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Datasheet for the decision of 18 September 2012

Case Number: T 0173/09 - 3.3.10

Application Number: 00110435.5

Publication Number: 1035111

IPC: C07C273/04

Language of the proceedings: EN

Title of invention:
Improved urea synthesis process and apparatus therefor

Patent Proprietor:
TOYO ENGINEERING CORPORATION

Opponent:
DSM IP Assets B.V.

Headword:

Relevant legal provisions:
EPC Art. 56, 100(a)
RPBA 12(2), 13(1), 13(3)

Keyword:
Inventive step - main request (no)
Auxiliary requests - not admitted into the proceedings

Decisions cited:
T270/90, T20/81

Catchword:

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Case Number: T 0173/09 - 3.3.10

D E C I S I O N
of the Technical Board of Appeal 3.3.10
of 18 September 2012

Appellant: (Opponent)	DSM IP Assets B.V. P.O. Box 9 6160 MA Geleen (NL)
Representative:	Jansen, Cornelis Marinus c/o VEREENIGDE Johan de Wittlaan 7 2517 JR Den Haag (NL)
Respondent: (Patent Proprietor)	TOYO ENGINEERING CORPORATION 2-5, Kasumigaseki 3-chome Chiyoda-ku, Tokyo 100 (JP)
Representative:	Hering, Hartmut Patentanwälte Berendt, Leyh & Hering Innere Wiener Strasse 20 81667 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 25 November 2008 rejecting the opposition filed against European patent No. 1035111 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman: P. Gryczka
Members: R. Pérez Carlón
F. Blumer

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the opposition division to reject the opposition.

II. Notice of opposition had been filed by the appellant requesting revocation of the patent in its entirety on the ground of lack of inventive step (Article 100(a) EPC).

Inter alia, the following documents were submitted in opposition proceedings:

D1: EP 0 329 215 A1
D2: Recycle Carbamate via Ejector, Hydrocarbon Processing, 1970, p. 115-116
D3: EP 0 155 735 A1

III. Independent claim 9 of the patent as granted (main request) reads as follows:

"*A urea synthesis apparatus comprising*
(a) a vertical urea synthesis column installed on the ground,
(b) a vertical condenser with a cooler, installed on the ground,
(c) a stripper for stripping unreacted ammonia and unreacted carbon dioxide, contained in a urea synthesis solution from said urea synthesis column, by means of feed carbon dioxide to separate them from the solution as a mixed gas of ammonia, carbon dioxide and water,
(d) a heat exchanger for preheating feed liquid ammonia,
(e) an ejector for sucking the condensate from said vertical condenser by using the preheated feed liquid

ammonia as the driving fluid,
(f) a down pipe that has an opening in the top part of said vertical condenser and is for supplying said condensate to the ejector,
(g) a piping for supplying said feed liquid ammonia to the ejector through the heat-exchanger,
(h) a piping for supplying the mixture of the feed liquid ammonia and the condensate from the ejector to the bottom part of said urea synthesis column,
(i) a piping for supplying the urea synthesis solution from said urea synthesis column to said stripper,
(j) a piping for supplying feed carbon dioxide to said stripper and, if necessary, to said urea synthesis column,
(k) a piping for supplying the mixed gas separated in said stripper to the bottom part of said vertical condenser,
(l) a piping for discharging an aqueous urea solution containing unseparated unreacted ammonia and unreacted carbon dioxide from the bottom part of said stripper for further treatments, and
(m) a piping for supplying an absorption medium to the bottom part of said vertical condenser."

IV. The opposition division agreed with the parties that document D1 was the closest prior art. D1 failed to disclose an ejector connecting the top of the condenser and the bottom of the reactor (feature (e) of claim 9), and a vertical condenser, installed on the ground (feature (b)). The problem to be solved was the provision of an apparatus for the production of urea which allowed forming additional urea in the condensation zone and was capable of placing the equipment on the ground. The claimed solution was not obvious in the light of the art.

V. The appellant argued that each of the distinguishing features solved an independent problem and were, therefore, not a true combination. The ejector served to place the condenser on the ground, which was obvious from D2, whereas the vertical placement of the condenser was an obvious alternative to a horizontal condenser known from D3. Urea was obtained in every submerged condenser, independently from whether it was horizontally or vertically placed, and the degree of conversion was dependent on the residence time, not on the placement of the condenser. The ejector did not increase the N/C ratio in the reactor, because said ratio was kept constant in every urea apparatus by adjusting the feed and the recirculation. Therefore, the claimed apparatus did not involve an inventive step.

