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Datasheet for the decision of 30 June 2023

Case Number: T 0906/21 - 3.3.05

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Language of the proceedings: EN

Title of invention:
ALUMINUM-ALLOY CLAD MEMBER AND METHOD FOR PRODUCING THE SAME

Patent Proprietor:
UACJ Corporation

Opponent:
Gränges AB

Headword:
ALUMINUM-ALLOY CLAD MEMBER/UACJ Corp.

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

Keyword:
Grounds for opposition - insufficiency of disclosure (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

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Beschwerdekammern

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Case Number: T 0906/21 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 30 June 2023

Appellant: (Opponent)	Gränges AB Linnégatan 18 Box 5505 114 85 Stockholm (SE)
Representative:	Valea AB Box 1098 405 23 Göteborg (SE)
Respondent: (Patent Proprietor)	UACJ Corporation 1-7-2, Otemachi Chiyoda-ku Tokyo 100-0004 (JP)
Representative:	TBK Bavariaring 4-6 80336 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 30 April 2021 rejecting the opposition filed against European patent No. 3029169 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	E. Bendl
Members:	J. Roider
	S. Fernández de Córdoba

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division to reject the opposition.

II. The following documents, which were cited in the opposition proceedings, are relevant here:

D1 Westergård et al.: "New High Strength, Long-Life Aluminium Alloys with Excellent Sagging Resistance for Heat Exchanger Tube Applications", SAE International, 2005

D2/D2a JP 2008-261026 A / English machine translation thereof

D3/D3a JP H11-209837 A / English machine translation thereof

D4/D4a JP 2013-036099 A / English machine translation thereof

D10/D10a JP 2008-111143 A / English machine translation thereof

After the summons to oral proceedings, the following document was cited by the appellant (opponent):

D15 Cohen and Nielsen, *"Aluminium-Legierungen"* in *Werkstoff-Handbuch Nichteisenmetalle*, VDI-Verlag, 1960, page 1

III. Independent claims 1 and 5 of the main request (i.e. the claims as granted) read as follows:

"1. An aluminum alloy clad material having an aluminum alloy core material and a sacrificial anode material

clad on at least one surface of the core material, wherein the core material is an aluminum alloy consisting of: 0.05 to 1.50 mass% Si; 0.05 to 2.00 mass% Fe; 0.50 to 2.00 mass% Mn; optionally one or two or more selected from 0.05 to 1.50 mass% Cu, 0.05 to 0.50 mass% Mg, 0.05 to 0.30 mass% Ti, 0.05 to 0.30 mass% Zr, 0.05 to 0.30 mass% Cr and 0.05 to 0.30 mass% V; and a balance of Al and unavoidable impurities, the sacrificial anode material is an aluminum alloy consisting of: 0.50 to 8.00 mass% Zn; 0.05 to 1.50 mass% Si; 0.05 to 2.00 mass% Fe; optionally one or two or more selected from 0.05 to 2.00 mass% Ni, 0.05 to 2.00 mass% Mn, 0.05 to 3.00 mass% Mg, 0.05 to 0.30 mass% Ti, 0.05 to 0.30 mass% Zr, 0.05 to 0.30 mass% Cr and 0.05 to 0.30 mass% V; and a balance of Al and unavoidable impurities,
a grain size of the sacrificial anode material before braze heating is 60 µm or more, and a ratio R1/R2 is 0.30 or less, when R1 is a grain size in a thickness direction, R2 is a grain size in a rolling direction in a cross section of the core material along the rolling direction."

"5. A method for producing the aluminum alloy clad material according to claim 1, comprising:
a step of casting the aluminum alloys for the core material and the sacrificial anode material, respectively,
a hot rolling step of hot rolling the cast sacrificial anode material ingot,
a cladding step of cladding the rolled sacrificial anode material on at least one surface of the core material ingot and thus obtaining a clad material,
a hot clad rolling step of hot rolling the clad material,
a cold rolling step of cold rolling the hot-rolled clad

material, and
one or more annealing steps of annealing the clad material either during or after the cold rolling step or both during and after the cold rolling step:
wherein in the hot clad rolling step, the rolling start temperature is 400 to 520°C, and the number of rolling passes each with a rolling reduction of 30% or more is restricted to one to five while the temperature of the clad material is 200 to 400°C, and
the clad material is held at 200 to 560°C for 1 to 10 hours in the one or more annealing steps."

Dependent claims 2-4, 6 and 7 concern particular embodiments of the invention.

IV. The key arguments of the appellant (opponent) are as follows:

(a) Sufficiency of disclosure, Article 100(b) EPC
The skilled person faced an undue burden in having to determine the exact reduction in the number of rolling passes in order to obtain a product according to claim 1. It was not clear from the examples which process parameters distinguished the inventive examples from the comparative examples. No information was disclosed for reduction ratios below 30%. It was not credible that the ratio R1/R2 varied so much between Example 11 on the one hand and Examples 22 and 57 on the other.

