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**Datasheet for the decision  
of 18 January 2008**

**Case Number:** T 0463/05 - 3.2.02

**Application Number:** 99111286.3

**Publication Number:** 0969108

**IPC:** C22C 11/06

**Language of the proceedings:** EN

**Title of invention:**

Alloy for battery grids

**Patentee:**

Johnson Controls Technology Company, et al

**Opponent:**

PATRAM (PATENT AND TRADEMARK ADMINISTRATION) LTD

**Headword:**

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**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty (yes)"  
"Inventive step (yes)"

**Decisions cited:**

T 0624/91, T 0594/01

**Catchword:**

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Case Number: T 0463/05 - 3.2.02

**DECISION**  
of the Technical Board of Appeal 3.2.02  
of 18 January 2008

**Appellant:** PATRAM (PATENT AND TRADEMARK ADMINISTRATION) LTD  
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**Respondent:** Johnson Controls Technology Company and  
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**Representative:** Lins, Edgar  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 14 March 2005  
rejecting the opposition filed against European  
patent No. 0969108 pursuant to Article 102(2)  
EPC (1973).

**Composition of the Board:**

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

## Summary of Facts and Submissions

- I. An opposition was filed by the present appellant against European patent No. 0 969 108. The opposition division held that the grounds for opposition pursuant to Article 100(a) EPC (1973) cited by the appellant did not prejudice the maintenance of the patent and decided on 2 March 2005, posted on 14 March 2005, to reject the opposition pursuant to Article 102(2) EPC (1973).
- II. The appellant lodged an appeal by notice received at the EPO on 11 April 2005 and paid the prescribed fee on the same day. A statement setting out the grounds of appeal was filed on 12 July 2005.

In support of its arguments the appellant essentially referred to the documents

D1: WO-A-98/48468, representing prior art pursuant to Article 54(3) EPC

D2: US-A-5 691 087

D6: GB-A-712 798

D8 R. D. Prengaman: "The metallurgy and performance of cast and rolled lead alloys for battery grids", Journal of Power Sources 67 (1997) pages 267 to 278

D9: N. E. Bagshaw: "Lead alloys: past, present and future", Journal of Power Sources 53 (1995), pages 25 to 30

D10: US-A-5 298 350

III. Oral proceedings took place on 18 January 2008 at the end of which the following requests were made:

The appellant (opponent) requested that the decision under appeal be set aside and the European patent No. 0 969 108 be revoked.

The respondent (patentee) requested that the appeal be dismissed, or in the alternative, that the decision under appeal be set aside and that the patent be maintained on the basis of the auxiliary request filed with a letter dated 13 December 2007.

Claim 1 as granted reads as follows:

"1. A grid supporting structure for use in a lead-acid battery comprising a container, at least one positive plate and a negative plate disposed within said container, a separator disposed within said container and separating said positive and negative plates, said plates comprising a grid supporting structure having a layer of active material pasted thereto, said grid supporting structure comprising a lead-based alloy having a composition comprising 0,005 to 0,0165 wt.% silver, 0,8 to 1,5 wt.% tin, and calcium in an amount of 0,03 to 0,055 wt.% such that the ratio of tin to calcium is greater than 12:1, and additionally optionally comprising 0,008 to 0,03 wt.% aluminium, the balance being lead and unavoidable impurities."

IV. The arguments of the appellant can summarized as follows:

As to the question of novelty, document D1 described the composition of the Pb-CaSnAg alloy which in the broadest definition comprised (all in percentage by weight) 0.002 to 0.035% Ag and overlapped the compositional restrictions of the lead alloy featuring in claim 1. Depending upon the production route for manufacturing battery grids, D1 disclosed, within the broadest aspect, two examples of preferred alloys. The composition to be used when forming battery grid plate by expanded metal processing set out in D1 on page 4, middle, included 0.045 to 0.085% Ca, 1.20 to 1.55% Sn and 0.002 to 0.0049% Ag at maximum. This alloy was only distinguished by 0.0001% Ag from the lower limit of 0.0050% Ag defined for the alloy claimed in the patent. Since every measurement in quantitative analytical chemistry could not be dissociated from the margin of uncertainty (see decisions T 0624/91 and T 0594/01), the distinction of only 1 ppm in silver could not establish novelty of the claimed alloy over that designed in D1.

