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**Datasheet for the decision  
of 25 January 2019**

**Case Number:** T 2180/14 - 3.3.06

**Application Number:** 08777309.9

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**IPC:** C12P7/56, B01D61/02, B01D61/14,  
B01D71/56, C12N15/09

**Language of the proceedings:** EN

**Title of invention:**  
LACTIC ACID PRODUCTION METHOD

**Applicant:**  
Toray Industries, Inc.

**Headword:**  
Lactic acid/TORAY

**Relevant legal provisions:**  
EPC Art. 83, 84

**Keyword:**  
Sufficiency of disclosure - (yes)  
Claims - clarity (yes)

**Decisions cited:**  
T 2001/12

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 2180/14 - 3.3.06

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.06**  
**of 25 January 2019**

**Appellant:** Toray Industries, Inc.  
(Applicant) 1-1, Nihonbashi-Muromachi 2-chome  
Chuo-ku  
Tokyo 103-8666 (JP)

**Representative:** Kador & Partner PartG mbB  
Corneliusstraße 15  
80469 München (DE)

**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 6 June 2014  
refusing European patent application No.  
08777309.9 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman** J.-M. Schwaller  
**Members:** S. Arrojo  
R. Cramer

## Summary of Facts and Submissions

- I. The appeal concerns the decision of the examining division to refuse patent application EP 08 777 309.9 for non-compliance with the requirements of Articles 83 and 84 EPC. Claim 1 of the main request underlying the decision read as follows:

*"A method of producing lactic acid, which is a method of producing lactic acid by separating lactic acid produced in a culture solution by means of microbial fermentation, comprising: a step A of filtering the culture solution through a nano filtration membrane; and a step B of distilling a lactic acid-containing solution obtained in the step A under a pressure ranging from 1 Pa to an atmospheric pressure (inclusive) at a temperature ranging from 25°C to 200°C (inclusive) for distillation of lactic acid to recover lactic acid."*

- II. With its statement of grounds of appeal, the applicant (from now on "the appellant") contested the decision and filed an amended main request and three auxiliary requests.

Claim 1 of the main request reads:

*"A method of producing lactic acid, which is a method of producing lactic acid by separating lactic acid produced in a culture solution by means of microbial fermentation, comprising: a step A of filtering the culture solution through a nano-filtration membrane; and a step B of distilling a lactic acid-containing solution obtained in the step A under a pressure ranging from **10 Pa to 30kPa** (inclusive) at a*

*temperature ranging from 50°C to 180°C (inclusive) for distillation of lactic acid to recover lactic acid."*

- III. The appellant requested to remit the case to the examining division for addressing novelty and inventive step issues, or alternatively to grant a patent on the basis of the claims according to this new main request or, auxiliarily, of one of auxiliary requests 1-3, all filed with the grounds of appeal of 15 October 2014.

### **Reasons for the Decision**

#### 1. Article 84 EPC

The Board has arrived to the conclusion that the subject-matter of claim 1 complies with the requirements of Article 84 EPC for the following reasons.

- 1.1 The subject-matter of claim 1 defines a method of producing lactic acid from a lactic acid solution comprising a nano-filtration step (i.e. step A) followed by a distillation step (i.e. step B), wherein the latter is performed within certain temperature and pressure ranges.

- 1.2 Distillation can be defined as a process of separating components from a liquid mixture by selective boiling and condensation of one or more fractions of that mixture.

By contrast, evaporation entails boiling a mixture to concentrate the less volatile substance in the liquid (i.e. it differs from distillation in that the evaporated fraction is not condensed and recovered).

1.3 For the Board there is no doubt that the feature "distillation of lactic acid to recover lactic acid" in claim 1 clearly and unambiguously refers to a separation step in which a fraction enriched in lactic acid is evaporated and subsequently recovered by condensation in order to separate it from other less volatile substances.

1.4 The examining division argued that the term "distillation" in claim 1 could not refer to the aforementioned well-known separation process, because lactic acid constitutes "the high boiling point component (having a boiling point of 122 °C at 1 bar) compared to the further components of the mixture as water, formic and acetic acid (all having lower boiling points)".

The division continued: "Thus, until these other components are completely removed from the solution, lactic acid is not the "distilled" component in the sense of the definition", and concluded that "the definition is contradictory to the actually occurring process" because "in the absence of any low (sic\*) boiling point components lactic acid is the only remaining volatile component and thus can only be evaporated but not distilled" (\* the division probably meant "high boiling point").

