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**Datasheet for the decision
of 28 March 2008**

Case Number: T 1589/05 - 3.3.06

Application Number: 00307506.6

Publication Number: 1080765

IPC: B01D 3/14

Language of the proceedings: EN

Title of invention:
Multieffect distillation

Applicant:
AIR PRODUCTS AND CHEMICALS, INC.

Opponent:
-

Headword:
Multieffect distillation/AIR PRODUCTS

Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
-

Decisions cited:
-

Catchword:
-



Case Number: T 1589/05 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 28 March 2008

Appellant:

AIR PRODUCTS AND CHEMICALS, INC.
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Representative:

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 27 July 2005
refusing European application No. 00307506.6
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: P.-P. Bracke
Members: P. Ammendola
U. Tronser

Summary of Facts and Submissions

- I. This appeal is from the decision of the Examining Division refusing the European patent application No. 00 307 506.6, published as EP-A-1 080 765, on the ground that the multieffect distillation process claimed in the then pending requests was obvious in view of the prior art (Article 56 EPC (1973)).
- II. In its decision the Examining division found, in particular, that the then claimed process resulted from an arbitrary selection among the possible obvious modifications of the process depicted e.g. in figure 1 of document

(2) = US-A-4 460 396.

In its reasoning the Examining division (see point 5 of the decision) also referred to the differences between the claimed process and the prior art multieffect distillation processes resumed in the description of application (see paragraphs 7 to 13 and Figures 1 to 4 of the application as published, hereinafter these processes are indicated as "the acknowledged prior art of Figures 1 to 4"). It concluded that these differences did not involve an inventive step, but would follow from circumstances when the skilled person would design the distillation process.

- III. The Applicant (hereinafter "Appellant") appealed this decision requesting, *inter alia*, the grant of a patent on the basis of the main request already refuted by the Examining division or, subsidiary, oral proceedings.

IV. In a communication dated 20 November 2007, enclosed to the summons to oral proceedings, the Board expressed its preliminary opinion on some aspects of the case. This communication comprised, *inter alia*, a preliminarily positive consideration of part of the Appellant's reasoning on inventive step (that referring to the acknowledged prior art of Figures 1 to 4) in the hypothetical case that the claims would had been allowably restricted to processes wherein each of the final products streams was prevailingly constituted by one of the components of the initial mixture feed to be distilled.

V. At the oral proceedings before the Board, held as scheduled on 28 March 2008, the Appellant finally withdrew any previously filed set of claims and filed two sets thereof respectively labelled as "main request" and "first auxiliary request". It also requested as second auxiliary request the continuation of the procedure in writing.

Claim 1 of the main request read:

"1. A process for multieffect distillation of a multicomponent fluid containing a most volatile component, a least volatile component and a component of intermediate volatility, said process using a first distillation column operating at a first pressure and a second distillation column operating at a different second pressure, wherein the first and second distillation columns are thermally linked comprising the steps of:

feeding the multicomponent fluid into the first distillation column at a first intermediate location;

removing a product stream from the top of the first distillation column;

removing a product stream from the bottom of the first distillation column;

withdrawing a mixture stream, rich in the component of intermediate volatility, from a second intermediate location of the first distillation column, said second intermediate location being either below said first intermediate location and at least one separation stage above the bottom of the first distillation column or above said first intermediate location and at least one separation stage below the top of the first distillation column;

said mixture and product streams being the only streams removed from said first distillation column;

feeding the mixture stream into the second distillation column;

removing a product stream from the top of the second distillation column; and

removing a product stream from the bottom of the second distillation column;

wherein one of said product streams from the second distillation column is rich in the component of intermediate volatility."

Claim 1 of the first auxiliary request read:

"1. A process for multieffect distillation of a multicomponent fluid containing a most volatile

component, a least volatile component and a component of intermediate volatility, said process using a first distillation column operating at a first pressure and a second distillation column operating at a different second pressure, wherein the first and second distillation columns are thermally linked comprising the steps of:

feeding the multicomponent fluid into the first distillation column at a first intermediate location;

separating at least a portion of the most or least volatile component from the multicomponent fluid in the first distillation column, thereby forming a mixture stream lean in one of the most volatile and least volatile components and rich in the component of intermediate volatility;

removing from the top of the first distillation column a product stream rich in the most volatile component;

removing from the bottom of the first distillation column a product stream rich in the least volatile component;

