BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File No.: T 0741/91 - 3.3.1

Application No.: 82 104 427.8

Publication No.: 0 066 205

Classification: C07C 65/11

Title of invention: Process for preparation of 2-hydroxynaphathalene-3-carboxylic acid

# D E C I S I O N
of 22 September 1993

Proprietor of the patent: Kabushiki Kaisha Ueno Seiyaku Oyo Kenkyujo

Opponent: Hoechst Aktiengesellschaft

Headword: BON-3-acid/Ueno

**EPC:** Art. 52, 56, 114(2) EPC

Keyword: "inventive step (confirmed)" - "problem-solution-approach" "comparative test - not expertly worked" "late filed evidence - disregarded" - "feature disclosed in old document disregarded among experts"

## Catchwords

1. *A proper application of the so-called "problem-solution-approach" requires the avoidance of formulating artificial and unrealistic technical problems (following T 0495/91; No. 3.3 of the Reasons).*

2. *All embodiments falling within a process claim have to meet the requirements of patentability set out in Articles 52 to 57 EPC (No. 4.2 of the Reasons).*

3. *To be relevant, it is sufficient for experiments, which aim at establishing that the promised result cannot be obtained over the whole range of a claim that they are carried out according to the Claim and with the normal experience of the man skilled in the art (Nos.4.2 and 4.3 of the Reasons).*

4. *An experiment which was not expertly carried out is not credible and sufficient evidence that a claim comprises embodiments which do not solve the technical problem (No. 4.5 of the Reasons).*

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Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 0741/91 - 3.3.1

**D E C I S I O N**
**of the Technical Board of Appeal 3.3.1**
**of 22 September 1993**

**Appellant:** (Opponent)
Hoechst Aktiengesellschaft, Frankfurt
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**Representative:**
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**Respondent:** (Proprietor of the patent)
Kabushiki Kaisha Ueno Seiyaku Oyo Kenkyujo
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**Representative:**
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**Decision under appeal:**
**Decision of the Opposition Division of the European Patent Office of 6 March 1990, posted 4 July 1991, rejecting the opposition filed against European patent No. 0 066 205 pursuant to Article 102(2) EPC.**

**Composition of the Board:**

**Chairman:** K.J.A. Jahn
**Members:** P.K.H. Krasa
J.A. Stephens-Ofner

## Summary of Facts and Submissions

I. The mention of the grant of the European patent No. 0 66 205 in respect of European patent application No. 82 104 427.8 filed on 19 May 1982, was published on 04 September 1985 (c.f. Bulletin 85/36) on the basis of nine claims, Claim 1 of which read:

"A process for preparing 2-hydroxynaphthalene-3-carboxylic acid, which comprises reacting a mixture being liquid under the reaction conditions and consisting of (1) an alkali-ß-naphtholate, (2) ß-naphthol and (3) a reaction medium with carbon dioxide at a reaction temperature of at least 180°C, characterized by the fact that as alkali-ß-naphtholate there is used potassium-ß-naphtholate, the reaction medium is selected from the group consisting of aliphatic hydrocarbons, alicyclic hydrocarbons, aromatic hydrocarbons and aromatic ethers, and that a carbon dioxide pressure of at least 14.715 bar (gauge) (15 $kg/cm^2$) is used."

II. In a notice of opposition which was duly filed by HOECHST AKTIENGESELLSCHAFT (Opponent and later Appellant) the revocation of the patent, on the grounds of lack of of inventive step was requested.

The opposition was supported by the following documents:

(1) DE-C-423 034
(2) IN-A-91 412
(3) I&EC Process Design and Development **4**[1965], 274 - 280
(4) DE-A-2 132 296
(5) DE-A-2 837 053.

III. The Opposition Division rejected the opposition by its decision of 06 March 1990, posted 04 July 1991.

The Opposition Division held that the process of the patent in suit was novel. Documents (1) and (5) were considered to represent the closest prior art in view of which the technical problem was defined as being the provision of an improved process for manufacturing 2-hydroxynaphthalene-3-carboxylic acid (BON-3-acid) on an industrial scale with increased product yields. The Opposition Division was satisfied that this problem had been credibly solved in view of the examples of the patent in suit and of the Respondent's comparative test results filed on 05 March 1990. The Appellant's repetition of example 1 of the patent in suit, resulting in a very low yield, was disregarded as neither being an exact repetition of the said example 1, nor showing any effort to optimise the process parameters. The Opposition Division, taking into account the extent of the yield increase, acknowledged that the claimed process was inventive, even when it was inclined to believe that a skilled person could have been aware that the claimed combination of process features could possibly lead to a yield improvement.

