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Anmeldenummer / Filing No / N^o de la demande : 80 300 577.6
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Bezeichnung der Erfindung: Vacuum swing adsorption for air
Title of invention: fractionation
Titre de l'invention :

Klassifikation / Classification / Classement : CO1B 21/04

ENTSCHEIDUNG / DECISION

vom / of / du 18 March 1986

~~Anmelder / Applicant / Demandeur :~~

Patentinhaber / Proprietor of the patent / AIR PRODUCTS AND CHEMICALS INC.
Titulaire du brevet : (Respondent)

Einsprechender / Opponent / Opposant : LINDE A.G. (Appellant)

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Art. 56
"Inventive step" - choice of one of several
obvious solutions

Leitsatz / Headnote / Sommaire

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Case Number : T 200 /84
220



DECISION
of the Technical Board of Appeal 3.3.1
of 18 March 1986

Appellant :
(Opponent)

Linde Aktiengesellschaft, Wiesbaden
Zentrale Patentabteilung
D-8023 Höllriegelskreuth

Representative :

Respondent :
(Proprietor of the patent)

AIR PRODUCTS AND CHEMICALS INC.
P.O. Box 538
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USA

Representative :

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Decision under appeal :

Decision of Opposition Division of the
European Patent Office dated 18 July 1984
rejecting the opposition filed against
European patent No. 16 558 pursuant to
Article 102(2) EPC.

Composition of the Board :

Chairman : K. Jahn
Member : G. Szabo
Member : C. Payraudeau

I. Summary of Facts and Submissions

I. European patent No. 16 558 was granted on 21 April 1982 with seven claims in response to the European patent application NO. 80 300 577.6 filed on 27 February 1980 claiming the priority of the earlier application in the USA of 28 February 1979. Claim 1 is worded as follows :

"1. A process for obtaining a dry oxygen-enriched gas and a nitrogen rich gas from air, which process comprises

- (a) obtaining said dry oxygen-enriched gas by passing air serially through
 - (i) a pretreatment bed containing an adsorbent to remove carbon dioxide and water vapour; and
 - (ii) a main bed containing an adsorbent to remove nitrogen
- (b) regenerating said pretreated bed and said main bed by
 - (i) passing a stream of gas rich in nitrogen and containing carbon dioxide and water vapour serially through said pretreatment bed and said main bed to produce voids gas comprising dry nitrogen and oxygen; and
 - (ii) evacuating said pretreatment bed and said main bed to provide a source of said gas rich in nitrogen and containing carbon dioxide and water vapour;

and characterised in that

- (i) part of said gas rich in nitrogen and containing carbon dioxide and water vapour is passed through a desiccant (which is separate and distinct from said pretreatment bed and said main bed) to dry said gas; and

(ii) said desiccant is periodically and at least partially regenerated by passing voids gas through."

- II. The Opponents filed opposition against the European patent on 21 December 1982 requesting that it be revoked on ground of non-patentability for lack of inventive step. The opposition was also supported by US-A-4 013 429 (1) and Ullmann's Encyklopädie der technischen Chemie, 1972, 4th Ed., Vol. 2, pages 610-611 (2).
- III. The Opposition Division rejected the opposition in a decision dated 18 July 1984. The reason for the rejection was that although process set forth in the preamble of Claim 1 was disclosed in document (1), the drying of wet CO₂ containing nitrogen-rich product on a desiccator and the regeneration of the desiccant for the purpose in the characterizing part with "voids" gas from the same process, i.e. a dry air-like fraction were not described there. Although it was admitted by the Proprietor that the use of a desiccant had been obvious, the cited document (2) suggested either the main product stream for drying or "Fremdgas", i.e. gas imported from outside, for the regeneration process. There were at least seven possible alternatives to the use of voids gas, and the Opponents had neither presented convincing reasons why other gas would not have been considered suitable by the skilled man, nor why voids gas should have presented itself as an obvious choice. The relatively simple apparatus required by voids gas tended to reinforce the inventivity of the claimed matter.
- IV. The Opponents filed an appeal on 14 September 1984 together with the payment of the fee, and submitted their Statement of Grounds on 14 November 1984. At the same time they introduced two new documents into the proceedings, i.e.

VDI-Zeitung, 98, (1956), 1055-1056 (3) and Chem. and Proc. Eng. September 1966, 70-77 (4). After a reply from the Respondents, an oral hearing was held on 18 March 1986. A few days before the oral hearing on 14 March 1986, the Appellants submitted a further document, GB-A-1 443 973 (5) for consideration.

