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Anmeldenummer / Filing No / N^o de la demande : 78 200 317.2
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Bezeichnung der Erfindung: Process and apparatus for the removal of
Title of invention: ammonium carbamate from a urea-synthesis
Titre de l'invention : solution

Klassifikation / Classification / Classement : C 07 C 126/02

ENTSCHEIDUNG / DECISION

vom / of / du 16 January 1986

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Unie van Kunstmestfabrieken B.V. (respondent)

Einsprechender / Opponent / Opposant : Snamprogetti S.p.A. (appellant)

Stichwort / Headword / Référence :

EPO / EPC / CBE

Art. 56
"Inventive step, disregard of unsolved technical
problem"

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt

Beschwerdekammern

Case Number : T 124 /84

European Patent
Office

Boards of Appeal

Office européen
des brevets

Chambres de recours



DECISION
of the Technical Board of Appeal 3.3.1
of 16 January 1986

Appellant :
(Opponent)

Snamprogetti S.p.A.
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Representative :

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Decision under appeal :

Interlocutory decision of the Opposition
Division of the European Patent Office
dated 28.03.84 concerning maintenance of
European Patent No. '2 298 in amended
form.

Composition of the Board :

Chairman : K. Jahn

Member : J. Arbouw

Member : F. Berussi

Summary of Facts and Submissions

- I. European patent No. 2298 incorporating 13 claims was granted on 21.01.81 on the basis of European patent application No. 78 200 317.2, filed on 25.11.78 and claiming a Dutch priority of 30.11.77.

- II. The Opponents filed opposition to the grant on 21.10.81 on the basis of the documents :
 - (1) DE-B-1 768 776 and
 - (2) US-A-3 471 558and requested that the patent be revoked in its entirety on grounds of lack of novelty and inventive step.

- III. By its decision of 28.03.84 the Opposition Division maintained the patent in an amended form, incorporating 12 claims, based on the Claims 1 to 11 and 13 as originally filed.

The independent Claims 1 and 12 read as follows :

1. A process for the removal of ammonium carbamate from a urea-synthesis solution, in which the urea-synthesis solution flows down along a surface as a thin film at a pressure of from 11767.98 to 19613.30 KPa (120 to 200 atmospheres absolute) and a temperature of from 170 to 200°C in counter-current flow to a gaseous stripping agent, while heat is applied, and stripped urea-synthesis solution and the gaseous mixture formed in stripping are discharged to respective collecting chambers and discharged therefrom, characterised in that during the contact with the stripping agent the urea-synthesis solution is first heated to a temperature of from 180° to 195°C for not more than 5 seconds and then cooled to a temperature of from 155° to 175°C.

12. Apparatus for the removal of ammonium carbamate from a urea-synthesis solution, comprising a tubular shell containing a plurality of heat-exchanger tubes extending along the length thereof and entering a first collecting chamber at one end thereof for the collection of stripped urea-synthesis solution and entering a second collecting chamber at the other end thereof for the collection of gases, the said first collecting chamber being provided with discharge means for the discharge of stripped urea-synthesis solution therefrom and with inlet means for the introduction of gaseous stripping agent therein, the said second collecting means being provided with discharge means for the discharge of gases therefrom, the said tubes each being provided with inlet means for the introduction therein of urea-synthesis solution to be stripped at a location adjacent to but not in the said second collection chamber whereby urea-synthesis solution may flow down the inner wall of each of the said tubes as a thin film when the said tubes are substantially in a vertical disposition, and the said tubular shell is provided with an inlet means adjacent to but not in the said second collection chamber for the introduction into the tubular shell of a hot condensable heating agent, and with outlet means adjacent to but not in the said first collecting chamber for the removal from the tubular shell of condensed heating agent; characterised in that the said outlet means for condensed heating agent comprises a plurality of discharge valves spaced along the length of the tubular shell wall, being independently operable.

IV. The decision to maintain the patent as amended was based on the argument that its subject-matter is novel with respect to (1) and (2) in that an auxiliary stripping agent is supplied. It was further argued that an inventive step is given over the closest prior art, which is represented by

citation (3) US-A-3 356 723, in that the skilled person is not encouraged by the teachings of the cited documents to modify the ammonium carbamate decomposition step in the manner as specified in the characterising part of Claim 1.

- V. A notice of Appeal was filed by the Appellants against this decision on 25 May 1984, and the appeal fee was paid. The statement of grounds for appeal submitted on 19 July 1984 runs essentially as follows. The subject-matter of the patent-in-suit is obvious over the documents (1), (2) and (3) since these documents disclose the preamble of Claim 1 and further implicitly the two stage decomposition process with the same temperatures as indicated in the characterising part of Claim 1. Document (2) further discloses a maximum of 5 seconds for the first decomposition stage. The Appellant further states that mosaicing of the documents (1), (2) and (3) is allowable since all three documents relate to the same subject-matter, i.e. urea-synthesis.

In a later submission, the Appellant further argues that a passage from the literature, (4) Urea process technology, 1968, page 201-203, is detrimental to novelty.

- VI. The Respondent argues that documents (1) and (2) do not unambiguously disclose the temperature conditions in the decomposition and stripping zone. It should be further considered as surprising that notwithstanding a higher temperature in comparison to document (2) a residence time of 5 seconds can be allowed.

As regards document (3) the Respondent makes the point that in the claimed process stripping can be carried out at higher pressures and temperatures without unacceptable hydrolysis of urea and that the consumption of high pressure steam is reduced in an unpredictable manner.

