

Veröffentlichung im Amtsblatt Publication in the Official Journal Publication au Journal Officiel	<input checked="" type="checkbox"/> Ja/Yes <input type="checkbox"/> Nein/No <input type="checkbox"/> Qui/Non
---	--



Aktenzeichen / Case Number / N° du recours : T 426/87 - 3.4.1

Anmeldenummer / Filing No / N° de la demande : 84 730 031.6

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 122 874

Bezeichnung der Erfindung: Process for separating a mixed gas into oxygen
Title of invention: and nitrogen under low temperature and low
Titre de l'invention : pressure conditions

Klassifikation / Classification / Classement : B01D 53/04, C01B 13/02

ENTSCHEIDUNG / DECISION

vom / of / du 23 September 1988

Anmelder / Applicant / Demandeur : Mitsubishi Jukogyo K.K.

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 123(2), 56 EPC

Schlagwort / Keyword / Mot clé : "Narrowing of temperature range
(admissible)" - "Inventive step (yes)"

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt

Beschwerdekammern

European Patent
Office

Boards of Appeal

Office européen
des brevets

Chambres de recours



Case Number : T 426/87 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 23 September 1988

Appellant : MITSUBISHI JUKOGYO KABUSHIKI KAISHA
5-1, Marunouchi 2-chome Chiyoda-ku
Tokyo
(JP)

Representative : Meissner, Peter
Herbertstrasse 22
D-1000 Berlin 33
(DE)

Decision under appeal : Decision of Examining Division 031
of the European Patent Office
dated 7 July 1987 refusing European
patent application No. 84 730 031.6
pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : K. Lederer
Members : E. Turrini
C. Payraudeau

Summary of Facts and Submissions

- I. European patent application No. 84 730 031.6 (publication number 0 122 874) was refused by decision of the Examining Division.
- II. The reason for the refusal was that the subject-matter of valid Claim 1 lacked novelty within the meaning of Article 54 EPC having regard to the disclosure of document US-A-3 313 091 (D1)

The Examining Division also stated in the decision that the specification of a temperature range from 10°C to minus 40°C for the absorption process in Claim 1 introduced subject-matter extending beyond the content of the application as filed (Article 123(2) EPC), and that, even in the absence of the novelty objection, the subject-matter of the claim would still be obvious in the light of the disclosure of document D1.

- III. The Appellant lodged an appeal against the decision.
- IV. Oral proceedings were held on 23 September 1988, at the end of which the Appellant requested that the decision be set aside and a patent be granted on the basis of Claims 1 to 4 as presented at the oral proceedings, of which Claim 1 reads as follows:

"1. A process for separating a mixed gas of oxygen and nitrogen under low temperature and low pressure conditions which comprises introducing a mixed gas comprising chiefly oxygen and nitrogen into at least two adsorption towers, each packed with Na-X at a temperature equal to or less than -30°C and under conditions of 1.02×10^5 to

2.9 x 10⁵Pa [1.05 to 3 ata] pressure thereby causing the nitrogen in the mixed gas to be selectively adsorbed, collecting highly pure oxygen or an oxygen-enriched gas from the outlet of the adsorption towers, and reducing the pressure of said at least two adsorption towers, in which the nitrogen has been adsorbed, to a level of from 7.84 x 10³ to 4.9 x 10⁴Pa [0.08 to 0.5 ata], to cause the nitrogen gas to be desorbed and the Na-X adsorbent to be regenerated."

Claim 1 distinguishes over Claim 1 on which the decision under appeal was based essentially by a different definition of the ranges for both the adsorption temperature and the adsorption pressure.

Claims 2 to 4 are appended to Claim 1.

- V. In support of the allowability of his request, the Appellant essentially argued that the temperature and pressure ranges as amended in valid Claim 1 were adequately supported by the application document as filed. The subject-matter of the claim also involved an inventive step, since not only the adsorption capability of Na-X had never been investigated below room temperature, but its advantageous behaviour at such temperature as discovered by the Applicant was unexpected. In particular, the skilled person having regard to the teaching in document D1 that the Na-X(13X) sodium molecular sieve achieves poorer results than the strontium X sieve at room temperature, had no obvious reason to expect that the opposite conclusion could apply at low temperatures as evidenced by the comparative test data submitted with Appellant's statement of grounds.

Reasons for the Decision

1. The appeal is admissible.
2. There is no objection under Article 123(2) EPC to the present application documents, since they are adequately supported by the application documents as originally filed.

In particular, the temperature range for the adsorption process in accordance with present Claim 1 ("a temperature equal or less than -30°C ") has been narrowed with respect to that set out in original Claim 1 ("a temperature not higher than room temperature) only by reducing the upper limit of the range to the value of -30°C , which was emphasized in the original description (page 14, line 24; page 15, line 25). Such amendment is considered allowable (cf. decision T 313/86 of 12 January 1988; point 3.1; not published in the OJ EPO). Furthermore, the claimed adsorption pressure range of from 1.05 to 3 ata (1.02×10^5 to 2.9×10^5 Pa) is disclosed in page 6, lines 15 to 17 of the original description.

