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**Datasheet for the decision
of 18 February 2014**

Case Number: T 1999/11 - 3.2.08

Application Number: 04775089.8

Publication Number: 1685266

IPC: C22C21/08

Language of the proceedings: EN

Title of invention:

Al-Mg-Si ALLOY SUITED FOR EXTRUSION

Applicant:

NORSK HYDRO ASA

Headword:

Relevant legal provisions:

EPC Art. 54

Keyword:

Novelty - after amendment - selection invention (no)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 1999/11 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 18 February 2014

Appellant: NORSK HYDRO ASA
(Applicant) 0240 Oslo (NO)

Representative: Hofseth, Svein
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted on 1 February 2011 refusing European patent application No. 04775089.8 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: M. Alvazzi Delfrate
Members: C. Herberhold
D. T. Keeling

Summary of Facts and Submissions

I. By decision dispatched on 1 February 2011 the examining division refused European patent application No. 04775089.8.

II. The appellant (applicant) lodged an appeal against this decision on 29 March 2011, paying the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 30 May 2011.

III. Oral proceedings took place on 18 February 2014.

At the end of the oral proceedings the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of "Auxiliary Request B with amendments", filed during the oral proceedings.

All other requests on file were withdrawn.

IV. Claim 1 of the sole request reads as follows:

"Aluminium alloy containing Mg and Si, in particular useful for extrusion purposes, the alloy including AlMnFeSi dispersoid particles which have formed during homogenisation and which have acted as nucleation sites for a large number of small Mg₂Si particles during cooling after homogenisation, with a cooling rate after homogenisation between 240°C/h and 400°C/h, wherein said alloy consists of in wt%:

Mg 0,3-0,47

Si 0,35-0,6

Mn 0,03-0,06

Cr max 0,05

Zn max 0,15

Cu max 0,1
Fe 0,08-0,28 and
in addition grain refining elements up to 0,1 wt% and
incidental impurities up to 0,15, and balance being
Al."

V. The following document played a role for the present
decision:

D4: EP-A-0 222 479.

VI. The essential arguments of the appellant can be
summarised as follows:

Novelty

Claim 1 defined a manganese range of 0.03-0.06 wt%
which was narrow with respect to the range disclosed in
D4. Furthermore, the D4 examples showed a manganese
content of 0.07 wt%, which was considerably far from
the claimed range. The claimed narrow manganese range
had been carefully chosen to provide the optimal
combination of improving extrudability while minimizing
adverse effect of Mn on quench sensitivity.
Consequently, claim 1 defined a novel selection.

Moreover, the interrupted cooling regimen disclosed in
D4, which included very rapid initial cooling in
combination with a longer holding period before final
cooling, was fundamentally different from and
considerably more laborious than the continuous and
slower cooling process claimed. The claimed continuous
cooling process was also crucial to reach the desired
microstructure. In particular there was no unambiguous
disclosure that it were the AlMnFeSi particles which
acted as dominating nucleation sites during the cooling
process according to D4.

While it was true that D4 also disclosed continuous cooling in Figure 4a, there was no disclosure that this cooling, which was applied to a composition with 0,07 wt% manganese, resulted in the large number of small Mg₂Si particles defined in claim 1. In fact, the marked increase in hardness during ageing treatment shown in Figure 4a and discussed on page 6, lines 52-56 indicated that the homogenised cooled ingots contained a substantial proportion of Mg and Si in supersaturated solution which only precipitated during age hardening.

Therefore, neither the interrupted nor the continuous cooling regimen disclosed in D4 produced the microstructure claimed. The subject-matter of claim 1 was thus new over prior art D4.

Reasons for the Decision

1. The appeal is admissible.
2. Novelty over D4

D4 has been published on 20 May 1987 and is thus prior art under Article 54(2) EPC.

Claim 1 according to the sole request on file defines the aluminium alloy firstly by its composition and secondly by its microstructure. Both definitions will be addressed successively in the following:

- 2.1 The composition:

Document D4 discloses an aluminium alloy with the following composition (page 3, lines 17-29, 6063-type alloy "optimum" and claim 3, in weight %):

Mg: 0.42-0.46
Si: 0.42-0.46
Fe: 0.16-0.20
Mn: 0.03-0.07
Ti: 0.015-0.025

balance Al, incidental impurities up to a maximum of 0.05% each and 0.15% in total.

The ranges disclosed for Mg, Si and Fe are fully within the ranges claimed for said elements in claim 1. With the incidental impurities disclosed in D4 being below a maximum of 0.05 wt%, also the content in Cr, Zn and Cu is below the respective upper limits defined in claim 1. Titanium is present at a level of 0.015 to 0.025 wt% in the form of titanium diboride as a grain refiner (D4, page 3, line 47,48), thus qualifying as grain refining element "up to 0.1 wt%", as required by claim 1.

