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Datasheet for the decision of 13 March 2007

Case Number: T 0310/02 - 3.3.06

Application Number: 97115974.4

Publication Number: 0827772

IPC: B01D 53/14

Language of the proceedings: EN

Title of invention:
Method for the removal of carbon dioxide and hydrogen sulfide from a gas containing these gases

Applicant:
THE KANSAI ELECTRIC POWER CO., INC., et al

Opponent:
-

Headword:
Removal of carbon dioxide and hydrogen sulfide/KANSAI

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no): obvious application of a known method"

Decisions cited:
-

Catchword:
-

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Case Number: T 0310/02 **-** 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 13 March 2007

Appellants: THE KANSAI ELECTRIC POWER CO.,INC.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 7 September 2001 refusing European application No. 97115974.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: P.-P. Bracke
Members: L. Li Voti
C. Heath

Summary of Facts and Submissions

I. This appeal lies from the decision of the Examining Division to refuse European patent application no. 97 115 974.4, relating to a method for the removal of carbon dioxide and hydrogen sulphide present in gases.

II. In its decision, the Examining Division, referring "inter alia" to document

(1): GB-A-1058304,

found that

- document (1) related to a method for the removal of both carbon dioxide and hydrogen sulphide from a gas containing them by bringing it into contact with an aqueous solution of a secondary amine of the type used in the present application;

- the disclosure of document (1) differed from the subject-matter of claim 1 according to the then pending request insofar as it did not disclose the treatment of a gas containing CO_2 in a molar amount equal to not less than 25 times that of H_2S;

- comparative data showing the achievement of a surprising improvement over the treatment of a gas according to document (1) had not been provided;

- therefore, the technical problem underlying the invention could be defined only as the provision

of a further method for the removal of CO_2 and H_2S from a gas containing them;

– since it was known from the prior art that amines such as, e.g. 2-(ethylamino)-ethanol (EAE), an amine falling within the class of absorbents used in document (1), were capable of absorbing large amounts of carbon dioxide, it was obvious for the skilled person to try these amines for the removal of carbon dioxide and hydrogen sulphide from gases containing them at a molar ratio of at least 25:1;

– therefore, the claimed subject-matter lacked an inventive step.

III. An appeal was filed against this decision.

The Appellants filed with the statement of the grounds of appeal an amended set of claims, the wording of independent claim 1 reading as follows:

" 1. A method for the removal of both CO_2 and H_2S at the same time from a gas containing CO_2 and H_2S which comprises bringing the gas into contact with an aqueous solution of 2-ethylaminoethanol, whereby the gas contains CO_2 in a molar amount equal to not less than 25 times that of H_2S."

IV. In a communication dated 8 December 2006, as annex to the summons to attend oral proceedings, the Board informed the Appellants of its provisional opinion.

It appeared, in particular, that the documents cited in the decision under appeal disclosed already the use of

2-ethylaminoethanol (EAE) for removing both carbon dioxide and hydrogen sulphide from a gas containing them and that the performance of EAE was better than that of monoethanolamine (MEA);

– therefore, the claimed subject-matter appeared not to involve an inventive step for the reasons submitted in the decision under appeal.

Oral proceedings were held on 13 March 2007.

V. The Appellants submitted orally and in writing that

– the prior art did not disclose a method wherein carbon dioxide and hydrogen sulphide were removed at the same time from a gas containing a high excess of carbon dioxide;

– document (1) related specifically to the removal of carbonyl sulphide from a treated gas and suggested that MEA was a satisfactory absorbent for the removal of carbon dioxide and hydrogen sulphide;

– therefore, the skilled person, by following the teaching of document (1), would have had no reason for replacing MEA with EAE in order to remove carbon dioxide and hydrogen sulphide from a gas containing them but not containing carbonyl sulphide;

– furthermore, the cited prior art did not suggest how to reduce the amounts of carbon dioxide and

hydrogen sulphide to a value of or below 10 ppm when a high excess of carbon dioxide was present;

– therefore, it would have not been obvious for the skilled person to apply the method disclosed in document (1) to a gas containing a high excess of carbon dioxide;

– moreover, as shown in table 1 and figures 9 and 10, filed under cover of the letter of 6 March 2007, which figures had to be considered instead of figures 3 and 4 mentioned in the description, EAE had a better selective absorption capacity than MEA;

– in fact, as shown in figures 9 and 10, the initial concentrations of hydrogen sulphide and carbon dioxide in the outlet gases in a continuous absorbing process was zero by using both MEA or EAE but the curve indicating the amounts of carbon dioxide and hydrogen sulphide in the outlet gas raised sharply when using MEA, indicating that the absorbing power of EAE for both gases was greater than that of MEA;

– therefore, by selecting EAE instead of MEA in the treatment of a gas containing CO_2 in a molar amount equal to not less than 25 times that of H_2S, concentrations of carbon dioxide and hydrogen sulphide of 10 ppm or less could be achieved and the absorption process could be carried out for a longer time and in a more efficient way;

– therefore, the selection of EAE brought about an improvement not expectable in the light of the teaching of the prior art;

– the claimed subject-matter thus involved an inventive step.

