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D E C I S I O N
of 9 March 2000

Case Number: T 0580/96 - 3.3.5

Application Number: 89305424.7

Publication Number: 0367372

IPC: C04B 35/52

Language of the proceedings: EN

Title of invention:
Manufacture of a soderberg electrode incorporating a high carbon-contributing phenolic sacrificial binder

Patentee:
Borden, Inc.

Opponent:
Elkem A/S

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"
"Obvious improvement"

Decisions cited:
-

Catchword:
-

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Case Number: T 0580/96 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 9 March 2000

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 10 May 1996 concerning maintenance of European patent No. 0 367 372 in amended form.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: A.-T. Liu
J. Van Moer

Summary of Facts and Submissions

I. The appeal is against the interlocutory decision of the opposition division maintaining European patent No. 0 367 372 with an amended set of claims consisting of claims 1 to 26.

II. Claim 1 of this set reads as follows:

"A feedstock composition for the production of a Soderberg continuous carbon electrode wherein said composition has sufficient mobility to travel through the Soderberg temperature gradient as a moving viscous bed and wherein said moving viscous bed of heated composition enters the use zone of said Soderberg electrode as a paste, hardens, and attains electrode integrity, comprising

a mixture of particulate carbonaceous aggregate, phenolic resin binder, plasticizer having a boiling point of at least about 200°C in an amount of 0-50% based on the combined weight of resin solids and plasticizer, optionally pitch in a weight amount equal to or less than the weight amount of said phenolic novolac resin, and from 0% to no more than 5% hexamethylenetetramine based on phenolic resin solids,

said phenolic resin binder consisting essentially of phenolic novolac resin characterized by a minimum melt point of 100°C and a free phenol content of not more than 4% by weight as measured by gas chromatography analysis."

III. The opposition division held that the subject-matter of the claims as granted involved an inventive step in view of the available prior art documents, in

particular:

D1: AU-A-71 002/87

D4: GB-A-926 295

IV. In the grounds of the decision it was indicated that the closest prior art was reflected in document D1 which disclosed electrode compositions comprising novolac resins and 6 to 10% of hexamethylenetetramine (hexa). The opposition division held that the technical problem to be solved by the invention with respect to D1 was to provide carbon compositions which remain fluid up to 500°C. The proposed solution of reducing the amount of hexa to 5% or less was considered novel and inventive with respect to the available prior art.

V. In the statement of grounds of appeal, the appellant maintained the objection that the subject-matter of claim 1 lacked an inventive step with respect to D1.

VI. Oral proceedings were held on 9 March 2000.

VII. The appellant's oral and written submissions can be summarised as follows.

The invention and D1 were directed to the same technical problem of avoiding the use of coal tar pitch in the preparation of Soderberg electrodes. The solution proposed by the invention was the same as in D1, namely to replace coal tar pitch with a phenol formaldehyde novolac resin binder. Furthermore, it was general knowledge that a Soderberg composition has to retain its plasticity up to a temperature of 500°C. In

view of the teaching in D1, the skilled person would have reduced the amount of hexa. The stipulated range of hexa would therefore inevitably be arrived at by routine trial.

VIII. The respondent contended that, in view of the specialised nature of Soderberg compositions, the closest prior art should be represented by D4 rather than D1. It was submitted that D1 only disclosed compositions used for forming pre-baked shaped articles. Although reference was made to the production of Soderberg anodes, the teaching of D1 was not enabling for this end use. Therefore, the skilled person would have purely and simply ignored this passage of the description in D1.

Whilst the respondent did not contest the general knowledge concerning the thermoplasticity requirement for Soderberg compositions, he was of the view that D1 did not contain any pointer toward the patent in suit. He went on to argue that, without the benefit of hindsight, the skilled person would not have considered reducing the hexa content in the known compositions but, rather, would have selected another resin binder than novolac.

IX. At the end of the oral proceedings, the parties' requests were as follows:

- The appellant (opponent) requested that the decision under appeal be set aside and the European patent No. 0 367 372 be revoked.

- The respondent (patentee) requested that the

appeal be dismissed.

Reasons for the Decision

1. Claim 1 is directed to a feedstock composition for the production of a Soderberg continuous carbon electrode. The Board concurs with the respondent in that D4 relates to the same subject-matter as the patent in suit. Indeed, the patent specification D4 bearing the title "Improvements relating to Electrode Paste for Söderberg Electrodes and its manufacture" is clearly directed to a process for producing electrode paste for Soderberg self-baking electrodes (see page 1, lines 9 to 15 and claim 1). In contrast, the subject-matter claimed in D1 concerns the manufacture of pre-baked electrodes. As a consequence, the Board accepts the respondent's view that D4 should be considered to comprise the closest prior art.

2. According to the teaching in D4, Soderberg electrodes are made from a mixture of partially graphitized carbonaceous material with a carbonisable binder such as tar and/or pitch (page 1, line 22; lines 50 to 55 and claim 1). The problem that the invention seeks to solve with respect to D4 is the reduction of pollution hazard caused by the use of coal tar pitch in the production of such electrodes (see patent in suit, page 3, lines 51 to 56).

3. The solution to the above problem, as proposed in claim 1, is to (partly) substitute the environmentally objectionable component coal tar pitch with phenol formaldehyde novolac binder(s) in combination with 0%

to no more than 5% hexa, based on the binder(s). The novolac binder is characterised by a minimum melt point of 100°C and a free phenol content of not more than 4%.

