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**Datasheet for the decision
of 19 September 2006**

Case Number: T 0878/04 - 3.5.02

Application Number: 94917232.4

Publication Number: 0704113

IPC: H02J 7/04

Language of the proceedings: EN

Title of invention:

Method and device for charging and improving sulphated lead storage batteries

Patentee:

Bengt Arrestad Fastighets AB

Opponent:

Macbat Aktiebolag

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

Keyword:

"Inventive step - main request - (no) "

"Inventive step - auxiliary request - (yes) "

Decisions cited:

G 0002/88

Catchword:

-



Case Number: T 0878/04 - 3.5.02

D E C I S I O N
of the Technical Board of Appeal 3.5.02
of 19 September 2006

Appellant:
(Patent Proprietor)

Bengt Arrestad Fastighets AB
Älvgatan 11
S-652 25 Karlstad (SE)

Representative:

Grennberg, Erik Bertil
Hjalmar Brantingsgatan 17
S-753 27 Uppsala (SE)

Former Opponent:

Macbat Aktiebolag
P.O. Box 189
S-671 24 Arvika (SE)

Representative:

-

Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 13 May 2004
revoking European patent No. 0704113 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: J.-M. Cannard
C. Holtz

Summary of Facts and Submissions

I. The proprietor appealed against the decision of the opposition division revoking European patent No. 0 704 113. That decision was taken by the opposition division acting in accordance with Rule 60(2) EPC, after the opposition had been withdrawn. The reasons given for the revocation were that the subject-matter of granted independent claim 6 according to the main request lacked novelty and the subject-matter of granted claim 1 according to the main and auxiliary requests then on file did not meet the requirements of Article 56 EPC.

II. The following documents:

D1: US-A-1 743 594, and

D2: US-A-3 963 976,

considered during the proceedings before the opposition division, and

D4: Storage Batteries, George Wood Vinal, Fourth Edition, John Wiley & Sons, New York, US, 1955, pages 310 to 311,

filed for the first time with the statement of grounds of appeal,

are considered in this decision.

III. During the oral proceedings held on 19 September 2006 before the Board of appeal, the appellant filed claims in respect of a main request and an auxiliary request.

Claim 1 according to the main request reads as follows:

"A charging method reconditioning sulphated lead storage batteries, comprising applying a varying direct voltage from a battery-charging unit which is sufficient to generate gassing at the positive and negative pole, and applying the direct voltage in intermittent non-negative current supply periods that are interrupted by pauses in which no current is supplied, having durations of between roughly 0,5 seconds and roughly 10 seconds, whereby the gases have the properties associated with the term "in statu nascendi", resulting in a particular activity which enables lead sulphate to be converted to lead and lead superoxide more easily".

Claim 1 according to the auxiliary request comprises all the features recited in claim 1 according to the main request followed by the additional features:

"whereby a battery is charged until the acid content in the best of its cells reaches a normal charged value, the battery is then discharged through an appropriately selected resistance and then recharged, this cycle being repeated until poor cells are improved."

Claims 2 and 3 of the auxiliary request are dependent on claim 1.

IV. The appellant's arguments may be summarized as follows:

Document D4 by Vinal, who was a long-time expert on storage batteries, described three possible senses of the word "sulfation", namely the formation of lead sulfate during the ordinary discharge of a battery which caused no problem, a kind of "self-sulfation" as a result of local action, and a third "perhaps more common" sense which "applies to the large crystals or crusts of lead sulfate that may form on the plates as a result of neglect or misuse". It was clear that the word "sulfation" in the description of the patent and the expression "sulphated batteries" in the claims were used in the sense of this third definition.

The charging method reconditioning sulphated batteries according to the main and auxiliary requests restored the original battery capacity, and should not be understood as covering any charging method or charger.

Document D1 was an historical document, which disclosed an old-fashioned solution for charging batteries, and would not be considered by a person skilled in the art, alone or in combination with the more recent document D2. D1 did not disclose "pauses in which no current is supplied, having durations of between roughly 0,5 and roughly 10 seconds". This was an essential feature of the presently claimed invention which made possible the reconditioning of a sulphated battery. Neither problems of sulphation, nor the influence of gassing, other than for indicating the presence of sediments at the bottom of a battery, were mentioned in D1.