The appellant also objected to inconsistencies between the examples and to the breadth of the claimed ranges, which allegedly led to the situation that the skilled person could not obtain

the grain size parameters without undue burden.

(b) Novelty, Article 100(a) EPC / Article 54(1) and (2) EPC
The appellant is of the opinion that D1 disclosed the subject-matter of claim 1 because, *inter alia*, any of the core materials of Table 1 combined with the clad material FA6815 of Table 2 anticipated the alloy of the subject-matter of claim 1. Although Tables 1 and 2 disclosed only the upper limits of silicon, iron and copper, it was clear that the amount of these elements in the alloy could not be zero. A typical pure aluminium, such as Al 99.5, contained iron, silicon and copper in the claimed ranges as impurities. The use of Al 99.5 for manufacturing the core material thus led to a product which anticipated the claimed ranges of silicon and iron. The same reasoning applied to the iron content in the clad material. The copper content in the clad material FA6815, shown in D1, Table 2, was an unavoidable impurity.

(c) Inventive step, Article 100(a) EPC / Article 56 EPC
The subject-matter of claim 1 lacked an inventive step starting from D1 in view of D15 or starting from D4/D4a in view of D3/D3a, D10/D10a or D2/D2a. Details of the arguments relating hereto are contained in the reasons for the decision set out below.

V. The key arguments of the respondent (patent proprietor) are as follows:

(a) Sufficiency of disclosure, Article 100(b) EPC
The patent in suit contained a number of examples. No evidence was provided that showed that the

invention was insufficiently disclosed.

(b) Novelty, Article 100(a) EPC / Article 54(1) and (2) EPC
The core material in D1 contained iron and silicon up to a certain amount. Similarly, the clad material contained iron and copper up to a certain amount. There was no basis for assuming that an amount of 0.1% of copper had to be considered an impurity. Therefore, the aluminium alloy according to D1 showed four ranges overlapping with the subject-matter of claim 1, which could not be regarded as novelty-destroying.

(c) Inventive step, Article 100(a) EPC / Article 56 EPC
The examples in D4/D4a did not show the grain size of the clad material before brazing. The documents the appellant combined with D4/D4a did not lead the skilled person to the claimed subject-matter.
The objections starting from D1 were unsubstantiated or late-filed.

VI. Substantive requests

The appellant (opponent) requested that the decision under appeal be set aside and the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or in the alternative that the patent be maintained in amended form based on the original auxiliary requests 1 to 8 filed in opposition proceedings, resubmitted with the reply to the appeal, or based on the alternative first to ninth auxiliary requests filed with the letter dated 4 May 2023,in the following order:

- alternative first auxiliary request;

- original auxiliary request 1;
- alternative second auxiliary request;
- original auxiliary request 2;

and so on until the end of the auxiliary requests.

Reasons for the Decision

1. Admission of D15

D15 was filed after the summons to oral proceedings, and therefore the requirements of Article 13(2) RPBA apply.

D15 is an extract from a handbook which is considered to comprise the common general knowledge of the skilled person. The cited part is concise and supplements the essential points for the assessment of patentability. The proprietor did not object to the admission thereof.

The board has therefore decided to admit D15 into the appeal proceedings.

2. Main request, Article 100(b) EPC

2.1 The subject-matter of independent claim 1 is directed to an aluminium alloy clad material and specifies the composition of the clad material and the core material as well as two parameters relating to the grain size.

The subject-matter of independent claim 5 defines a method for manufacturing the claimed aluminium alloy clad material, consisting only of method steps. Claim 5

also contains the grain size parameters by virtue of its reference to claim 1.

The patent contains a number of examples which show that the parameters relating to the grain size were achieved. Even if the inconsistencies between the examples were to be confirmed, they would not lead to an insufficiency of disclosure for this reason alone. Moreover, the breadth of the claimed ranges does not in itself lead to an insufficient disclosure; at most it may cast doubt as to whether or not the invention can be carried out over the whole claimed range.

However, it is not enough to express such doubts when challenging sufficiency of disclosure since it must actually be demonstrated that the invention cannot be carried out over the whole claimed range.

The appellant did not provide any evidence that showed, for example, that it consistently failed to reproduce an aluminium alloy clad material with the claimed grain size parameters.

The alleged lack of sufficiency of disclosure was therefore not demonstrated.

3. Novelty of claim 1, Article 100(a) EPC / Article 54(1) and (2) EPC

3.1 D1 at least does not disclose a core material or a clad material anticipating the subject-matter of claim 1.

Tables 1 and 2 of D1 refer to alloy specifications. According to their headings, the tables disclose the maximum value for the elements unless given as a range. They therefore do not disclose measured amounts of the

alloying components for the core or clad materials.

