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D E C I S I O N
of 7 June 1994

Case Number: T 0269/92 - 3.2.3

Application Number: 88311713.7

Publication Number: 0321163

IPC: F25J 3/04

Language of the proceedings: EN

Title of invention:
Separating argon/oxygen mixtures

Applicant:
Air Products and Chemicals, Inc.

Opponent:
-

Headword:
-

Relevant legal norms:
EPC Art. 123(2), 111(1)

Keyword:
"Amendments - added subject-matter (no)"
"Decision re appeals - remittal (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0269/92 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 7 June 1994

Appellant: Air Products and Chemicals, Inc.
Route no. 222
Trexlertown
Pennsylvania 18087 (US)

Representative: Burford, Anthony Frederick
W.H. Beck, Greener & Co.
7 Stone Buildings
Lincoln's Inn
London WC2A 3SZ (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 22 November 1991 refusing European patent application No. 88 311 713.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: C. T. Wilson
Members: H. Andrae
L. C. Mancini

Summary of Facts and Submissions

I. European patent application No. 88 311 713.7 filed on 9 December 1988 was refused by the decision of the Examining Division dated 23 October 1991, dispatched in writing on 22 November 1991. The decision was based on Claims 1 to 12 submitted with the letter dated 25 April 1991, according to the main request, and on Claims 1A and 1G submitted during the oral proceedings held on 23 October 1991, according to auxiliary requests.

II. The reason given for the refusal was that the subject-matter of the independent claims of the main request and the auxiliary requests did not comply with Article 123(2) EPC. It was pointed out that Claims 1 and 10 of the main request as well as Claims 1A and 1G of the auxiliary requests all contained the feature that the structured packing is utilized in "at least one" or "a" region of the distillation column system where argon concentration is within the range from 0.6 to 75 volume percent. This feature was said to mean that the invention as claimed covers embodiments where there are several regions having the indicated argon concentration range and structural packing is used in one such region only. Further according to the impugned decision, such embodiments are not covered by the application as filed. As described consistently in the application as filed "at least those" regions of the distillation column system where the argon concentration is in the indicated range should be provided with structured packing, which clearly means that the structured packing should at least be used in all those regions where the argon concentration is in the indicated range.

III. The Appellant (Applicant) lodged an appeal against this decision on 7 January 1992 paying the appeal fee on the same day. The Statement of Grounds of Appeal was filed

on 23 March 1992 by Telefax, confirmed in writing on 24 March 1992, together with further auxiliary Claims 1H, 1J and 10A and two declarations of experts.

IV. Claim 1 according to the main request and Claim 10A according to the auxiliary request read as follows:

"1. A process for the separation of mixtures, which comprise oxygen and argon, by cryogenic distillation, wherein in a distillation column system having at least one column, a liquid phase stream containing oxygen and argon and a vapour phase stream containing oxygen and argon are intimately contacted in at least one region of the distillation column system where argon concentration is within the range from 0.6 to 75 volume percent, thereby allowing mass transfer which enriches the liquid phase stream with oxygen and strips argon from the liquid phase stream, and enriches the vapour phase stream with argon and strips oxygen from the vapour phase stream, characterised in that intimate contact of said liquid and vapour phase streams in said region is effected utilizing a structured packing and the densimetric superficial gas velocity in said region is a least 1.8 cm/sec (0.06 feet per second).

10.A. The use of structured packing to reduce the HETP (height of packing equivalent to a theoretical plate) in a region of a distillation column system separating oxygen and argon by intimately contacting a liquid phase stream containing oxygen and argon, and a vapour phase stream containing oxygen and argon at an argon concentration within the range from 0.6 to 75 volume percent and a densimetric superficial gas velocity of at least 1.8 cm/sec (0.06 feet per second), said reduction of HETP being in comparison with the calculated value assuming no enhancement of mass transfer performance."

V. In the Statement of Grounds of Appeal and during the oral proceedings held on 7 June 1994 at the Appellant's request, the Appellant made the following points:

(i) The inherent problem underlying the subject-matter of the application in suit is to improve the separation of oxygen and argon by cryogenic distillation by reducing the pressure drop per theoretical stage without degradation of column performance. When conducting cryogenic separation of oxygen and argon, a distillation column system is used having at least one column in which a liquid phase stream containing oxygen and argon and a vapour phase stream containing oxygen and argon are intimately contacted so that mass transfer enriches the liquid phase stream with oxygen and the vapour phase stream with argon. To promote the required intimate contacting of the vapour and gas phase streams distillation trays are conventionally used . The invention is concerned with the complete or partial replacement of the distillation trays with structured packing in regions of a specified argon concentration and a minimum densimetric superficial gas velocity.

