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D E C I S I O N
of 16 February 2006

Case Number: T 0682/02 - 3.3.06

Application Number: 98914170.0

Publication Number: 0977918

IPC: D21C 3/10

Language of the proceedings: EN

Title of invention:

A wood delignification chemical process using ammonium magnesium bisulphite as the active reagent

Applicant:

Almeida Oliveira Baptista, Joao, Manuel

Opponent:

-

Headword:

Acid bisulphite cooking/ALMEIDA

Relevant legal provisions:

EPC Art. 123(2), 84, 56

Keyword:

"Inventive step - yes"

Decisions cited:

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Catchword:

-



Case Number: T 0682/02 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 16 February 2006

Appellant: Almeida Oliveira Baptista, Joao, Manuel
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Representative: Pereira da Cruz, Joao
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 11 February 2002
refusing European application No. 98914170.0
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: P. Krasa
Members: G. Dischinger-Höppler
J. Van Moer

Summary of Facts and Submissions

I. This appeal is from the decision of the Examining Division to refuse the European patent application No. 98 914 170.0 (international publication number WO-A-98/49390) entitled "a wood delignification chemical process using ammonium magnesium bisulphite as the active reagent".

II. The decision was based on the grounds

- of Article 123(2) EPC for introducing subject-matter which extended beyond the content of the application as filed;

- of Article 84 EPC for lack of clarity and

- of Article 56 EPC for lack of inventive step in view of the disclosure of

D1 SU-A-1 359 387 (& English translation);

D2 US-A-4 634 499;

D3 GB-A-732 216;

D4 US-A-4 141 787 and

D5 K.W. Britt, Handbook of Pulp and Paper, 1970, Van Nostrand Reinhold Company, New York, page 162.

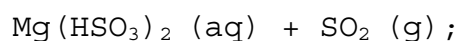
III. The Applicant (hereinafter Appellant) filed an appeal against this decision, refuted the arguments set out in the decision under appeal and referred, inter alia, to the following document

D6 S.A. Rydholm, *Pulping Processes*, 1965,
Interscience Publishers, New York, pages 455, 468,
469.

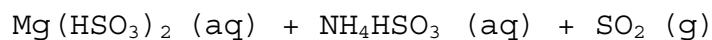
which had already been filed during the examining proceedings. Subsequent to two communications, wherein the Board raised objections under Article 84, 123(2) and 56 EPC, and corresponding replies by the Appellant, oral proceedings were held before the Board on 31 August 2005, during which the Appellant filed a new request containing the following single claim:

"Wood delignification process, applied to eucalyptus wood, characterized by the utilisation of a mixture of magnesium and ammonium bisulphite salts as the active chemicals, as follows:

a) start from an initial cooking acid at pH 1.5, temperature of 50°C and pressure of 2 kg cm⁻², with the following composition:



b) add ammonium hydroxide in order to obtain a final cooking acid with the following composition:



with a pH between 2 to 4 and a concentration of total SO₂ from 4% to 7%."

V. The Appellant, orally and in writing, submitted in essence the following arguments:

- The application in suit related to a one step pulp cooking process suitable for improving the mechanical and physical properties of the pulp as well as the degree of conversion of wood into pulp (hereinafter pulp yield).
- The application in suit started from the conventional one stage magnesium bisulphite process using an initial cooking acid of pH 1.5 as measured at 25°C.
- D4 was not suitable as a starting point for the assessment of inventive step since it disclosed a two-step process starting from a higher pH value as compared to the claimed process.
- The addition of ammonia in the process of D4 was counterintuitive since it would raise the pH.
- D2 was irrelevant since it was conceived for the different purpose of degradation of hemicellulose by hydrolysis at pH 2 to 3 and a temperature of 140 to 155°C.
- D1 was irrelevant since it did not disclose a process for pulp cooking, let alone an acid bisulphite process.
- D3 was irrelevant since it related to a process for hydrolysing eucalyptus wood chips prior to an alkaline digestion for the purpose of manufacturing artificial silk.

VI. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the single claim submitted during oral proceedings.

VII. At the end of the oral proceedings, the Board gave the following decision:

The proceedings are continued in writing to allow the Appellant to submit further evidence within a period of four months.