Table 1 discloses a silicon content of up to 0.6% and an iron content of up to 0.7% for all core materials. Similarly, Table 2 discloses an iron content of up to 0.7% and a copper content of up to 0.1% for the clad material FA6815.

Claim 1 stipulates minimum amounts for silicon and iron for the core and clad materials. Such minimum amounts are not disclosed in D1 since only the upper limits are indicated therein.

Moreover, since claim 1 does not define the amount of copper in the clad material, it can only be contained up to the level of an impurity.

It is undisputed that a certain amount of impurities is inevitable. The exact amount of impurities is not disclosed in D1, however.

The appellant argues that D1 anticipated the novelty of the patent in view of D15, which disclosed that commercial purity aluminium, Al 99.5, was typically used as a basis for aluminium alloys. If Al 99.5 was used, D1 anticipated the claimed ranges.

There is first of all no evidence that the alloys in D1 were made from Al 99.5.

Moreover, D15 does not disclose the minimum amounts of iron and silicon inevitably contained in Al 99.5. Thus, it is not self-evident that the impurities in Al 99.5 exceed the minimum content of iron and silicon of the claimed alloy required in claim 1 on file.

It cannot therefore be concluded that the alloys in Tables 1 and 2 of D1 implicitly contain a content of silicon and iron within the claimed ranges.

The subject-matter of claim 1 is therefore novel.

4. Novelty of claim 2, Article 100(a) EPC / Article 54(1) and (2) EPC

The subject-matter of claim 2 contains all of the features of the subject-matter of claim 1. Claim 2 is thus novel for the same reasons as claim 1.

5. Inventive step of claim 1, Article 100(a) EPC / Article 56 EPC

5.1 The patent in suit is directed to an aluminium alloy clad material.

5.2 D1 and D4/D4a were cited as starting points for a number of inventive-step objections. Since they both disclose an aluminium alloy clad material similar to the one at issue and deal with product properties like corrosion and formability, they are both suitable for this purpose.

5.3 Starting from D4/D4a

5.3.1 The patent in suit aims to provide a highly corrosion-resistant and highly formable aluminium clad material.

5.3.2 However, since D4/D4a proposes an aluminium clad material with high corrosion resistance and formability, the technical problem is already solved in D4/D4a (see the last few lines of claim 3). No proof is

available that shows that the properties of the products as claimed are superior to those of D4/D4a. Therefore, the problem must be reformulated to a less ambitious one, i.e. as being to provide an alternative.

5.3.3 With regard to providing high corrosion resistance, D4/D4a, paragraph [0064], discloses that the potential difference between the core material and the (sacrificial) clad layer must be 50 mV or more. With regard to providing high formability, paragraph [0041] discloses that the crystal size in the rolling direction should be in the range of 80-500 µm and the crystal size in the thickness direction should be in the range of 30-100 µm. According to paragraph [0042], these ranges must be observed individually. No interrelation between the crystal size in the rolling direction and the crystal size in the thickness direction is apparent.

The thickness to length ratio of the crystals in the core material according to D4/D4a thus extends over the range of 0.06-1.25, which only partly overlaps with the claimed range of less than 0.30.

The appellant argued that Table 4 of D4/D4a also showed in Examples 1, 2, 4-9, 11 and 12 grain sizes in the core material which fulfilled the conditions according to the patent in suit.

However, only Examples 9 to 12 show a sacrificial layer having the claimed composition. Thus, in view of the R1/R2 ratio in Example 10, a promising starting point for an inventive-step objection can therefore only be Example 9, 11 or 12.

The appellant argued that not only D3/D3a but also

D10/D10a and D2/D2a disclosed that large grains in the sacrificial anode improved corrosion resistance.

5.3.4 D4/D4a, Examples 9, 11 or 12, with D3/D3a, claim 1

The appellant argued that when providing an alternative, the skilled person would consider, in view of D3/D3a, a grain size for the sacrificial anode clad material of 150-370 µm after brazing (see D3, paragraph [0014]), which meant that a grain size of 60 µm or more must be provided before brazing.

However, D3/D3a states in paragraphs [0013]-[0016] that the anticorrosive property of the sacrificial layer can only be provided for by the combination of a Zn content of at least 6%, a grain size of at least 100 µm and a limitation of the Cu impurity to 0.05% or less.

Contrary thereto, D4/D4a limits the Zn content to a maximum of 5.0% (paragraph [0061]), because beyond that value, the self-corrosion rate of the potential gradient becomes too high.

The skilled person is therefore discouraged from combining the teachings of D4/D4a and D3/D3a.