withdrawing the mixture stream from a second intermediate location of the first distillation column, said second intermediate location being either below said first intermediate location and at least one separation stage above the bottom of the first distillation column or above said first intermediate location and at least one separation stage below the top of the first distillation column;

said mixture and product streams being the only streams removed from said first distillation column;

feeding the mixture stream into the second distillation column;

separating at least a portion of the most or least volatile component in which the mixture stream is not lean and at least a portion of the component of intermediate volatility from the mixture stream in the second distillation column;

removing a product stream from the top of the second distillation column; and

removing a product stream from the bottom of the second distillation column;

wherein one of said product streams from the second distillation column is rich in the component of intermediate volatility, and the other of said product stream from the second distillation column is rich in the most or least volatile component in which the mixture stream is not lean."

VI. Only the inventive step assessment for the subject-matter of these claims was discussed at the oral proceedings of 28 March 2008 before the Board of Appeal. In particular, the Appellant considered that claim 1 of the main request and that of the first auxiliary request defined substantially the same subject-matter and presented for both claims the same arguments, which may be resumed as follows.

The Appellant argued initially that, as discussed in details in paragraph 62 of the application as published, the claimed process solved the technical problem of achieving energy saving vis-à-vis the multieffect distillation of the acknowledged prior art of Figures 1 to 4. It did not dispute the Board's criticism to the

credibility of the statements contained in this paragraph 62 and conceded not to have any further evidence demonstrating the alleged achievement of an energy advantage.

The Appellant argued nevertheless that, even if the technical problem actually solved was regarded as just that of providing an alternative to the acknowledged prior art processes, nothing would have motivated the skilled person to modify these latter so as to obtain a second product stream from the top or the bottom of the first column.

In particular, the claimed process would imply an inventive step in view of the absence of any reason or evidence suggesting that such modification of the multieffect distillation processes of the prior art would not substantially affect the overall energy consumption of these processes and not obstacle the separation aimed at.

The Appellant stressed not only the three years time span passed between the publication of this prior art (in 1996, see paragraph 13 of the application as published) and the year 1999 in which the present application had been filed, without any inventor active in the field considering such alternative, but also the existence of many other theoretically possible modifications of the prior art distillation process and the fact that many of them could also not work.

At the hearing the Appellant recognised that the Board's communication of 20 November 2007 contained no definitive acknowledgement of an inventive step. In

particular, it conceded that the partially positive consideration expressed therein by the Board in respect of part of the Appellant's reasoning in the grounds of appeal, was explicitly indicated as being only a preliminary opinion of the Board and as being conditional to a condition not present in the claims according to any of the present Appellant's requests. Nevertheless, the Appellant maintained to have presumed on the basis of such preliminary consideration of the Board that the advantage in terms of energy saving provided by the claimed process was not going to be disputed by the Board at the oral proceedings.

It maintained also that not even the Examining division had expressly disputed such energy saving advantage.

Hence, in case the Board would not have considered credible the advantage in terms of energy saving alleged in the application, the Appellant should have been given the opportunity to file further evidence supporting such advantage and, thus, it would have been justified to continue the procedure in writing.

VII. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims labelled as main request or of the set of claims labelled as first auxiliary request, both requests submitted during oral proceedings, or, as a second auxiliary request, to continue the procedure in writing.

Reasons for the Decision

Main request

1. Inventive step (Article 56 EPC (1973)): claim 1
 - 1.1 This claim (see above section V of Facts and Submissions) defines a multieffect distillation process of mixtures containing at least three ingredients of different volatility. This process uses two thermally linked columns operating at different pressures and is characterized in that the first distillation column (i.e. the column in which the feed mixture is introduced) generates exclusively two product streams (one at the top and the other at the bottom of the column, respectively) and one mixture stream (at an intermediate position of the same column). The mixture feed, inevitably enriched in the component of intermediate volatility, is then fed to the second column in which it is separated into two further product streams (collected from the bottom and the top of the second column, respectively).
 - 1.2 According to the description at paragraphs 14 and 62 of the application as published the claimed process aimed at solving the problem of rendering available a multieffect distillation process with even lower heat demand than that already achieved by the acknowledged prior art multieffect distillation processes of Figures 1 to 4.
 - 1.3 The Board concurs with the Appellant that the acknowledged prior art of Figures 1 to 4 represents a reasonable starting point for the assessment of

inventive step and that the claimed process differs substantially therefrom in that (whereas in the acknowledged prior art only one single product stream and the mixture stream are collected at the extremes of the first column) in the process of the invention the first column comprises an additional separation section so as to produce two product streams at the two extremes of this column. Of course, this also implies that the mixture stream to be fed at the second column is no longer collected at the bottom or at the top of the first column, but rather at an intermediate position thereof.