VIII. Under cover of a letter dated 15 December 2005, the Appellant filed comparative laboratory tests in relation to the process disclosed in D4 carried out by I.P.T. (Instituto Politécnico de Tomar) on eucalyptus wood chips.

Reasons for the Decision

1. *Amendments (Article 84 and 123(2) EPC)*

The Board is satisfied that the single claim as amended in accordance with the new request complies with the requirements of Article 123(2) EPC since its wording is supported by the application as filed (see, in the application as filed, Claims 1 to 3, page 2, first, second and last paragraph and page 3, first paragraph).

Further, the objections made by the Examining Division under Article 84 EPC have been overcome except for the question on which basis the percentage of the concentration of total SO₂ has been calculated. No such basis is originally disclosed. However, according to D6

the term "total SO₂" is well-defined in the art of sulphite cooking and denotes the total content of SO₂ taken up by the cooking acid in more or less hydrated form, as well as sulphurous acid and bisulphite ions (page 455, lines 27 to 31). The Board concludes, therefore, that it is well known in the art that the percentage is calculated on the basis of the weight of the aqueous cooking acid (see also page 469, last three lines, where the SO₂ content is given as g/l). Since the amendments do not create new clarity problems, the claim complies with the requirements of Article 84 EPC.

2. *Novelty*

The claimed subject-matter is novel under Article 54(2) EPC over the available prior art documents since none of them discloses a delignification process applied to eucalyptus wood wherein magnesium **and** ammonium bisulphite salts are used as the active chemicals.

3. *Inventive Step*

3.1 The application in suit relates to a bisulphite wood delignification process using at pH 2 to 4 ammonium and magnesium bisulphites together as the active chemicals and aims at an improvement of the mechanical and physical properties of the pulp and the pulp yield whilst decreasing wood consumption and environmental impact as compared to the known magnesium acid bisulphite process (page 1, lines 1 to 7 and 14 to 16, page 3, lines 4 to 18).

3.2 According to the Case Law of the Boards of Appeal of the European Patent Office (see I.D.3.1), a suitable

starting point for the assessment of inventive step is normally a prior art document disclosing subject-matter conceived for the same or a similar purpose as the claimed invention.

- 3.3 In the present case, the state of the art disclosed in D4 qualifies as a starting point for the assessment of inventive step since it relates to a process using an aqueous solution of magnesium oxide and excess SO₂ in amounts to give a pH of 2 to 4.5 in order to improve the yield by avoiding hydrolysis or other degradation of cellulose or hemicellulose, reduce the consumption of chemicals and environmental pollution and improve the strength properties of the pulp obtained (column 1, lines 15 to 19 and 55 to 59 in combination with column 2, lines 30 to 60, column 3, lines 1 to 11 and 22 to 30, column 4, lines 25 to 68 and column 5, lines 62 to 68).

The other prior art on file is less suitable as a starting point since none of them is conceived for a similar purpose.

- 3.3 D4 specifically discloses (see column 2, lines 17 to 29, column 3, lines 1 to 7 and 22 to 30 and lines 24 to 41 and examples) a two step process comprising

- a first step wherein the wood chips are impregnated with cooking acid containing MgO or CaO and SO₂ at a temperature of between 45°C to 90°C and a total SO₂ content of below 5% by weight, followed by feeding liquid SO₂ into the digester to increase the total SO₂ content to a value of 6 to 10% by weight or,

respectively, to obtain a pH in the cook of from 2 to 4.5, and

- a second step wherein digestion is completed in a known manner by heating at a temperature of from 130 to 150°C.

3.4 The Appellant argued that an essential difference in relation to the process of D4 consisted in that the claimed process was a one step process. Nevertheless, he conceded during the oral proceedings that according to the claimed delignification process it was also necessary to complete the digestion at a temperature above 100°C as is common in the art of pulp production.

In the Board's judgment, the claimed subject-matter does not, therefore, exclude a two-step process as in D4 and differs from the latter in that

- the process is specifically applied to eucalyptus wood, and that

- the pH of 2 to 4 is obtained by adding sufficient ammonia to an initial cooking acid of pH 1.5 at a pressure of 2 kg cm⁻¹.