Document D2 did not destroy the novelty of the claimed methods. D2 disclosed a charging method in which gassing was obtained pulse-wise, in order to improve agitation and mixing to avoid stratification of the electrolyte and the problems associated therewith. The technical effect of removing sulphation in batteries by using gases generated by the charging current had not been previously made available to the public. Following the practice of G 2/88, this effect should be interpreted as a new functional technical feature of the claimed methods.

D2 teaches "every day" charging of well-preserved batteries, whereas the method according to claim 1 of the main request remedied trouble caused by sulphation in batteries which had been used over a long period of time without maintenance charge. Although an uncharged battery might be improved by the prior art charging, the reconditioning provided by the removing of sulphation from a neglected battery was an entirely different improvement. It was part of the general common knowledge of the skilled person that it was simply not possible to remove lead sulphate having the structure and properties of sulphation by charging a neglected battery. The new functional technical feature comprised in claim 1 of the main request was not obvious to the skilled person. The method according to claim 1 of the auxiliary request which contained the additional feature of successively charging and discharging a sulphated battery until poor cells were improved was not obvious.

V. The appellant (patentee) requested that the decision under appeal be set aside and that the patent be

maintained on the basis of claims 1 to 7 of the main request filed in the oral proceedings; or claims 1 to 3 of the auxiliary request filed in the oral proceedings, description: columns 1 to 7 and insert <A>, all as filed in the oral proceedings; and figures 1 and 2 as granted.

Reasons for the Decision

1. The appeal is admissible.

Interpretation of the claims

2. Claim 1 of the main and auxiliary requests relates to a charging method reconditioning sulphated lead storage batteries. The exact meaning of the expression "sulphated lead storage batteries" is not explicitly defined in the description of the patent which in this regard simply mentions that the batteries referred to in example III "had stood 6-12 months without maintenance charge and (were) therefore heavily sulfated" (patent specification, column 6, lines 3 to 5).
3. Referring to the third definition of the word "sulfation" given in document D4 (page 310, last paragraph), the appellant argued that "sulphated batteries" according to claim 1 of both requests means batteries in which there are "large crystals or crusts of lead sulfate that may form on the plates as a result of neglect or misuse" and are difficult to reduce by the charging current. Although it is not disputed that a sulphated battery is a battery where "sulfation" has

occurred, the Board cannot share the appellant's view when construing claim 1 of the main request.

- 3.1 According to D4 which is considered beyond doubt to form part of the general knowledge of the skilled person, the word "sulfation" has been used in several senses and this has led to some confusion. Besides the third "and perhaps most common" definition quoted by the appellant, "sulfation" in general means the formation of lead sulphate on and in the plates of a battery "as a natural part of the process of discharge" of the battery. It also applies to lead sulphate which "is also formed as a result of local action or self-discharge of the plates" of a battery and is caused by parasitic currents or by the action of the acid solution on the material of the plates. This kind of lead sulphate could be a source of trouble, if it is neglected (see D4, page 310, first and second paragraphs under the heading "sulfation").
- 3.2 Although lead sulphate is formed as a natural part of the process of discharge of a battery and a discharged battery is improved by charging, the reconditioning (or regeneration) process exemplified in the patent (columns 3 and 4, bridging paragraph; examples III and V) appears to relate to an entirely different improvement in that it restores the original capacity of a neglected battery by removing sulphation, namely any lead sulphate which is a cause of trouble. The Board thus judges that the sulphated lead batteries specified in claim 1 of the main request should not be merely understood as batteries affected by "sulfation" according to the third use of this word given in D4, but this expression has a meaning broad enough to cover

the batteries used in the example III given in the patent specification, i.e. batteries which have stood for a long time without maintenance and may be affected by lead sulphate formed by local action or self-discharge, as explained in D4 (see the second definition of this word).

