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**Datasheet for the decision
of 25 July 2024**

Case Number: T 1602/21 - 3.3.10

Application Number: 13864516.3

Publication Number: 2937328

IPC: C07C29/76, C07C29/80,
C07C31/08, C07C31/10,
C07C31/12, C07C31/20

Language of the proceedings: EN

Title of invention:
ALCOHOL PRODUCTION METHOD

Patent Proprietor:
Toray Industries, Inc.

Opponent:
Cooley (UK) LLP

Headword:

Relevant legal provisions:
EPC Art. 54, 56, 83
RPBA 2020 Art. 13(2)

Keyword:

Sufficiency of disclosure - main request (yes)

Novelty - main request (yes)

Inventive step - main request (yes)

Late-filed evidence - admitted (no)

Decisions cited:

G 0002/21

Catchword:



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Case Number: T 1602/21 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 25 July 2024

Appellant: Cooley (UK) LLP
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Respondent: Toray Industries, Inc.
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
7 July 2021 concerning maintenance of the
European Patent No. 2937328 in amended form.**

Composition of the Board:

Chairwoman R. Pérez Carlón
Members: A. Zellner
T. Bokor

Summary of Facts and Submissions

- I. The opponent lodged an appeal against the decision of the opposition division to maintain the European patent No. 2 937 328 in amended form (Article 101(3) (a) EPC).
- II. The opposition was based on the opposition grounds under Articles 100(a) and 100(b) EPC, for lack of novelty and lack of inventive step (Articles 54 and 56 EPC) and for insufficiency of the disclosure.
- III. In the appealed decision, the opposition division held that the subject-matter of the granted claims was sufficiently clearly and completely disclosed to be carried out by the skilled person (Article 100(b) EPC). The division further concluded that the method for producing an alcohol according to claim 1 of the patent as granted was novel in view of the disclosure of documents D1, D5, D6 and D7 (Article 100(a) and 54 EPC). The provision of the claimed method was, however, found to lack an inventive step when starting from D1 as closest prior art (Article 100(a) and 56 EPC).

Auxiliary request 1 before the opposition division was found to meet the requirements of Rule 80 EPC and Articles 123(2) and (3) EPC, which was not contested by the opponent. The opposition division also came to the conclusion that the request complied with the requirements of Articles 84, 83, 54 and 56 EPC.

The opposition division admitted documents D30, D32 and D33 into the proceedings, but not D34 and D35.

- IV. In its grounds of appeal the appellant argues that the opposition division erred in their decision when

holding the subject-matter of the patent as maintained (auxiliary request 1 in opposition proceedings) to be sufficiently disclosed (Article 83 EPC), and claim 1 to be novel in view of the disclosure of documents D1 and D5 (Article 54 EPC), and to be based on an inventive step (Article 56 EPC). The appellant also submits that the non-admittance of D34 and D35 was erroneous.

V. With its reply to the appellant's statement setting out the grounds of appeal the respondent patent proprietor requests that the appeal be dismissed and that the patent be maintained on the basis of auxiliary request 1, *i.e.* as maintained by the opposition division. Alternatively, the patent be maintained on the basis of auxiliary requests 2 to 13 as filed with the reply on 19 April 2022. They also request not to admit documents D34 to D36 into the proceedings, and not to admit the objections of lack of novelty in view of D1 and D5 against claim 1 as maintained. The appellant furthermore requests that Mr Adkesson and Mr Hebert be allowed to attend oral proceedings as accompanying persons and that Mr Adkesson be allowed to make submissions via videoconference.

VI. The board informed the parties in a communication under Article 15(1) RPBA about its preliminary opinion that the respondent's main request appeared to meet the requirements of Articles 83 and 54 EPC. The board further set out the points to be discussed in the oral proceedings, in particular concerning inventive step.

