BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 755/91 - 3.4.2

Application No.: 86 308 127.9

Publication No.: 0 220 075

Title of invention: Process for removal of pollutants from waste gas emissions

Classification: B01D 53/34

D E C I S I O N
of 20 October 1992

Applicant: ISCA MANAGEMENT LIMITED

Headword:

EPC Articles 54, 56

Keyword: "After amendment: novelty (yes), inventive step (yes)"
"Prior art document containing speculative, non-enabling disclosure"

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 755/91 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 20 October 1992

Appellant : ISCA MANAGEMENT LIMITED
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Decision under appeal : Decision of Examining Division of the European Patent Office dated 7 May 1991 refusing European patent application No. 86 308 127.9 pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : E. Turrini
Members : M. Chomentowski
J.-C. Saisset

Summary of Facts and Submissions

I. European patent application No. 86 308 127.9 (publication No. 0 220 075) was refused by the Examining Division on the grounds that the subject-matter of original Claim 1 was not novel having regard to the disclosure in

D1 = CA-A-1 168 025;

the subject-matter of the original independent Claim 24 and of the original dependent Claims 2, 5, 6 and 21 to 23 was considered as lacking novelty for the same reasons; moreover, the subject-matter of original dependent Claims 3, 4 and 7 to 20 was considered as lacking an inventive step having regard to the same disclosure and to the obvious possibilities which the skilled person would select in accordance with circumstances.

II. The Appellant (Applicant) filed an appeal against this decision. He requested that the decision under appeal be set aside and that a patent be granted, either on the basis of the original claims, or on the basis of auxiliary requests. Moreover, oral proceedings were requested auxiliarily.

III. In the communication accompanying the invitation to oral proceedings, the Board of Appeal expressed the opinion that the subject-matter of original Claim 1 and of Claim 1 of the auxiliary requests appeared to lack novelty having regard to the disclosure in D1; moreover, the Board mentioned that a new main claim, based on a combination of original Claim 1 with original dependent Claim 3 would be novel because it would include a feature, the lower temperature limit of 200°C of the temperature range, which was not derivable from D1, but that an inventive step did not appear to be involved because there was no clear

indication about any surprising effect resulting from said further feature.

IV. During the oral proceedings, the Appellant filed a new set of claims with an adapted description and requested that the decision under appeal be set aside and that a patent be granted on the basis of these documents and of the drawings as originally filed.

V. Claim 1 reads as follows:

"1. A process for oxidizing non-particulate chlorine oxidizable components selected from the group consisting of SO_2, NO, NO_2, NO_x and H_2S in a hot flue gas stream, said oxidized form of the components being more readily removable from the hot flue gas stream than the non-oxidized form thereof, comprising injecting sufficient chlorine and water in a gaseous or liquid form into the gas stream while the gas stream is at a temperature greater than 200°C to react with the chlorine oxidizable components, and permitting the gas stream/chlorine/water mixture to react for a time sufficient to enable oxidation of the oxidizable components of the gas to occur."

Claims 2 to 7 are dependent claims.

VI. The Appellant submitted the following arguments in support of his request.

D1 has disclosure in common with the present application, but repeatedly betrays its speculative nature; the Affidavit evidence of Mr Brian William McIntyre, who is one of the inventors of the present invention and is also one of the inventors mentioned in D1, confirms that no work was done until after D1; D1 must be read objectively and without the present invention in mind. Being totally

speculative, D1 covers "many hundreds" of alternative processes including gas phase or liquid phase oxidations and steps selected from 8 sections of an overall possible process. There is no positive teaching in D1 of a necessity for a process temperature above a certain lower limit, for instance 100°C, neither in the main process definition, nor in parts of the disclosure, whereby even the chlorine addition step can be omitted in some circumstances. There is no express instruction in D1 to use gas phase oxidation at temperatures higher than a lower limit, for instance 100°C, and chlorine/water simultaneously, and no disclosure of any definite enhancement of oxidation under these conditions. The process chemistry disclosed in D1 is all admittedly based on possibility or expectation and is entirely speculative. There is no temperature mentioned in the system illustrated by Figure 1 of D1 and the system of Figure 2 is a low temperature process, below 100°C. No claim in D1 is specifically directed to the features of the presently claimed process; Claim 18 of D1 is the only one to specify temperatures above a certain lower limit, i.e. 100°C, but refers only to Claims 1 to 3, which do not mention the injection of water. Mere expectations should not confound a later application based on demonstrated results; this is in agreement with the conclusions in the Decision T 81/ 87 (Preporennin), OJ 1990, 250, that a document must contain an enabling disclosure in order to be novelty destroying. Moreover, in accordance with the conclusions of the decision of the Enlarged Board of Appeal G 002/88 (Mobil), OJ 1990, 93, a new technical effect should not be discounted on the argument of inherency. Therefore, the subject-matter of present Claim 1 is novel. The new effect in the present case is of unexpected magnitude, in particular for a range of temperatures above 200°C. Therefore, the subject-matter of present Claim 1 also involves an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. Allowability of the amendments