1.5 What the division seems to argue in this paragraph is that there is an inherent contradiction in the definition of a distillation step for the lactic acid, because this substance constitutes the least volatile in the mixture. Therefore, the lactic acid would remain as a liquid residue while the other substances evaporate. In other words, the examining division appears to base its objection pursuant to Article 84

EPC on the idea that claim 1 refers to "distillation" in a situation in which only evaporation (or concentration through evaporation) would be feasible, leaving the reader in doubt as to how this term should be interpreted.

- 1.6 This argumentation cannot be followed because there is nothing in the claim or in the application which permits to conclude that lactic acid is indeed the least volatile substance in the mixture.

The only definition of the solution to be treated in claim 1 is that it is "produced in a culture solution by means of microbial fermentation". Neither this reference nor the additional information in the application allow to exclude the presence of substances with a boiling point higher than that of the lactic acid in the mixture. The Board agrees with the division in that water, formic acid and acetic acid might be present, and that all of these substances are more volatile than lactic acid, but this only leads to the conclusion that these substances would be separated first from the mixture, e.g by distillation.

In fact, the application itself refers to a number of substances which can be present in the lactic acid solution and have a higher boiling point than the lactic acid, such as oligomers of lactic acid or inorganic salts (see paragraph [0004]). While the nano-filtration step is intended to remove the salts in order to reduce oligomerisation, it is clear for the Board that the distillation process in step B represents a way to reduce the concentration of oligomers (see paragraphs [0008] and [0022]) and other residues which were not removed in the nano-filtration step.

1.7 The Board furthermore notes that document US 6489508 B, a family member of the "patent document 1" (JP 2001 506274) cited in the application, discloses the following distillation/purification step of a lactic acid solution obtained from fermentation (see column 4, lines 47-57):

*"4. Purification of the Lactic Acid by Distillation (4)*

*This step is characterized by the demineralized and concentrated lactic acid solution, as produced in steps (1) to (3), being subjected to conditions such that the monomer (and, to a lesser extent, the dimer) of this acid is/are distilled quantitatively and selectively. "Quantitatively" is understood as meaning that the entirety of the distillable fraction is efficiently distilled. "Selectively" is understood as meaning that only the monomer (and to a lesser extent the dimer) of the lactic acid is/are distilled, without entraining impurities or degradation products."*

It is thus clear that separating monomers of lactic acid from the corresponding oligomers and other impurities using distillation is not only technically feasible but also known in the art at least since 1997, the priority date of this document.

1.8 The Board is therefore of the opinion that the meaning of the feature "distillation of lactic acid to recover lactic acid" is clear for a person skilled in the art.

2. Article 83 EPC

The Board further concludes that the invention defined in claim 1 is sufficiently disclosed pursuant to Article 83 EPC for the following reasons.



- 2.1 While sufficiency of disclosure is assessed on the basis of the content of the application as a whole, the "invention" referred to in Article 83 EPC corresponds to the subject-matter of the claims. Consequently, an objection under this Article cannot legitimately be based on lack of information for carrying out a non-claimed technical effect (see for example T 2001/12; Reasons point 3.4).
- 2.2 In the present case, the invention according to claim 1 includes a distillation step to recover lactic acid from a lactic acid solution "under a pressure ranging from 10 Pa to 30 kPa" and a "temperature ranging from 50 °C to 180 °C". The relevant question for assessing compliance with Article 83 EPC is therefore whether the skilled person would be able to perform such a distillation step under the defined conditions or not.
- 2.3 For the Board, it is plausible that the skilled person would be aware of the components of the fermented lactic acid solution. From this starting point, the design of an appropriate distillation step would merely require taking into account well-known data such as the boiling point of the mixture at a given pressure (to determine the working conditions) and the boiling point of the different components (to determine the fraction enriched in lactic acid to be recovered).
- 2.4 The examining division argued that there was not enough information in the examples of the application (as the most detailed available disclosure) to carry out the distillation step. In particular, there would be no reference to the type of distillation being performed, the equipment being used, the exact temperature and pressure of the process, or the target concentration of lactic acid in the distillate and/or residue.

The examining division also considered that, in view of the boiling point of lactic acid, it was not technically possible to perform the distillation step under some of the temperatures and pressures defined in the claim.

