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Datasheet for the decision of 22 October 2019

Case Number: T 2240/15 - 3.2.03

Application Number: 05791238.8

Publication Number: 1794338

IPC: B22D11/00, C22C21/08, C22F1/04

Language of the proceedings: EN

Title of invention:
Method for producing plural panel automotive members

Patent Proprietor:
Aleris Rolled Products, LLC

Opponent:
Arconic Inc.

Headword:

Relevant legal provisions:
EPC Art. 123(2), 56
RPBA Art. 12(4)

Keyword:
Amendments - allowable (yes)
Inventive step - ex post facto analysis
Late-filed evidence - admitted (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 2240/15 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 22 October 2019

Appellant: (Opponent)	Arconic Inc. 201 Isabella Street Pittsburgh, PA 15212-5858 (US)
Representative:	Lenzing Gerber Stute PartG von Patentanwälten m.b.B. Bahnstraße 9 40212 Düsseldorf (DE)
Respondent: (Patent Proprietor)	Aleris Rolled Products, LLC 25825 Science Park Drive, Suite 400 Beachwood, OH 44122 (US)
Representative:	Müller Schupfner & Partner Patent- und Rechtsanwaltspartnerschaft mbB Bavariaring 11 80336 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 2 October 2015 rejecting the opposition filed against European patent No. 1794338 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	G. Ashley
Members:	B. Miller
	E. Kossonakou

Summary of Facts and Submissions

I. European patent No. 1 764 338 (hereinafter: the patent) relates to a process for producing plural panel automotive members having inner and outer panels.

II. An opposition was filed against the patent, based on the grounds of Article 100(c) EPC and of Article 100(a) EPC together with both Articles 54 and 56 EPC.
The opposition division found that the contested patent met the requirements of the EPC and decided to reject the opposition.

This decision was appealed by the opponent (hereinafter: the appellant).

III. The appellant requested that the impugned decision be set aside and that the patent be revoked.

The respondent (the patent proprietor) requested that the appeal be dismissed (main request), alternatively that the patent be maintained on the basis of one of auxiliary requests 1 to 7, as filed in opposition proceedings, or auxiliary request 8, submitted with the reply to the grounds of appeal, or auxiliary requests 9 or 10, submitted with the letter of 8 October 2019.

IV. The sole claim according to the main request reads as follows:

"A process for producing plural panel automotive members having inner and outer panels connected to form said members,
said inner panels having threaded fasteners securely crimped to said inner panels to provide

means for bolting accessories to said automotive member, said inner panel formed by the process consisting of:

a.) providing a molten aluminum alloy consisting of:
2.7 to 3.3 wt.% Mg,
0.1 to 0.35 wt.% Mn,
0.02 to 0.2 wt.% Si,
0.1 to 0.25 wt.% Fe,
0.1 wt.% max. Cu,
0.25 wt.% max. Cr,
0.2 wt.% max. Zn,
0.15 wt.% max. Ti,
the remainder aluminum and impurities;

b.) providing a continuous caster for continuously casting said molten aluminum alloy;

c.) casting said molten aluminum alloy into a slab having Al-Fe, Al-Fe-Mn or Mg_2Si intermetallic particles;

d.) hot rolling said slab into a sheet product;

e.) annealing said sheet product to an O-temper condition, said sheet having substantially uniform distribution or minimized striations of said intermetallic particles;

f.) forming a portion of said sheet product in said O-temper into said inner panels by stamping to provide inner panels having raised portions and recessed portions to provide stiffeners to said inner panels;

g.) crimping at least one threaded fastener to said inner panel;

h.) providing an outer panel for joining to said inner panel; and

i.) connecting said outer panel to said inner panels to provide said plural panel automotive member having threaded fasteners joined thereto."

V. State of the art

The following documents were cited by the appellant in the statement setting out the grounds of appeal:

E2: US 6 264 765 B1;
E3: D.G.Altenpohl, "Aluminium: Technology, Applications and Environment, A Profile of a Modern Metal, Aluminum from Within", Sixth Edition (1998), pages 356 to 362;
E7: US2004/0094245 A1 and
E8: US2004/0031551 A1.

