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**Datasheet for the decision
of 10 January 2012**

Case Number: T 1691/09 - 3.2.08

Application Number: 02076669.7

Publication Number: 1254965

IPC: C22C 21/00, B23K 35/28,
B32B 15/01, F28F 21/08

Language of the proceedings: EN

Title of invention:
High strength aluminium tube material

Patent Proprietor:
Sapa Heat Transfer AB

Opponent:
Aleris Aluminum Koblenz GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-



Case Number: T 1691/09 - 3.2.08

DECISION
of the Technical Board of Appeal 3.2.08
of 10 January 2012

Appellant:
(Opponent)

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted 8 June 2009
rejecting the opposition filed against European
patent No. 1254965 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
E. Dufrasne

Summary of Facts and Submissions

- I. By its decision posted on 8 June 2009 the opposition division rejected the opposition against European Patent No. 1 254 965.
- II. The appellant (opponent) lodged an appeal against this decision on 13 August 2009, paying the appeal fee on the same day. The statement setting out the grounds of appeal was received on 29 September 2009.
- III. In an official communication, the Board gave its provisional view on the case, in particular with respect to the documents
- D4A: Translation of JP-A-H4 263033 (D4) into English
and
- D5: H. Zoller und A. Ried: "Metallurgical Aspects in the Development of AlMgSi alloys with a Low Sensitivity to Quenching", Metallkunde, 1971, 62, (5), pages 354 to 358.
- IV. Oral proceedings took place before the Board on 10 January 2012. The following requests were made:
- The appellant requested that the decision under appeal be set aside and that the patent be revoked.
- The respondent (patent proprietor) requested that the appeal be dismissed.
- V. Independent claim 1 of the patent as granted reads as follows:

"A heat treatable aluminium alloy for brazed products with high strength, characterized in that the alloy comprises 0.6-0.9 wt% silicon, 0.1-0.35 wt% magnesium, 0.4-0.7 wt% manganese, 0.1-0.25 wt% titanium, 0.25-0.35 wt% copper, up to 0.7 wt% Fe and optionally 0.05-0.25 wt% zirconium and the balance consisting of aluminium and unavoidable impurities."

VI. The appellant's arguments can be summarized as follows:

D4A disclosed the composition of an AlMgSiMnCuTi alloy which overlapped with the composition of the alloy set out in claim 1 of the patent. However, the elemental ranges of the claimed alloy were not narrow in relation to those given in D4A and at least the exemplifying alloys 1, 3 and 5 in Table 1 of D4A came close to the claimed composition. Nothing was discernible from the patent specification to prove that the alleged effects that were attributed to the claimed alloy in paragraph [0013] were obtained exclusively within the selected ranges and not within the broader ranges of the AlMgSi alloy known from in D4A and designed for the same purpose. Hence the criteria for a novel selection from the prior art were not satisfied.

Even if novelty was acknowledged, which was denied, the claimed alloy composition lacked an inventive step. The problem to be solved, when starting from D4A, was the provision of the composition of an AlMgSiMnCuTi alloy which, in addition to a high strength, a high corrosion resistance and a good brazeability, exhibited a low quench sensitivity so that it was suitable for controlled atmosphere brazing (CAB). It was however

clear from the skilled person's general technical knowledge, reflected for instance in document D5, that the content of Mn should be selected at the lower end of the range disclosed in D4A and that Cu should not exceed 0.4% in order to make the alloy less sensitive to quenching.

Hence, the claimed alloy amounted to nothing more than what was taught in document D4A in combination with the skilled person's general knowledge reflected in D5.

VII. The respondent's arguments are summarized as follows:

The composition of the AlMgSi alloy featuring in claim 1 was novel since it was a specific selection of contents of the elements included in the alloy from the AlMgSi alloy composition disclosed in D4A. Compared to this prior art, the elemental ranges selected in particular for Mn, Cu and Mg were narrow. The majority of the examples in D4A, Table 1 comprised 1.0% Mn and 0.5% Cu. Thus, the exemplifying alloy compositions given in document D4A were sufficiently far removed from the claimed ranges. Moreover, the claimed alloy combined a high strength with a low sensitivity to quenching, an effect not at all mentioned in document D4A. Hence the selected composition range was a purposive rather than an arbitrary selection. The subject matter of claim 1 was therefore novel over D4A.

In particular in view of the examples given in D4A, Table 1, the skilled person would not contemplate working within the multiply selected range of overlap since the examples pointed away from it and consequently there was no reason for doing so.