- 2.5 The Board is not convinced by these arguments because the type of distillation, the equipment, the exact pressure-temperature conditions and the target concentrations of lactic acid are considered to be relevant for the degree of efficiency of the distillation step rather than for its technical feasibility.
- 2.6 As previously indicated, an invention cannot be considered to be insufficiently disclosed pursuant to Article 83 EPC for lack of information to obtain non-claimed effects, and since in the present case the invention is not restricted to any particular efficiency (e.g. a particular concentration of lactic acid in the distillate and/or residue), the only relevant question is whether or not the information in the application suffices to carry out an appropriate distillation step.
- 2.7 For the Board it is apparent that the information in the application, which includes specific examples with the exact pressure and temperature conditions (see examples 1-4 in paragraphs [0086]-[0088]), is manifestly sufficient to enable the skilled person to carry out an appropriate distillation step under the conditions defined in the claim.
- 2.8 Concerning the technical feasibility of the distillation step within the pressure and temperature ranges defined in the claim, the Board agrees with the

appellant in that the data used by the examining division to support the alleged inconsistencies are wrong. In particular, the division erroneously indicates that the boiling point of lactic acid at atmospheric pressure is 122°C. This value actually corresponds to the boiling point of lactic acid at 15 mm Hg or 2000 Pa (see Wikipedia article for "lactic acid"), whereas the boiling point of this substance at atmospheric pressure is 227.6°C.

2.9 Thus, the different conclusions reached by the division, namely that the boiling point of the water-lactic acid mixture at low pressures would be significantly lower than 122°C and that the upper limit of 200°C defined in claim 1 (currently amended to 180°C) would not be "technically feasible" because it is "far above the technically feasible value of 122°C maximally achievable in the extreme case that only lactic acid is present and distillation is carried out under atmospheric pressure" are manifestly incorrect.

Once the real data are taken into account, the boiling point of the mixture at low pressures can plausibly be higher than 122°C (e.g. with higher contents of lactic acid under pressures above 2000 Pa) and, for the extreme case of pure lactic acid at atmospheric pressure, the mixture could reach temperatures up to 227.6°C.

2.10 Consequently, the Board finds no reason to doubt that the skilled person would be able to perform a distillation of the lactic acid solution within the claimed pressure-temperature ranges of 10 Pa to 30KPa and 50°C to 180°C, this conclusion being further supported by the specific pressure-temperature data

disclosed in examples 1-4 (133 Pa and 130°C) of the application.

3. Preliminary opinion on patentability

3.1 The examining division has not taken any decision concerning patentability but has provided a preliminary opinion on novelty in the form of an "*obiter dictum*".

Thus, while the Board considers that issuing a decision on patentability would deprive the appellant of its right to a first instance decision and would therefore be inappropriate, some preliminary comments will be provided for the convenience of the appellant and the examining division.

3.2 Document D1 (US 2004/033573 A1) discloses subjecting a lactic acid solution to a nano-filtration step (paragraphs [0031]-[0034]), wherein the lactic acid is subsequently concentrated by evaporation or by other known methods such as vapor compression for distilling off formic acid, acetic acid and water (paragraph [0052]).

3.3 As indicated above, a distillation step of a given substance is clearly distinguished from an evaporation step in that, unlike the latter, the former implies a recovery of an evaporated fraction enriched in that substance through condensation.

3.4 The examining division takes the view that D1 inherently discloses a distillation step of lactic acid, because the evaporated substances would be recovered and would include at least a small amount of lactic acid.

3.5 The Board is not convinced that document D1 clearly and unambiguously discloses a distillation step of lactic acid within the claimed pressure and temperature ranges because the only indirect reference to a possible recovery of condensed vapours is the expression "distilled off" in paragraph [0052], mentioned in connection to the "compression evaporator" which would obviously not operate within the low pressure range of 10 Pa to 30 kPa defined in claim 1. It is also not apparent for the Board how a distilled fraction which is not enriched in lactic acid (with respect to the liquid residue) can be regarded as a distillation step of this substance.

3.6 However, the Board is of the preliminary opinion that the differentiating feature of claim 1 with respect to D1 (i.e. the selection of a distillation step for the concentration of lactic acid) constitutes an unpromising approach for complying with the requirements of Article 56 EPC, since paragraph [0052] of this document refers to "other known methods" and, as shown above, it is known in the art to use distillation steps to concentrate/purify lactic acid solutions.

Furthermore, as repeatedly argued by the appellant, the distillation step is regarded as a secondary aspect of the invention, whose main role is to underline the key contribution of the nano-filtration step in reducing salt concentration to prevent oligomerisation in a subsequent heating process "such as distillation" (see paragraphs [0004] and [0022] of the application).

The Board is therefore also of the opinion that the inventive contribution of the application is unlikely

to relate to the details of the distillation and/or evaporation process.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division for further prosecution.

The Registrar:

The Chairman:



D. Magliano

J.-M. Schwaller

Decision electronically authenticated