The following documents were filed in addition

a) by the appellant with the letter dated 20 September 2019:

A1: Certificate issued by the Secretary of the Commonwealth of Pennsylvania, 28 October 2016;
E9: R. Gedney, "Sheet Metal Formability", Advanced Materials & Processes, August 2002, pages 33 to 36;
E10: Article "Crimp (joining)" from the online encyclopedia Wikipedia;
E11: Article "Rivet nut" from the online encyclopedia Wikipedia.

b) by the respondent with the reply to appeal:

X1: Zhong Li et al: "Development of Continuous Cast 5754 Alloy Sheet for Automotive Application" TMS, 2005.

VI. With the summons to oral proceedings, the Board sent a communication pursuant to Articles 15(1) and 17(2) of the Rules of Procedure of the Boards of Appeal (RPBA) indicating to the parties its preliminary opinion of the case.

VII. Oral proceedings were held on 22 October 2019.
At the end of the oral proceedings the Board pronounced its decision.

VIII. The appellant's arguments, as far as relevant for this decision, can be summarised as follows.

Documents E9 to E11 reflected the general knowledge of the skilled person and should be admitted into the proceedings.

The deletion of the terms "to provide" and "for improved formability" on page 5 of the description as filed allowed for a new interpretation of the claimed subject-matter which extended beyond the teaching as originally filed.

The subject-matter of claim 1 was obvious when starting from each of documents E2, E3 and E7 as the closest prior art. The subject-matter of claim 1 was not limited to a process wherein the whole panel was work-hardened during stamping and wherein the crimping required deformation of the inner panel. The wording of claim 1 constituted a mere aggregation of features individually known to the skilled person. The choice of coil 5754-1 in table 1 of E2 was obvious for the skilled person, since this alloy provided the highest work-hardening exponent n and therefore could be expected to achieve the highest formability.

IX. The respondent's respective arguments can be summarised as follows.

Documents E9 to E11 were filed only after receipt of the summons to attend oral proceedings without any reasoning for their late filing. Furthermore E10 and E11 were not published before the priority date of the patent. Therefore these documents should not be admitted into the proceedings pursuant to Article 12(4) RPBA.

The technical teaching of paragraph [0022] of the patent corresponded to claim 1 as granted.
The mere adaptation of the description to the wording of the claims did not go beyond the teaching as originally filed.

Starting from E2 or E3 as the closest prior art it was not obvious that threaded fasteners could be crimped to an aluminium sheet after stamping. E2 did not disclose that the sheet should be annealed to O-temper before the stamping.

E7 was not a suitable starting point, since it was concerned with the provision of tube products which were placed in a forming die and were hydroformed into a vehicular frame member. The requirements for the forming step of E7 were entirely different from the requirements for stamping and crimping steps defined in claim 1 of the patent.

Reasons for the Decision

1. Admission of documents E9 to E11

Article 12(2) RPBA stipulates that the appellant has to submit all evidence together with the grounds of appeal.

Documents E9 to E11 were submitted after receipt of the summons to attend oral proceedings.

Following the provision of Article 12(4) RPBA, the consideration of a document which was not submitted in the first instance proceedings is at the discretion of the Board.

To this end the Board must establish whether these submissions can be considered an appropriate and immediate reaction to developments in the proceedings.

In the present case, the late filing of documents E9 to E11 is not considered an appropriate reaction to the events of the proceedings, since the general knowledge which is supposed to be confirmed by these documents is not contested.

Therefore the Board in exercise of its discretion according to Article 12(4) RPBA holds documents E9 to E11 inadmissible.

2. Article 100(c) EPC

It is undisputed that claim 1 as granted is based on claim 41 as filed and thus fulfils the requirement of

Article 123(2) EPC. Claim 41 as filed defines in step e) that the sheet is annealed and has substantially uniform distribution or minimized striations of intermetallic particles.