IV. An appeal was lodged against this decision on 6 September 1991 with the payment of the prescribed fee. In his statement of Grounds of Appeal, filed 13 November 1991, the Appellant argued that it was not justified to disregard the result of his comparative test, as an exact repetition of example 1 of the patent in suit was not required. In his opinion, the discrepancy in the respective yields could be due to different stirring conditions, which, although an important feature, could not contribute to inventive step. Furthermore, he rejected the Opposition Division's position that he should have optimised the process parameters. If the use

of a particular stirrer, such as an turbo-stirrer, were decisive for obtaining the promised yields, this should have been disclosed in the patent in suit. Asked by the Board whether the poor result of his experiment filed on 21 August 1987 should have called for a repetition of the experiments, the Appellant's representative admitted that the result had actually raised his doubts on the correctness of the working method. The Appellant further submitted that it was obvious for a skilled person, faced with the problem of improving the product yields, to increase the carbon dioxide pressure and reaction time, and supported this argument by an experimental report dated 24 August 1993. The beneficial effect of using a further solvent in the reaction known from (1) was also said to have been obvious in view of the disclosure of documents (4) and (5). He concluded that the advantages promised by the patent in suit could not be achieved and even if they could, such advantages were predictable from the state of the art, only their extent could not be foreseen by the skilled person.

V. The Respondent submitted that the remarkably higher yield of the claimed process as compared with the processes disclosed in citations (1) or (5) was achieved by a specific combination of process features which was not obvious to the skilled person, since no hint could be found in the prior art that this combination would result in such an improvement. In particular, the Respondent argued that such an improvement could not be found by carrying out only a few experiments and that the improvements were, surprisingly, found in a well-worked technical field, and, furthermore, that there had been a long felt need for a process for the manufacture of BON-3-acid with an improved yield. All the features of the process according to Claim 1 of the patent in suit contributed to the beneficial result, the use of the potassium salt and the increased carbon dioxide

pressure being the essential changes as compared with the state of the art. The Respondent argued that the skilled person had become used to work solely with the sodium-ß-naphtholate (BON sodium salt) as was demonstrated by the citations (2) to (5), which all were published in the period as from 1965 to 1979. Thus, it would not have been obvious for the skilled person to avail himself of the potassium-ß-naphtholate (BON potassium salt) disclosed only in the very old document (1) from 1925 with an expectation that this could contribute to a higher yield.

While the Respondent was of the opinion that it was not necessary that all the possible embodiments falling within the range of a claim had to be better than the state of the art, he emphasised that for a multi-phase reaction system, as the present one, it would have been self-evident for a skilled person to apply a stirring system as efficient as possible, so as to ensure an intimate mixing of the reaction components, and that the use of a turbo-stirrer to that end was nothing particular in such a situation. The Appellant's failure to apply his common general knowledge and to use a turbo-stirrer when repeating the example 1 of the patent was, therefore, insufficiently competent in the circumstances and could well explain the extra-ordinary low yield that he obtained.

VI. The Appellant requested that the decision under appeal be set aside and that the patent be revoked. The Respondent requested to dismiss the appeal or, alternatively, to maintain the patent in amended form on the basis of claims as submitted during oral proceedings, which took place on 22 September 1993. At the end of the oral proceedings the Chairman announced the Board's decision to dismiss the appeal.

## Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

After examination of the cited prior art, the Board has reached the conclusion that the claimed subject-matter is novel. Since novelty was not disputed, it is not necessary to give detailed reasons for this finding.

3. *The Technical Problem*

3.1 The patent in suit relates to the manufacture of BON-3-acid by reacting a salt of 2-hydroxynaphthalene (BON) with carbon dioxide.

3.2 Such processes for the manufacture of BON-3-acid by carbonation of BON, i.e. according to the Kolbe-Schmitt reaction, are well known in the art as represented by documents (1) to (5). Document (5), which the Board considers as closest prior art, discloses the production of BON-3-acid by reacting a mixture of a BON alkali salt, BON, and light oil or kerosene with carbon dioxide at a pressure of not more than 15 $kg/cm^2$ and at a temperature of at least 180 °C (see claim 1). The yields are, according to the examples, about 40% to 45% (based on BON sodium salt).