- V. It was argued by the Appellants that the removal of the undesirable components from the nitrogen-rich fraction of the process according to document (1) with an appropriately selective adsorbent was obvious in the art and so was the use of dry voids gas to regenerate the desiccants. The fact that the air-like voids gas might contaminate the desiccating material with oxygen was accepted by the patentees, who admitted that initially there would be some slight increase of oxygen concentration in the nitrogen product stream. Otherwise, the dry voids gas, being free from the materials to be removed from the desiccator, was predictably advantageous in providing the desired result. This is notwithstanding the advantages or disadvantages of using other gases for the purpose.

The submission of document (5) at the latest stage of the proceedings was due to a recognition of the existence of the same by accident.

- VI. The Respondents strongly argued that the choice of the regenerant from seven different gases was not obvious. It would have been logical to use some of the virtually pure nitrogen product for the purpose, but this would be a loss economically. The skilled person would have been reluctant to take the risk of heavily contaminating the desiccator and thereby the nitrogen product with oxygen. If anything of the same kind, the dry air obtained in the process after the first pretreatment stage would have been a more preferred choice.

- VII. The Respondents raised strong objections to the filing of a document a few days before the oral hearing and requested that this should be dismissed from the proceedings.
- VIII. The Appellants (Opponents) request that the decision under appeal be set aside and the patent be revoked. The Respondents (Patentees) request that the appeal be dismissed and that the patent be maintained in its present form.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. As regards document (5), submitted two working days before the proceedings, the Board felt that no postponement of the oral proceedings was necessary at the expense of the Appellants, since the contents thereof were prima facie less relevant to the issue in the case than the state of the art already raised. The document had therefore to be dismissed from any consideration altogether.
3. The subject-matter of the patent according to Claim 1 concerns a process for obtaining a dry oxygen-enriched gas and a nitrogen-rich gas from air. The closest prior art is a process described in (1). This process involves a nitrogen-rich fraction which is obtained by desorption of adsorbents used to remove nitrogen from the air. This gas, however, also contains all the water and CO₂ from the air, and is partly used to rinse the nitrogen from the adsorbent to provide a dry air-like exit gas (i.e. voids gas). The technical problem was to remove the accumulating moisture from such nitrogen-rich fraction economically i.e.

involving also a step regenerating the means for it, and also to produce thereby dry substantially pure nitrogen gas as well.

The solution of the problem is to combine the process of the stated art with the steps of treating part of such nitrogen-rich gas with a desiccating material, and using part of the dry voids gas to regenerate the desiccators. Preferably the desiccating material would also remove CO₂ from the nitrogen-rich fraction.

4. Since the cited document only used part of the wet gas for regenerating the nitrogen absorber, the rest was stored or released into the air. No disclosure related to the treatment of this fraction in a manner to obtain substantially dry nitrogen-rich gas or to the regeneration of the means therefor, in (1) or other documents cited in the proceedings. The claimed process is, therefore, novel.
5. As regards the inventive step, it was not disputed by the Respondents that the use of a desiccant to dry the gas was obvious in view of the first part of the problem posed vis-à-vis the closest art (1). It was also admitted by them that the regeneration itself, as an effect in consequence of the treatment with dry voids gas, was foreseeable, albeit without the exact knowledge of the degree of contamination with oxygen. No other unexpected effect has, however, been recognized in respect of such particular manner of regeneration.
6. The tentative submission on behalf of the Respondents that the degree of absorption of oxygen of the desiccant could well be less than expected, was not supported by any evidence. The specification warns the public that there is a "slight increase of the oxygen concentration of the dry nitrogen product stream during the initial period of the

product withdrawn from the desiccant column" (emphasis added, page 8, lines 5-7). The Applicants accepted such disadvantage and what happened was, therefore, in accordance with general expectations (cf. Thermoplastic moulding compositions/ BAYER, T69/83, OJ 8/1984, 357, Headnote I).

7. The reasoning of the Opposition Division that the Opponents should have presented convincing reasons why other gases would not be suitable or why voids gas recommends itself in particular, cannot be followed. The other suggested gases for drying all are acceptable candidates for achieving the same goal with some known advantages and disadvantages. The skilled person's general knowledge of physico-chemistry would have suggested that any gas which is dry or unsaturated in respect of water would regenerate the desiccator if given sufficient time. The experience that dry voids gas is for instance less advantageous than dry nitrogen product gas in view of its limited oxygen content, is no surprise to anyone. There is no invention in choosing either of such solutions.

8. In view of the above, Claim 1 lacks inventive step. The same applies to dependent Claims 2 to 6, and independent Claim 7 which only contain features known in themselves in the art of processing gas mixtures and for which no additional inventive contribution has been advanced.

Order

For these reasons it is decided that :

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar

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Rbe

The Chairman

John