3. Novelty

- 3.1 Document D1 discloses a process for separating a mixed gas of oxygen and nitrogen which comprises introducing a mixed gas comprising chiefly oxygen and nitrogen into at least two adsorption towers (Bed 1, Bed 2, Figure 1), each packed with Na-X (e.g. column 9, lines 37 to 55) thereby causing the nitrogen in the mixed gas to be selectively adsorbed, collecting highly pure oxygen or an oxygen-enriched gas from the outlet of the adsorption towers, and reducing the pressure of said at least two adsorption towers in which the nitrogen has been adsorbed to cause the nitrogen gas to be desorbed and the Na-X adsorbent to be regenerated. Nitrogen adsorption and desorption are preferably performed

at pressures in the ranges from 15 to 50 psia (i.e. about 1 to 3.4 ata) and from 50 to 400 mm Hg (i.e. about 0.07 to 0.5 ata), respectively (column 1, lines 57 to 63), which closely encompass the corresponding pressure ranges as defined in Claim 1. The process preferably uses a type X molecular sieve having at least 30% of its sodium cations replaced by Sr^{++} cations as an adsorbent, at a temperature of -10 to 110°F (i.e. about -23 to 43°C ; Claim 1) but Na-X has been used also, at 70°F (21°C), for comparison purposes and found to yield poorer results (Figure 4; column 9, lines 53 to 55).

Thus, the subject-matter of Claim 1 distinguishes over the process disclosed in document D1 with reference to the comparative test performed with Na-X in that the claimed process is performed at a low temperature equal or less than -30°C rather than at room temperature.

- 3.2 Document US-A-3 973 931 (D2), which is the only document cited in the European search report, specifically discloses the use of Na-X for air separation with reference to its Figure 1, which illustrates the results of a comparative study of O_2 recovery as conducted between 0 and 160°F (-18° and 71°C) with Na-A, Na-X and Ca-A molecular sieves (column 2, line 64 to column 3, line 18). Figure 1 shows that O_2 recovery is better with Na-A than with Na-X in the whole temperature range investigated and that it is maximal at about 90°F (32°C) for all three adsorbents.

Thus the temperature range disclosed in document D2 in combination with the use of Na-X is higher than the range given in Claim 1; moreover, this document does not specify the other process conditions of the comparative study as defined in present Claim 1 such as the adsorption and desorption pressure ranges and the number of towers used.

- 3.3 The remaining documents cited in the course of the examining procedure do not come closer to the claimed subject-matter.
- 3.4 For these reasons, the subject-matter of Claim 1 is considered to be novel within the meaning of Article 54 EPC.

4. Inventive step

- 4.1 Starting from the nearest prior art, which is the process disclosed in document D1 in connection with the comparative test performed at room temperature with Na-X, the technical problem to which the invention seeks a solution is to improve the known process in terms of power consumption, O₂ concentration and adsorbent requirement.

This problem is solved by carrying out the process as claimed. As evidenced by the experimental data presented in the application documents with reference to Figures 4 to 6, the validity of which the Board has no reason to question, the before mentioned characteristics all exhibit better values at temperatures equal to or less than -30°C as specified in the distinguishing feature of Claim 1, than at room temperature.

- 4.2 This enhanced performance of Na-X at low temperatures was not, in the Board's view, predictable from the disclosure of documents D1 or D2, since in none of them is the behaviour of Na-X at temperatures equal to or less than -30°C even addressed. On the contrary, document D1 stresses the problem presented by the freezing of water vapor in air at temperatures below 35°F (1.5°C, cf. column 2, lines 25 to 28) whereas Figure 1 of document D2 clearly shows that, at least at temperatures as low as 0°F (-18°C) O₂ recovery is poorer for any of the tested adsorbents than at room

temperature. The man skilled in the art had therefore no obvious ground to depart from the implicit teaching of document D1 that, among all the adsorbents tested, the claimed strontium-substituted X molecular sieve (Claim 1) is the best adsorbent for use in the process disclosed in that document, and to investigate instead the effect of temperatures equal to or less than -30°C on the efficiency of the process when using the very adsorbent explicitly said in the document to achieve poorer results than the strontium X molecular sieve, namely Na-X (column 9, lines 53 to 55).

- 4.3 The Board therefore is satisfied that the subject-matter of Claim 1, involves an inventive step within the meaning of Article 56 EPC.
5. For the above reasons, Claim 1 defines patentable subject-matter (Article 52(1) EPC) and is allowable, accordingly. So are the remaining Claims 2 to 4 by virtue of their dependence upon allowable independent Claim 1.

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 claims, description and drawings handed over by the Appellant at the oral proceedings held on 23 September 1988.

The Registrar:

The Chairman:

F. Klein

K. Lederer