3.5 The experimental data submitted by the Appellant show that using cooking acid of average pH 2.0 (as calculated for 25°C) in accordance with the process of D4, provides pulp of reduced brightness at comparable physical properties (breaking length and tear factor) and yield, as compared with conventional magnesium bisulphite cook of pH 1.6 when applied to eucalyptus wood at identical cooking conditions, in particular, at

the same ratio of acid to wood (see in particular Table III of the laboratory tests). However, the addition of ammonia (resulting in a pH of 2.4 as calculated for 25°C) in accordance with the claimed process at otherwise identical conditions brings about considerably improved physical properties and yield of the pulp at a brightness comparable with that obtained with conventional magnesium bisulphite cook (Table IV of the laboratory tests).

Hence, the Appellant's experimental data show that the increase in pH of the initial cooking acid by adding ammonia improves not only the physical properties and the yield of the pulp but also its brightness, contrary to what should have been expected.

3.6 In applying the so-called problem-solution approach which is normally used by the Boards of Appeal for the assessment of inventive step (see Case Law of the Boards of Appeal of the European Patent Office I.D.2) to the present circumstances, the technical problem actually solved by the claimed invention in comparison with the disclosure of D4 must be considered to consist in providing pulp of improved strength and brightness and at higher yield. In view of the above considerations, the Board accepts that this technical problem was credibly solved by the provision of the claimed acid bisulphite cooking process.

3.7 It remains to be decided whether it was obvious for someone skilled in the art to modify the process of D4 by the above distinguishing features in the reasonable expectation of solving the above stated technical problem.

3.8 D4 does not contain any suggestion how to further improve the physical properties of the pulp and the pulp yield, let alone a proposal to adapt for that purpose the pH of the initial cooking solution by adding ammonia.

The other prior art on file is still less suitable for giving the skilled person a relevant hint for the following reasons:

- D1 relates to a fibrous stock for manufacturing corrugated paper consisting of a mixture of magnesium bisulphite softwood cellulose and **magnesium ammonium bisulphite alkaline hardwood hemicellulose** (see patent claim). D1 does not disclose the process by which the **"bisulphite alkaline"** hemicellulose has been made, let alone an acid bisulphite cook, irrespective of any common general knowledge disclosed in D5 (which was referred to in this respect by the examining Division) that the pH is the controlling variable in all sulphite pulping. D1 is, therefore, as a whole irrelevant in relation to the claimed acid bisulphite cooking process.

- D2 relates to the production of fibres suitable to make tissue paper which is particularly soft to the touch by hydrolyzing the lignin sulphonate and the hemicellulose in an ammonium acid bisulphite process (column 1, lines 11 to 16, column 2, lines 9 to 15, column 2, line 50 to column 3, line 22, column 5, lines 21 to 33 and column 6, line 39 to column 7, line 7). It is not concerned with the strength, yield or brightness of the pulp.

- D3 relates to a process wherein an alkaline digestion step using caustic soda is carried out subsequent to a particular hydrolysing treatment with SO₂ containing steam in order to reduce steam consumption and to simplify the plant as compared with prior art (page 1, lines 9 to 26, page 2, lines 21 to 39, Examples and Claim 1).

- Finally, D5 was cited by the Examining Division only to show that it was within the general technical knowledge of those skilled in the art that the pH of the cooking acid was the most important controlling variable with respect to the final pulp properties in all (bi)sulphite pulping processes. Particularly contemplated is the change of the pH during the pulping process. However, D5 is totally silent on how the pulp properties are influenced by the initial pH of the pulp. Moreover, the only cooking acid specifically mentioned has an initial pH of 1.3 at room temperature (page 162, left-hand column, last paragraph to right-hand column, second paragraph).

3.9 The Board, therefore, concludes that it was not obvious for someone skilled in the art to add ammonia to the cooking acid used in the process disclosed in D4 in the reasonable expectation of improving the strength, yield and brightness of the pulp.

4. For all these reasons, the Board concludes that the claimed subject-matter is based on an inventive step as required by Article 52(1) EPC in combination with Article 56 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 grant a patent on the basis of the single claim filed on 31 August 2005 during the oral proceedings and the description as filed.

The Registrar:

The Chairman:

A. Wallrodt

P. Krasa