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Datasheet for the decision of 10 October 2023

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Language of the proceedings: EN

Title of invention:
MULTI-LAYER BRAZING SHEET

Patent Proprietor:
Arconic Technologies LLC

Opponents:
Gränges AB
Novelis Koblenz GmbH
Mahle International GmbH
C-TEC CONSTELLIUM TECHNOLOGY CENTER / CONSTELLIUM NEUF-BRISACH

Headword:
aluminium brazing sheet/Arconic Technologies

Relevant legal provisions:
EPC Art. 123(3), 123(2)
RPBA 2020 Art. 13(2)

Keyword:
Amendments - broadening of claim - main request (yes) - extension beyond the content of the application as filed - auxiliary requests (yes)
Amendment after summons - new auxiliary request filed during oral proceedings - taken into account (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 0698/21 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 10 October 2023

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Respondent 2: (Opponent 4)	C-TEC CONSTELLIUM TECHNOLOGY CENTER / CONSTELLIUM NEUF-BRISACH Boite Postale CS10027/ZIP RHENANE NORD Propriété Industrielle 725, Rue Arstide Berges / RD 52 38341 Voreppe / 68600 Biesheim (FR)
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Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 8 April 2021 concerning maintenance of the European Patent No. 2686165 in amended form.**

Composition of the Board:

Chairman	E. Bendl
Members:	S. Besselmann
	P. Guntz

Summary of Facts and Submissions

I. The appeals of the patent proprietor (appellant 1) and opponents 2 and 3 (appellants 2 and 3) are against the opposition division's interlocutory decision that European patent EP 2 686 165 B1 in the form of then auxiliary request 6 met the requirements of the EPC.

The patent in suit concerns a multi-layer brazing sheet.

II. The patent proprietor's final main request in the appeal proceedings was that the opponents' appeals be rejected and that the patent be maintained in the form found allowable by the opposition division. During the oral proceedings before the board, they modified auxiliary request 8 as filed with the reply to the appeals of opponent 2 and 3 by deleting dependent claims 3-5. The patent proprietor maintained this modified auxiliary request 8 as well as auxiliary requests 9 and 15-19 as filed with their reply to the appeals of opponent 2 and 3. All of the other auxiliary requests were withdrawn.

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

"*A multi-layer aluminum alloy brazing sheet (10) comprising:*
- a core layer (20) comprising a 3XXX-series alloy;
- an outer interliner layer (30) comprising an aluminum alloy; and
- an outer braze liner layer (40) comprising an aluminum alloy,

wherein after brazing, the sheet has an electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20);
wherein the 3XXX-series alloy of the core layer (20) comprises less than or equal to 1.1% Si, from 0.15% to 0.5% Fe, 0.5% to 1.2% Cu, 0.8% to 1.8% Mn, up to 0.25% Mg, up to 0.2% Ti and up to 0.3% Cr;
wherein the aluminum alloy of the outer interliner layer (30) comprises 0.1 to 1% Si, up to 0.5% Fe, up to 0.5% Cu, 0.5 to 1.8% Mn, up to 0.3% Cr, up to 0.1% Mg and between 0.5% and 5% Zn;
wherein the outer interliner layer (30) has a thickness from 20 microns to 50 microns;
wherein the aluminum alloy of the outer braze liner layer (40) is a 4XXX-series alloy comprising between 6% and 12% Si and up to 5% Zn;
further comprising an inner braze liner layer (50) positioned on the other side of the core layer (20) from the outer interliner layer (30) and having a thickness in the range of 15 to 40 microns, said inner braze liner being a 4XXX-series aluminum alloy comprising from 6% to 12% Si and less than 0.2% Zn, the inner braze liner layer (50) further containing less than 0.3% Cu, no more than 0.1 % Mn and no more than 0.05 % Mg,
further comprising an inner interliner layer (60) positioned between the core layer (20) and inner braze liner layer (50) on the other side of the core layer (20) from the outer interliner layer (30),
wherein the aluminum alloy inner interliner layer (60) comprises 0.1 to 1% Si, up to 0.5% Fe, 0.1 to 1% Cu, 0.5 to 1.8% Mn, up to 0.05% Mg, up to 0.2% Ti, up to 0.3% Cr and less than 0.2 weight % Zn."