3.3 According to the patent in suit, which refers, *inter alia*, to the said document (5), the technical problem to be solved was to improve these yields (page 2, lines 30 to 31 in combination with lines 23 and 24). The Board cannot see any need to rely on a different document for defining the technical problem. This Board has already decided (c.f. decision T 0495/91 of 20 July 1993, not

published in the OJ EPO) that a proper application of the so-called "problem-solution-approach" requires the avoidance of formulating artificial and unrealistic technical problems and that, to this end, the technical problem as defined in the patent in suit should be the basis for evaluation of inventive step, provided that no re-definition is necessary in view of the true state of the art or in the light of an inadequate solution. Applying this principle, the Board refuses to take as its starting point old document (1), firstly, because it is silent as to yields and secondly, and even more importantly, as it seems to be highly artificial and unrealistic to assume that the technical problem which objectively existed at the priority date of the patent in suit (28 May 1981) should be seen to lie in the improvement of the yields of this process (published in 1925), having regard to the comprehensive and more up-to date state of the art that was cited during the opposition proceedings. Therefore, the Board sees the technical problem underlying the patent in suit as being the increase in the yield of the process as set out in document (5).

4. *The Solution*

4.1 This problem is essentially solved by reacting a liquid mixture of BON, BON potassium salt, and a particular reaction medium as defined in Claim 1, with carbon dioxide at a temperature of at least 180 °C and at a pressure of at least 15 $kg/cm^2$.

4.2 According to the examples of the disputed patent, yields of from 70% up to 85.6% BON-3-acid are obtained, based on BON potassium salt used. However, the Appellant submitted the results of an experiment, which, in his opinion, while not being an exact repetition of example 1 of the patent in suit owing to the use of a different

solvent, was in any case an embodiment covered by Claim 1 of the disputed patent, as the particular solvent used met the definition given there. The yields of BON-3-acid obtained according to that experiment were only 23.7% based on the BON potassium salt used (see the appendix to the submission dated 19 August 1987, received 21 August 1987). The first instance did not consider this experiment for the reason that it was not an exact repetition of the example 1 of the patent in suit, and also because there were no efforts to optimise the various process parameters of the claim (see page 8, paragraph 5 of the decision on appeal). In the Board's opinion, the relevance of experiments, which aim at establishing that the promised result cannot be obtained over the whole range of a process claim, does not depend on the exactness of repeating an example of the patent in suit. On the contrary, it is quite sufficient that such experiments are carried out according to the process claim. The reason is that the claims define the subject-matter for which a monopoly right (i.e. the patent) is granted under the EPC, and that, according to Article 52 EPC, it is justified to grant such rights only for new, inventive and industrially applicable subject-matter. Therefore, all embodiments falling within a process claim have to meet the requirements of patentability set out in Articles 52 to 57 EPC.

4.3 Furthermore, to be relevant, such experiments have to be carried out with the normal expertise of the man skilled in the art. The Appellant's experiment of 19 August 1987 did not comply with this latter requirement. This was confirmed by the Appellant's representative. At the oral proceedings, he frankly admitted that the strikingly low yield of 23.7% was surprising even to him, and cast doubt in his mind on the correctness of the mixing method. As soon as the Respondent expressed the idea that the poor results could be explained by insufficient

stirring, the Appellant's representative pressed his client, without success, for a repetition of the experiment with the replacement of the counter-rotating stirrer by a turbo-stirrer, as suggested by the Respondent. The consequence of failing to carry out the experiment to the required standard is that the Appellant has failed to discharge the evidential burden of proof to the degree required to shift that burden to the Respondent's shoulders, requiring him to render plausible that the solution of the underlying problem is attainable throughout the entire claimed range.

4.4 In the present, case the reaction concerned is a multi-phase reaction involving one gaseous reactant and a second reactant forming part of a liquid phase which has, owing to the presence of a solvent, good flowability. It is clear for the skilled person that under such conditions it is important to achieve an intimate contact between the respective phases and that, accordingly, a highly efficient stirring method is required. In view of the surprisingly low yields obtained with a conventional counter-rotating stirrer operating at 600 rpm, in the Board's judgement, the skilled person, when looking for success in carrying out the technical teaching of the patent in suit, would have used other stirring means, such as a turbo-stirrer which, as the Appellant conceded, was a conventional equipment, and should therefore have been applied in his experiment. The fact that the Appellant - as he submitted - performs the Kolbe-Schmitt reaction on industrial scale, however in the melt, using a counter-rotating stirrer, makes it understandable that the experiment was carried out with such an equipment, but this does not alter the fact that the increased flowability of the solvent comprising phase according to the patent in suit, as compared with the flowability of the melt, called for a more intensive stirring method.