Main request

4. The charging method according to claim 1 of the main request, which reconditions sulphated lead storage batteries, can be seen as a method improving the useable capacity of a discharged battery, which has stood for a long time without maintenance charge, to such an extent that it restores a useful proportion (not necessarily 100%) of its original capacity. Document D2 relates to a charging method which improves the useable capacity and the useful life of a liquid electrolyte electric storage battery (column 1, lines 13 to 41). In view of the reference to "automobile or truck" in line 40 of column 1, the person skilled in the art would realise that D2 was concerned with lead storage batteries. The Board considers D2 to be the closest prior art.
- 4.1 The method disclosed in the first embodiment of D2 with reference to figures 1 to 3 (column 2, lines 19 to 54; column 3, lines 19 to 38; column 5, lines 42 to 67; column 6, lines 31 to 43) comprises a step of applying a varying direct voltage from a battery-charging unit which is sufficient to generate gassing at the positive and negative pole, this voltage being applied in intermittent non-negative current supply periods interrupted by pauses in which no current is supplied,

as specified in claim 1 of the main request. The duration of these pauses is roughly 3 seconds and falls within the range specified in the claim.

- 4.2 However, D2 does not disclose reconditioning a battery according to the claimed method, in which gases "have the properties associated with the term "in statu nascendi", resulting in a particular activity which enables lead sulphate to be converted to lead and lead superoxide more easily" (last lines of claim 1). Claim 1 can thus be construed as a claim to a new use (i.e. reconditioning - as distinct from merely improving - of sulphated lead batteries) of a known method (i.e. the method disclosed in the first embodiment of D2), this use being based on gases having as a technical effect said "particular activity". This technical effect, which is described in the patent (column 3, lines 12 to 24), has not previously been made available to the public. In accordance with the decision of the Enlarged Board of appeal G 2/88 (OJ 1990, 93), the Board finds that claim 1 of the main request should be interpreted as including that effect as a new functional technical feature and thus meeting the requirement of novelty (Article 54 EPC).
5. Starting from document D2 and having regard to the effect provided by the claimed invention, the objective technical problem addressed by the invention can be seen as improving the prior art charging method to enable the reconditioning of sulphated lead batteries that have been standing for a long time without maintenance charge.

6. In the judgment of the Board, the subject-matter of claim 1 according to the main request does not involve an inventive step having regard to the teaching of document D2 taken in combination with the general common knowledge of the skilled person as exemplified by D4.
- 6.1 According to D4, and particularly the second definition of the word "sulfation", sulphated lead batteries which have stood for a long time without maintenance charge (that is to say, neglected), as those covered by claim 1, are a source of trouble because lead sulphate is formed as a result of local action or self-discharge caused by parasitic currents or by the action of the acid solution on the materials of the plates, the rate at which "sulfation" proceeds depending, *inter alia*, on the concentration of the electrolyte. This kind of lead sulphate does not appear to have an irreversible structure. D2 (column 1, lines 20 to 36) explains that the amount of energy returnable after discharge of the battery is affected by the non-homogeneity of the electrolyte, i.e. electrolyte stratification: "in the absence of agitation or mixing techniques or apparatus, the electrolyte (acid) concentration decreases at the top of a cell battery and increases at the bottom" and "cell plate deterioration (e.g. "whiskers" or "branch" growths near the bottom of the cell plates...) is enhanced by stratification". According to the teaching of D2, the agitation resulting from the gases generated by the pulses of charging current minimizes the stratification, allows prevention of reduction of the electrolyte between adjacent battery cell plates available for recharge (column 1, lines 28 to 31) and thus increases the useable capacity and the useful life

of the battery. In the judgment of the Board, the skilled person, who would be aware of the above explained teaching, would consider it worthwhile to try using the gases produced by the method disclosed in D2 for reducing, at least to some extent, the lead sulphate formed as a result of local action or self-discharge in batteries which were "sulphated" in the sense of the second definition given on page 310 of D4. Although the explanation at the end of claim 1, that the "particular activity enables lead sulphate to be converted to lead and lead superoxide more easily", may be regarded as a new functional feature (in the sense of G 2/88), it does not imply an inventive step. Such a new and obvious use of the method known from D2 falls within the terms of claim 1 of the main request.

