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Datasheet for the decision of 20 February 2020

Case Number: T 1209/17 - 3.3.05

Application Number: 11842453.0

Publication Number: 2634278

IPC: C22C23/02, B22D21/04

Language of the proceedings: EN

Title of invention:
MAGNESIUM ALLOY HAVING EXCELLENT IGNITION RESISTANCE AND MECHANICAL PROPERTIES, AND METHOD FOR MANUFACTURING SAME

Applicant:
Korea Institute of Machinery and Materials

Headword:
Magnesium alloy/Korea Institute of Machinery and Materials

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

Keyword:
Amendments - intermediate generalisation - added subject-matter (yes)
Inventive step - improvement not credible - reformulation of the technical problem - auxiliary request (no)

Decisions cited:
T 0201/83, T 0403/12

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 1209/17 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 20 February 2020

Appellant: (Applicant)	Korea Institute of Machinery and Materials 171, Jang-dong Yuseong-gu Daejeon 302-743 (KR)
Representative:	Patent- und Rechtsanwälte Ullrich & Naumann PartG mbB Schneidmühlstrasse 21 69115 Heidelberg (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 17 November 2016 refusing European patent application No. 11842453.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Glod
Members:	T. Burkhardt
	R. Winkelhofer

Summary of Facts and Submissions

I. The appeal lies from the examining division's decision to refuse European patent application No. EP 11842453.0.

II. The following documents were among those discussed at the examination stage:

D1 S. L. Cheng *et al.*, "Effect of Ca and Y additions on oxidation behavior of AZ91 alloy at elevated temperatures", Trans. Nonferrous Met. Soc. China, 19, 2009, 299-304

D2 F. Wang *et al.*, "Effects of combined addition of Y and Ca on microstructure and mechanical properties of die casting AZ91 alloy", Trans. Nonferrous Met. Soc. China, 20, 2010, s311-s317

D3 CN 101 037 753 A

III. The examining division had held that the main request did not meet the requirements of Article 123(2) EPC because the upper limits of the calcium and yttrium contents had been isolated from Example 1 of Table 1 of the application in this case and introduced into the independent claims as upper limits.

The examining division had also held that the independent claims of the auxiliary request did not meet the requirements of Article 56 EPC in view of either of D1 and D2. On the one hand, the lower limit of the Mn range in the independent claims of the application in this case encompassed levels that were common for impurities, and on the other hand, the

skilled person would know that the Fe, Si and Ni contents should be limited in order to reduce corrosion.

IV. Claim 1 of the main request filed with the submission of 8 December 2015 reads as follows:

"1. A magnesium alloy manufactured by melt casting, the magnesium alloy comprising, by weight, 7.0% or greater but less than 9.5% of Al, 0.05% to 0.61% of Ca, 0.05% to 0.19% of Y, greater than 0% but not greater than 6.0% of Zn, greater than 0% but not greater than 1.0% of Mn, a balance of Mg, and other unavoidable impurities,
wherein a total content of the Ca and the Y is [sic] ranges from 0.1% to 0.8% of a total weight of the magnesium alloy."

Claim 1 of the auxiliary request filed with the submission of 19 September 2016 reads as follows:

"1. A magnesium alloy manufactured by melt casting, the magnesium alloy comprising, by weight, 7.0% or greater but less than 9.5% of Al, 0.05% to 1.0% of Ca, 0.05% to 1.0% of Y, greater than 0% but not greater than 6.0% of Zn, greater than 0% but not greater than 1.0% of Mn, a balance of Mg, and other unavoidable impurities,
wherein among said other unavoidable impurities a content of Fe is maintained at 0.004% by weight or less, a content of Si is maintained at 0.04% by weight or less, and a content of Ni is maintained at 0.001% by weight or less,
wherein a total content of the Ca and the Y is [sic] ranges from 0.1% to 1.5% of a total weight of the magnesium alloy."

V. The applicant (appellant) essentially argues as follows:

The upper limits of the Ca and Y contents and of the "total content of the Ca and the Y" (in the following "Ca+Y content") in the main request were taken from Example 1 of Table 1 of the application as originally filed. The skilled person would recognise that these values were suitable range limits.

With regard to the auxiliary request, an inventive step was present since the prior art disclosed neither a logarithmic relationship between the Ca+Y concentration and the ignition temperature of the magnesium alloy, nor any teaching that the presence of Fe, Ni and Si in the claimed concentrations prevented corrosion.

VI. The appellant requests that the decision under appeal be set aside and a patent be granted on the basis of the main request or on the basis of the auxiliary request.

Reasons for the Decision

Main request

1. Amendments

For the following reasons, the main request does not fulfil the requirements of Article 123(2) EPC.

Claim 1 differs from claim 1 as originally filed *inter alia* in that:

- the upper limit of Ca has been modified from 2.0% to 0.61%
- the upper limit of Y has been modified from 2.0% to 0.19%
- the "total content of the Ca and the Y" has been modified from 2.5% to 0.8%

The same holds for the independent method claims, claims 6, 8 and 10.

Example 1 of Table 1, which has been cited as a basis for the amendments to the independent claims, discloses the Ca and Y contents as well as the Ca+Y content, namely 0.61%, 0.19% and 0.8% (that is 0.61% + 0.19%), respectively.

