical properties when suitable amounts of both manganese and chromium were added. The reasons are the following.

6.7.1 The respondents convincingly argued that manganese and chromium are not equivalent and that appropriate amounts of both manganese and chromium are necessary to obtain the claimed properties. This argument is consistent with the results obtained in D20. D20 is concerned with improving the mechanical properties of a castable aluminium alloy containing iron, but it only teaches to control the amount of manganese, i.e. the ratio of manganese to iron, to improve these properties (see paragraph [0019]). No chromium is added. The results of D20 itself (see figure 3) show that only a good tensile strength is obtained, but not the elongation values required in claim 1 at issue.

6.7.2 While the skilled person would have known that manganese and chromium each inhibit the formation of beta-phase platelets and thereby improve the mechanical properties (see the common general knowledge set out in D1a, page 4, line 3, to page 5, line 4, in conjunction with page 3, lines 16-20), as has also been acknowledged in the patent in suit (see paragraph [0008]), the skilled person would not have been taught that suitable amounts of both manganese and chromium

(or manganese and chromium and vanadium) in combination were needed to obtain the claimed mechanical properties.

6.8 The subject-matter of claim 1 therefore involves an inventive step in view of D2.

6.9 The appellants cited D1, D1a, D5, D20, D25 and D28 as alternative starting points for assessing inventive step. D1/D1a and D20/D28 belong to the same patent families, respectively. Hence, reference is only made to D1a and D20.

6.9.1 D1a, acknowledged in paragraph [0010] of the patent in suit, also relates to the production of iron-containing aluminium alloys having improved mechanical properties (page 1, lines 1-3) and specifically mentions foundry (casting) alloys produced from scrap (recycled aluminium) (see page 1, lines 14-19). D1a thus relates to the same purpose as the patent in suit.

However, despite its explicit reference to improved mechanical properties, D1a is no more relevant than D2 with respect to claim 1 at issue, because D1a discloses neither a ratio of Mn+Cr(+V) $\geq$ 50% Fe, nor a T6 heat treatment, nor the mechanical property values.

6.9.2 D5 and D20 are less relevant because neither D5 nor D20 relate to the purpose of preparing an aluminium alloy casting from secondary (recycled) aluminium.

6.9.3 D25 is no more relevant than D2 either. D25 mentions recycled aluminium in the introduction (first page, left-hand column, last sentence). However, the document presents experiments conducted using a "commercial grade" alloy (see the "Materials and methods" section),

the iron content of which has been adjusted to 0.8 wt.% (see table 2), thus outside the scope of claim 1. D25 uses manganese as one of several addition metals (see table 2) but does not mention the presence of chromium. The alloys of D25 have not been shown to exhibit the properties defined in claim 1 at issue.

6.10 For these reasons, the objections of lack of inventive step of claim 1 are not convincing. This also applies to claims 2 and 3 that directly depend on claim 1.

Claim 4

6.11 Appellant I raised an independent objection of lack of inventive step against claim 4, stressing that the product-by-process definition of this claim did not limit the aluminium alloy casting as such. This objection was based on D20 as the closest prior art.

6.12 D20 does not mention the casting of secondary alloys but refers to aluminium produced from bauxite containing ferric oxide (paragraph [0003]). It discloses a castable aluminium alloy consisting essentially of, in weight %, about 6.0 to 9.0% Si, 0 to about 0.75% Cu, about 0.2% to about 0.4% Mg, up to about 1.0% Zn, 0 to about 1.5% Ni, up to 0.3% Ti, about 0.35% to about 0.65% Fe, about 0.4% to about 0.9% Mn, and balance Al, wherein the weight ratio of Mn/Fe is 0.6 or greater when Fe is less than 0.4 weight % and is 1.0 or greater when Fe is 0.4 weight % or more (claim 11).

6.13 The problem to be solved is to provide a recycled aluminium casting having mechanical properties close to those obtained in primary alloys (paragraph [0011] of the patent in suit).

6.14 The problem is solved by an aluminium alloy according to claim 4 characterised in that it contains Cr and that the elongation values are between 4,5-9%.

6.15 It is accepted that the problem is solved as is evident from example 3 of the patent in suit. There is no evidence in support of the argument that the mechanical properties of the alloys defined in claim 11 of D20, when cast and subjected to a T6 heat treatment, would inevitably exhibit the mechanical properties defined in the claim at issue. The mere observation that other commercial, primary alloys exist which exhibit such properties is not sufficient.

6.16 Appellant I argued that the mention of the presence of chromium in D2 would have motivated the skilled person to employ chromium as an additional component of the alloy composition known from D20. According to the appellant, the skilled person would have subjected the composition to a T6 heat treatment and inevitably have arrived at the desired mechanical properties.

6.17 The board does not agree. As indicated, D2 is silent as to the mechanical properties of the cast alloy. There is no explicit teaching in D2 according to which the addition of chromium would improve the mechanical properties, in particular, the elongation value.

6.18 As follows from the considerations concerning claim 1 (see point 6.7), the skilled person would have found no guidance in the available prior art that the desired mechanical properties were attainable when suitable amounts of both manganese and chromium were added. The proposed solution (see point 6.14) is not obvious.

6.19 The subject-matter of claim 4 consequently involves an inventive step. This also applies to claim 5 (use of the aluminium alloy casting) and claim 6 that directly depends on claim 4.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of the sole request filed as auxiliary request III on 15 October 2019 and a description to be adapted.

The Registrar: The Chairman:

C. Vodz G. Glod

Decision electronically authenticated