The appellant also requested that the auxiliary requests I, II and III, filed during the oral proceedings before the board, not be admitted, since it considered that it was taken by surprise at that late stage of the proceedings. The respondent had ample opportunity to amend the claims earlier since the objections were known to it from the opposition proceedings. These new requests were thus not a reaction to any new evidence or argument.

VI. The respondent (patent proprietor) saw as additional distinguishing features when starting from D1 as closest prior art that the piping (k) supplied the mixed gas to the bottom part of the vertical condenser, and that the pipings (i) and (k) could not be further split, so that the additional pipes disclosed in D1 were not present in the claimed apparatus.

The problem to be solved by the invention was the

provision of an improved apparatus for the synthesis of urea with less height, increased urea synthesis rate, measured as the conversion of CO2 to urea, and which was simpler since some lines did not need to be diverted. The ejector increased the nitrogen to carbon ratio in the reactor and the pressure in the condenser, and the gas residence time in a vertical condenser was longer than in a horizontal equivalent, so that the distinguishing features worked in combination to achieve a synergistic effect which was not obvious in the light of the art. The claimed subject-matter involved, therefore, an inventive step.

The auxiliary requests I, II and III filed during the oral proceedings before the board were a response to a new situation which arose from a different way of assessing inventive step. Auxiliary request I had already been filed before the opposition division. If the auxiliary requests would not be admitted, the proprietor would not be given a fair chance to properly defend its patent.

VII. Oral proceedings were held before the board on 14 September 2012.

The chairman closed the debate, informed the parties that the decision would be announced in writing and asked them to state their final requests, which were as follows:

- The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 1 035 111 be revoked.

- The respondent (patentee) requested that the appeal be dismissed and the patent be maintained

as granted, or, subsidiarily, that the patent be maintained on the basis of any one of the auxiliary requests I, II or III, all as filed during the oral proceedings before the board.

VIII. With a communication sent by fax on 18 September 2012, the board announced its decision.

Reasons for the Decision

1. The appeal is admissible.

Main request:

Novelty, Article 54 EPC:

2. Neither the opposition division nor the appellant had any objection with regard to the novelty of the subject-matter of the claims of the main request, and the board sees no reason to depart from this view in the light of the available prior art.

Inventive step, Article 56 EPC:

3. Closest prior art:

3.1 The board considers, in agreement with the opposition division and the parties, that the closest prior art is the disclosure of document D1.

Document D1 describes an apparatus for producing urea which comprises (see figure) a vertical urea synthesis column (A), a condenser (C) and a stripper (B).

3.2 The board agrees with the parties and the opposition division that D1 fails to disclose the following

features required by claim 9 of the main request:

- an ejector (feature (e)) whose suction side is connected via line (f) to the top part of the vertical condenser, and
- a vertical condenser, installed on the ground (feature (b)).

3.3 The respondent saw line (i), which supplies the urea synthesis solution into the stripper, as an additional distinguishing feature, because in D1 there is an additional line (10) supplying the gas phase of the synthesis column to the condenser. The wording of claim 9 excluded the presence of this additional pipe, since claim 9 contained all the features required by the claimed invention.

However, claim 9 defines an apparatus "comprising" the features defined therein, which does not exclude the splitting of its lines. In the apparatus disclosed in D1, line (16) is "a piping for supplying the urea synthesis solution from said urea synthesis column to said stripper", and corresponds to feature (i) of claim 9, irrespectively from whether a part of the "synthesis solution" is led to another unit of the apparatus via an additional line.

Therefore, line (i) is not a feature distinguishing the claimed apparatus from that disclosed in document D1.

3.4 The respondent argued that D1 failed to disclose "a piping for supplying the mixed gas separated in said stripper to [...] said vertical condenser" (see feature (k) of claim 9). Claim 9 of the patent in suit excluded any splitting since it contained all the features required by the claimed invention, whereas the

corresponding line was further split in D1.

However, in the apparatus of D1, lines (6), (8) and (9) constitute a piping for supplying the mixed gas separated in said stripper to the condenser, as required by claim 9. As explained above (point 3.3), claim 9 does not exclude the splitting of the lines defined therein. Therefore this part of feature (k) is also disclosed in D1.