2.1 Claim 1 results from original Claim 1, whereby the temperature range of operation has been limited to the range above 200°C instead of 100°C, which lower limit 200°C is mentioned in original dependent Claim 3 and is disclosed in particular in relation with the measurement results of Figures 3 and 4; the feature specifying that the water used for the process is injected in the hot flue gas stream in addition to the injected chlorine, is disclosed in the original description (see page 6, lines 10 to 24, more in particular line 17; see also page 17, lines 1 to 3, 20 to 24 and 30; page 17, line 34 to page 18, line 13). Therefore, the European patent application has not been amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

3. Clarity

3.1 Claim 1 specifies that the water is injected in the hot flue gas stream in addition to the chlorine and thus, there is no ambiguity concerning the water used for effecting the chlorine oxidisation of the chlorine oxidisable components; moreover, the description does not contain any statement concerning other forms of injection of water in the invention or concerning operating temperatures of the invention lower than 200°C, and is thus consistent with the main claim. Therefore, Claim 1 is clear in the sense of Article 84 EPC.

4. Novelty

4.1 A process for oxidising non-particulate chlorine oxidisable components selected from the group consisting of SO_2, NO_x and H_2S in a hot flue gas stream, said oxidised form of the components being more readily removable from the hot flue gas stream than the non-oxidised form thereof, is known from D1 (see page 5, first section to page 5a, last section; page 7, first section to page 10, first section).

4.2 The Appellant has submitted that D1, which does not disclose any worked example of the cited process, is no more than a work of speculative imagination prior to any reduction to practice; this is confirmed by the Affidavit of Mr Brian William McIntyre, who is one of the inventors of the present invention and is also one of the inventors mentioned in D1; it is derivable from said Affidavit that the process could be carried out by chlorine alone, thus without water, and that the importance of water, i.e. the synergetic co-action of chlorine and water, in the oxidation process, was completely unexpected and was not discovered until practical development was undertaken on the basis of said theoretical ideas; in this respect, concerning the range of operating temperatures, although a lower limit of 100°C is mentioned in D1, in particular in Claim 18, this feature is not related with a process including the injection of water; the person skilled in the art of D1, presented with the information contained in this prior art document, would have to bring together the separate and isolated elements of information concerning the disclosed process and would have arrived at the presently claimed process, wherein chlorine and water vapour are injected in the hot flue gas stream at a temperature above a certain lower temperature limit

(200°C), only at the price of undue burden; therefore, in the Appellant's opinion, the information contained in D1 does not destroy the novelty of the presently claimed subject-matter.

4.3 The following is to be noted with respect to the disclosure in D1. It is derivable from D1 (see page 8, first section to page 9, last section; see also Claim 18) that the chlorine added in the gas stream for the gaseous oxidation of objectionable components can be added for instance in the form of a water solution of chlorine, whereby the water vapour concentration may be adjusted in particular by addition of one or more of liquid water or a water solution of chlorine, and that it is anticipated that this stage of the process will be used only if the gas stream is 100°C or higher in temperature. Thus, although D1 does not provide any result of measurement of a practical embodiment in the temperature range immediately above 100°C, and in particular between 100°C and 200°C, the person skilled in the art could however have been incited to operate according to the indications of D1 that chlorine and water vapour could be injected in the hot flue gas stream at a temperature of 100°C or somewhat higher, and it cannot be considered that it is an undue burden to make the relevant measurements because it is only a direct reduction to practice of some of the examples mentioned in D1. Therefore, it is derivable from D1 that the known process comprises injecting sufficient chlorine and water in a gaseous or liquid form into the gas stream to react with the chlorine oxidisable components, for instance by injecting a water solution of chlorine and adjusting the water vapour concentration and the temperature, in particular above a certain lower limit, for instance at 100°C or higher, and permitting the gas stream/chlorine/water mixture to react for a time sufficient to enable oxidation of the oxidisable

components of the gas to occur; it is to be noted that, at a temperature of 100°C or higher, water is in the state of water vapour.