The sentence starting at page 5, line 6 of the application as originally filed (reference is made to the International publication of the application, WO 2006/026330 A2) has been adapted to the wording of claim 1 as granted by the following amendment, see paragraph [0022] of the patent:

"The slab is **hot** rolled into a sheet product, which is then annealed **to an O-temper condition**, ~~to provide a~~ **the** sheet ~~product~~ having ~~a~~ substantially uniform distribution or ~~less~~ **minimized** striations of the intermetallic particles ~~for improved formability~~".

The amended wording therefore corresponds to the wording of claim 41 as filed on which claim 1 as granted is based.

Should it be possible in view of paragraph [0022] to interpret claim 1 as granted in a certain manner as argued by the appellant, the same interpretation applies for claim 41 as originally filed, since the teaching of claim 41 is not limited by any specific sentence in the description as filed.

In conclusion, the adaptation of the description to the wording of claim 1 as granted does not go beyond the teaching of the application as filed. Therefore the ground of opposition pursuant to Article 100(c) EPC does not prejudice the maintenance of the patent as granted.

3. Article 100(a) EPC in conjunction with Article 56 EPC

3.1 Both parties agree that each of documents E3 and E2 is a suitable starting point for the assessment of inventive step.

3.2 Document E3 as starting point

3.2.1 E3 is an appropriate starting point for the assessment of inventive step, since it discloses in Figure 15.30 automotive door components and therefore addresses the plural panel members for the automotive industry as aimed at by the process defined in claim 1 as granted.

3.2.2 E3 discloses on page 361, left hand column, first paragraph and on page 362, table 15.6 that the panel can be made of a 5754 aluminium alloy. However, E3 does not describe the specific composition of the alloy or a specific process which can be used for manufacturing the door panels shown in Figure 15.30.

3.2.3 The subject-matter of claim 1 therefore differs from the disclosure of E3 in that the manufacturing process comprises the following steps:

a.) providing a molten aluminum alloy consisting of:
2.7 to 3.3 wt.% Mg,
0.1 to 0.35 wt.% Mn,
0.02 to 0.2 wt.% Si,
0.1 to 0.25 wt. % Fe,
0.1 wt.% max. Cu,
0.25 wt.% max. Cr,
0.2 wt.% max. Zn,
0.15 wt.% max. Ti,
the remainder aluminum and impurities;

b.) providing a continuous caster for continuously casting said molten aluminum alloy;
c.) casting said molten aluminum alloy into a slab having Al-Fe, Al-Fe-Mn or Mg_2Si intermetallic particles;
d.) hot rolling said slab into a sheet product;
e.) annealing said sheet product to an O-temper condition, said sheet having substantially uniform distribution or minimized striations of said intermetallic particles;
f.) forming a portion of said sheet product in said O-temper into said inner panels by stamping to provide inner panels having raised portions and recessed portions to provide stiffeners to said inner panels;
g.) crimping at least one threaded fastener to said inner panel;
h.) providing an outer panel for joining to said inner panel; and
i.) connecting said outer panel to said inner panels to provide said plural panel automotive member having threaded fasteners joined thereto.

3.2.4 The objective technical problem can be formulated as to provide a process for manufacturing the panels shown in Figure 15.30 of E3 which in addition comprise threaded fasteners.

3.2.5 It can be accepted that the skilled person has the expectation that the door components can be manufactured from sheets by stamping, since this represents the commonly used manufacturing method.

However, starting from Figure 15.30 of E3 the skilled person has no motivation

a) to turn to E2 and to use the manufacturing process for aluminium sheets as disclosed therein,

b) to select alloy 5754-1 from table 1 in E2,

c) to expect that fasteners can be crimped to the inner panel after stamping.

(i) *concerning a)*

E2 discloses a process for producing a sheet of aluminium alloy for "the manufacture of transportation products, such as automotive structural sheet", see column 1, lines 18 to 19.