IV. Claim 1 of auxiliary request 8 differs from the main request as follows:

- The indication "*after brazing*" has been deleted from the respective feature in claim 1 (changes indicated by the board):
"*wherein ~~after brazing~~ the sheet has an electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20)*"

- The range of the Si content in the core layer (2) has been amended to less than 0.18%:
"*wherein the 3XXX-series alloy of the core layer (20) comprises less than ~~or equal to 1.1%~~ 0.18% Si, from 0.15% to 0.5% Fe...*"

- The last two paragraphs of the claim, relating to the presence and composition of the inner interlayer (60) (i.e. the last part of the claim starting with "*further comprising an inner interliner layer (60)*"), have been deleted.

V. Claim 1 of auxiliary request 9 differs from claim 1 of auxiliary request 8 in that the range of the Si content in the core layer (20) has been amended to 0.18% to 1.1% Si:
"*wherein the 3XXX-series alloy of the core layer (20) comprises ~~less than~~ 0.18% to 1.1% Si, from 0.15% to 0.5% Fe...*"

VI. Claim 1 of auxiliary request 15 differs from claim 1 of auxiliary request 9 in that it specifies that Zn is incorporated into the outer braze liner layer (40):
"*wherein the aluminum alloy of the outer braze liner layer (40) is a 4XXX-series alloy comprising between 6% and 12% Si and up to 5% Zn, wherein Zn is incorporated into the outer braze liner layer (40);*"

VII. Claim 1 of auxiliary request 16 differs from claim 1 of auxiliary request 9 in that the range of the Si content in core layer (20) is as in the main request ("*wherein the 3XXX-series alloy of the core layer (20) comprises less than or equal to 1.1% Si, from 0.15% to 0.5% Fe...*"), and in that the minimum amount of Zn in the outer braze liner layer (40) is specified:
"*wherein the aluminum alloy of the outer braze liner layer (40) is a 4XXX-series alloy containing > 1% Zn and comprising between 6% and 12% Si and up to 5% Zn;*"

VIII. Claim 1 of auxiliary request 17 differs from claim 1 of auxiliary request 8 in that the range of the Si content in core layer (20) is as in the main request ("*wherein the 3XXX-series alloy of the core layer (20) comprises less than or equal to 1.1% Si, from 0.15% to 0.5% Fe...*").

IX. Claim 1 of auxiliary request 18 essentially differs from claim 1 of auxiliary request 17 in that the composition of the outer interliner layer (30) is different, and is as follows:
"*wherein the aluminum alloy of the outer interliner layer (30) comprises up to 0.35% Fe, up to 0.6% Si and from 0.5% to 5% Zn;*"

X. Claim 1 of auxiliary request 19 differs from claim 1 of auxiliary request 18 in that the definition of the outer interliner layer (30) has been amended as follows:
"*wherein the aluminum alloy of the outer interliner layer (30) comprises up to 0.35% Fe, up to 0.6% Si and from 0.5% to 5% Zn, and no other intentional elemental additions;*"

XI. The patent proprietor's arguments, where relevant to the present decision, can be summarised as follows:

Main request

Claim 1 as granted did not specify at which stage the electrochemical potential gradient was to be measured and thus encompassed all possible stages, before and after brazing. It could not be concluded from the reference to a "sheet" that it was the sheet prior to brazing, because the brazed product was also referred to as a sheet. Claim 1 of the main request constituted a limitation of the scope of the claim because it specified that the gradient after brazing was meant.

Even if claim 1 as granted were to be understood as specifying the gradient before brazing, the scope of protection had not been extended. The skilled person would read the claim of the main request as "*after brazing, the sheet* still *has an electrochemical potential gradient*".

Furthermore, the main request did not require a specific value of the electrochemical potential gradient; it merely required the presence of a gradient in qualitative terms. If the broad and general requirement as to the presence of the gradient was met after brazing, it had also been met before brazing. The scope of protection had not been broadened.

Auxiliary request 8

Auxiliary request 8 as amended during the oral proceedings before the board should be admitted into the proceedings because the amendment was merely the deletion of dependent claims. This clearly overcame the

objection raised against these claims, without giving rise to new objections. The request therefore contributed to procedural economy.

The requirements of Article 123(2) EPC were met because the electrochemical potential gradient was disclosed in paragraph [0025] (last few lines), paragraph [0026] and paragraph [0027] of the application as originally filed without mentioning "*after brazing*". The electrochemical potential gradient was the result of the specific arrangement and composition of layers in the brazing sheet as claimed.

Auxiliary requests 9 and 15-19

The same arguments as to why the requirements of Article 123(2) EPC were met also applied to these requests.

XII. The arguments of opponent 1-3, where relevant to the present decision, can be summarised as follows:

The scope of the main request extended beyond the scope of the patent as granted because now the requirement relating to the electrochemical potential gradient only had to be met after brazing.