VII. Claim 1 of the main request has the following wording:

"A method for producing an alcohol, comprising a step of contacting an alcohol solution comprising sugar and/or sugar alcohol as impurities and comprising an

alcohol other than sugar alcohol as a main component, with one kind or a mixture of two or more kinds selected from zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina and alumina, thereby adsorbing and removing the sugar and/or sugar alcohol,

wherein the alcohol other than sugar alcohol is an alcohol having 2 to 6 carbon atoms, and

wherein a concentration of the alcohol other than sugar alcohol in the alcohol solution is 50 weight % or more."

VIII. The following documents are referred to:

- D1: WO 2004/101479 A2
- D3: WO 01/25178 A1
- D5: US 2,504,169
- D6: M Mattisson, et al., The Sorption of Polyalcohols from Aqueous Alcohol by Cation Exchange Resins, Acta Chemica Scandinavica 12 (1958), p. 1395-1404
- D7: H. Rückert, et al., Die Verteilung von Glukose bei Ionenaustauschern auf Harzbasis in Äthylalkohol-Wassergemischen, Acta Chemica Scandinavica 11 (1957), p. 315-323
- D19: Encyclopaedia Britannica "Fuller's earth"
- D20: Encyclopaedia Britannica "Palygorskite"
- D25: Kenji Mori, et al., Quantitative Analysis of Sugars in Plant Extracts by Ion-exchange Chromatography, with Special Reference to the Examination of Conditions for Preparing the Sample Sugar Solutions, Bulletin of the Agricultural Chemical Society of Japan, 23:5, 389-397
- D27: Shiguang Li, et al., Separation of

1,3-propanediol from glycerol and glucose using a ZSM-5 zeolite membrane, Journal of Membrane Science 191 (2001) 53-59

- D30: Experiment Adsorption removal test of glycerol in 1,3-propanediol solution by adsorbent, submitted by the respondent on 6 August 2020
- D32: Experiments for removal of sugar and/or sugar alcohol contained in an aqueous alcohol solution by mixed ion exchange resins, submitted by the respondent on 6 August 2020
- D33: Expert declaration by Mr Adkesson, submitted by the appellant on 16 April 2021
- D36: Response statement by Mr Adkesson, submitted by the appellant on 17 November 2021
- D39: Technical expert declaration by Mr Kurian, submitted by the appellant on 14 September 2023
- D40: Technical expert declaration by Mr Kurian, submitted by the appellant on 14 September 2023
- D41: Declaration of James A. Zahn, submitted by the appellant on 17 July 2024
- D42: US 5,686,276

IX. Oral proceedings were held on 25 July 2024. At the end of the proceedings the decision was announced.

X. The appellant argued essentially as follows:

The main request (patent as maintained by the opposition division) does not disclose the claimed method in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The claimed method is furthermore not novel in view of the disclosure of documents D1 and D3, and is not based on an inventive step in view of documents D1 or D5 as closest prior art.

XI. The respondent argued essentially as follows:

The method as claimed in the main request is sufficiently disclosed. The method is also novel, at least because document D5 does not disclose a method for producing an alcohol wherein the alcohol containing solution is contacted with an OH-type strongly basic ion-exchange resin, and because document D5 does not disclose a method for producing an alcohol at all. The claimed method is also novel with respect to D1. It differs from the method disclosed therein in the nature of the adsorbent used in the purification of the alcohol. Presence of an inventive step has to be acknowledged as well. Document D1 is the closest prior art. The differing feature either leads to an improved process (in case the adsorbent is an OH-type strongly basic ion-exchange resin) or to an alternative process (in case of the other adsorbents of claim 1). Either way, the cited prior art would not lead the skilled person to the claimed solutions.

XII. The final requests are as follows:

The appellant requests that the decision under appeal be set aside, and that the patent be revoked. They further request that auxiliary requests 2 to 13 not be admitted into the proceedings, and that documents D34 to D41 be admitted into the appeal proceedings.

The respondent (patent proprietor) requests that the appeal be dismissed, (main request), and that the patent be maintained as maintained by the opposition division, or on the basis any of auxiliary requests 2 to 13, filed on 19 April 2022 with the reply to the statement setting out the grounds of appeal. They also request that documents D36 and D41 not be admitted into

the proceedings, and that document D42 be admitted if D41 were to be admitted into the appeal proceedings.