5.3.5 D4/D4a, Examples 9, 11 or 12, with D10/D10a or D2/D2a, claim 1

The appellant argued that the grain size of the sacrificial anode clad material of at least 60 µm before brazing was necessary to ensure a grain size after brazing of at least 100 µm (patent in suit, paragraph [0087]). When providing an alternative, the skilled person would aim, in view of D10/D10a, at a sacrificial anode material with a grain size of

150-220 µm after brazing (see D10, Table 5), which meant that a grain size of 60 µm or more had to be provided before brazing. A similar conclusion was drawn in view of D2/D2a.

D10/D10a discloses that the presence of iron reduces the grain size after brazing (paragraph [0022]). This suggests that in order to achieve a grain size of 100 µm after brazing, a sacrificial layer containing a low amount of iron may have a smaller grain size before brazing when compared with a sacrificial layer containing a higher amount of iron.
The sacrificial layer in D10/D10a contains up to 0.5% iron and the sacrificial layer of D4/D4a contains up to 0.2% iron. This is significantly less than the patent in suit, which allows for up to 2.0% iron.
With regard to achieving a grain size of at least 100 µm after brazing, D10 therefore does not imply that a grain size of at least 60 µm before brazing has to be achieved.
Evidence to support this allegation was not provided by the appellant.

Thus, even when starting from one of Examples 9, 11 or 12 as mentioned above, the subject-matter of claim 1 is not rendered obvious by the cited documents.

The statement of grounds of appeal did not refer to any relevant passage in D2/D2a. Notwithstanding the question of admission, the attack is deemed unsuccessful.

D2/D2a also discloses a lower maximum iron content in the clad material than the patent in suit (paragraph [0036]; all examples show an iron content of 0.25% or less). Grain refinement due to a high iron content is

thus less of an issue than for the patent in suit. Moreover, D2/D2a discloses a most preferred grain size after brazing in the range of 40-100 µm (paragraph [0038]). Thus, D2/D2a does not aim at a grain size of at least 100 µm after brazing. The appellant did not provide any reasons why the skilled person would be prompted to achieve a grain size of at least 60 µm before brazing, nor are any apparent.

5.4 Starting from D1

Notwithstanding the question of the admission of the objection under Article 56 EPC starting from D1, this objection is not convincing.

5.4.1 The appellant referred to paragraphs [0047], [0048], and [0060] of the patent in suit and considered the problem to be solved to be avoiding high costs due to the use of a high-purity aluminium; a purely economic motivation. The skilled person would have produced the alloys in D1 with commercial purity aluminium, i.e. Al 99.5, as shown in D15. In particular, they would not have considered producing them with a high-purity aluminium containing less than 0.05% iron or silicon.

5.4.2 As already indicated in the reasoning concerning novelty, there is no proof that Al 99.5 was actually used in D1.

5.4.3 However, even if it is accepted that the aluminium used for alloys is usually Al 99.5, as indicated in D15, its specification is not disclosed, in particular the minimum and maximum contents of iron and silicon. As already assessed in detail with respect to the novelty of claim 1 over D1, even if the alloys in D1

were produced from Al 99.5, it has not been demonstrated that this led to alloys within the claimed range.

5.4.4 In addition, the clad material FA6815 (D1, Table 2) contains up to 0.1% copper. The effect of this amount was disputed.

The respondent argued in view of paragraph [0036] of the patent in suit that an amount of more than 0.05% copper was an alloying element. Since the clad material in D1 contained up to 0.1% copper, keeping the amount of copper at the level of an impurity, i.e. below 0.05%, was a further selection to be made.

The appellant was of the opinion that the upper limit of 0.1% copper in the clad alloy of D1 was merely the explicit mentioning of the upper limit of this impurity. A copper content below this limit had no effect on the alloy. There was thus no further selection with respect to the amount of copper in the clad material.

It cannot be derived from D1 that copper is only present in amounts considered an impurity in the clad alloy FA6815. If silicon and iron are contained in the alloys in an amount corresponding to the upper limits indicated in Tables 1 and 2, these elements are undisputedly considered alloying elements. In view of paragraph [0031] of the patent in suit, according to which a copper content of more than 0.05% is considered an alloy, it cannot be excluded that copper contained at 0.1% must also be considered an alloying element. No evidence to the contrary has been obtained. A further selection must hence be made in order to arrive at a copper content at the stipulated level of

impurities.

5.4.5 In further inventive-step attacks starting from D1, the appellant did not cite any specific reference in the documents they combined with D1. These attacks were therefore insufficiently substantiated.

6. Inventive step of claims 2-7, Article 100(a) EPC / Article 56 EPC

The subject-matter of claims 2-7 contain all of the features of the subject-matter of claim 1. These claims are therefore not rendered obvious by the cited prior art for the same reasons as those set out with respect to claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz E. Bendl

Decision electronically authenticated