4.4 However, no process temperature greater than 200°C is mentioned in D1. The Board is of the opinion that in this case the Appellant's argument about the derivable content of a prior art document is convincing and that a skilled person, presented with the information contained in D1, and in particular that the process temperature is 100°C or higher for some forms of the process, and with the further information that the process temperature in examples of D1 (see page 20, second and third section) can be below 100°C, for instance 50°C or 60°C, would not have been incited to reduce to practice the disclosed process at temperatures which are far away above 100°C, and would have considered it an undue burden. Thus, D1 does not contain an enabling disclosure of the process of present Claim 1, i.e. of a process carried out while the gas stream is at a temperature greater than 200°C and, therefore, does not destroy the novelty of Claim 1 (cf. the Decisions T 206/83, OJ EPO, 5, point 11, second section, last sentence, of the reasons; T 81/87, OJ 1990, 250, point 15 of the reasons).

4.5 The other documents of the available prior art are less relevant because they only relate to isolated features of the claimed process.

4.6 Therefore, the subject-matter of Claim 1 is novel in the sense of Article 54 EPC.

5. Inventive step

5.1 As mentioned here above, it is not derivable from D1 that the process can be carried out at a temperature greater

than 200°C. According to the Affidavit of Dr A. Paul Watkinson, professor of Chemical Engineering at the University of British Columbia, which was provided by the Appellant, a problem of the process known from D1 (see in particular page 10, first paragraph) is that it provides, due to the presence of moisture, a minor enhancement of reaction rates, i.e. an increase of 10% in absorption of objectionable components over that which would be absorbed with this section omitted.

5.2 It is derivable from Figures 3 and 4 of the present application that the percentage of removal of NO, a chlorine oxidisable component, in a hot flue gas stream, by a process comprising injecting sufficient chlorine and water in a gaseous or liquid form into the gas stream, is much higher, i.e. at least doubled, at temperatures greater than 200°C, as compared with the results at temperatures lower than this value. Table 1 of the present application provides further information in this sense about the removal of NO or SO_2, which can be about 44% and about 80%, respectively, at higher oxidation temperatures, such as 400°C or 450°C; in this respect, it is to be noted that the Appellant's argument that these results are obtained even if concurrent components such as NO and SO_2 are present in the flue gas stream is supported by the values mentioned in said Table 1 (see the three first lines), wherein in particular the presence of SO_2 results in substantially no reduction of the removal of NO.

5.3 Neither the problem nor its solution, in particular the use of a temperature of operation greater than 200°C, is derivable from D1 or from the other documents of the available prior art.

5.4 It is generally known to people skilled in the art that, by modifying the features of a chemical reaction, for instance the reaction temperature thereof, the effectiveness of said chemical reaction is also modified; for instance, said effectiveness can possibly be increased by increasing the reaction temperature. Thus, the question arises, whether or not the skilled person, presented with the information contained in D1 and knowing that any modification of one of the features would result in a modification of the effectiveness of the reaction, would not have considered it obvious to try to carry out the chlorine/water vapour oxidising step at a higher temperature, for instance greater than 200°C.

The information derivable from Figure 3 of the present application, which illustrates the percentage of removal of NO as a function of the reaction temperature, is that, by increasing the temperature from 100°C to 150°C, the effectiveness gets smaller and, by increasing the temperature somewhat more, the effectiveness gets only slightly better than at 100°C and does not differ from the results obtained at temperatures lower than 100°C. The information derivable from Figure 4 of the present application, which illustrates the percentage of removal of NO as a function of the reaction temperature with different compositions of the reactants, show a similar result. Since this is the only information available concerning the influence of the temperature of operation about 100°C, i.e. in the range of temperatures of the known process, it can only be concluded that the person skilled in the art would have obtained by trying no incitation to use temperatures of operation higher than 100°C, but, on the contrary, lower than that.

5.5 Therefore, since the subject-matter of Claim 1 is not obvious having regard to the available prior art and,

thus, it involves an inventive step in the sense of Article 56 EPC.

6. Therefore, a European patent can be granted (Articles 52(1) and 97(2) 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 set of Claims 1 to 7 and the adapted description (pages 1 to 23) presented during the oral proceedings and the drawings (Figures 1 to 16) as originally filed.

The Registrar: The Chairman:

P. Martorana E. Turrini

MCH