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D E C I S I O N
of 11 November 1994

Case Number: T 1027/93 - 3.4.2

Application Number: 87402408.6

Publication Number: 0266271

IPC: B01D 53/22

Language of the proceedings: EN

Title of invention:
Process for membrane separation of gas mixtures

Patentee:
L'AIR LIQUIDE, SOCIETE ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES GEORGES CLAUDE

Opponent:
THE DOW CHEMICAL COMPANY

Headword:
-

Relevant legal provisions:
EPC Art. 111(1)

Keyword:
"Remittal to Opposition Division"

Decisions cited:
-

Headnote/Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1027/93 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 11 November 1994

Appellant: (Proprietor of the patent)
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Respondent: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 14 October 1993, written decision posted on 27 October 1993 revoking European patent No. 0 266 271 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: C. Black
L. C. Mancini

Summary of Facts and Submissions

I. European patent No. EP-B-0 266 271 (application No. 87 402 408.6) was revoked by a decision of the Opposition Division.

II. The appeal lies against this decision. The Appellant (Patentee) requests that the decision under appeal be set aside and a patent granted on the basis of the published patent specification (main request), or on the basis of amended claims according to a first or a second auxiliary request.

III. Claim 1 according to the main request reads as follows:

"Method for continuous substantial separation of at least one gas component from a gas mixture to generate a residue gas substantially depleted of said gas components comprising the steps of,

providing a semipermeable membrane having a feed gas side and a sweep gas side,

contacting said feed gas side of said semipermeable membrane with a feed gas mixture containing at least one gas to be retained and at least one gas to be separated therefrom,

simultaneously contacting said sweep side of said semipermeable membrane with a sweep gas having a pressure lower than that of said feed gas,

withdrawing a residue gas after contact with said feed side of said membrane which is substantially depleted of said gases to be separated,

withdrawing a permeate gas after contact with said sweep side of said membrane which is substantially enriched with said gases to be separated,

characterized by further comprising:

balancing the partial pressure of one of the gas components to be retained on said feed gas side which is present on both sides of the membrane so that the partial pressure differential on both sides of the membrane is substantially zero."

Claim 1 according to the first auxiliary request reads as follows:

"Method for substantial separation of at least one gas component from a gas mixture to generate a residue gas substantially depleted in said at least one gas component comprising the steps of:

providing a semipermeable membrane (12), having a feed gas side (13) and sweep side (15);

contacting said feed gas side of said membrane with a feed gas mixture containing at least one gas to be retained and said at least one gas component to be separated therefrom;

simultaneously contacting said sweep gas side of said membrane with a sweep gas having a pressure lower than that of said feed gas;

withdrawing a residue gas after contact with said feed side which is substantially depleted in said at least one gas component to be separated;

withdrawing a permeate gas after contact with said sweep side which is substantially enriched with said at lest one gas component to be separated,

characterized in that it comprises:

balancing the partial pressures of one of the gas components to be retained on the feed gas side which is present on both sides of the membrane so that the partial pressure difference across the membrane is substantially zero, and

providing a partial pressure difference across the membrane for each said at least one gas component to be separated, such that the partial pressure on the feed side is higher than on the sweep side."

Claim 1 according to the second auxiliary request reads as follows:

"Method for substantial separation of at least one gas component from a gas mixture to generate a residue gas substantially depleted in said at least one gas component comprising the steps of:

providing a semipermeable membrane (12), having a feed gas side (13) and sweep side (15);

contacting said feed gas side of said membrane with a feed gas mixture containing two gases to be retained and said at least one gas component to be separated therefrom;

simultaneously contacting said sweep gas side of said membrane with a sweep gas having a pressure lower than that of said feed gas;

withdrawing a residue gas after contact with said feed side which is substantially depleted in said at least one gas component to be separated;

withdrawing a permeate gas after contact with said sweep side which is substantially enriched with said at least one gas component to be separated,

characterized in that it comprises:

balancing the partial pressures of the first gas component to be retained on the feed gas side which is present on both sides of the membrane so that the

partial pressure difference across the membrane is substantially zero, and

providing a partial pressure difference across the membrane for the second gas component to be retained, which partial pressure difference is less than the partial pressure difference of the gas component to be separated."

IV. The Respondent requests that the appeal be dismissed in its entirety.

V. In the opposition proceedings, thirteen documents were cited by the Opponent, for the most part with a view to establishing what was common general knowledge for the average skilled person. In its decision, the Opposition Division referred specifically to the documents US-A-4 591 365 (D1) and US-A-3 604 246 (D4), and found that the claimed subject-matter was novel over the disclosure in these documents. In particular, the Division found that while partial pressure balancing as required by the characterising portion of Claim 1 was partly derivable from D1, this occurred only at the inlet of the membrane unit; example 1 of the patent in suit indicates that the partial pressure of nitrogen in the sweep gas is substantially constant.

As regards inventive step, the Opposition Division noted that the subject-matter of Claim 1 embraced the possibility that the gas mixture to be treated could consist of two components of which one was to be removed and that the sweep gas could consist solely of the other component. As a means of reducing the concentration of one component in the two-component feed gas, the claimed method was disadvantageous in this respect as compared with simply adding sufficient of the pure other

component to the feed gas. Therefore in the Opposition Division's opinion the claimed subject-matter could not be seen as involving an inventive step.