However, the appellant failed to highlight any pointer in the application as originally filed indicating that:
- these specific contents in Example 1 may be isolated from the contents of the other compounds, in particular Al and Zn, and that
- these contents may be introduced into the independent claims as upper limits.

No such pointer could be identified. On the contrary, the thermal and mechanical properties of the magnesium alloy result from an *interaction* between all of the components of the alloy.

For example, the strength of the alloy, which is one of the objectives of the application in this case (see page 1, lines 10 to 12, or page 2, lines 26 to 28), depends not only on Ca, Y and Ca+Y, but also on Al (see page 4, lines 26 to 27) and Zn (page 5, lines 32 to 33). For instance, according to page 5, lines 4 to 5,

strength is influenced by the formation of Mg-Al-Ca intermetallic compounds.

The interdependence between Ca and Y on the one hand, and Al and Zn on the other hand with regard to the strength of the alloy is confirmed by the statement "even in the alloys in which the respective contents of Al and Zn were decreased to 8wt% and 0.55wt%, when both 0.61wt% of Ca and 0.19wt% of Y were added, the tensile strength and elongation of the cast material were increased ..." on page 14, lines 26 to 32.

In other words, in line with e.g. T 201/83 (OJ 1984, 481), reasons 12, the skilled person would consider the Ca, Y and Ca+Y contents of Example 1 of Table 1 to be so "closely associated" with the contents of the other compounds as to determine the desired combination of mechanical properties and ignition resistance.

It is therefore not allowable to isolate only the Ca, Y and Ca+Y contents of Example 1 of Table 1 from the other components and to introduce them into the independent claims as upper limits since this amounts to an intermediate generalisation that infringes Article 123(2) EPC.

Auxiliary request

2. Inventive step

For the following reasons, the auxiliary request does not meet the requirements of Article 56 EPC.

2.1 Invention

The invention of claim 1 relates to a magnesium alloy.

2.2 Closest prior art

It is common ground that either D1 or D2 is the closest prior art. Both documents deal with the addition of Ca and Y to magnesium alloys. In the following the reasoning is based on D1, but the result would be the same when starting from D2. D1 also addresses the ignition resistance and the mechanical properties (e.g. brittleness, formation of cracks; see abstract). It relates to the same technical field and to the same problem to be solved and has numerous features in common with the subject-matter claimed by the application in this case. Reference is made in particular to alloys AZ91-0.5Ca-0.5Y and AZ91-1.0Ca-0.5Y in D1 (Table 1).

It has not been contested that the Al and Zn contents of the magnesium alloy AZ91 are within the ranges in the independent claims of the application in this case. This is confirmed by Table 1 of the application.

Contrary to the appellant's assertions, it is irrelevant whether the relationship between the "total content of the Ca and the Y" and the ignition temperature of the magnesium alloy is linear or logarithmic because the specific alloys described in D1 *already* respect the Ca, Y and Ca+Y concentration ranges in claim 1.

2.3 Problem to be solved

According to the appellant, the technical problem to be solved is to provide an alloy with improved corrosion resistance. In this regard, the appellant refers in particular to page 6, lines 4 to 19 of the application.

In particular, page 6, line 5 indicates that "Mn improves corrosion resistance", and page 6, line 16 states that "iron (Fe), silicon (Si) and nickel (Ni) are components that particularly worsen the corrosion resistance of the Mg alloy".

The appellant also points to page 1, line 28, page 7, line 13, and page 10, line 4 of the application in this case to show that corrosion/oxidation is a central aspect of the application.

2.4 Solution

It is suggested that this problem is solved by the alloy according to claim 1, which is characterised by the specific contents of Mn and of the impurities Fe, Si and Ni.

2.5 Success of the solution

There is no evidence on file to demonstrate that the claimed Mn, Fe, Si and Ni concentration ranges have any such effect on the corrosion resistance, in particular when compared with usual levels of Mn and impurities in a magnesium alloy. The absence of any such evidence was not contested.

The examples in the application in this case do show an effect related to the addition of Y (see Tables 1 to 3 or Figure 1), but this effect is of no relevance for the assessment of inventive step since the alloys AZ91-0.5Ca-0.5Y and AZ91-1.0Ca-0.5Y of D1 (Table 1) already have Ca, Y and Ca+Y contents in the claimed range.

2.6 Reformulation of the technical problem

Hence, the problem has to be reformulated in less ambitious terms as the provision of a *further* magnesium alloy.

2.7 Obviousness

In the absence of any surprising effect, the concentration ranges of Mn and of the impurities Fe, Si and Ni in claim 1 are arbitrary.

The skilled person looking for further magnesium alloys would consider the Mn and impurity levels known in the field as suitable to be used therein, without exercising any inventive activity. As the problem is simply to provide a further magnesium alloy, no further motivation is needed by the skilled person to include such levels of Mn and impurities in claim 1. This is in line with established case law (see for example T 403/12, reasons 1.3 and 1.4).

D3 discloses heat resisting magnesium alloys which comprise Al and Zn, with the following Mn and impurity concentration ranges (abstract):
- Mn between 0.1% and 0.4%
- Fe no more than 0.003%
- Si no more than 0.02%
- Ni no more than 0.003%

In particular, the range of Mn in D3 is a sub-range of the range in claim 1, and there is a significant overlap between the ranges of Fe, Si and Ni in D3 and those in claim 1.

Consequently, the subject-matter of claim 1 does not involve an inventive step within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz G. Glod

Decision electronically authenticated