As to inventive step, there was no mention of the quench sensitivity being a problem in D4A and, consequently, nothing would prompt the skilled person to modify the composition in order to avoid this problem. Hence, there was no support for the appellant's reasoning that the skilled person would consider decreasing the quench sensitivity of the AlMgSi alloy used in D4A. For the same reason the skilled person had no inducement to look at document D5, since this document dealt with heat treatable AlMgSi alloys comprising 0.55 to 0.65% Mg, which was outside the Mg-range of 0.2 to 0.5 set out in D4A. Hence no reason whatsoever was given to the skilled person to apply the teaching of D5 to the AlMgSi-alloys described in D4A.

The invention lay in the identification of the problem of the Mn-effect on the precipitation of Mg₂Si in alloys comprising up to 0.35% Mg. Its solution was to lower the Mn content to a range that gave sufficient precipitation of Mg₂Si at low cooling rates and still preserved strength and corrosion resistance. As described in paragraph [0030] of the patent, reducing the Mn from 0.9% (which was close to the Mn-content of 1.0% in the examples in Table 1 of D4A) to 0.6% increased the artificially aged strength. This was attributed to the lower quench sensitivity. If in D5 the presence of Mn had been found to be detrimental to the quench sensitivity, it would have been obvious to avoid the addition of Mn. The combined technical teaching of D4A and D5 did not give any hint to select a low Mn-content as claimed and to confine the remaining elements within the ranges set out in claim 1.

The subject matter of claim 1 therefore also involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. Novelty

Although the question of novelty was amply discussed at the oral proceedings, the Board came to the conclusion that the subject matter of claim 1 of the patent at issue did not involve an inventive step. Hence there is no need to consider the issue of novelty.

3. The closest prior art
 - 3.1 Like the patent at issue, document D4A is concerned with a heat-treatable aluminium clad material (cladding and core material) which has a high strength, excellent brazing properties and corrosion resistance and which is used as tube material for aluminium heat exchangers and aluminium radiators (D4A, [54] Abstract; paragraphs [0001], [0004], [0023]).

In the following Table, the composition of the claimed aluminium core alloy is compared with the composition of the aluminium core alloy disclosed in claim 2 of D4A:

| | | |
|----------|---------------------|---------------------|
| Element: | opposed patent | D4A, claim 2 |
| | (wt%) | (wt%) |
| Si | 0.6 - 0.9 | 0.2 - 1.0 |
| Mg: | 0.1- 0.35 | 0.2 - 0.5 |
| Mn: | 0.4 - 0.7 | 0.3 - 1.5 |
| Ti: | 0.1 - 0.25 | 0.10- 0.3 |
| Cu: | 0.25 -0.35 | 0.2 - 0.9 |
| Fe: | ≤ 0.7 | 0.1 - 0.7 |
| Zr: | 0.05 - 0.25 | 0.05 - 0.2 |
| | (optionally) | |
| Al: | balance and | balance and |
| | residual impurities | residual impurities |

The comparison shows that the elemental ranges for Ti, Fe and Zr of both Al-alloys are almost identical, whereas the ranges for Si and Mg overlap. According to D4A, page 8, lines 34 to 37, brazing was carried out by heating to 600°C for 3 minutes in nitrogen gas. The brazing conditions thus correspond to the controlled atmosphere brazing (CAB) referred to in the patent, paragraphs [0001], [0005] and [0013]. Given that document D4A is concerned with the same technical field, brazing method and type of Al-alloy addressed in the patent at issue, this document qualifies as the closest prior art since it presents the most promising springboard for the development of the aluminium alloy claimed in the patent at issue.

3.2 Turning to the exemplifying alloy compositions given in D4A, Table 1, it is evident that the contents of Fe, Ti, Zr and also of Mg (0.2%, except for sample 5, comprising 0.5% Mg) fall within the corresponding elemental ranges of the claimed alloy. The silicon content of 0.5% of all but one example (no. 6: 0.2% Si)

in Table 1 of D4A is rated as being close to the lower limit of 0.6% of the claimed silicon range. However, as correctly pointed out by the respondent, the majority of the examples in Table 1 of D4A comprise 1.0% Mn and 0.5% Cu. The contents of both components are significantly higher than claimed in the patent at issue, which restricts Mn to 0.4 - 0.7% and copper to 0.25 - 0.35%.

4. The problem to be solved
 - 4.1 Although the Al-alloys meeting the elemental ranges specified in D4A are found to exhibit high strength, excellent brazing properties and corrosion resistance and are provided for the same purpose as the Al-alloys claimed in the patent in suit, document D4A remains silent on the quench sensitivity which is one of the key features of the Al-alloys according to the patent in suit (the patent specification, paragraphs [0005], [0013], [0030]).
 - 4.2 Starting from the teaching of document D4A, the objective problem underlying the patent at issue therefore resides in providing an Al-alloy composition, which further exhibits a low quench sensitivity so that it may be brazed using a CAB furnace, but without adversely affecting the other properties such as brazeability, strength and corrosion resistance (the patent specification paragraph [0013]).