- 1.4 The Board however notes that, as also acknowledged by the Appellant, the only statement as to the reasons for which the claimed process was considered more energy efficient than that of the acknowledged prior art is contained in paragraph 62 of the application as published, reading "*...The reason for the improvement resides in the fact that the feed mixture is distilled in the first distillation column to produce two product streams rather than one product stream as in the prior art processes of Figures 1 through 4. By producing a second product stream from the first distillation column, the recovery of this product stream from the second distillation column is decreased. This can reduce the vapour flow requirement in either one or both the distillation columns and hence the decrease in heat duty.*".

The Board finds this short statement lacking credibility already for the reason that it does not take into account the other features distinguishing the claimed process from the acknowledged prior art and

that are manifestly also very relevant in terms of heat demand (such as, for instance, the influence on heat consumption deriving from the fact that part of the matter previously separated as a product exclusively in the second column is now separated in the first column at different pressure and temperature).

Hence, the Board finds that the sole relevant portion in the whole application, i.e. the above-cited portion of paragraph 62, rather than rendering credible the achievement of an improved energy saving, suggests that this advantage amounts to an allegation that is apparently only based on an unjustifiably simplified evaluation of the differences in heat demand between the invention and the prior art processes. Thus the energy advantage vis-à-vis the prior art that, according to the application, would be provided by the claimed process is not rendered credible by the disclosure of the application itself.

1.5 As the Appellant has conceded not to have any experimental evidence or more complete theoretical reasoning supporting the alleged improvement in energy saving, the technical problem credibly solved by the process of the invention can only be reformulated into the less ambitious one of providing a **further** multieffect distillation process for mixtures of three or more components of different volatility, i.e. the problem of providing an alternative to the prior art.

1.6 In the Board's opinion, the person skilled in multicolumn distillation, i.e. the same field to which the multieffect distillation processes of the acknowledged prior art of Figures 1 to 4 also belong,

would be aware that one of the conventional plant design options consists in having more than one product stream collected already in a first column and, thus, in locating at an intermediate position of the first column the collection point for the mixture to be fed to the subsequent column.

The conventional nature of this plant design option has not been disputed by the Appellant and is, for instance, also exemplified by the mixture collection pipeline 23 and the product collection pipelines 8, 15 and 20 in the specific case of the multicolumn distillation depicted in Figure 1 of document (2).

Hence the Board concludes that no inventive step is required by the skilled person, who aims at providing an alternative to the acknowledged prior art of Figures 1 to 4, for arbitrarily selecting among the possible plant design options already known to represent conventional alternatives for systems of multicolumn distillation processes the modification of the prior art that leads to the claimed subject-matter.

- 1.7 The Appellant has nevertheless argued (see also above section VI of Facts and Submissions) that the collection of two product streams already at the extremes of the first column would be only one possibility among the many alternatives already present on distillation plants of the prior art, and stressed that none of the available citations indicated a single reason for specifically preferring such possibility among the many others. In particular, the possibility of shifting part of the product separation from the

second column to the first one would not be disclosed as being energy neutral.

It has finally stressed that some of these alternatives could occasionally even be detrimental to the effectiveness of the multieffect distillation aimed at and that the non-obviousness of the claimed process would also be confirmed by the fact that at least for three years after the public availability of the acknowledged prior art of Figures 1 to 4 no other inventor active in the field of multicolumn distillation plants had arrived at conceiving the claimed process.

- 1.8 In respect to the Appellant's argument that it cannot be considered obvious for a skilled person, in the absence of specific reasons, to choose among the several existing conventional distillation plant design alternatives exactly those whose application to the acknowledged prior art would lead to the claimed process, the Board refers to the established jurisprudence of the Boards of Appeal that the mere existence of several equally obvious alternative solutions to the posed problem does not render inventive the arbitrary selection of any of them. In other words, **in the absence of any specific reason for preferring one or the other**, the arbitrary selection of a solution to the posed problem among those that are equally suggested requires no particular skills and, for this reason, does not involve an inventive step.