Auxiliary request

7. The board is satisfied that the amendments made to the claims and the description according to the auxiliary request satisfy the requirements of Article 84 EPC and do not contravene Article 123(2) and (3) EPC.
- 7.1 This applies in particular to claim 1 of the auxiliary request, which now is directed to "a charging method reconditioning sulphated lead storage batteries" and differs in substance from granted claim 1 in that it comprises the features of claim 5 as granted. Such a charging method is disclosed in the application as originally filed (see the published application, pages 4 and 5, bridging paragraph).

- 7.2 The description has been adapted to the amended claims and a mention of the particularly relevant document D2 has been included.
8. The charging method disclosed in D2 does not comprise the new functional technical feature based on the new technical effect provided by the particular activity of the gases according to claim 1 of the auxiliary request which "enables lead sulphate to be converted to lead and lead oxide more easily" (see above paragraph 4.2). Nor does D2 disclose the claimed steps of charging the battery until the acid content in the best of its cells reaches a normal charged value, discharging the battery through an appropriately selected resistance and then recharging the battery, this cycle being repeated until poor cells are improved. Claim 1 according to the auxiliary request meets the requirement of novelty.
9. The repeated use of the new technical effect provided by the "particular activity" of the gases in a charging-discharging cycle provides a new technical effect of reconditioning batteries, which have been used over a long period of time and have lost their efficiency due to "sulfation" in the sense of the third definition given on page 310 of D4, by improving the poor cells of the batteries each time the cycle is repeated, as explained in the patent. Accordingly, claim 1 of the auxiliary request should be interpreted as relating to a new use of the method disclosed in D2, this new use including as a new functional technical feature the repetitive use of the "particular activity" of the gases.

10. Starting from D2 and having regard to the effects provided by the claimed invention, the objective technical problem addressed by the invention can be seen as reconditioning sulphated batteries where large crystals or crusts of lead sulphate have formed. This problem is solved by the new functional technical feature which distinguishes the method of claim 1 over D2 (see the previous paragraph).

11. There is no hint in the prior art of the solution provided by the invention according to claim 1 of the auxiliary request and more specifically no suggestion that the new functional technical feature included in claim 1 would recondition a battery which has lost its efficiency due to "sulfation" caused by large crystals or crusts of lead sulphate.
 - 11.1 More specifically, according to the general knowledge of the skilled person as appearing in D4, the large crystals or crusts of lead sulphate that are formed on the plates of a lead battery as a result of neglect or misuse, unlike the lead sulphate formed as a natural part of the process of discharge or as the lead sulphate formed as a result of local action or self-discharge of the plates, are a kind of "sulfation" which is difficult to reduce by a charging current and may damage the plates themselves. Various cures for sulphated batteries are proposed in D4 (page 311), such as, for instance, pouring out the electrolyte, filling the cells with water and putting the battery on charge at a low rate of continuous or constant current. But the claimed solution based on the *repeated use* of the claimed "particular activity" of gases caused by the charging current is not suggested in D4.

11.2 Document D1 discloses a charging method in which the charging current is caused to flow in cycles where periods of high amperage current alternate with periods of low amperage current, so that the plates are softened and cleared of sulphate. However, D1 is not concerned with the problem of sulphation in the sense of the third definition given on page 310 of D4 and does not disclose a particular activity of gases which enables lead sulphate to be converted more easily to lead and lead superoxide. Nor does D1 disclose a repetitive cycle of charging, discharging and recharging a battery, until its poor cells are improved. Accordingly, the subject-matter of claim 1 according to the auxiliary request is not obvious to a person skilled in the art.

12. In the Board's judgement, taking into account the amendments according to the auxiliary request the patent in suit and the invention to which it relates satisfy the requirements of the Convention (Article 103(3) EPC).

Order

For these reasons it is decided that :

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in amended form in the following version:

claims: 1 to 3 (auxiliary request) filed in the oral proceedings,
description: columns 1 to 7, with insert <A> to column 1, filed in the oral proceedings, and
drawings: figures 1 and 2 of the patent specification.

The registrar:

The Chairman:

U. Bultmann

W. J. L. Wheeler