In paragraph 5 of its decision, stated to be "not relating to the present decision", the Opposition Division suggested that a claim which incorporated the further features of Claim 2 and was therefore restricted to less simple possibilities, might have been found to be allowable, but such a claim might have to be also restricted to application in the fermentation field as particularly described.

VI. The Appellant contends that the claimed process cannot be deemed non-inventive merely because certain embodiments falling within its scope might entail disadvantages. In any case in certain circumstances these disadvantages could be outweighed by advantages. Moreover, none of the cited documents disclose the concept of balancing the partial pressure of a gas found on both sides of a membrane to prevent diffusion of a gas across a membrane.

The Appellant, in response to the Opposition Division's suggestion that the main claim ought to be restricted to the field of fermentation, described four other possible applications of the claimed process.

VII. The Respondent disagrees with the Opposition Division's finding that the subject-matter of Claim 1 was novel, because this depended on an interpretation of what was intended by balancing which could not be derived from the patent in suit. There is no indication of what the pressure might be at the outlet of the sweep gas, only an outlet 62 which seems to communicate directly with the atmosphere. There would therefore be a pressure gradient just as in D1. The suggestion by the Opposition

Division that the sweep stream pressure at the exit is 277 kPa appears to be entirely without foundation. The Respondent also disagrees with the Opposition Division's suggestion, reflected in the Appellant's second auxiliary request, that an inventive step might be seen in a restricted claim. Any useful separation depends on the respective permeation constants of oxygen, nitrogen and carbon dioxide and on the membrane employed. Balancing of the partial pressures of two gases to be retained would not be sufficient to define a patentable invention.

Reasons for the Decision

1. The appeal is admissible.

2. In view of the outcome of this appeal, the Board finds it unnecessary to go into the formal allowability of the amended claims according to the auxiliary requests of the Appellant.

3. The Board shares the doubts of the Respondent as to the interpretation of balancing by the Opposition Division. This interpretation relies on the Opposition Division's finding (towards the end of point 2.1 of the reasons for the decision) that example 1 of the patent in suit indicated that the nitrogen partial pressure in the sweep gas is 277 kPa at the exit, that is, there is a negligible pressure drop. The Board, agreeing with the Respondent, cannot see how this value is derived from the information given in example 1. If it were the case then the Board would accept that the average skilled person would have to assume the presence of some sort of pressure valve in outlet 62, but otherwise it does appear that the sweep gas is vented to the atmosphere.

On the other hand, D1, to the extent that its disclosure is comparable to that of the patent in suit, does not appear to be concerned with balancing of partial pressures, but rather with adjusting the input of nitrogen so that the sweep gas output contains the correct molar ratio (1:3) of nitrogen to hydrogen for direct supply to the ammonia synthesis plant.

In the Board's opinion therefore, the question of novelty requires further investigation.

4. The Board can agree with the Opposition Division that the wording of Claim 1 of the granted patent covers the possibility that a gas containing two components A and B, from which B is to be removed at least in part, is supplied to the feed gas side of a membrane, and pure A is fed to the sweep gas side, the partial pressures of A on either side being balanced so that A does not pass through the membrane. In the extreme, pure A is obtained from the feed gas outlet and A plus B from the sweep gas outlet so that in effect nothing has been achieved. The Opposition Division took the view, not expressed in words in the decision, but derivable from the minutes of oral proceedings held on 14 October 1993, that no technical problem was solved, and for this reason the claim did not involve an inventive step. The Board cannot agree with this conclusion. It is true that if the desired result was dilution of B in the mixture of A plus B, this would be achieved more readily by adding A directly to A plus B. However, whether the aim is partial or complete removal of B, the apparent futility of achieving this by carrying out the claimed process cannot be said to be obvious. In fact in view of the futility, it could be said to be completely non-obvious.

Further the Board can agree with the Appellant that the fact that the scope of a claim covers possibilities which do not share the advantageous effects of other possibilities embraced by the claim does not in itself indicate lack of inventive step. It is also noted, as set out in the Guidelines for Examination in the European Patent Office, C-IV,1.3, that the Convention does not require that an invention to be patentable must entail some technical progress or even any useful effect. Accordingly, if there is an objection to Claim 1, and the Board does not propose to take a position on this, it is not that it lacks inventive step for the reason given by the Opposition Division. Since this was the sole reason for revocation of the patent, it is therefore clear that the decision under appeal cannot stand.

5. It is also clear that the substantive issues require further examination. In the Board's opinion neither party should be deprived of the right to have this examination carried out at two levels of jurisdiction. The Board has therefore decided to make use of its power under Article 111(1) EPC to remit the case to the Opposition Division for further prosecution.

6. The Respondent requested the appointment of oral proceedings in the event that the Board was minded to uphold the patent either in its original form or in any amended form. Since this has not been the case, the appointment of oral proceedings was not necessary at this stage.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division for further prosecution.

The Registrar: The Chairman:

P. Martorana E. Turrini