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Datasheet for the decision of 31 January 2012

Case Number: T 0380/10 - 3.3.06

Application Number: 00123532.4

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IPC: B01D 3/14, B01D 3/32, C07C 57/05, C07C 57/07, C07C 51/44

Language of the proceedings: EN

Title of invention:
Column treating process and apparatus therefor

Patent Proprietor:
NIPPON SHOKUBAI CO., LTD.

Opponent:
THE DOW CHEMICAL CO.

Headword:
(Meth)acrylic acid column treating process/NIPPON SHOKUBAI

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

Keyword:
"Main request: Art. 56 EPC 1973 met"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0380/10 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 31 January 2012

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 21 January 2010 concerning maintenance of the European patent No. 1097741 in amended form.

Composition of the Board:

Chairman: P.-P. Bracke
Members: E. Bendl
U. Tronser

Summary of Facts and Submissions

I. The appeal lies from the decision of the Opposition Division to maintain the European patent 1 097 741 in amended form.

II. Claim 1, the only independent claim of the set of three claims as maintained, read as follows:

"1. A column treating process included in a production process for (meth)acrylic acid or (meth)acrylic acid ester, which column treating process comprises:
introducing a treating fluid in a treatment column, wherein the treatment column is any one of a distillation column, an absorption column, a stripping column, an extraction column and a collection column, carrying out physical and/or chemical treatment of the treating fluid in the treatment column, taking out a portion of a fluid after the treatment from a column top side, and drawing out a residual fluid that is not taken out from the column top side but is left from a column bottom side,
wherein: with advancing the treatment in the treatment column, the process further comprises performing continuously:
step (a) of drawing out the treating fluid from the column bottom side outside the treatment column,
step (b) of removing solid impurities from the treating fluid drawn out in step (a), wherein step (b) includes removing the solid impurities by filtrating the treating fluid, and
step (c) of returning the treating fluid, from which the solid impurities are removed in step (b), to the treatment column, and

wherein molecular oxygen and a polymerization inhibitor are added to the treating fluid."

III. In the course of the opposition procedure inter alia the following documents were filed:

D1 = US-A-5 872 288
D2 = US-A-3 629 076
D3 = US-A-3 476 656
D4 = CA-A-2 196 913
D5 = PAJ of JP-A-07-053449
D6 = EP-A-0 685 447
D7 = US-A-4 021 310
D10= EP-A-0 620 206.

IV. The Opponent, thereafter referred to as Appellant, filed on 22 February 2010 an appeal against the Opposition Division's decision and paid the appeal fee on the same day. The grounds of appeal were submitted on 23 April 2010. Essentially it was argued that the claimed subject-matter did not involve an inventive step. In order to support the argumentation further documents were cited to exemplify the general knowledge of a person skilled in the field by showing that vinyl compounds including (meth)acrylic acid and styrene possess similar properties.

V. The Proprietor, thereafter referred to as Respondent, disputed the Appellant's arguments, maintained the set of claims cited above as the main request and additionally filed an auxiliary request.

VI. The main arguments of the **Appellant** were as follows:

– Either of D1 or D4 represents the closest state of the art.

– D4-D7,D10 describe the inhibition of polymerization of (meth)acrylic acid compounds; the addition of a polymerization inhibitor and oxygen belongs to routine operation. Therefore, the skilled person would use these compounds in the process of D1.

– Filtering systems are known from D2 and D3. Given the fact that each of D1, D2 and D3 refers to vinyl compounds, the skilled person would combine the teaching of D1 with D2 or D3.

– Therefore, the claimed subject-matter is obvious.

The main arguments of the **Respondent** were as follows:

– D1 is the closest state of the art. In this disclosure the filtration step is carried out prior to column treatment; no polymerization inhibitor and no oxygen are added. Even when combining D1 with D4-D7,D10 no hint to use the claimed filtration system could be found.

– D2 and D3 relate to styrol, the skilled person would not combine their teachings with the one of the patent-in-suit, since the properties of the polymerized styrol are quite different from polymerized (meth)acrylic acid: the polymer

described in D2 and D3 has to be precipitated in order to be ready for filtration.

– Thus, the claimed subject-matter is not derivable from the available state of the art.

VII. The Appellant requested that the decision under appeal be set aside and that the European patent no. 1 097 741 be revoked.

The Respondent requested that the appeal be dismissed or the patent be maintained on the basis of the auxiliary request submitted with the letter dated 30 August 2010.

Reasons for the Decision

According to the problem and solution approach, which is used by the Boards of Appeal of the European Patent Office in order to decide on the question of inventive step, it has to be determined which technical problem the object of a patent objectively solves vis-à-vis the closest prior art document. It also has to be determined whether or not the solution proposed to overcome this problem is obvious in the light of the available prior art disclosures.

1. The object of the patent-in-suit is the provision of a column treating process for (meth)acrylic acid or (meth)acrylic acid ester in which impurities such as precipitates and polymers are effectively removed.

The Appellant cited D1 and D4 as the closest prior art.