Reasons for the Decision

1. The appeal is admissible.

Admittance of documents D41 and D42

2. Document D41 has been submitted, and its admission into the appeal proceedings requested, by the appellant on 17 July 2024 in reply to the board's communication pursuant to Article 15(1) RPBA, after the parties had been notified of the summons to oral proceedings. According to Article 13(2) RPBA, any amendment to a party's appeal case made after notification of a summons to oral proceedings shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.
3. The appellant relied on document D41 in support of the objection of lack of novelty of the method according to claim 1 of the main request. In particular, the appellant intended to demonstrate with document D41, a declaration concerning the content of document D1, that D1 disclosed a composition according to claim 1 of the main request, *i.e.* a composition comprising a sugar and/or sugar alcohol as impurities and comprising an alcohol other than the sugar alcohol as a main component in a concentration of 50 weight % or more. The appellant submitted that document D41 provided evidence that the starting material used in example 1 of document D1 had a glycerol content of only 3.6 g/L, which corresponded to 2,7 weight % and that, consequently, the alcohol content had to be above

50 weight %. The appellant further submitted that document D41 could not have been identified by conventional search strategies, and that repeating the method disclosed in D1 would not have been feasible, since it required a full commercial operation. According to the appellant, these reasons were exceptional circumstances justifying the admittance of the document into the appeal proceedings.

4. The board concludes that in the present case there are no exceptional circumstances which have been justified with cogent reasons by the appellant, and that document D41 is thus not to be taken into account in the appeal proceedings. The reasons are as follows:

4.1 As submitted by the appellant, document D41 is a declaration which is part of the file wrapper of a divisional application from the US national phase entry of document D1. Document D1, however, has already been filed by the appellant at the beginning of the opposition proceedings. The appellant, in the notice of opposition (see pages 6 to 8), referred to D41 in order to support its objection of lack of novelty. In particular, the appellant argued that the feature that the concentration of the alcohol other than sugar alcohol in the alcohol solution is 50 weight % or more was inherently disclosed in D1. This was contested by the respondent (see point 4.4 of the submission of 4 December 2019) and the opposition division indicated, in the annex to the summons to attend oral proceedings (see point 4.3), their preliminary opinion to consider the said feature not to be disclosed in D1. This issue has thus been known to the appellant before the oral proceedings before the opposition division. In addition, the US divisional application referred to in D41, as well as document D41 itself, has been available

to the public several years before the appellant filed its notice of opposition concerning the contested patent. The board also notes that - as submitted by the respondent by reference to document D33 - the appellant has been in contact with one of the inventors of Document D1, *i.e.* Mr Adkesson, at the latest in December 2021. The board is thus not convinced that document D41 could only be retrieved under exceptional circumstances within the meaning of Article 13(2) RPBA.

- 4.2 The board is also not convinced by the appellant's argument that repeating the method disclosed in D1 would not be feasible, because it required a full commercial operation. As mentioned above, document D1, as well as the novelty objection based on it, have been on file since the beginning of the opposition proceedings. The appellant's reasoning does also not support the view that there are exceptional circumstances, because this situation occurs in all processes relating to large-scale, or commercial operations.
5. Therefore the board decided not to admit D41 into the appeal proceedings (Article 13(2) RPBA).
6. Document D42 has been filed by the respondent in reply to the filing of document D41 by the appellant. The respondent requested to admit the document in case document D41 was admitted. Therefore the board decided not to admit D42 into the appeal proceedings either.