3.5 The respondent also saw in the feature "for supplying the mixed gas to the bottom part of the condenser" (see feature (k)) a distinguishing feature with respect to the apparatus disclosed in document D1.

Document D1 is silent about feeding mixed gas to the bottom of the condenser. Since a feed could be introduced at the top, at the bottom or at any intermediate position of a vertically placed condenser, feeding the mixed gas at the bottom of the condenser is not an inherent consequence of the vertical construction of the condenser.

The board concludes, thus, that "a piping for supplying the mixed gas separated in said stripper *to the bottom part* of said [vertical] condenser" represents a distinguishing feature with respect to the apparatus of D1.

3.6 The distinguishing features of claim 9 with respect to the closest prior art document D1 are, thus:

- an ejector (feature (e)) whose suction side is connected via line (f) to the top part of the vertical condenser,

- a vertical condenser, installed on the ground (feature (b)), and
- a piping for supplying mixed gas from the stripper to the bottom part of the condenser (feature (k)).

4. Technical problem underlying the invention:

The respondent defined the problem underlying the claimed invention as to provide a simplified apparatus with less height, improved circulation, and allowing an increased urea conversion rate, measured as CO2 conversion.

5. Solution:

The solution claimed in the patent in suit is the apparatus subject-matter of claim 9, characterised in that it comprises a piping for feeding mixed gas from the stripper to the bottom part of a vertical condenser, placed on the ground, and an ejector between the condenser and the urea synthesis column.

6. Success:

6.1 It has not been disputed that the apparatus subject-matter of claim 9 reduces the height of the urea plant by allowing placing the condenser on the ground.

The parties were, however, divided as to whether it also solved the problems of providing a simplified apparatus and whether it allowed an increase in the urea synthesis rate.

6.2 The respondent argued that the ejector and the vertical condenser worked in combination and resulted in a

synergistic effect in terms of the urea conversion rate, by increasing the N/C ratio and the pressure in the condenser and by increasing the gas residence time for the following reasons:

6.2.1 The respondent explained that urea synthesis was normally carried out under an ammonia to carbon dioxide ratio (from now on N/C) higher than stoichiometric (2:1). An increase in the relative amount of ammonia led to an increase in the CO2 conversion and a reduction in the NH3 conversion, which was advantageous, as separating ammonia from the reaction mixture was less expensive in terms of energy. As the ejector introduced more ammonia in the reactor, the N/C ratio was necessarily higher, and the CO2 conversion increased.

However, claim 9 does not exclude adding more CO2 to the reactor or increasing the recirculation of unreacted material, which would maintain a low N/C ratio. Additionally, whether the ejector introduces more ammonia in the vertical reactor with respect to D1 is a matter of its operating conditions, which are not features of claim 9.

6.2.2 According to the respondent, the presence of the ejector increased the total pressure in the condenser and, hence, the urea conversion rate therein.

It is not plausible, however, that the sole location of the ejector (e) as required by claim 9 implies an increase on the pressure in the condenser with respect to D1, where an ejector (F) feeds also ammonia into the urea synthesis column.

6.2.3 Finally, according to the respondent, the residence time of the gases in a vertical condenser was longer than in a horizontal equivalent, therefore the cooling was more efficient and more liquid phase was formed. As urea synthesis took place in the liquid phase, its synthesis rate increased.

In this respect, it is doubtful whether the orientation of the vertical condenser changes the residence time of the gaseous phase as long as the remaining design of the condenser, in particular its length which, according to the appellant, is primarily responsible for this residence time, is left open in claim 9. Therefore, the alleged improvement in urea synthesis rate due to a longer gas residence time vis-à-vis a horizontal condenser is not plausible.

These arguments should, therefore, fail.

6.3 Thus, the board concludes that it has neither been proven nor it is plausible having solely regard to the distinguishing technical features that the problem of increasing the urea synthesis rate is solved by the subject-matter of claim 9.

6.4 The respondent argued that it had not to carry the onus of proof for the fact that the claimed process achieved the alleged technical benefit over the closest prior art. It was rather on the appellant to show that the claimed process did not achieve said benefit.