Structural components of a vehicle such as the frame require different mechanical properties than non-structural parts such as panel members for doors, and thus are not necessarily made from the same sheet material.

Hence, it is not immediately apparent to the skilled person that the method and all of the alloys for manufacturing structural sheets disclosed in E2 are suitable for manufacturing door panels as disclosed in E3, which have in general a more complicated shape than structural parts such as a frame.

Furthermore, E2 is mainly concerned with the realisation of a continuous annealing process, and teaches that homogeneous properties can be achieved despite variations in annealing temperatures, see

example 1. In column 5, lines 5 to 14, stamping is mentioned as a possible option for further processing, but E2 does not provide any details on the influence of the alloy composition or relevance of specific mechanical properties on subsequent process steps such as stamping.

Therefore a combination of documents E2 and E3 could only be made with the benefit of hind-sight.

(ii) *concerning b)*

E2 discloses in table 1 four aluminium alloys.
The alloy of coil 5754-1 consists of
3.09% Mg, 0.20% Mn, 0.11% Si, 0.16% Fe, 0.03% Cu, 0.01% Cr, 0.04% Zn, 0.01% Ti, the remainder being Al and impurities such as Ni
and therefore fulfils the definition in claim 1 of the patent. The further alloys disclosed in table 1 do not fulfil the requirements defined in claim 1, since they contain iron and manganese in amounts too high.

It can be seen that coil 5754-1 provides the highest work-hardening exponent n, which is a parameter that is linked to the formability.

However, for producing an automotive panel the work-hardening exponent n is not the only parameter to be observed, since the final panel, for example, also has to have sufficient mechanical stability after forming.

In this regard E3 discloses in table 15.6 on page 362 typical mechanical and formability values of various aluminium sheets. For alloy 5754-O the following values are disclosed in E3:

total yield strength ($TYS_{0,2}$): 100 MPa (14,5 ksi),
total elongation: 28 %,
work hardening exponent n: 0.30,
anisotropic factor r: 0.75.

Starting from the teaching of E3, the skilled person therefore would not only consider one but rather all of the parameters indicated in table 15.6 of E3 for selecting an appropriate alloy from the alternatives disclosed in table 1 of E2. Should the skilled person primarily focus only on the n value, it is noted that all alloys in O-temper condition disclosed in table 2 of E2 have a n-value of 0.3 or above as required according to the teaching of E3. The n-value therefore does not give a direct hint to select coil 5751-1 from the alternatives disclosed in table 1 of E2.

If all parameters disclosed in E3 are considered, it appears that coil 5754-3 annealed at a temperature of 790°F or higher comes closer to the values presented in E3 than coil 5754-1, since it has the following properties
yield strength: 14.7 ksi,
total elongation: 24.5 %,
work hardening exponent n: 0.310,
anisotropic factor r: 0.688.

Hence, starting from E3 it cannot be concluded with certainty that the skilled person would select coil 5754-1 from the alternatives disclosed in table 1 of E2.

Furthermore, the choice of the alloy composition as defined in claim 1 is not arbitrary. Paragraph [0053] of the patent describes that the iron content of the

aluminium alloy has an influence on the formation of cracks during crimping.

This effect is confirmed by document X1, which is a paper presented at a conference after the priority date of the patent. Although X1 is not prior art according to Article 54(2) EPC, it was submitted by the respondent to provide further experimental data relevant to the claimed process.

On page 2, under "Effect of Fe Content on Forming", X1 compares two different 5754 alloys with a different iron content, namely of 0.1 to 0.2 wt.% and 0.2 to 0.3 wt.%. Figure 2 confirms that a nut can be inserted by crimping in a sheet of both alloys, but that a higher iron content leads to cracks.

Thus the teaching in paragraph [0053] of the patent concerning the detrimental effect of iron in aluminium alloys on the suitability for crimping is confirmed by the experimental evidence. Due to the observation that crack formation during crimping starts at an iron content between 0.2 and 0.3 %, the threshold of 0.3 % in claim 1 as granted cannot be seen as arbitrary.