VI. The Appellants request that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 and 2 filed with the statement of the grounds of appeal.

Reasons for the Decision

1. *Amended documents*

The Appellants requested during examination the consideration of pages 3 and 4 of the description and of figures 1 to 3 which had been omitted in filing the application.

In the decision under appeal these pages and figures had been apparently taken into account (see point 6 of the facts and submissions).

The Board notes that a decision upon the admissibility of these documents had never been explicitly taken by the Examining Division.

However, since the appeal fails on other grounds which are not affected by the admissibility of these documents, a further discussion on this point is unnecessary.

2. *Inventive step*

2.1 The subject-matter of claim 1 relates to a method for removing CO_2 and H_2S at the same time from a gas containing them.

The description of the present application as filed explains that it was known to use an absorbent for removing acid gases such as CO_2 and H_2S from various gases such as natural gas. For example, MEA was known to be an effective absorbent for the removal of both CO_2 and H_2S from a gas containing them (page 1, lines 7 to 10; page 2, lines 4 to 7).

Therefore, according to the description, the technical problem underlying the invention consisted in the selection of an absorbing medium which showed a better absorbing power for both CO_2 and H_2S than MEA even in the treatment of gases containing a high excess of CO_2 (page 5, lines 8 to 13; page 9, lines 6 to 16).

2.2 Document (1) describes the use of an absorbent for removing any of CO_2, H_2S and COS alone or in combination and therefore also of CO_2 and H_2S only from a gas containing them (page 1, lines 28 to 29; claim 1).

The invention described in this document relates to the provision of an absorbent having a better performance than MEA (page 1, lines 22 to 23).

Therefore, the Board finds that document (1) is a suitable starting point for the evaluation of inventive step of the claimed subject-matter.

2.3 Since one of the preferred secondary amines which can be used as absorbent according to the teaching of document (1) is EAE (page 2, lines 26 to 27; claim 4), the method disclosed in this document differs from the subject-matter of claim 1 only insofar as it does not disclose the treatment of a gas having a ratio of CO_2 and H_2S of at least 25 to 1.

Moreover, document (1) already teaches that EAE has a greater absorbing power for carbon dioxide and hydrogen sulphide than MEA and that the use of such secondary amines enables a complete removal of both impurities (see page 3, lines 61 to 63; page 4, table and lines 15 to 20).

The application as filed did not contain any information as to the efficiency of EAE compared to other secondary amines equally disclosed in document (1). In fact, the only example contained in the application shows only that, in a continuous absorption process, the starting concentrations of CO_2 and H_2S in the outlet gases are both zero, thus indicating a complete removal of the impurities both by using EAE and MEA, the only difference in behaviour consisting in a greater absorbing power of the EAE versus MEA, which property had already been disclosed in document (1).

The Board thus finds that the technical problem underlying the present invention, in the light of the teaching of document (1), cannot be seen in the selection of a particular secondary amine capable of providing a more efficient removal of both CO_2 and H_2S from the treated gas, as argued by the Appellants, but

only in the selection of a secondary amine suitable as absorbent for the removal of both CO_2 and H_2S from a gas having a ratio of these impurities of at least 25:1.

The Board has no doubt that the claimed subject-matter solves this existing technical problem.

2.4 As explained above, document (1) already teaches that EAE is a suitable absorbent for the removal of both CO_2 and H_2S from a gas containing them and that EAE is more efficient than MEA.

Moreover, the teaching of document (1) was not limited to the treatment of a gas having a particular molar ratio of CO_2 and H_2S, but could be applied to gases comprising both an excess of CO_2 as well as an excess of H_2S, independent of the ratio.

Therefore, it would have been obvious for the skilled person to try EAE also in the removal of both CO_2 and H_2S from a gas containing a high excess of carbon dioxide as required in present claim 1.

The Board concludes that the subject-matter of claim 1 does not involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Rauh P.-P. Bracke