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**Datasheet for the decision
of 31 March 2026**

Case Number: T 1010/24 - 3.3.05

Application Number: 18729573.8

Publication Number: 3622096

IPC: C22C21/02, C22C21/08, C22F1/05

Language of the proceedings: EN

Title of invention:
METHOD OF MANUFACTURING AN AL-SI-MG ALLOY ROLLED SHEET PRODUCT
WITH EXCELLENT FORMABILITY

Patent Proprietor:
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Opponents:
C-TEC Constellium Technology Center /
Constellium Neuf-Brisach
Speira GmbH

Headword:
MANUFACTURING AN AL-SI-MG ALLOY ROLLED SHEET/Aleris

Relevant legal provisions:
EPC Art. 56

Keyword:

Inventive step - (no) - effect not made credible within the whole scope of claim

Decisions cited:

T 0939/92

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 1010/24 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 31 March 2026

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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted on
3 June 2024 concerning maintenance of the
European Patent No. 3622096 in amended form.

Composition of the Board:

Chair R. Winkelhofer
Members: J. Roider
G. Glod

Summary of Facts and Submissions

- I. Of the appeals filed, the only one remaining is the appeal by opponent 2 (appellant) against the interlocutory decision of the opposition division to maintain European Patent No. 3622096 in amended form, based on what was then auxiliary request 1, now the main request.
- II. The following document, which had already been cited in the opposition proceedings, is relevant here.

D9 US 6,652,678 B1

- III. Main request

Claim 1 reads as follows.

"1. A method of manufacturing an aluminium alloy rolled sheet product, in particular an automotive sheet product, with excellent formability and good paint bake hardenability, the method comprising:

- (a) casting an ingot of an Al-Si-Mg aluminium alloy having a composition consisting of, in wt. %:*

*Si 1.0% to 1.50%,
Mg 0.10% to 0.40%,
Fe 0.08% to 0.30%,
Cu up to 0.15%,
Mn 0.01% to 0.15%,
Cr up to 0.10%,
Zr up to 0.03%,
V up to 0.03%,
Zn up to 0.20%,
Ti up to 0.10%,*

impurities each <0.05%, total <0.15%, balance aluminium;

wherein the Si- and Mg-content in the aluminium sheet are present such that Si/Mg weight ratio is more than 4.0;

- (b) heating the ingot to a temperature of above 550°C; maintaining the ingot at a temperature of above 550°C for at least 4 hours; cooling the ingot to a temperature in a range of 460°C to 520°C; and maintaining the ingot at a temperature in a range of 460°C to 520°C for less than 6 hours;*
- (c) hot-rolling of the ingot in one or more rolling steps to an intermediate gauge in a range of 15 mm to 40 mm, preferably 15 mm to 30 mm, and wherein the hot-mill exit temperature is in a range of 370°C to 480°C;*
- (d) further hot-rolling from intermediate gauge in one or more rolling steps to a final hot rolling gauge in a range of 3 mm to 15 mm, and wherein the hot-mill exit temperature is in a range of 310°C to 400°C;*
- (e) cooling of the hot-rolled material at hot rolling final gauge from hot-mill exit temperature to below 200°C, and preferably to ambient temperature;*
- (f) cold rolling of the hot-rolled product to a cold-rolled product of final gauge of 0.8 to 4.0 mm, preferably of 0.8 to 3.0 mm, and more preferably of 0.8 to 2.5 mm."*

IV. Auxiliary requests 1 to 4

In relation to the main request, the auxiliary requests contain the following amendments (in bold) in feature (a) of claim 1.

