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File Number: T 540/91 - 3.3.1

Application No.: 82 111 139.0

Publication No.: 0 081 753

Title of invention: Process for selective production of 2-hydroxynaphthalene-6-carboxylic acid

Classification: C07C 65/11

DECISION
of 9 December 1992

Applicant: Kabushiki Kaisha Ueno Seiyaku Oyo Kenkyujo

Opponent: Hoechst Aktiengesellschaft, Frankfurt

Headword: Naphthalenecarboxylic acid/UENO

EPC Articles 54(3) and 114(1)

Keyword: "Novelty (denied) - construction of document, identical technical teaching"



Case Number : T 540/91 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 9 December 1992

Appellant : Hoechst Aktiengesellschaft, Frankfurt
(Opponent) Ressortgruppe Patente, Marken und Lizenzen
W-6230 Frankfurt am Main 80 (DE)

Representative :

Respondent : Kabushiki Kaisha Ueno Seiyaku Oyo Kankyujo
(Proprietor of the patent) 2-31, Koraibashi
Higashi-ku
Osaka-shi
Osaka-fu (JP)

Representative : Diehl, Glaeser, Hiltl & Partner
Patentanwälte
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Decision under appeal : Interlocutory decision of the Opposition Division
of the European Patent Office of 26 February
1991, with written reasons posted on 30 April
1991, concerning maintenance of European patent
No. 0 081 753 in amended form.

Composition of the Board :

Chairman : K.J.A. Jahn
Members : R.W. Andrews
J.C. Saisset

Summary of Facts and Submissions

- I. European patent No. 0 081 735 in respect of European patent application No. 82 111 139.0, which was filed on 2 December 1982, was granted on 6 November 1985 (cf. Bulletin 85/45).

- II. On 6 August 1986 a notice of opposition was filed in which the revocation of the patent was requested on the grounds that its subject-matter extended beyond the content of the application as filed, that its subject-matter lacked novelty and did not involve an inventive step, and of insufficiency. The opposition was supported by the following documents:
 - (1) EP-A-0 053 824 and
 - (2) US-A-4 287 357.

- III. By a decision issued orally on 26 February 1991, with the corresponding interlocutory decision being issued on 30 April 1991, the Opposition Division maintained the patent on the basis of Claims 1 to 3 filed on 19 April 1989.

The Opposition Division held that the subject-matter of the disputed patent did not extend beyond the content of the application and that the disclosure of the invention was sufficient. The Opposition Division also decided that the subject-matter of the amended claims was novel and involved an inventive step.

With respect to inventive step, the Opposition Division considered that the proposed solution to the problem of providing an improved process for the preparation of 2-hydroxynaphthalene-6-carboxylic acid which gives higher yields than those obtained by the process described in

document (2) and which is suitable for large-scale operation was inventive. According to the Opposition Division, the teaching of document (2) would not suggest that the removal of the by-product β -naphthol from the reaction system would increase the yield of the desired product and, certainly, not by such a large amount.

- IV. An appeal was lodged against this decision on 8 July 1991 with payment of the prescribed fee. In the statement of grounds of appeal filed on 9 September 1991 and during the oral proceedings held on 9 December 1992, the Appellant maintained that the disclosure of the patent was insufficient and that its subject-matter did not involve an inventive step.

With respect to insufficiency, the Appellant contended that there was no indication in the disputed patent of what is meant by the expression "proper stirring" or how and by what technical means the β -naphthol formed during the reaction is continuously removed from the reaction system. Since proper (suitable) stirring of the reaction mixture is an essential feature of the invention which is not disclosed in the prior art, a skilled person was not in a position to carry out the process and verify the yields of 2-hydroxy-6-naphthalenecarboxylic acid obtained in the examples of the disputed patent. The explanations put forward by the Respondent during the opposition and appeal proceedings could not remedy this defect.

The Appellant also argued that, since document (2) disclosed that the use of a solvent was advantageous and that a too large an excess of β -naphthol was disadvantageous no matter whether it was present in the starting material or formed during the reaction, it was obvious to continuously remove it from the reaction mixture.

- V. The Respondent contended that the skilled person could design a suitable apparatus which would allow the continuous introduction and withdrawal of material from a reactor under pressure through one outlet without the need for a detailed description in the disputed patent.

Additionally, it would be obvious to the skilled person that one of the aims of the claimed process was to achieve as high a conversion of potassium β -naphtholate to the desired product as possible. The skilled person would also be aware from the description in column 4, lines 12 to 19 of the disputed patent that a further aim was to remove the β -naphthol from the reaction system as quickly as possible. With these two aims in mind it would be self-evident to the skilled person that the residence time in the reactor of the lower phase containing most of the molten potassium β -naphtholate should be long whereas that of the upper phase containing substantially all of β -naphthol dissolved in the reaction medium should be short. Therefore, the skilled person would understand the expression "proper stirring" to mean stirring at such a rate to obtain these two different residence times for the reactant and by-product and achieve a satisfactory conversion of the starting material. Irrespective of the various other parameters involved, it would be a matter of routine for the skilled person to determine the most suitable stirring rate.