Since neither E3 nor E2 disclose that the iron content is important for reducing the crack formation during crimping, the choice of alloy 5754-1 in table 1 of E2 is not obvious for the skilled person.

(iii) *concerning c)*

Crimping requires deformation of the threaded fastener, the inner panel or both. Even if the main deformation takes place at the fastener, it is still necessary that the panel be made of sufficiently deformable material,

since inevitably a certain amount of deformation takes place in the panel, as demonstrated in E8, figures 6 to 10.

The main alloying component of the aluminium alloy defined in claim 1 and used according to E2 is magnesium (5xxx alloy series). It is undisputed that 5xxx series aluminium alloys are work-hardenable materials.

Hence, the skilled person would realise that after stamping the inner panel will not be in the O-temper condition any more, but will have undergone some degree of hardening due to cold deformation during stamping which is used to form raised and recessed portions to create stiffeners for the inner panel, as is required by claim 1 as granted.

As already indicated above, E2 is mainly concerned with the realisation of continuous annealing and teaches that homogeneous properties can be achieved under various conditions, see example 1. It does not provide any details of the effect of alloy composition or specific mechanical properties on subsequent process steps in general. In particular, E2 does not suggest that a threaded fastener could be crimped on the sheet after stamping which inherently leads to work-hardening.

The appellant argues in this regard that the wording of claim 1 encompasses areas which are not work-hardened, since only a portion of the sheet is formed into an inner panel by stamping.

However, this argument is not persuasive, since an inner panel produced from a sheet material is usually

stamped in its entirety. The expression "forming a portion of said sheet product" only defines that the inner panel is not made from the whole sheet. This reflects the technical reality that a coil of a metal sheet is used to manufacture a plurality of panels by stamping.

In this regard it is also known that during stamping material flow takes place over the whole working piece in the stamping press and that the presence of small flat areas in the panel, as visible in Figure 15.30 of E3, does not exclude that these areas have undergone work-hardening to some extent.

The skilled person therefore has no reason to expect that crimping on the inner panel can be performed at least in these flat areas without crack formation.

3.2.6 In conclusion the subject-matter of claim 1 is not obvious when starting from E3.

3.3 E2 as starting point

3.3.1 E2 contains the general statement that the invention therein refers to the production of sheets for "the manufacture of transportation products, such as automotive structural sheets", see column 1, lines 18 to 19 by continuous casting, hot rolling and annealing an aluminium alloy (example 1).

E2 does not provide a specific hint that the structural sheets can be used for producing plural panel automotive members which have in general a more complicated shape than structural parts such as a frame. Moreover, starting from E2 the skilled person has no incentive to expect that coil 5754-1 in contrast

to coils 5754-2, 5754-3 and 5754-4 would be more suitable for achieving an inner panel by using steps such as stamping followed by crimping.

Therefore the skilled person has no motivation to start from the process according to example 1 of E2 and to use in particular coil 5754-1 when aiming at a process for producing plural panel members. Hence, E2 is less relevant as a starting point than E3.

3.3.2 E2 discloses a process comprising the following steps:

a.) providing a molten aluminum alloy

b.) providing a continuous belt caster for continuously casting said molten aluminum alloy (example 1: column 6, line 16);

c.) casting said molten aluminum alloy into a slab;

d.) hot rolling this slab into a sheet product (example 1: column 6, line 17);

e.) continuously annealing the sheet product between 750°F to 950°F (400°C to 510°C) for 10 seconds by an induction heater (column 6, line 24 and column 7, line 3).

E2 does not describe *expressis verbis* that the sheet is annealed to an O-temper condition. However, E2 discloses in table 2 and figure 3 that an increase of the anneal temperature from 700°F to 715°F results in a dramatic decrease of the yield strength from 22.9 to 14.2 ksi while the elongation increases from 17.5 to 24.0%. The further increases in temperature up to 860°F only contribute to a minor change in properties. This

is a clear indication that a fully annealed O-temper condition is reached following the thermal exposure at 715°F or higher for 10 seconds.