These objects are achieved according to the claim by restricting essentially the ranges for manganese and copper to 0.4 to 0.7% Mn and 0.25 to 0.35% Cu,

respectively (the patent specification, paragraphs [0022], [0020], and [0030]).

5. Inventive step:

It is, however, considered that the solution to the identified problem, i.e. the selection of the ranges for manganese and copper within the corresponding ranges of these elements defined in D4A, was obvious for the person skilled in the art in the light of the general technical knowledge disclosed for example in document D5.

Contrary to the respondent's position, the skilled person would consider document D5 because this document addresses exactly the identified objective problem and its solution. Specifically, D5 is concerned with detailed metallurgical aspects in the development of heat-treatable AlMgSi alloys which are to exhibit a low sensitivity to quenching (D5, title). A good compromise between sufficient strength and low quench sensitivity was found to be an AlSiMg alloy comprising 0.6 to 0.7% Si and 0.55 to 0.65% Mg (D5, page 356, left hand column, penultimate paragraph, last sentence). Although the range for Mg is somewhat above that of D4A (0.2-0.5% Mg), as pointed out by the respondent, both ranges are nevertheless close and thus make it clear that D5 and D4A are concerned essentially with the same type of alloy.

It is to be noted in this context that the basic investigations carried out in D5 did not take into account the brazing properties of AlMgSi alloys. It is however known from D4A, page 7, first paragraph, that

the brazing properties become poor if the magnesium content exceeds 0.5% and, therefore, Mg should be kept in a range from 0.2 to 0.5% and preferably at 0.2 as is apparent from the examples. This finding on the influence of Mg on the brazing properties complies with the statement in paragraph [0019] of the patent specification reflecting that brazing becomes difficult above 0.35% Mg. Contrary to the respondent's position, the somewhat higher amount of Mg in D5 is therefore no reason to disregard the general teaching in D5 about the effect that is exerted by the addition of other alloying constituents such Si, Cu, Mn, Cr etc. on the quench sensitivity.

Document D5 further shows in the paragraph entitled "Festigkeitssteigernder Zusatz" on page 356 that, aside from contributing to an increase in strength, copper additions up to 0.4% Cu do not adversely affect the quench sensitivity. On the contrary, the presence of copper up to 0.4% was found to attenuate slightly the quench sensitivity. By applying this general knowledge described in D5 to the Al alloy of D4A, adjusting copper in the range from 0.2 - 0.9%, it would be obvious for the skilled person to limit the additions of copper to 0.2 - 0.4%. This range complies with the claimed range of 0.25 to 0.35% Cu.

Moreover, document D5 deals with the influence of manganese on the quench sensitivity of AlMgSi alloys in the paragraph, entitled "Zusatz von Mangan, Chrom und Zirkonium" in column 1 of page 357. In order to prevent embrittlement during artificial ageing, AlMgSi alloys generally require the addition of Mn or Cr. The inhibiting effect on embrittlement is attributed to the

fact that during artificial ageing the Mg_2Si -phase is precipitated mainly within the grains rather than on the grain boundaries. Thus Mn (and also Cr) actuate the precipitation behaviour of the AlMgSi alloys and, therefore, exert influence on the quench sensitivity as well, but in a negative sense: both elements increase the quench sensitivity, in particular manganese significantly more than chromium (D5, page 357, column 1, to column 2, line 5). It is important to note in this context that the same effect of Mn on the Mg_2Si precipitation mechanism and its influence on the alloy's strength and quench sensitivity described in D5 are reflected in paragraph [0030] of the patent.

Bearing in mind this general technical knowledge about the impact of manganese on the quench sensitivity, the person skilled in the art would select a rather low amount of manganese for the Al alloys known from document D4A. It would be therefore close at hand for the skilled person to restrict the additions of manganese to amounts close to the lower limit of the known range of 0.3 to 1.5% Mn. In doing so, merely some routine experiments need to be carried out to determine the optimum amount of manganese that is necessary to achieve an optimum strength without adversely affecting the quench sensitivity.

The appellant argued that, based on the general teaching e.g. of D5, the skilled person would dispense with adding manganese at all to the AlMgSi alloys. However, there is no basis for this allegation. Firstly, D5 mentions that the addition of Mn is a pre-condition to prevent embrittlement during artificial ageing. More importantly, D4A teaches that the alloy's strength is

insufficient unless 0.3% Mn is added. Hence, at least a minimum amount of 0.3% Mn would be necessary to provide the alloy with sufficient strength. This value is very close to the lower limit of 0.4% for Mn of the claimed alloy.

The Board is therefore convinced that the implementation of the general technical knowledge described in D5 in the composition of the AlMgSiMnCu alloy disclosed in document D4A leads to the subject matter of present claim 1 being without inventive step.

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:

V. Commare

T. Kriner