With respect to inventive step, the Respondent argued that there was no realisation in document (2) that even small amounts of β -naphthol were disadvantageous, therefore it is surprising that its continuous removal should increase the yields of 2-hydroxy-6-naphthalene-carboxylic acid to such an extent.

- VI. Although the Appellant no longer contended that the claimed subject-matter lacked novelty in the light of the disclosure of document (1), the Board raised this issue on its own motion.
- VII. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the patent be maintained on the basis of Claims 1 to 3 filed during oral proceedings. The only independent claim of this request reads as follows:

"A process for the selective production of 2-hydroxy-naphthalene-6-carboxylic acid, which comprises continuously reacting anhydrous potassium β -naphtholate with carbon dioxide at a reaction temperature in the range of 230 to 350°C and under a carbon dioxide pressure suitable for the reaction temperature and selected within the range 1 to 20 kg/cm² (G), characterised in that the potassium β -naphtholate was obtained by reacting β -naphthol with 1.00 mole per equivalent of the alkaline potassium compound and the by-product β -naphthol is continuously removed out of the reaction system as a solution in the reaction medium in order to avoid an increase in the concentration of the by-product β -naphthol by using a reaction medium having a specific gravity of 0.5 to 1.5 and being capable of dissolving β -naphthol but substantially incapable of dissolving potassium β -naphtholate and by performing the continuous reaction with proper stirring."

- VIII. At the conclusion of the oral proceedings, the Board's decision to revoke the patent was announced.

Reasons for the Decision

1. The appeal is admissible.
2. There are no objections under Article 123 EPC to the present claims. In particular, Claim 1 finds a basis in granted Claim 1 in combination with column 2, lines 59 to 60, the sentence bridging columns 2 and 3 and column 4, lines 12 to 19 of the printed patent specification (cf. also Claim 1 as filed, in combination with the sentences bridging pages 3 and 4 and 5 and 6 and page 4, lines 6 to 8 of the published patent application). Claims 2 and 3 correspond to Claims 2 and 3 as filed and granted.
3. Document (2) discloses a process for the preparation of 2-hydroxynaphthalene-6-carboxylic acid by reacting, optionally in the presence of a reaction medium, such as 1- or 2-isopropyl-naphthalene and kerosene, essentially anhydrous potassium β -naphtholate with carbon dioxide at a temperature in the range of about 255°C to 280°C under a carbon dioxide pressure of 0.4 to 5.3 kg/cm² (G) under agitation until the ratio of 2-hydroxynaphthalene-6-carboxylic acid to 2-hydroxynaphthalene-3-carboxylic acid in the reaction mixture reaches at least 2 (cf. Claim 1 in combination with column 1, lines 62 to 64 and column 2, lines 33 to 42). In the absence of any indication in this document that the process is carried out continuously or that the β -naphthol is continuously removed from the reaction system, the subject-matter of the present claims is novel with respect to the disclosure of this document.
 - 3.1 The contents of document (1), which was published on 16 June 1982 claiming a priority date of 8 December 1980, is considered, pursuant to Article 54(3) and (4) EPC, as

comprised in the state of the art for all designated states.

- 3.2 This document discloses a continuous process for the preparation of 2-hydroxynaphthalene-6-carboxylic acid by reacting substantially anhydrous potassium β -naphtholate with carbon dioxide at a temperature of at least 180°C and a carbon dioxide pressure of at least 1 kg/cm² (G) in the liquid phase (cf. Claim 1, page 6, line 10 to page 7, line 12 and Examples 5 and 6). The necessary liquid phase is said to be obtained by incorporating a small amount of β -naphthol in the potassium β -naphtholate and/or by using a reaction medium having a melting point of not more than 180°C (cf. Claims 1, 2 and 4 and page 2, lines 3 to 23).

According to page 3, lines 11 to 21, aliphatic, alicyclic and aromatic hydrocarbons such as gasoline, kerosene, light oil (gas oil), lubricant oils, white oil, alkylbenzenes, alkyl naphthalenes, diphenyl and diphenylalkanes and aromatic ethers such as diphenyl ether, anisole and ditolyl ether are suitable as the reaction medium. From the similarity between this list and the one in column 2, lines 48 to 56 of the disputed patent it is clear that this prior art document anticipates the use of a reaction medium having a specific gravity of 0.5 to 1.5 which is capable of dissolving β -naphthol but substantially incapable of dissolving potassium β -naphtholate.

- 3.3 The Respondent considered that the requirement that the potassium β -naphtholate starting material did not contain any free β -naphthol served to distinguish the present process from the one described in the earlier document. This consideration was based on the Respondent's view that the statement of invention on page 2, lines 6 to 23 of document (1) should be construed as disclosing that the

presence of β -naphthol in the potassium β -naphtholate was essential in this prior art process irrespective of whether a reaction medium was used or not. In his opinion this construction was supported by the reference on page 4, lines 13 to 17 that the reaction of potassium β -naphtholate with carbon dioxide may be carried out in the presence of not more than 0.1 mole, preferably 0.01 to 0.05 mole per mole of potassium β -naphtholate, of free β -naphthol.