This interpretation of E2 is supported by the teaching of the contested patent, since the conditions for annealing described in E2 correspond to the conditions for obtaining an O-temper condition as described in paragraph [0040] of the patent which discloses that an induction heater is suitable for achieving full recrystallization by continuous / in-line annealing for 0.5 - 60 seconds at 316°C to 593°C (600°F to 1100°F).

E2 also discloses that the sheet can be used in a stamping operation (column 5, lines 11 to 14).

3.3.3 Should the skilled person start from the process according to example 1 of E2 and arbitrarily use coil 5754-1 as disclosed in table 1, the process of claim 1 differs from E2 by the following features:

x1.) producing plural panel automotive members having inner and outer panels connected to form said members;

x2.) said inner panels having threaded fasteners securely crimped to said inner panels to provide means for bolting accessories to said automotive member;

f.) forming a portion of said sheet product in said O-temper into said inner panels by stamping to provide inner panels having raised portions and recessed portions to provide stiffeners to said inner panels;

g.) crimping at least one threaded fastener to said inner panel;

h.) providing an outer panel for joining to said inner panel; and

i.) connecting said outer panel to said inner panels to provide said plural panel automotive member having threaded fasteners joined thereto.

3.3.4 The problem to be solved by the method of claim 1 in the light of E2 can be regarded as to provide a low cost process (paragraph [0016] of the patent) for forming plural panel members without fracturing (paragraphs [0019] and [0020] of the patent).

3.3.5 As argued above in point iii) of paragraph 3.2.5, E2 does not provide any hint that crimping can be performed after stamping a sheet of any of the work-hardening alloys disclosed in table 1.

Also the remaining documents cited by the appellant do not provide any hint for the skilled person to expect that following the manufacturing process of E2 the stamped sheet is suitable for crimping threaded fasteners onto the sheet.

E3 discloses that a 5754 alloy can be used for producing plural panel automotive members having inner and outer panels (Figure 15.30). However, E3 does not provide any information on the required manufacturing steps and in particular does not teach that the door components shown in Figure 15.30 are obtained by a process comprising a step of stamping and a subsequent step of crimping threaded fasteners on the inner door panels.

E8 discloses that threaded fasteners can be attached to an automotive panel (paragraph [0003]) by crimping (paragraphs [0006], [0008] and [0009]; Figures 2 to 10). However, it does not disclose specific aluminium alloys and does not teach that crimping can be performed on any stamped material. Therefore E8 does not provide an incentive for the skilled person to conclude that the work-hardened aluminium sheets disclosed in E2 can not only be stamped but also be crimped without cracking.

3.3.6 In summary, the Board reaches the conclusion that the argument of the appellant starting from document E2 can only be made with knowledge of the invention and is not persuasive.

3.4 E7 as a starting point

3.4.1 E7 is directed to a process for forming a vehicular frame member (paragraph [0001]) and therefore does not relate to the same purpose as the contested patent. E7 therefore is not an appropriate starting point for the assessment of inventive step.

3.4.2 E7 (claim 1) discloses an automotive frame member made of an alloy according to claim 1 of the patent. The process according to E7 includes the steps of providing a sheet by continuous casting, rolling and annealing to an O-temper condition (claim 1). The sheet is then formed to a tube (E7, claim 1, figure 1).

3.4.3 Even if the skilled person were to start from E7, there is not incentive

- to disregard the explicit teaching of E7 concerning the formation of a tube,

- to produce inner and outer panels by stamping and
- to crimp fasteners in the stamped panels.

3.4.4 It follows, that the subject-matter of claim 1 of the contested patent is not obvious, even if the skilled person considers E7 as a starting point.

3.5 In conclusion, the ground of opposition pursuant to Article 100(a) EPC does not prejudice the maintenance of the patent as granted.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

I. Aperribay G. Ashley

Decision electronically authenticated