Regarding the manganese content, claim 1 defines a range of 0.03 to 0.06 wt% whereas D4 discloses a range of 0.03 to 0.07 wt %. Thus, the claimed range is a sub-range of the broader range disclosed in the prior art.

According to established case law (Case Law of the Boards of Appeal, 7th edition 2013, I.C.5.2.1) a sub-range is new when each of the following criteria is satisfied:

- (a) the selected sub-range should be narrow;
- (b) the selected sub-range should be sufficiently far removed from the known range illustrated by means of examples;
- (c) the selected area should not provide an arbitrary specimen from the prior art, i.e. not a mere embodiment

of the prior description, but another invention (purposive selection).

In the present case, at least criteria (b) and (a) are not fulfilled:

(b) The specific manganese content of the examples (D4, page 6, example 1-3) is at 0.07 wt%, and thus just outside the claimed range of 0.03-0.06 wt%. It is noted that both the D4 examples and the upper and lower limits of the claimed range are accurate up to the second digit after the decimal point. Consequently, whether the claimed range is far removed from the examples or not is to be judged on the basis of said accuracy. The manganese content of the examples (0.07 wt%) is thus as close to the claim border of 0.06 wt% as possible under the given accuracy without falling within the claimed range. It thus cannot be considered sufficiently far removed.

(a) Analogously, the claimed sub-range has the largest size possible for any sub-range at the given level of accuracy and covers 75% percent of the range known from D4. The claimed range thus does not qualify as narrow.

Consequently, the composition of the alloy defined in claim 1 cannot establish novelty over the disclosure of D4.

2.2 The microstructure:

2.2.1 In addition to defining the composition, claim 1 further defines that the alloy includes "AlMnFeSi dispersoid particles which have formed during homogenisation".

According to the description (page 2, line 6), AlMnFeSi dispersoid particles are formed during homogenisation, the number of dispersoid particles formed being dependent on the manganese content in the alloy (page 3, line 28, 29). The application is silent about any particular homogenisation conditions and it thus has to be concluded that also the homogenisation process disclosed in the prior art ("...an ingot which has been homogenised for several hours at around 580°C...", see D4, page 4, line 51), which is applied to an alloy with a composition against which the claimed composition does not qualify as novel, will result in the formation of the AlMnFeSi dispersoid particles. The slightly higher Mn content in the D4 examples (0.07 wt% vs the 0.03-0.06 wt% claimed) will not lead to a reduced formation of AlMnFeSi dispersoid particles, as can be deduced from Figure 1 of the application. Also the appellant has not contested the formation of AlMnFeSi particles during the homogenisation process in prior art D4.

- 2.2.2 Claim 1 further defines that the AlMnFeSi dispersoid particles "have acted as nucleation sites for a large number of small Mg₂Si particles during cooling after homogenisation with a cooling rate after homogenisation between 240°C/h and 400°C/h". This definition comprises product features (i.e. there is a "large number of small Mg₂Si particles", crystallized at AlMnFeSi nucleation sites) as well as process features (the crystallization takes place during "cooling after homogenisation with a cooling rate after homogenisation between 240°C/h and 400°C/h").

D4 discloses that after the cooling process after homogenisation, the Mg₂Si is almost fully precipitated as beta'-phase particles 1-5 microns long with a

particle cross-section of up to 0.5 microns and a particle density of $7-16 \times 10^4/\text{mm}^2$ (page 4, line 54 - page 5, line 4 and abstract). As also accepted by the appellant during the oral proceedings, these beta'-phase particles qualify as "small" particles in the sense of the application. Thus D4 discloses the presence of a large number of small Mg_2Si particles.

The appellant has pointed out that the cooling process in D4 leading to said large number of small Mg_2Si particles (see e.g. the abstract: cooling to a holding temperature of 250°C to 425°C at a cooling rate of at least $400^\circ\text{C}/\text{h}$, holding the ingot for 0.25 to 3 hours, then further cooling) was different from the cooling process defined in the claim.

However, a different process feature can only establish novelty of a product claim if it causes the product to have different properties from the previously described product (Case Law of the Boards of Appeal, 7th edition, 2013, I.C.4.2.7 and II.A.7). Thus the different cooling process per se cannot establish novelty, unless it results in an identifiable microstructural difference.

In the appellant's view such a difference could be that the small particles of D4 had nucleation sites different from the AlMnFeSi particles because of the different cooling regimen. At least it was not unambiguously disclosed that the AlMnFeSi particles had indeed acted as nucleation sites for said large number of small Mg_2Si particles.