Amended auxiliary request 8 should not be admitted into the appeal proceedings.

Claim 1 of this request infringed the requirements of Article 123(2) EPC because it did not specify that the electrochemical potential gradient related to the sheet after brazing.

Auxiliary requests 9 and 15-19 should not be admitted into the appeal proceedings either because they related to the patent proprietor's own appeal case and the requirements of Article 13(1) RPBA 2020 applied.

Claim 1 of these requests did not meet the requirements of Article 123(2) EPC for the same reasons as those set out with respect to claim 1 of auxiliary request 8.

XIII. Opponent 4 did not make any submissions regarding the substance of the case.

XIV. The patent proprietor (appellant 1) requested that the opponents' appeals be rejected (main request), or, alternatively, that the patent be maintained on the basis of auxiliary request 8, auxiliary request 9 or one of auxiliary requests 15-19 as filed with the reply to the grounds of appeal of opponents 2 and 3, with the modification in auxiliary request 8 that dependent claims 3-5 were deleted.

Opponents 2 and 3 (appellants 2 and 3) requested that the impugned decision be set aside and that the patent be revoked.

Opponent 1 (respondent) requested that the patent proprietor's appeal be dismissed.

Reasons for the Decision

Main request

1. Article 123(3) EPC

1.1 Claim 1 relates to a multi-layer aluminium alloy brazing sheet. It is specified that, "*after brazing, the sheet has an electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20)*". The electrochemical potential gradient is thus a property of the brazed product. The claim is silent as to any electrochemical potential gradient before brazing. There is no basis for construing the claim as implicitly specifying that the electrochemical potential gradient was additionally present before brazing. Contrary to the patent proprietor's view, the skilled person would not read the claim as "*after brazing, the sheet* still *has an electrochemical potential gradient increasing from...*".

1.2 Claim 1 as granted, by contrast, specified that "*the sheet has an electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20)*", with no mention of "*after brazing*". While the term "sheet" on its own does not unambiguously specify the sheet before brazing - it may also refer to the brazed product, which in fact is not a sheet any more (but, for example, a tube, see paragraphs [0014], [0015], [0018], [0019] and [0021]) - the claim as a whole is clear in that the "sheet" designates the brazing sheet in the sense of a sheet suitable for brazing. The only antecedent in the claim for "*the sheet*" is "*[a] multi-layer aluminium alloy*

brazing sheet (10)". This brazing sheet is to exhibit the electrochemical potential gradient.

There is no reference to a brazed product in claim 1 as granted, nor is there any indication that the electrochemical potential gradient could be a property of the brazed product. It is consequently not convincing that it can be derived from the absence of the expression "*after brazing*" in claim 1 as granted that the claim was open to the electrochemical potential gradient being measured before or after brazing.

1.3 The brazing process changes the layer structure of the brazing sheet in line with the intended function of the brazing layer. The patent in suit states that brazing may cause the diffusion of the zinc (paragraph [0031]) and the magnesium (paragraph [0028]). Silicon is also diffusive. These metals and the associated formation or dissolution of solid solutions affect the electrochemical potential of the aluminium alloy (paragraph [0022]). Before brazing, i.e. in the brazing sheet, the layers specified in the claim, including the braze liner layers, are intact and the outer surface is thus the outer surface of the outer braze liner layer. After brazing, the outer braze liner layer is no longer intact and metal diffusion occurred.

In the light of these changes induced by brazing, there is no basis to assume that the electrochemical potential gradient measured in the brazing sheet would correspond to that measured in the brazed product. This is all the more so in cases in which the outer braze liner layer contains no zinc, even though zinc would be needed to make the electrochemical potential more negative (paragraph [0022]).

There is no evidence for the patent proprietor's assertion that the electrochemical potential gradient would at least in qualitative terms remain unaffected by brazing. The patent in suit in fact supports the view that it would be affected, because it states that "*the sheet can be structured so that after brazing, the electrochemical potential gradient increases from near surface 4 towards the core layer 20*" (paragraph [0021], corresponding to page 9, last sentence, of the application as originally filed), meaning that other structures are possible.

1.4 The main request consequently encompasses sheets which exhibit the electrochemical potential gradient only after brazing (there being no limitation of the brazing conditions or the final structure, i.e. the contacting surface parts, in the claim), and not prior to brazing; these were not encompassed by claim 1 as granted.

1.5 The requirements of Article 123(3) EPC are therefore not met.

Auxiliary request 8

2. Article 13(1) and (2) RPBA 2020

2.1 During the oral proceedings before the board, the patent proprietor deleted claims 3-5 of previous auxiliary request 8 in order to address an objection under Article 123(2) EPC, concerning the range of the content of Mg in the core layer (20) in conjunction with the presence of inner interliner layer (60).