D1 relates to a process for removing impurities efficiently from an aqueous methacrylic acid solution.

D4 describes "a process for the continuous preparation of alkyl esters of (meth)acrylic acid which makes possible not only an optimized yield but also milder reaction conditions and thus greatly reduced ether formation, less formation of high boilers, a high space-time yield, an increased flexibility of operation of the plant and also low capital costs owing to a minimized number of equipment items" (D4, page 3, first full paragraph). Although polymerization inhibitors and oxygen are used in the process of D1, the removal of impurities is not described.

Thus, since D1 refers to the same problem as the patent-in-suit, whereas D4 relates to different objectives, D1 is considered to represent the closest state of the art.

2. In D1 a crude (meth)acrylic acid solution was cooled **prior** to the distillation step in order to deposit and remove solid impurities.

3. From paragraphs 16 and 39 of the patent-in-suit it follows, that it is the object of the present invention to provide a column treating method included in a production process for (meth)acrylic acid or (meth)acrylic acid ester enabling to effectively remove solid impurities such as precipitates and polymers contained or produced in a treating fluid and to thereby stably operate the column treatment.

4. Claim 1 of the main request describes the proposed solution for solving the problem.

5. The Appellant did not contest that the problem has been solved over the entire range claimed. The Board shares this view.

In the examples and comparative examples of the patent-in-suit it is shown that omitting the continuous recirculation of fluid obtained by filtration **after** the column treatment leads to inferior results with regard to the removal of solid matter than carrying out this step. Although the wording of the comparative examples of the patent-in-suit leaves room for interpretation on the actual processing conditions, the Appellant neither disputed the effect described nor provided further tests or arguments showing that such an effect cannot be achieved. Thus, it has to be concluded, that the effect shown in the patent-in-suit has been achieved by the process claimed.

Consequently, since the cited step of recirculating the filtered fluid and the effect associated therewith have not been described in D1, the objective problem vis-à-vis D1 is the provision of an improved removal of solid impurities in a (meth)acrylic acid or (meth)acrylic acid ester column treatment process.

6. The remaining question to clarify is, whether it was obvious, when starting from D1, to arrive at the solution claimed.

Claim 1 of the patent-in-suit differs in (a) the use of a polymerisation inhibitor in combination with oxygen

and (b) the continuous removal of solid impurities of a fluid drawn out from the column bottom side of the treatment column and returning the remaining fluid to the column.

Since D1 does not give any hint towards these two differing features, D1 alone does not lead towards the proposed solution.

The Appellant combined the teaching of D1 with any of D2-D7, D10 to demonstrate the obviousness of the proposed solution.

(a) D2

D2 refers to the treatment of styrene. The Appellant argued, that vinyl monomers, no matter whether they are (meth)acrylic acid or styrene, behave in a similar way. The skilled person would therefore apply the teaching of D2 also to (meth)acrylic acid or (meth)acrylic acid esters. This conclusion was countered by the Respondent given the fact that polymerized styrene had to be precipitated according to the teaching of D2 in order to be removed.

In spite of the known and undisputed chemical similarities of members of the group of vinyl monomers, the Board cannot see, that in the specific case the person skilled in the art would combine the teaching of D1 with D2, since D2 exclusively refers to styrene and under the processing conditions described in D2 the polystyrene has to be **precipitated** by the addition of an alcohol to be filtered out, whereas in the

patent-in-suit the aim is to remove already existing **solid** impurities in the fluid, which were formed in the course of the column treatment.

However, even when assuming that D2 would be taken into consideration by the skilled person, the document relates to the distillation of crude styrene and the recovery and recycling of expensive materials such as undistilled styrene and the polymerization inhibitor sulphur. Although the presence of polymerized styrene is described to be undesired, neither the use of oxygen (the styrene column is preferably maintained under vacuum), nor problems caused by the presence of solid impurities in the processing device, like the blocking of tubes, are mentioned in D2.

Thus, the combination of D1 and D2 does not lead towards the claimed subject-matter.

(b) D3

Similar considerations apply to D3, which relates to the distillation of styrene and the recovery of the polymerization inhibitor and the separation of polymeric material by means of a chilled filter.

(c) D4

D4 teaches the continuous formation of (meth)acrylic acid esters. The addition of a polymerization inhibitor and the use of air as co-stabilizer are shown. However, the problems caused by solid impurities are not disclosed in D4, nor is the use of a continuous filtration and recycling step.

Consequently, the skilled person would not have an incentive to combine D1 with D4 to arrive at the claimed subject-matter.

(d) D5-D7, D10

All four documents relate to the inhibition of polymerization of (meth)acrylic acid by means of polymerization inhibitors and oxygen. Neither the problem of removing solid polymer, nor the step of continuously filtering a fluid drawn from the bottom of the treatment column and recycling it to the column, as suggested in the patent-in-suit, are proposed.

The combination of D1 with any of these documents does not lead towards the solution proposed either.

7. Thus, the claimed subject-matter is considered to involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar The Chairman

D. Magliano P.-P. Bracke