It appears also unjustified the unsupported assumption, implicit in the Appellant's reasoning, that the claimed processes are necessarily at least as energy effective

as those of the acknowledged prior art providing improved energy saving. As a matter of fact, the application itself qualifies the level of energy saving achieved by the prior art multieffect distillation processes of Figures 1 to 4 only by vaguely saying that these latter "**generally** required less heat duty" (see paragraph 13 of the application as published, emphasis added by the Board). This suggests that also specific embodiments of the presently claimed processes are likely to display no improved energy saving and, considering the breadth of present claim 1 wherein most of the technical features used for characterising the claimed process are defined in very generic terms, it appears unjustified to presume that such non-advantageous embodiments would only be occasional.

Accordingly, the Board remains convinced that the only problem credibly solved by the whole claimed subject-matter of present claim 1 is that already indicated above at point 1.5, i.e. that of providing a **further** multieffect distillation process for mixtures of three or more components of different volatility. Since such problem does not imply any strict requirement as to a particularly advantageous level of energy consumption to be retained, the Appellant's argument based on the absence of any reason for expecting that a low energy consumption could also be associated to the presence of more than one product stream collected already in the first column, is found irrelevant for the inventive step assessment in the present case.

Moreover, there is no indication in the file that the common general knowledge in the field of multieffect distillation was such that the person skilled in the

art would have regarded either specifically the shift of part of the product separation from the second column to the first one, or in general any whatever modifications of the acknowledged prior art, as likely to be detrimental to the achievement of any acceptable separation process or as necessarily involving an unacceptable increase in energy consumption. Therefore, no inventive step may be seen in the generic hypothetical assumption made by the Appellant that some of the apparently equally obvious alternatives for designing multieffect distillation plants might possibly turn out to be unsuitable for ensuring the desired separation.

In addition, neither the possibility that the number of alternative plant design options might be very high nor the at least triennial time span between the prior art and the invention are considered convincing proofs of the non-obviousness of the claimed subject-matter.

- 1.9 Hence, the subject-matter of claim 1 of the main request does not comply with the requirements of Article 56 EPC (1973) and, thus, this request is not allowable.

First auxiliary request

2. Inventive step (Article 56 EPC (1973)): claim 1

Claim 1 of this request (see above section V of the Facts and Submissions) differs substantially from that of the main request only in that the compositions of the mixture and product streams are defined more explicitly.

Hence, the Board concurs with the Appellant that the subject-matter of this claim request is substantially the same of claim 1 of the main request and, thus, also this auxiliary request is not allowable for the same reasons already given above for the main request.

Second auxiliary request

3. At the oral proceedings before the Board the Appellant maintained to have relied on the statement in the communication of the Board (see above section IV of Facts and Submissions) as to the fact that a part of the Appellant's reasoning on inventive step given in the grounds of appeal was preliminarily considered convincing, as an indication that the advantage in terms of energy saving allegedly provided by the claimed process vis-à-vis the acknowledged prior art would not be disputed by the Board at the then forthcoming hearing.
It has maintained that not even the Examining division had expressly disputed this energy saving advantage and has then requested to return to the written procedure in order to be given the opportunity to file evidence demonstrating such advantage, in case this latter would not be acknowledged by the Board.
- 3.1 However, as also expressly recognised by the Appellant at the oral proceedings, the partially positive statement in the communication of the Board cannot in any way be possibly considered a definitive acknowledgement of an inventive step for the whole or part of the then claimed subject-matter. Indeed, this statement was not only conditional to an amendment which is not present in the sets of claims now on file,

but was unequivocally indicated as part of the preliminary and not binding opinion of the Board.

The Board notes further that even though the decision under appeal has not disputed explicitly the credibility of the advantageous energy saving of the invention alleged in the refused application, it has certainly neither explicitly or implicitly acknowledged such alleged advantage.

In accordance with the general principles regulating the proceedings before the EPO and, thus, also before the Boards of Appeal, the burden of providing the means of proof supporting an argument on which a party intends to rely rests on the party's side. Hence, in the present case the Appellant carried the burden of rendering credible that the claimed process resulted in the energy savings vis-à-vis the acknowledged prior art.

- 3.2 The fact that the Appellant has for the first time at the hearing before the Board realized that the reasons given in paragraph 62 of the application were possibly insufficient for rendering credible the alleged advantage of the invention and/or that it had erred in presuming such advantage as being already accepted by the Board, does not justify further prosecution of the appeal procedure in writing. Thus, also the second auxiliary request is not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

C. Eickhoff

P.-P. Bracke