2.2 This objection had already been raised before the opposition division and was considered in the impugned decision, though it was not held to be convincing (see point II.4.7 of the decision). The objection was maintained during the appeal proceedings (see point 11 of the board's preliminary opinion). In their letter of 9 August 2023, opponent 2 stated that the objection applied to the auxiliary requests (see page 4, first paragraph, of the letter).

Furthermore, previous auxiliary request 8 was also objected to because the omission of the feature "after brazing" infringed the requirements of Article 123(2) EPC.

In addition, the admissibility of the former version of auxiliary request 8, which included dependent claims 3-5, had already been contested under Article 13(1) RPBA 2020 because it formed part of the patent proprietor's own appeal.

Moreover, no convincing arguments were submitted by the proprietor as to why the amendment was not made until the oral proceedings before the board.

2.3 The deletion of claims 3-5 of previous auxiliary request 8, resulting in the submission of new auxiliary request 8, therefore does not constitute a reaction to a fresh objection and could and should have been filed earlier. It does not overcome the objections raised in such a way as to contribute to procedural economy either because claim 1 of new auxiliary request 8 is, like claim 1 of previous auxiliary request 8, not allowable in view of the omission of the feature "after brazing", which infringes the requirements of Article 123(2) EPC (see below).

2.4 This request was not to be admitted into the proceedings.

3. Article 123(2) EPC

3.1 Claim 1 specifies that "*the sheet has an electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20)*", as in claim 1 as granted. Thus, in the context of this claim, the gradient is that of the brazing sheet in the sense of the sheet suitable for brazing (see also point 1.2 above).

3.2 The application as originally filed, however, only describes the electrochemical potential gradient after brazing (paragraphs [0023] and [0026]). This is explicit in paragraph [0023] ("*post-braze structure*"; "*after brazing, the electrochemical potential gradient increases from near surface 4 towards the core layer 20*"). It is also directly derivable from the reference to an *air surface* of the *tube* in paragraph [0026], i.e. the sheet after brazing transformed into a tube.

Paragraph [0025] also states that "*[i]n all embodiments, core layer 20 can be more electrochemically noble than surface 4 of sheet 10 after brazing*" (see page 10, lines 14-15) and consequently relates to the electrochemical properties after brazing. This is also clear from the reference to the "*post-braze strength and shift in electrochemical potential*" (see page 10, line 21). In light of this, the last part of this paragraph, which deals with the influence of various metals in the core layer on corrosion resistance and describes that "*[h]igher Si*

levels can pull Mn out of solution, but as long as the other elements in the various layer of sheet 10 are properly controlled, core layer 20 can still be sufficiently noble relative to near-surface 4 of sheet 10 that corrosion protection is achieved" (page 11, lines 14-17), also relates to the effects of the brazing step and the state after brazing. Furthermore, no electrochemical potential *gradient* is mentioned in paragraph [0025].

Paragraph [0027] states that "*[o]uter interliner layer 30 should be more electrochemically negative than core layer 20*", but does not mention any electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20). Furthermore, the outer interliner layer is not located near the outer surface of the brazing sheet due to the presence of the intact outer braze liner layer before brazing.

3.3 As set out above in relation to the main request (see point 1.3), the brazing process changes the layer structure. The argument that the electrochemical potential gradient was merely the result of the arrangement and the composition of the layers in the brazing sheet is not convincing, because the effects of the brazing process also need to be taken into account.

3.4 For these reasons, the feature according to which "*the sheet has an electrochemical potential gradient increasing from near an outer surface (4) towards the core layer (20)*" in relation to the brazing sheet, i.e. without the indication "*after brazing*", is not directly and unambiguously derivable from the application as originally filed.

Auxiliary requests 9 and 15-19

4. Consideration of the requests

4.1 The question of whether auxiliary requests 9 and 15-19 formed part of the patent proprietor's own appeal and should be not taken into account pursuant to Article 13(1) RPBA 2020 does not have to be addressed because these requests do not meet the requirements of Article 123(2) EPC.

5. Article 123(2) EPC

5.1 The parties agreed that the same feature regarding the electrochemical potential gradient of the sheet, without the indication "after brazing", was present in claim 1 of auxiliary requests 9 and 15-19, and therefore the same arguments as those set out with respect to auxiliary request 8 applied (see point 3.).

The requirements of Article 123(2) EPC are therefore not met.

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:

C. Vodz E. Bendl

Decision electronically authenticated