Moreover, the disclosure of D1 was not restricted to the preferred embodiments given in the form of examples 1 (book mould) and 2 (expanded metal), but included also the compositional range of the alloy there between. Apart from book mould and expanded metal processing, many other processing routes for fabricating battery grids were at the skilled person's disposal that would prompt him to seriously contemplate working within the intermediate range which coincided widely with the PbCaSnAg alloy claimed in the patent. The subject matter of claim 1 therefore lacked novelty vis-à-vis the disclosure of D1.

In addition, document D2 disclosed an alloy employed in positive grids and containing (in wt.%) 0.025% to 0.06% Ca, 0.3 to 0.06% Sn and 0.015 to 0.045% Ag, the balance being Pb with the Sn content being 12 to 18 times that of Ca. This composition overlapped that claimed in the patent. Despite the fact that according to D2 silver was preferably added in amounts of 0.025 to 0.045% and the examples even comprised 0.032% Ag, the technical disclosure of D2 could not be narrowed down to these preferred embodiments of the alloy, but encompassed the full elemental ranges. Nothing could be found anywhere in this document to prevent a skilled person from designing a PbCaSnAg alloy within the range of overlap. The claimed battery grid was therefore not novel with respect to document D2 either.

Turning to inventive step, document D8 as the closest prior art disclosed in Table 4 a conventionally cast PbCaSnAg alloy comprising (in wt.%) 0.046% Ca, 1.05% Sn, 0.032% Ag, balance Pb. As set out in part 5 of D8, the known PbCaSnAg alloys exhibited an improved corrosion resistance, a high mechanical strength and creep resistance and, therefore, already solved the problem(s) addressed in the patent. Since, however, silver was a costly component, the skilled person was taught by document D9, page 29, left hand column, 2nd paragraph that even small amounts of this element dramatically improved the resistance to creep and corrosion and that additions of 0.01 up to 0.25% Ag to PbCaSn-alloys should be investigated. Consequently, it was close at hand for the skilled person to add silver in amounts as low as 0.01% to the PbCaSn alloy disclosed in document

D8, thus arriving at the composition claimed in the patent.

In a second approach, the skilled person starting from the Ag-free PbSnCa alloy given in document D6 and faced with the problem of the low creep and corrosion resistance of these alloys, would add silver in amounts as low as about 0.01% as was recommended by document D9, page 29, left hand column to improve these properties.

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

V. The respondent argued as follows:

None of the cited documents anticipated the composition of a lead-calcium-tin-silver alloy which fell within the elemental ranges claimed in the patent. Document D1 taught that different production techniques require two different lead alloys both falling outside the elemental ranges specified for the claimed alloy composition.

The technical teaching of document D8 as the closest prior art, considered either individually or in combination with that of D9, did not make the claimed low silver lead-calcium-tin alloy and the battery grids produced thereof obvious, given that no hint was found in either document to turn to the low silver contents claimed in the patent. Document D6 was even more remote since it related to silver-free lead alloys. The subject matter of claim 1 was therefore novel and involved an inventive step over the cited prior art.