Auxiliary request 1: *Si/Mg [...] more than **4.5***

Auxiliary request 2: *Fe* 0.08% to **0.25%**

Auxiliary request 3: *Mg* 0.10% to **0.35%**

Auxiliary request 4: *Mg* **0.15%** to **0.35%**

- V. In a communication under Art. 15(1) RPBA, the board expressed the (preliminary) opinion that the patent should be revoked.
- VI. The patent proprietor (respondent) then withdrew their request for oral proceedings.
- VII. Since there are no reasons to deviate from the preliminary opinion, the scheduled oral proceedings were cancelled.
- VIII. The appellant is of the view that the subject-matter of claim 1 does not involve an inventive step in any of the requests.
- IX. However, the respondent is of the view that the main request and the auxiliary requests fulfil the requirements of the EPC.
- X. Requests
- (a) The appellant (opponent 2) requests that the decision under appeal be set aside and amended such that the patent be revoked.
- (b) The respondent (patent proprietor) requests that the appeal be dismissed (main request), or that the patent be maintained on the basis of one of auxiliary requests 1 to 4, filed with their reply to the appeal.

Reasons for the Decision

1. Main request, inventive step, Art. 56 EPC

The appellant's only objection to the main request is under Art. 56 EPC.

The patent in suit is directed to a method of manufacturing a rolled sheet product of an AA6000-series aluminium alloy (paragraph [0009]).

- 1.1 D9 was taken as a suitable starting point for an inventive-step assessment at the opposition stage. Since it also concerns a method of manufacturing a rolled sheet product of an AA6000-series aluminium alloy, it is indeed suitable for this purpose.
- 1.2 According to the respondent, the technical problem the patent aims to solve is to provide an aluminium alloy sheet with improved formability and an improved hardening rate.
- 1.3 It is proposed to solve this technical problem by the features of claim 1, which differ from the examples in D9 (trial routes 50170 and 50171, see Table 1) in that:
 - (1) the content of Zr is up to 0.03% (D9, column 1, line 44: comprised in the impurities in an amount of up to 0.05%)
 - (2) the content of V is up to 0.03% (D9, column 1, line 44: comprised in the impurities in an amount of up to 0.05%)
 - (3) the soaking time for the first-stage homogenisation is at least 4 hours (D9, column 1, line 66: at least one hour)
 - (4) the weight ratio of the Si/Mg content in the alloy

is more than 4.0 (D9, column 3, lines 34 and 35:
Si/Mg=2.9)

- 1.3.1 The respondent saw the soaking time for the second-stage homogenisation of less than 6 hours as a further difference.

This is not convincing.

The second soaking time is not explicitly disclosed in D9. However, D9 discloses that the soaking should merely ensure thermal equilibrium (D9, column 2, lines 7 to 19).

Aluminium is one of the best heat conductors known. There is no doubt that a thermal equilibrium is reached within a soaking time of less than 6 hours.

- 1.4 The effect of the differences, and the contribution to solution of the purported technical problem, are to be assessed as follows.

- 1.4.1 The effect of differences (1) and (2) is described in paragraph [0039] of the patent in suit: V and Zr may prevent full recrystallisation of the sheet product.

The respondent asserted that the low V and Zr content reduced recrystallisation, thereby improving formability (reply, page 14, last two lines).

This is not convincing, because it contradicts paragraph [0039] of the patent in suit, which discloses that the presence of V and Zr may prevent full recrystallisation of the sheet product.

Furthermore, all the examples in the patent in suit

have the same alloy composition. Therefore, the examples cannot demonstrate that differences (1) and (2) solve the problem as stated by the respondent. In particular, they cannot show that the upper limit of 0.03% for these elements is of any significance; in addition, the composition of the examples in the patent does not mention the Zr and V content.

Moreover, the patent in suit does not demonstrate any improvements over D9 that are linked to these differences. D9 discloses self-annealing aluminium sheets. These sheets do not require recrystallisation annealing because, as in the claimed aluminium sheets, full recrystallisation occurs without annealing.

The contribution made by these differences to solution of the technical problem as stated by the respondent is not apparent, let alone proven.

- 1.4.2 Difference (3) merely ensures homogenisation. The patent in suit does not disclose anything other than that requirement for the minimum soaking time (paragraph [0017]).

The homogenisation processes described in D9 and in the patent in suit serve the same purpose, and the patent in suit does not demonstrate any advantage over the homogenisation process in D9.