(ii) The original version of Claim 1 and description refer to the presence of structured packing "in at least those regions of the distillation column system" having the specified criteria. There is no statement in the specification to the effect that it is essential that all regions having the specified criteria should contain structured packing.

(iii) In determining whether subject-matter has been added to an application, it is necessary to consider the entire disclosure of the application and not to limit consideration to the claims and corresponding statements of the invention. The sentence on page 14, line 10 to 13 of the original description is part of a lengthy discussion of the effect of argon concentration on HETP when using structured packing. The discussion which extends from page 12, line 33 to page 17, line 26 is not restricted to an arrangement in which every part of the low pressure and argon sidearm column having an argon concentration within the specified range is packed with structured packing. The discussion concerns individual columns and the skilled man is clearly and unambiguously taught that the advantages accruing from the presence of structured packing where the argon concentration is within the specified range is not restricted to an arrangement in which all such areas are packed. The discussion makes it clear that the advantages which do accrue arise from a decrease in pressure drop per theoretical stage and, especially, a reduction in HETP, these advantages being clearly a function of the extent to which such packing is used with the specified argon concentration at the required densimetric superficial velocity.

The Appellant requests that the decision under appeal be set aside and that the case be remitted to the first instance for further prosecution on the basis of Claims 1 to 12 of the main request, alternatively on the basis of Claims 1A,1G,1H,1H' or 1J and, as an alternative to Claim 10, on the basis of Claim 10A.

Reasons for the Decision

The appeal is admissible.

1. *Main request*:

1.1 Claim 1 differs in substance from the original Claim 1 in that the feature concerning the utilisation of a structured packing in at least those regions of the distillation column system of an argon concentration and a densimetric superficial gas velocity as specified has been replaced by the feature concerning the utilisation of a structured packing in at least one region of the distillation column system of an argon concentration and a densimetric superficial gas velocity as specified.

Thus, it is the substitution of the feature "...in at least one region..." for the feature "...in at least those regions..." which was considered by the first instance to contravene Article 123(2) EPC because it allegedly extends the subject-matter of the European patent application beyond the content as filed.

1.2 When investigating the question of an infringement of Article 123(2)EPC it has to be first determined what is the content of the application as filed in respect of the subject in question.

According to the jurisprudence of the Boards of Appeal, cf. e.g. decision T 169/83 dated 25 March 1985 (published in OJ EPO 1985, 193); in particular section 3.4, it is the application as a whole which serves the purpose under Article 83 EPC of providing the information needed to carry out the invention. This information includes the statements concerning particular effects to be obtained and the problem to be solved.

1.3 In the present case, the critical question to be answered is, therefore, whether the skilled person reading the application as a whole is taught that the underlying problem can still be solved with the structured packing being utilized in at least one region of the distillation column of the argon concentration and gas velocity as specified or whether the application teaches that to obtain the desired aim the structured packing has to be utilized in all these regions.

1.4 In a number of passages, the original description of the application emphasises the relevance of attaining a reduced pressure drop per theoretical stage within the different components of the distillation system such as the high pressure column, the low pressure column and the argon column of the usual three column distillation system, cf. e.g. page 6, line 13 to 14, page 13, lines 27 to 34, page 16, lines 9 to 31 and page 17, lines 18 to 26.

The inherent technical problem to be solved by the application as illustrated in the original description has therefore to be seen in obtaining savings in the energy to be raised in the separation process by means of arriving at a pressure drop per theoretical stage in the separation components of the distillation system.

1.5 On page 16, line 9 to page 17, line 26 of the original description an analysis is presented in which the improvement in the total power consumption of a cryogenic air separation plant having a high pressure column and a low pressure column-argon column combined system is calculated as the pressure drop per theoretical stage in the column system is reduced. It arises from this analysis that in each of the two system components a certain percentage of power in dependence of a given reduction in the pressure drop within the

respective component can be saved. It is substantiated that a reduction of pressure drop in the high pressure column can lead to substantial but not overwhelming power saving up to about 2.6% in the example given whereas a reduction in the pressure drop within the low pressure column-argon column system can result in power savings of substantially greater extent (in the order of 6% depending on the cycle used). It is further stated that for a 800 TPD high purity oxygen plant, for distillation trays the pressure drop per theoretical stage would be 0.5 KPa/stage and that experiments indicate that the use of ordered (structured) packing would lead to a pressure drop of 0.06 KPa/stage, i.e. a substantially smaller pressure drop as compared with the use of distillation trays.