4.5 Thus, the Board finds that the Appellant's experiment was not expertly carried out and, for that reason, is not credible and sufficient evidence that the subject-matter of Claim 1 comprises embodiments which do not solve the above defined technical problem. Therefore, on the balance, the Board is satisfied, in view of the examples in the patent in suit disclosing yields for the BON-3-acid of from 70% up to 85.6%, that it is more probable than not that the above technical problem is solved by the claimed process.

4.6 For the sake of completeness, the Board wants to emphasise that this conclusion was drawn without considering the evidence filed by the Respondent on 05 March 1990, i. e. only one day prior to the oral proceedings which took place before the Opposition Division on 06 March 1990. To file evidence at such a late date, which allows the other party only to consider and to respond to it only during the oral proceedings, is not an acceptable conduct by the submitting party and, therefore, the Opposition Division should have disregarded this evidence applying the discretion conferred upon it under Article 114 (2) EPC.

4.7 Moreover, the Appellant's submission, that the stirring means should be a distinct feature of the claim has to be rejected, if such means are indeed essential for successfully carrying out the claimed process. As already explained, the use of a turbo-stirrer follows simply from applying the skilled person's common general knowledge, so that it could not be an inventive feature in this case and is no important feature of the present invention.

5. *Inventive Step*

This leads to the need to decide whether or not the claimed process meets the requirement of inventive step.

5.1 The process as disclosed in document (5) (see No. 3.2, above) is carried out with carbon dioxide pressures of not more than 15 kg/cm$^2$, preferably of from 1 to 10 kg/cm$^2$, most preferred of from 2 to 7 kg/cm$^2$ (page 8, lines 21 to 24), the only BON alkali salt specified in document (5) as starting material being the BON sodium salt (see the examples 1 to 9 on pages 17 to 25). The fact that the pressures applied in this state of the art and and the patent in suit overlap punctually at the value of 15 kg/cm$^2$, loses importance when considering the respective pressure ranges. Thus, document (5) contains no pointer that the combination of a $CO_2$-pressure of at least 15 kg/cm$^2$ with the use of the BON potassium salt as the starting material would result in increased yields of BON-3-acid.

5.2 Document (1) discloses the application of "very high pressure" (page 1, lines 12 to 13) and the possibility to use BON potassium salt as the starting material in the Kolbe-Schmitt reaction (example 2) as an alternative to the use of BON sodium salt (example 1). As this document is silent on the obtainable product yields, and puts both salts on the same footing, the skilled person could not derive any hint from this citation that the selection of the BON potassium salt as the starting material would have any beneficial effect on the BON-3-acid yields, and, thus, does not hold out any prospect for the successful solution of the technical problem addressed in the disputed patent.

5.3 The Appellant argued that it would have been obvious for a skilled person that improved yields could be obtained

by carrying out the process of example 2 of document (1) under a higher $CO_2$ pressure and at increased reaction period. He submitted experimental evidence in support (submission of 24 August 1993). Neither the argument nor the evidence is convincing. First of all, his interpretation of the "very high pressure" as meaning also pressures as high as 45 kg/cm$^2$ (applied in experiments Nos. 4 and 6 of 24 August 1993) is arbitrary and finds no support in this document, which discloses only values of 14 to 21 kg/cm$^2$ (page 2, lines 63 and 85). Thus, in the Board's judgement, the "very high pressure" of document (1) has to be understood as a pressure which is in the order of magnitude of about 14 to 21 kg/cm$^2$. Furthermore, to combine, in view of the existing technical problem, an increased pressure just with the use of BON potassium salt as a starting material (and not with the BON sodium salt) results from knowledge which one could only derive from the patent in suit, and is, in other words, based on hindsight.

5.4 None of the citations (2) to (4), which all relate to the BON-3-acid manufacture via the Kolbe-Schmitt reaction, and which were all published between 1965 and 1972, mentions BON potassium salt but all refer only to BON sodium salt as a starting material for the process in question. This, in the Board's judgement, confirms that the skilled person did not pay much attention to citation (1) and did not consider BON potassium salt as an appropriate starting material for an industrial scale BON-3-acid manufacture, let alone to expect any advantage of its use.

5.5 Thus, the Board concludes that none of the citations (1) to (5), either alone or in combination, would have led the skilled person, faced with the existing technical problem, to the combination of process features of Claim

1. It follows that the subject-matter of Claim 1 involves an inventive step.

5.6 Dependent Claims 2 to 9 relate to particular embodiments of Claim 1 and derive their patentability from that of Claim 1.

**Order**

**For these reasons, it is decided that:**

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier K. Jahn