However, the Board cannot accept this interpretation of the disclosure of document (1). In the Board's judgment, the above-mentioned statement of invention has to be construed as disclosing two alternative processes; i.e. one in which the potassium β -naphtholate contains a small amount of free β -naphthol and the other in which a reaction medium is used and, optionally, the potassium β -naphtholate contains β -naphthol. This construction is supported by Claims 1 and 4 since it is clear from Claim 1 that the potassium β -naphtholate can be used by itself provided it is liquid under the reaction conditions and from Claim 4 that it may be used in combination with a reaction medium. Furthermore, in the absence of a lower limit in the passage on page 4, lines 13 to 17, the absence of free β -naphthol in the potassium β -naphtholate cannot be excluded.

3.4 According to page 3, lines 22 to 24 of document (1), the potassium β -naphtholate used as starting material can be prepared in customary manner from β -naphthol and potassium hydroxide. It was not disputed by the Respondent that the skilled person would, as a matter of course, employ equimolar proportions of β -naphthol and potassium hydroxide in this preparation. Therefore, in the Board's judgment, the potassium β -naphtholate used in Examples 5 and 6 of document (1) was obtained by reacting β -naphthol

with 1 mole per equivalent of alkaline potassium compound. Therefore, this feature cannot serve to distinguish the present process from that described in document (1).

3.5 The Respondent saw a further distinguishing feature in that the by-product β -naphthol is continuously removed from the reaction system as a solution in the reaction medium in order to avoid an increase in its concentration. However, as pointed out above, the same reaction media are referred to in both the disputed patent and document (1). In fact, the same reaction medium, light oil is used in example 1 of the disputed patent and examples 5 and 6 of document (1). Therefore, in the continuous process disclosed in document (1), in particular in examples 5 and 6, the β -naphthol formed during the reaction is continuously extracted by the reaction medium and discharged from the reaction system. Thus, this feature fails to distinguish the present process from that disclosed in document (1).

3.6 The only remaining feature relied on by the Respondent to confer novelty on the subject-matter of the present Claim 1 is that the reaction is carried out with proper or suitable stirring.

During the oral proceedings, the Respondent agreed that it was common general knowledge at the effective date of document (1), i.e. its filing date of 4 December 1981, which is earlier than the claimed priority date of the disputed patent, that it is necessary to stir or agitate reaction mixtures involving reactants in two or more different phases if reasonable conversion of the starting materials to the final products is to be achieved within a reasonable time frame. Since it is the established jurisprudence of the Boards of Appeal that common general knowledge at the effective date of a document can be

combined with its disclosure, the Board considers that the actual content of document (2), as it would have been understood by a skilled person on its effective date, has made available to the public a process for the preparation of 2-hydroxynaphthalene-6-carboxylic acid which is carried out continuously with stirring.

Finally, the Respondent contended that the qualification of the word "stirring" by the adjective "proper" imparted novelty to the claimed process. In the Respondent's view "proper stirring" was distinguished from stirring in general by the fact that it had to be at such a rate that the residence time of the β -naphthol in the reactor was short whereas that of the potassium β -naphtholate was long as was clear from the two aims of the process of achieving high conversions of potassium β -naphtholate and of quickly removing β -naphthol from the reaction system.

However, the Board is not convinced that the skilled person reading the disputed patent without the benefit of the Respondent's submissions during the opposition and appeal proceedings would arrive at this principle of two different residence times. On the contrary, since the reaction media are solvents for β -naphthol and non-solvents for potassium β -naphtholate, the skilled person would consider that, irrespective of the stirrer speed, they would dissolve the by-product β -naphthol and that, in a continuous process, this would automatically result in the β -naphthol dissolved in the reaction medium being continuously removed from the reaction system, thereby avoiding an increase in its concentration in the reaction mixture. Thus, the normal stirrer speed chosen by the skilled person in the light of his common general knowledge of reactions involving at least two phases would, in the case of the process of document (1) being carried out continuously in the presence of one of the

reaction medium disclosed in document (1), automatically result in the continuous removal of β -naphthol dissolved in said reaction medium from the reaction system.

Therefore, in the Board's judgment, the functional feature "proper stirring" does not restrict the scope of the present Claim 1 to a process in which the residence times of the β -naphthol and potassium β -naphtholate in the reactor are different from each other. In these circumstances, a skilled person following the teaching of document (1) in the light of his common general knowledge with respect to the need to stir reaction mixtures containing at least two phases would inevitably arrive at a process falling within the terms of the present Claim 1. The subject-matter of the present Claim 1, therefore, lacks novelty.

Order

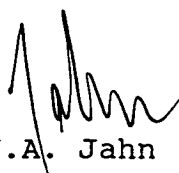
For these reasons, it is decided that:

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

The Registrar:


E. Gorgmayer

The Chairman:


K.J.A. Jahn