In the view of the Board, the skilled person reading the application including the detailed description is provided with the information that he can arrive at a pressure drop already by providing structured packing only in one of the components of the distillation system where argon concentration and the densimetric superficial gas velocity are within the range as specified and following therefrom attain a power saving which would achieve the object as defined above in section 1.4.

This interpretation of the disclosure of the application is consistent with the general knowledge of the skilled person relating to the laws of flow technology. In a flow system comprising a number of flow resistance elements, the removal or reduction of only part of the flow resistance elements leads already to a reduction of the overall pressure loss of the fluid while it is clear that the maximum benefit is obtained by removing or affecting all the flow resistance elements.

1.6 The Appellant has drawn the attention of the Board to the decision T 331/87 dated 6 July 1989 (published in OJ EPO 1991, 22) pointing out that the claims according to the main request of the application in suit comply with the principle set up in the cited decision.

According to this decision, the replacement or removal of a feature from a claim may not violate Article 123(2) EPC provided the skilled person would directly and unambiguously recognise that (1) the feature was not explained as essential in the disclosure, (2) it is not, as such, indispensable for the function of the invention in the light of the technical problem it serves to solve, and (3) the replacement or removal requires no real modification of other features to compensate for the change.

The examination of the question whether these criteria are fulfilled in the present case leads to the following result:

(1) No passage can be found in the application from which it has to be concluded that it is essential to provide structured packing in all those regions where argon concentration and densimetric superficial gas velocity is in the range as specified in order to solve the inherent problem.

(2) Notwithstanding the circumstance that the greatest energy saving may be obtained in a process in which all the regions of the specified conditions utilise a structured packing, the skilled person derives from the application that a reduction in pressure drop and thus a benefit due to energy saving is effected in the case that only a part of the regions of the specified conditions is provided

with the structured packing which due to its characteristic properties under the conditions as specified shows the effect of a reduced pressure drop in the range of use.

(3) The removal of the feature "...in at least those regions..." and the replacement thereof by the feature "...in at least one region..." does not require any modification of the other features of the invention. With exception of this feature, Claim 1, indeed, has not been changed in substance as compared with the original Claim 1.

1.7 It follows from the foregoing that the test for essentiality as suggested in the above-mentioned decision confirms the finding according to the above sections 1.3 to 1.5 which results from interpreting the disclosure of the application taking account of the general knowledge of the skilled person.

Summing up, the Board takes the view that the subject-matter of Claim 1 is consistent with the original disclosure of the application taken as a whole and interpreted in the light of the general knowledge of the skilled person.

Claim 1 is therefore in compliance with Article 123(2) EPC.

1.8 Having regard to the independent Claim 10, the opinion expressed in the decision under appeal (cf. page 3, paragraph 3) that Claim 10 filed with the letter of 25 April 1991 does not comply with Article 84 EPC because contrary to the requirement of clarity of the claims under Article 84 EPC, it does not contain the information compared to which arrangement the "HETP" is reduced, is shared by the Board. The Representative of

the Appellant, when asked by the Chairman of the Board during the oral proceeding whether he was prepared to substitute Claims 10A for Claim 10 due to the objection of lack of clarity of Claim 10, agreed with the proposed substitution amending his request correspondingly.

Claim 10A is supported essentially by the original Claim 1 in combination with the original description page 14, lines 7 to 10. The wording of Claim 10A "said reduction of HETP being in comparison with the calculated value assuming no enhancement of mass transfer performance" explains the reference value of the reduced HETP and is based on page 7, line 4, to page 9, line 9 of the original description.

Having regard to the feature relating to the use of structured packing **in a region** of a distillation column system, the considerations presented in above sections 1.1 to 1.7 apply correspondingly.

Claim 10A is, therefore, in compliance with Article 123(2) EPC.

2. *Auxiliary request*:

Since Claims 1 and 10A are found to comply with the requirements of Article 123(2) and 84 EPC, respectively, consideration of the auxiliary requests is not necessary.

3. The examination of the issue of patentability by the first instance has only been initiated by expressing an opinion, but not been concluded. Since the ground of refusal of the application is not confirmed by the Board, the decision under appeal has to be set aside and the case, in conformity with the request of the

Appellant, has to be remitted to the first instance for further prosecution (Article 111(1)) EPC.

In the substantive examination to be carried out by the first instance, the subject-matter of the observation by a third party filed with the letter dated 18 May 1993 will also have to be taken into consideration.

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 for further prosecution on the basis of Claims 1 to 9, 11 and 12 of the main request and Claim 10A filed on 23 March 1992.

The Registrar: The Chairman:

N. Maslin C. T. Wilson