## Reasons for the Decision

1. The appeal is admissible.
2. *Main request*
- 2.1 Novelty

Document D1 is relevant only for the issue of novelty within the meaning of Article 54(3) EPC. In its broadest aspect it discloses a battery grid plate comprising in weight percent 0.035 to 0.085% Ca, 1.2 to 1.55% Sn, 0.002 to 0.035% Ag, optionally 0.005% Al and the balance being Pb (cf. D1, page 4, first paragraph, page 5, third paragraph). However, the document leaves no doubt that specific alloy compositions within the broad range have to be selected depending on the process of forming positive grid plates. Since the two currently used production routes (i) book mould casting and (ii) expanded metal processing are entirely different techniques, they require two slightly different lead-calcium alloys (cf. D1, page 3): For book mould casting D1 teaches the composition of alloy I: 0.035 to 0.055% Ca, 1.3 to 1.55% Sn, 0.025 to 0.035% Ag, 0.005% Al, and balance Pb which comprises low Ca contents and high amounts of Ag to provide sufficient strength during the high temperatures the battery grid will experience. In case of processing battery grids by the expanded metal technique, the alloy should include higher Ca contents in combination with a low silver content to provide sufficient but not too high a hardness (alloy II (wt.%): 0.045 to 0.085% Ca, 1.2 to 1.55% Sn, 0.002 to 0.0049% Ag, balance Pb; cf. D1,



page 4). It is undisputed that the silver content of both lead alloys to be selected for the different production routes falls outside the range for silver claimed in the patent.

More specifically, D1 remains silent about the intermediate range of 0.005 to 0.0165% Ag which is not covered by alloy I and II. It may be true, as alleged by the appellant, that fabrication routes other than book mould and expanded metal processing exist for producing battery grids which could require a modified Pb-CaSnAg alloy composition situated between the elemental ranges set for alloys I and II. Since, however, document D1 fails to give any hint or pointer to do so, the skilled person would not seriously contemplate selecting a Pb-CaSnAg alloy composition within that range.

When considering the broadest aspect of the alloy of D1, the lead alloy composition selected in the patent is to be rated as being narrow in relation thereto and represents a purposive selection due to its unique balance of mechanical and chemical properties. Despite the fact that in D1 two specific embodiments (alloys I and II) are called "examples", they actually define preferred ranges rather than the singular composition of an example. Constructing a specific example within the range of alloy II exhibiting silver content of 0.0049 wt.%, as proposed by the appellant, would mean making an intentional choice *ex post facto* which is not disclosed in the document. Consequently, the appellant's allegation that, within analytical accuracy, 0.0049 wt.% would equate with 0.0050 wt.% Ag has therefore no bearing on the question of novelty since

document D1 does actually not disclose a singular exemplifying composition comprising 0.0049 wt.% Ag.

2.2 The same statement applies to the lead alloys given in documents D2 and D10 which disclose silver contents ranging from (all values in wt.%) 0.015 to 0.045% in combination with 0.3 to 0.9% tin and 0.025 to 0.06% Ca for making positive battery grids by expanded metal fabrication (cf. D2, claim 1; column 12, line 60 to column 13, first line; D10 abstract; column 6, lines 1 to 12). It is noted that the overlapping part of 0.015 to 0.0165% Ag existing for the claimed and known alloys is extremely narrow. Moreover, the examples (alloys I to III) given in both documents comprise 0.031 or 0.032% Ag, respectively, which is far remote from the upper limit of 0.0165% Ag claimed in the patent at issue. The reasons for restricting silver to such low levels is given in the patent in paragraphs [0009], [0026], [0028] and [0029] justifying that the claimed silver content has been selected on purpose rather than by guesswork. The conditions for the novelty of a selection are therefore met vis-à-vis the disclosure of D2 and D10.

2.3 Documents D8 and D9 do not disclose a lead-calcium-tin silver alloy whose composition falls within the claimed ranges, and neither does document D6 which relates to silver-free lead-calcium-tin alloys.

2.4 In the board's assessment, none of the cited documents disclose lead-calcium-tin-silver alloys which satisfy the elemental requirements of the lead alloy set out in claim 1 of the patent at issue. Hence, the subject

matter of claim 1 of the main request of the patent at issue is novel under Article 54 EPC.

3. *Inventive step*

3.1 Given that document D8 is most closely associated with the objects of the invention addressed in paragraph [0012] of the specification, this document qualifies as the closest prior art. In part 5 and in Table 4, it discloses a silver containing alloy consisting of 0.046 wt.% Ca, 1.05 wt.% Sn and 0.032 wt.% Ag which exhibits the highest mechanical strength and an improved creep resistance. Compared with the alloy featuring in claim 1 of the patent, the added amounts of silver in the other alloys described in document D8, Table 4, are either too high (0.030 to 0.036 wt.%) or the alloys are silver-free.