However, there is no evidence at all for the alleged difference in nucleation and it is questionable whether it is at all possible to distinguish Mg_2Si particles which have nucleated at AlMnFeSi particles from those

which have nucleated on other sites. Furthermore, with the AlMnFeSi particles being present in the homogenised D4 alloy (see the discussion above), precipitation nucleating at these particles upon cooling has to be expected: According to the application, nucleation at AlMnFeSi particles leading to a large number of small Mg₂Si particles occurs at a continuous cooling rate between 240°C/h and 400°C/h from the homogenisation temperature. The Board cannot see why there should be a particular preference for other nucleation sites at a holding temperature of 250°C to 425°C (holding temperature of D4, see the abstract), although the AlMnFeSi nucleation sites are present and substantially all the Mg is indeed precipitating as beta' phase Mg₂Si during holding at said temperature (D4, page 2, line 43, 44). Nucleation at other sites may be co-occurring to a certain extent, but this is no different for the cooling regimen of the application.

Also the appellant could not provide any evidence or name any mechanism to support its allegation, but simply stated that D4 did not explicitly disclose that the nucleation sites were AlMnFeSi dispersoid particles. However, the disclosure of a document is not limited to explicit or literal statements but equally includes inherently disclosed information.

From the above discussion the Board concludes that nucleation at AlMnFeSi dispersoid particles has to be seen as a considerable precipitation mechanism in the cooling after homogenisation disclosed in D4. Consequently, the D4 alloy includes AlMnFeSi dispersoid particles which have formed during homogenisation and which have acted as nucleation sites for a large number of small Mg₂Si particles. Thus, claim 1 is not novel.

2.2.3 Even if it were accepted that the specific cooling rate defines some product feature, the claim would still be anticipated by D4.

- (a) Firstly, the minimum initial cooling rate of at least 400°C/h (D4, abstract), which is applied initially in the interrupted cooling regimen disclosed in D4, qualifies as "cooling rate after homogenisation between 240°C/h and 400°C/h". Consequently, the cooling process claimed is anticipated. Therefore, even if there was a product-by-process product feature recognizable on the product which could be derived from said process, also said feature would be anticipated.

The appellant was of the opinion that the person skilled in the art would understand the term "cooling rate after homogenisation" to refer to a continuous cooling down to room temperature. However, the wording of the claim is not so restricted, and also the "initial cooling rate" of D4 has to be considered "a cooling rate after homogenisation" as claimed.

- (b) Secondly, D4 further discloses comparative examples. In these examples, the homogenised alloy was submitted to continuous cooling to ambient (D4, page 6, example 3) at cooling rates of 100°C/h, 300°C/h and 600°C/h (see Figure 4a). The continuous cooling at a rate of 300°C/h falls under the definition of the cooling process in the claim. It is applied to an alloy compared to which the claimed composition does not qualify as novel and which - as discussed above - includes AlMnFeSi dispersoid particles. It thus has to be expected that - just as disclosed in the application- these

AlMnFeSi particles act as nucleation sites for a large number of small Mg₂Si particles during cooling after homogenisation. In fact, no further requirements for the cooling process after homogenisation are disclosed in the application.

The appellant has argued that the disclosed continuous cooling rate would not lead to the precipitation of a large number of small Mg₂Si particles, because the so cooled ingots were disclosed in D4 as containing "substantial proportion of Mg and Si in supersaturated solution" (page 6, lines 52-56). However, the existence of a "substantial proportion" of Mg and Si in supersaturated solution does not exclude the simultaneous existence of "a large number of small Mg₂Si particles". None of the relative terms "substantial proportion" and "large number" has a well defined meaning which would result in a contradiction.

In this context it must also be kept in mind that the application provides embodiments with a cooling rate of 240°C/h (page 5, line 16 ff, "third example") as well as 400°C/h (page 4, lines 11 and 30,31) which according to the application lead to a "large number of small Mg₂Si particles" for which the AlMnFeSi dispersoid particles have acted as nucleation sites. The Board thus sees no reason why there should be no such precipitation at a continuous cooling rate of 300°C/h unless the sufficiency of the entire disclosure was to be questioned.

- 2.3 To conclude, neither the composition, nor the microstructural features can differentiate the product

of claim 1 from the disclosure of prior art D4.
Consequently, the subject-matter of claim 1 is not novel.

3. Articles 84 and 123(2) EPC

In view of the above analysis, it can be left open whether the requirements of Articles 84 and 123(2) EPC are fulfilled or not.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



V. Commare

M. Alvazzi Delfrate

Decision electronically authenticated