As regards document (4) the Respondent states that this document deals with low pressure decomposition and stripping and that therefore this document is not relevant.

VII. In a communication the Board drew, inter alia, attention to doubts whether the alleged object of the invention was effectively achieved.

VIII. The parties reaffirmed their points of view in the oral proceedings on 16.01.86.

The Appellant requests that the decision under appeal be set aside and that the patent be revoked.

The Respondent on the other hand requests that the appeal be dismissed and that the patent be maintained.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.
2. The closest prior art is represented by (3). This document is concerned with a process for removal of ammonium carbamate from urea-synthesis solution having all the features of the preamble of Claim 1 (see (3), column 7, lines 9-24; column 5, lines 29-45) and also mentions the problem of avoiding biuret formation and hydrolysis of urea into ammonia and carbon dioxide (see (3), column 5, lines 46-55).

3. The Patentee alleges that the problem underlying the invention is to reduce both the hydrolysis of urea and the conversion of urea into biuret (see the description column 2, lines 2-4).
4. The objection made by the Board that the aimed object appears not to be achieved to a higher extent than by the process of (3) has not been met by the submission of a comparable experiment or other evidence as might have been expected. The patent-in-suit (cf. column 1, lines 53-57) only indicates that the biuret content of solid urea used for fertilizing purposes should not exceed 2.5% by weight and that in urea fertilizer solutions that are applied to the leaves, the maximum allowable biuret content is only 0.3% by weight. Document (3) (cf. column 7, lines 33) discloses a biuret content of 0.4%.
5. The question put forward by the Board to provide some evidence for the alleged reduction of high pressure steam consumption was not answered by the Respondent.
6. Consequently the conclusion must be drawn that the advantages referred to by the Respondent have not been properly demonstrated. Such alleged but unsupported advantages cannot be taken into consideration in respect of the determination of the problem underlying the invention (cf. "Shell/Aryloxyben zaldehyde"; T020/81; OJ 6/1982, p. 217).
7. Therefore in the absence of any of the alleged advantages the problem underlying the invention with respect to (3) can only be seen in suggesting a further method and apparatus for decomposing and stripping a urea-synthesis solution at high pressure and temperature.

8. To solve this problem the patent proposes, as set out above, essentially a two-stage stripping process at relatively high pressure (120 - 200 at) whereby the first step is performed at a temperature of from 180°-195°C for not more than 5 seconds and the second step is performed at a temperature of from 155°-175°C.
9. The process according to Claim 1 is novel, even over document (4) since this document describes the removal of ammonium carbamate from urea-synthesis solutions at much lower pressure (6.2 at respectively 785 mm Hg) and temperature (136°C respectively 70°C) (cf. (4), page 202, paragraphs 5 and 6). In view of the outcome of the proceedings this question need not be discussed in more detail.
10. The skilled practitioner seeking a solution for this problem was aware of (3) which document teaches that a urea-synthesis solution can be decomposed and stripped in a film evaporator in a one step process under the pressure and temperature conditions as suggested by the patent-in-suit for its first step provided that this is done for a short time only (cf. (3), column 5, lines 37-55 and column 7, lines 7-33). The determination of the maximum allowable time for the first stage at the given temperature and pressure is merely a matter of routine experimentation. The difference between the patent-in-suit and (3) therefore lies merely in the addition of an extra step which is performed at lower temperature.
11. Document (4), also dealing with the subject of the decomposition and stripping of urea-synthesis solutions was able to provide the required suggestion for performing the decomposition and stripping in two steps. This publication imparts the teaching that it is advantageous in the low pressure stripping process to execute the process in two

stages whereby the first step is executed at higher temperature for an extremely short period and the second step at a lower temperature (cf. (4), page 202, paragraphs 2 and 3). This teaching will suggest the man skilled in the art, seeking a solution for the problem of making available another process for decomposition and stripping of a urea-synthesis solution, to transfer this teaching of (4) from the low pressure stripping to the high pressure stripping.

12. Therefore a man skilled in the art would have expected that the combination of the teaching of (3) and (4) could solve the problem as defined above.
13. This reasoning applies not only to Claim 1, but equally to the dependent Claims 2-11, based on the main claim, which merely represent preferred embodiments of the process according to Claim 1 and thus fall with it.
14. It was not contested between the parties that an apparatus having all the features of the pre-characterising portion of Claim 12 is known in the art (cf. (3), Fig. 2 in combination with column 5, lines 37-45).

The apparatus according to Claim 12 differs therefrom only in the sense that the outlet means for condensed heating agent comprises a plurality of independently operable discharge valves spaced along the length of the tubular shell.

15. The skilled practitioner seeking a solution for the problem of modifying the known apparatus to make it suitable for the removal of ammonium carbamate from a urea-synthesis solution according to the non-inventive process according to Claim 1-11 is aware of the fact that condensate in the lower part of the heat exchanger will have a lower temperature than the gaseous heating agent introduced at

the top and therefore will cause a temperature drop along the heat exchanger tubes. He is also aware of the fact that variation of the condensate level corresponds to variation of the duration of the first (high temperature) and second (low temperature) stage.

The control of the condensate level by the installation of a plurality of discharge valves along the length of the tubes shall therefore have presented itself from the point of view of the skilled practitioner as a solution to the problem defined above. The skilled man not only could have come to the apparatus according to Claim 12, but he would have come to it (cf. "Simethicone Tablet/Rider", T002/83, OJ 6/1984, p. 265).

Order

For these reasons it is decided:

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

The Registrar


J. Rückerl

The Chairman


K. Jahn