However, according to the established jurisprudence of the Boards of Appeal, each of the parties to the proceedings carries the burden of proof for the facts it alleges (see e.g. decision T 270/90, OJ EPO 1993, 725, point 2.1). In the present case, where the

respondent relies on an improvement over the process disclosed in D1 with respect to urea synthesis rate, the burden of proof for this fact lies on its side.

In addition, as the respondent did not present a comparison between the closest prior art and the claimed invention, the purported technical benefits are devoid of corroborating evidence. Hence, the respondent has not discharged its burden of proof.

6.5 The parties were also divided as to whether the apparatus of claim 9 was a simplification over the apparatus of document D1.

The respondent explained that the apparatus claimed needed less pipings than the apparatus of D1.

Both parties agreed that the apparatus of the invention could perform its function of synthesising urea in the absence of additional pipings, and the board does not see a reason to depart from this view.

The appellant, however, considered that omitting pipings (7) and (15) could not be considered a simplification with respect to the apparatus disclosed in D1, since other measures were needed to compensate for its absence, as was apparent from D1.

On column 4, lines 37-40, document D1 explains that the role of those additional lines is providing heat for the production of urea. It is, hence, obvious that these lines can be suppressed, provided that alternative heating means are installed, such as those mentioned in the same passage, lines 30-36 of document D1. These means are left open in claim 9.

The respondent further relied on the savings derived from omitting expensive special steel pipings from the apparatus of D1 as an advantage of the apparatus claimed.

As explained above, this omission needs to be compensated by other heating means, so that an overall saving is not apparent. D1 refers to the disadvantages of those alternative measures and explains that installing a steam coil is difficult in terms of construction and supplying CO2 to the reactor affects the stripping efficiency. The board concludes, therefore, that an overall saving effect is not achieved by suppressing lines as alleged by the respondent since other, less efficient measures, shall be used for compensating.

For these reasons, the board concludes that the apparatus subject-matter of claim 9 cannot be considered a simplification of the apparatus disclosed in D1.

6.6 According to the jurisprudence of the Boards of Appeal, alleged but unsupported advantages cannot be taken into consideration in respect of the determination of the problem underlying the invention (see e.g. decision T 20/81, OJ EPO 1982, 217, point 3, last paragraph of the reasons). As the alleged improvements in terms of urea conversion rate and simplification lacks the required support, the technical problem as defined in point 4. above needs reformulation.

Thus, in view of the teaching of D1, the objective problem underlying the invention is providing an apparatus for the synthesis of urea with less height.

It is not disputed that this technical problem has been solved by the claimed apparatus. The presence of the ejector allows placing the condenser on the ground and, hence, decreases the total height of the apparatus.

7. Finally, it remains to be examined whether the claimed solution was obvious for the person skilled in the art:

7.1 In order to reduce the height of the apparatus of D1, the skilled person will place all its parts at ground level. The skilled person knows that the reason for placing the condenser at a higher level than the reactor and the stripping unit in D1 is to use gravity as the driving force for circulation; if the condenser is placed at ground level, a different driving force should be provided. The skilled person would turn, then, to the disclosure of document D2, dealing with this problem (see footnote of figure 2). D2 teaches that by using an ejector for carbamate recycle, the carbamate condenser, stripper and reactor can be located on the same level. Following the teaching of D2, the skilled person will place an ejector between the condenser and the synthesis column, and arrive to the subject-matter of claim 9 without using inventive skills.

7.2 No functional dependency has been shown between the presence of an ejector and the other distinguishing features of present claim 1, namely the vertical placing of the condenser, and the feeding of the stripped gas to the bottom of said condenser. These features do not contribute to solving the problem of reducing the height of the apparatus. Additionally, these features are obvious construction alternatives for the skilled person for the following reasons:

7.2.1 Document D3, describes that both vertical and horizontal condensers of the submerged type can be used in a urea apparatus (see page 4, lines 29 and 30) and both have the advantage that additional urea is formed therein (see page 4, lines 7-13). A vertical submerged condenser is, therefore, as efficient as a horizontal condenser in terms of urea conversion and an obvious alternative to the later.

7.2.2 The patent in suit does not mention any advantage which might be associated to the feeding of the stripped gas to the bottom of the condenser, and the respondent has not provided any such advantage during the proceedings.

The board concludes, thus, that this construction measurement is a mere choice among equally suitable alternatives for feeding mixed gas to a vertical condenser and is, for this reason, obvious for a person skilled in the art.