The question is therefore as to whether the proposed solution is obvious with respect to the available prior art.

4. As is accepted by all the parties, the environmental problem caused by the use of coal tar pitch in the production of electrodes in general and Soderberg electrodes in particular is already addressed in D1 (see page 2, lines 9 to 21 and page 4, lines 30 to 35).

4.1 In order to solve this problem, D1 proposes to substitute coal tar pitch, preferably with phenolic novolac resins having a minimum melt point of 100°C and a free phenol content of not more than 4% (page 5, lines 7 to 22 and page 9, lines 15 to 26). The proposed solution differs from that stipulated in present claim 1 only in that it requires the incorporation of 6 to 10% of hexa in addition to the novolac resin binder (page 5, lines 28 to 31 and page 10, lines 10 to 12).

4.2 It is undisputed that the compositions as disclosed in D1 are not suitable for the present purpose of making Soderberg electrodes. However, the Board does not concur with the respondent that the skilled person would have merely discarded the mention in D1 that "one practising the art will readily realize the utility of the invention for the production of Soderberg anodes" (page 19, lines 7 to 10) as unenabling. The Board notes that D1 already teaches that the composition for the production of a Soderberg continuous electrode is fed

directly to the operating electrode of the furnace (see page 3, lines 2 to 5). As is undisputed, it is further common knowledge that such composition must therefore retain sufficient thermoplasticity at temperatures up to 500°C (see points VII and VIII). Thus, the Board holds that the express reference in D1 as to its utility in the production of Soderberg anodes must be interpreted as an invitation to modify the compositions disclosed therein in such way that the resulting Soderberg compositions have the desired thermoplasticity.

4.3 It is irrefutable that D1 is primarily directed to the preparation of pre-baked electrodes. For this particular use, the green mixture of carbonaceous material and binder is shaped and fired and complete cure of the resin binder is achieved at temperatures of 150 to 200°C.

4.3.1 The presence of a curing agent in the compositions of D1 is necessary in order to avoid a prolonged and slow baking cycle which would lead to extensive energy consumption. The prescribed degree of cure is also necessary for the pre-baked electrodes to possess the appropriate green strength (see respondent's letter dated 6 January 1997, page 2, third paragraph from bottom and D1, page 3, lines 2 to 3; page 5, lines 1 to 5 and page 6, lines 18 to 22).

4.3.2 In contrast to the teaching of D1, the skilled person knows as a fact that a composition which may find utility as Soderberg paste must not cure at temperatures as low as 200°C (see point 4.2). In addition, it is also known that the role of hexa is to

cure the novolac resin (D1, page 9, 27 to 29; and page 16, line 35 to page 17, line 3).

4.3.3 In view of this teaching, the Board holds that a skilled person seeking to adapt the resin compositions of D1 to the use as Soderberg pastes, would have tried to achieve a lesser degree of curing and would therefore have reduced the content of hexa with respect to the known compositions. Since D1 already suggests curing with a minimum amount of hexa (page 10, lines 10 to 11), no inventive skill is needed in this case to reduce the hexa content of 6% as disclosed in D1 to a hexa content of 5% or less.

5. As corollary of the above, it is obvious that the skilled person seeking to reduce the use of coal tar pitch in the preparation of Soderberg electrodes according to D4, would have applied the teaching of D1 with the modification that hexa is incorporated in an amount of no more than 5% based on the novolac binder.

6. The respondent's argument that hexa also has the positive effect of enhancing the coking value of the novolac resin and that the skilled person therefore would not have reduced its content is irrelevant. The respondent has not submitted that the effect of hexa on the coking value was known before the priority date of the patent in suit. Therefore, such effect cannot be construed as a reason preventing the skilled person from modifying the compositions according to D1.

The respondent has also asserted that the skilled person may have expected the reduction of the hexa content to have a detrimental effect on the physical

properties of the resulting electrode. The Board, however, cannot accept that the mere anticipation of such detrimental effect is a prejudice, deterring the skilled person from carrying out a routine experiment.

For the reasons indicated in point 4.3.3, it is obvious for the skilled person, seeking to solve the problem as stated in point 2, to try reducing the hexa content in the compositions according to D1 and thereby arrive at the compositions according to claim 1 by routine experiment.

7. The Board cannot follow the respondent's argument that, when seeking to solve the present problem, the skilled person could have, for example, chosen another resin binder instead of contemplating reducing the hexa content.

7.1 As is discussed in the patent in suit, earlier attempts to replace pitch binders with furfural resins were not successful. Not only are the fumes of these resins noxious and toxic, their incorporation into the electrode compositions also results in structures which set at a temperature too low for the present purpose and therefore lack the required plasticity beyond this temperature (page 3, lines 33 to 40).

7.2 On the other hand, D1 expressly mentions that novolac is the resin of choice for replacing pitch in the production of electrodes (see D1, page 13, lines 33 to 35 and page 14, line 8). The respondent has not given any plausible explanation as to why the skilled person would deviate from this specific teaching.

7.3 The Board therefore holds that in view of the prior art available to the skilled person (including D1), novolac is also the straightforward and natural choice of resin binder in the production of Soderberg electrodes.

8. The composition as stipulated in claim 1 thus does not involve an inventive step in view of D4 in combination with D1 and the common general knowledge as indicated in point 4.2.

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:

S. Hue R. Spangenberg