3.2 Starting from D8, the objective problem underlying the patent at issue could be seen as further improving the performance of battery grids made of lead-calcium-tin-silver alloys, in particular in terms of the alloy's resistance to creep, hot cracking, corrosion and its increased hardness.

As set out in claim 1 of the patent at issue, this technical problem is solved by adding silver in amounts ranging from 0.005 to 0.0165 wt.% to a lead alloy comprising 0.03 to 0.055 wt.% Ca and 0.8 to 1.5 wt.% Sn and optionally 0.008 to 0.03 wt.% Al. It is evident from Figure 6 of the patent that only this narrowly defined range for silver in combination with the stipulated amounts of tin guarantees reduced corrosion rates together with maximum hardness and hardening

rates as well as the absence of hot cracking when using the book mould gravity casting technique (cf. the patent specification, paragraph [0037]; Table 3). It is, therefore, beyond doubt that the technical problem has been successfully solved by the alloy composition designed by the patent at issue.

- 3.3 It thus has to be examined whether or not a pointer exists in the prior art which could lead the skilled person faced with the above-mentioned problem to the claimed solution, in particular to design a lead-calcium-tin alloy for battery grids comprising 0.005 to 0.0165 wt.% silver.

In the Board's assessment no such hint or pointer can be identified in the cited prior art. Nothing in document D8 is found implying that the addition of silver in amounts of 0.005 to 0.0165 wt.% has been even remotely contemplated to improve the alloy's performance. If silver has been actually added to PbCaSn alloys, then in much higher amounts, i.e. in the range of 0.030 to 0.036 wt.%. Even when possibly combining the technical teaching of D8 with that given in document D9, the skilled person would not be lead to take into account the low silver amounts present in the claimed alloy. It is true, as pointed out by the appellant, that document D9 advices researchers to investigate the effect of silver additions of 0.01 to 0.25 wt.% to lead-calcium-tin alloys on their creep and corrosion performance (cf. D9, page 29, left hand column, second full paragraph). In the next sentence, however, D9 goes on pointing to document D10 teaching that 0.015 to 0.045 wt.% silver are considered appropriate for improving the alloys creep resistance

and strength and which, more specifically, recommends silver additions of 0.031 or 0.032 wt.% (cf. D10, column 6, lines 6 to 12; alloys 1 to 3 in the example). It is important to note that this silver level exactly complies with that of the silver bearing alloys referred to in Table 4 of document D8. The skilled reader was, therefore, held to conclude that additions of 0.030 to 0.036 wt.% Ag are most effective to improve the above mentioned properties.

Hence the technical teaching of documents D8 and D9, taken either singly or in combination, does not lead in an obvious way to the lead-calcium-tin-silver alloy featuring in claim 1 of the patent.

Also when starting from document D6 as closest prior art, as proposed by the appellant, the claimed lead alloy for battery grids would not be obvious. Document D6 discloses silver-free lead alloys, and even if the person skilled in the art had added silver to these alloys in the light of the technical information given in document D9, he would, for the same reasons already referred to above, not have arrived in an obvious manner at the claimed solution.

3.4 The subject matter of claim 1 therefore involves an inventive step under Article 56 EPC.

3.5 The dependent claims 2 to 12 relate to preferred embodiments of the PbCaSnAg grid supporting structure set out in claim 1. Therefore, these claims are also allowable. For the same reasons, the lead acid cell featuring in independent claim 13 and comprising the

grid supporting structure defined in claim 1 is also new and inventive.

4. In view of the Board's conclusions on the main request, there is no need to consider the auxiliary request.

## **Order**

### **For these reasons it is decided that:**

1. The appeal is dismissed.

The Registrar:

The Chairman:

V. Commare

T. Kriner