7.3 For these reasons, the apparatus according to claim 9 is not inventive over the combination of the closest prior art document D1 and the teaching of documents D2 and D3.

7.4 The respondent argued that the distinguishing features represented a true combination in the sense that they all work together to achieve a synergistic effect on the urea conversion rate. This argument is however rejected for the reasons already explained in point 6.2, above.

7.5 The respondent further argued that D2 related to ammonia stripping technology, which was so remote from the CO2 stripping technology of D1 that the skilled person would not contemplate combining the teaching of

D2 with the closest prior art D1.

The board considers, however, that the physical principle described in D2 that the ejector provides the necessary driving force to recycle the carbamate product back to the reactor independently from gravity forces is not altered by the nature of the gas used in the stripping step.

This argument of the respondent should, therefore, fail.

7.6 The respondent also relied on the time lapsed between the publication of documents D2 and D1, which should discourage the skilled person from combining their teaching.

However, the board does not consider that the skilled person would have disregarded the teaching of D2 only for this reason. Document D2 describes the advantages of using an ejector, which obviously still apply to the more modern technology of document D1.

This argument of the respondent is, therefore, rejected.

7.7 Finally, the respondent explained that the presence of the ejector in the process of the invention was only feasible by using a different (higher) N/C ratio, and this teaching could not be found in any of the processes of the art.

However, the N/C ratio is not a feature of claim 1, and this argument of the respondent must, therefore, also fail.

7.8 Thus, the main request must be refused for lack of inventive step pursuant to Article 56 EPC.

Auxiliary requests I, II and III, admissibility:

8. The auxiliary requests I, II and III were filed at the very last stage of the appeal proceedings, namely at the beginning of the oral proceedings before the board.

The respondent argued that the proprietor should be allowed enough chances to properly defend its patent. The amendments proposed in claim 1 of the auxiliary request I found a basis on paragraph [23] of the patent as granted and said request had been already filed during the opposition proceedings. Independent claim 1 of the auxiliary requests II and III was directed to combinations of the subject-matter of claims as granted. The newly filed requests did not introduce any new issue in terms of added subject-matter or clarity and should not represent a surprise for the appellant.

The purpose of the appeal procedure in *inter partes* proceedings is mainly to give a party being adversely affected the possibility of challenging the decision of the first instance. According to Article 12(2) of the Rules of Procedure of the Boards of Appeal, the statement of grounds of appeal and the reply shall contain a party's complete case. If, at a later stage of the proceedings, the respondent wants other requests to be considered, admission of these requests into the proceedings is a matter of discretion of the board of appeal and not a matter of right of the proprietor of the patent (Article 13(1) of the Rules of Procedure of the Boards of Appeal).

In the present case, the objections which may have prompted the auxiliary requests, namely lack of inventive step over the combination of documents D1, D2 and D3, and the arguments why the appellant considered the patent in suit a mere aggregation of features, had been known to the respondent from the statement of grounds of appeal. Therefore, the filing of these auxiliary requests is not induced by objections, facts or evidence freshly raised.

The board concurs with the appellant that he could not be expected to provide during the oral proceedings sufficient arguments against the subject-matter of these auxiliary requests without a detailed analysis of the state of the art and without the possibility to provide additional evidence.

The respondent also argued that auxiliary request I had been already filed before the opposition division. However, procedural requests or statements made by a party during proceedings in the first instance are not applicable in any subsequent appeal proceedings, and have to be repeated during the latter if they are to remain procedurally effective (see Case Law of the Boards of Appeal, 6th edition 2010, page 822, first paragraph). Auxiliary request I has not been filed with the response to the grounds of appeal, so that its admission into the proceedings remains at the board discretion under Article 13(1) of the Rules of Procedure of the Boards of Appeal.

The board concludes that if the respondent was allowed to file at this late stage of the proceedings these new requests, the appellant could not be expected to deal with it so that the oral proceedings would have to be postponed (Article 13(3) of the Rules of Procedure of

the Boards of Appeal). The board, therefore, uses its discretion under Article 13(1) of the Rules of Procedure of the Boards of Appeal not to admit the auxiliary requests into the proceedings.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar: The Chairman:

C. Rodríguez Rodríguez P. Gryczka

Decision electronically authenticated