Moreover, all the examples in the patent in suit have the same alloy composition, and have soaking times for the first homogenisation well in excess of 4 hours. They cannot demonstrate that the lower limit of 4 hours has any significance.

Therefore, the examples are likewise unable to

demonstrate that this difference contributes to solution of the technical problem as stated by the respondent. Nor is an improvement over D9 shown by the examples.

- 1.4.3 Finally, difference (4), added during the opposition proceedings, has the purpose of increasing the elongation and strain hardening rate, thus improving formability and delaying plastic instability and fracture (paragraph [0034]).

However, all the examples in the patent in suit have the same alloy composition with a Si/Mg ratio of 5.4 (=1.35%/0.25%), which is significantly above the claimed limit.

The examples do not demonstrate that the limit for the Si/Mg ratio of 4 has any significance. They show that for the specific alloy, the careful control of the pre-heat temperatures and of the hot-rolling practice provides the desired sheet product (paragraph [0051]). Indeed, comparative sheets B, C and D all have the same composition as sheet A but some processing temperatures that are too high or too low, i.e. outside the claimed range at specific steps (see Table 1 of the patent in suit).

Therefore, the examples are also unable to show that difference (4) contributes to solution of the technical problem as stated by the respondent. On the contrary, sheets C and D do not show the desired properties (Ag of more than 24%) despite having a Si/Mg ratio of more than 4.

The examples do not make it possible to conclude that this difference provides an increased elongation and strain hardening rate compared with lower ratios Si/Mg,

let alone over the alloy disclosed in D9.

- 1.4.4 The respondent also argued that the combination of these differences provided the solution to the technical problem.

However, as is immediately apparent from the analysis above, the examples also fail to show the alleged combined effect. They only show that the careful control of the pre-heat temperatures and of the hot-rolling practice provides the desired sheet product when using a specific alloy.

- 1.4.5 To summarise, the examples in the patent in suit do not demonstrate that (any of) differences (1) to (4) contribute to the solution of the purported technical problem. Nor can they demonstrate that the formability and the hardening rate are improved over the alloy and the manufacturing process disclosed in D9.

- 1.5 Therefore, the technical problem must be reformulated to a less ambitious problem, which is to provide an alternative aluminium alloy rolled sheet product.

- 1.6 D9 discloses that the alloy may contain up to 0.05% (each) of other elements, including V and Zr (column 1, line 44).

D9 further discloses that the soaking time of the first homogenisation is at least one hour (column 1, line 66).

D9 further discloses that Si may be present in an amount of 0.3% to 1.8% (column 1, line 39).

- 1.7 Consequently, the skilled person who is tasked with the provision of an alternative aluminium alloy sheet starting from the example in D9, column 3, lines 34

to 36 would immediately consider a possible alternative alloy with $V < 0.03\%$, $Zr < 0.03\%$, a Si content of 1.8% (hence $Si/Mg = 4.7 (=1.8/0.38)$) and a possible manufacturing process with a soaking time for the first homogenisation stage of more than 4 hours. When many alternatives are possible, a mere arbitrary choice made from the possible solutions cannot be regarded as involving an inventive step (T 939/92, Reasons 2.5.3).

In view of the considerations above, the subject-matter of claim 1 lacks an inventive step.

2. Auxiliary requests 1 to 4

All the auxiliary requests differ from the main request in that the alloy composition is defined more narrowly.

However, as is apparent from the assessment of the main request, none of the examples in the patent in suit are capable of showing an effect related to the alloy composition, because all the examples in the patent use the same alloy composition.

Therefore, the problem under consideration is the same as for the main request, i.e. the provision of an alternative.

D9 further discloses that Fe may be present in an amount of up to 0.5% and Mg may be present in an amount of 0.30% to 1.5% (column 1, lines 40 and 41).

The skilled person would, when providing an alternative, envisage an alloy as claimed in any of auxiliary requests 1 to 4 as a possible alternative.

Consequently, auxiliary requests 1 to 4 must also fail, because they do not fulfil the requirements of Art. 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chair:



A. Wille

R. Winkelhofer

Decision electronically authenticated