Main request (patent as maintained by the opposition division)

Sufficiency of disclosure (Article 83 EPC)

7. In the impugned decision, the opposition division came to the conclusion that the objection based on Article 100(b) EPC did not prejudice the maintenance of the patent as granted, or the patent in amended form based on auxiliary request 1 pending before the opposition division (current main request). According to the division, document D27, invoked by the appellant, did not prove that the claimed method could not be carried out when using a suitable zeolite according to the contested patent, such as ZSM-5. The division found that the concentration of the alcohol to be purified (ethanol) was significantly lower in D27 than in the claimed method (10 wt.% vs. 50 wt.% or more). Furthermore, the division did not consider the appellant's arguments based on D32 to be convincing either, because the claimed method did not require a minimum rate of impurity removal.
8. The appellant contested this conclusion and argued along two lines of attack, as in the opposition proceedings. Both lines relied on the scope of the claim. According to the appellant, many non-functional embodiments were encompassed by the claimed method and the skilled person would know that a very large number of potential combinations (any adsorbent, any alcohol, any sugar/sugar alcohol) would not be functional.
9. Firstly, the appellant argued that the contested patent only disclosed a limited number of examples, in particular for the use of an OH-type strongly basic ion-exchange resin as adsorbent, which was only exemplified by resin SA10AOH. Examples 49, 68, 70 or 71 failed to remove most of the sugar alcohol glycerol from a solution comprising the non-sugar alcohols 1,4-butanediol or 1,3-propanediol. The same held true for the experimental data provided by the respondent during

the opposition proceedings (D32, Test solutions 12, 17 and 18). The appellant argued that in some of these cases the method, even when using the most preferred OH-type strongly basic ion-exchange resin, and even under favourable conditions, where only alcohol and some impurities were present rather than the multitude of compounds present in a fermentation broth, did not succeed, and only led to a very low removal rate. Since the method essentially started from an alcohol and resulted in the same alcohol, with hardly any removal of sugar alcohol impurities, it could not be considered a *"method for producing an alcohol"*.

10. Secondly, the appellant argued, with reference to D3, that not every zeolite is suitable for the separation of any combination of an alcohol and a sugar alcohol. D3 disclosed that H-ZSM-5 zeolite, a representative example of a suitable adsorbent according to the contested patent (paragraph [0017]), was able to adsorb 1,3-propanediol, but not ethanol, and that this zeolite also eluted adsorbed glycerol. This made the zeolite unsuitable for the claimed method. According to the appellant, D3 also disclosed that the properties of the zeolites affected the selectivity in a non-predictable manner, and that not any zeolite would thus be suitable for the claimed method. The appellant submitted that this was in particular shown by example 2 of D3, which disclosed that adsorbed glycerol was eluted from ZSM-5 by a solution comprising 50% ethanol.
11. This reasoning was disputed by the respondent. They argued that the patent in suit disclosed a plurality of working examples in which alcohols were separated from sugars or sugar alcohols. Various different types of zeolites and other adsorbents, as well as different alcohols and sugar alcohols were used in these

examples. The patent furthermore disclosed in paragraphs [0017] and [0018] as well as [0010] to [0013] detailed information on adsorbents and alcohols, sugar alcohols and sugars, respectively. Furthermore, the concentration of the alcohol other than the sugar alcohol had to be more than 50% according to claim 1, which was not the case in the examples of D3, relied upon by the appellant. Document D3 could thus not provide any evidence that the claimed method was not sufficiently disclosed. The respondent also argued that, although several of the examples disclosed in e.g. document D32 showed a low removal rate, claim 1 did not require the removal of a minimum amount of sugar and/or sugar alcohol. It did also not require the production of a high quality alcohol. The contested patent rather aimed at reducing sugar and sugar alcohol conveniently and sufficiently, as disclosed in paragraph [0005]. Furthermore, the observed removal rate was always higher in the numerous examples according to the invention, compared to the corresponding comparative examples. The claimed method thus led to a reduction of impurities. Finally, the respondent argued that the appellant had not provided any experimental data to support the objection.

12. The board comes to the following conclusion:

12.1 Claim 1 of the main request relates to a method for producing an alcohol. The method comprises a step of contacting a solution - comprising an alcohol other than the sugar alcohol as a main component, and sugar and/or sugar alcohol as impurities - with one of, or a mixture of two or more of, zeolite, an OH-type strongly basic ion exchange resin, silica-alumina and alumina, thereby adsorbing and removing sugar and/or sugar alcohol. The alcohol other than the sugar alcohol has 2

to 6 carbon atoms, its concentration in the solution is 50 weight % or more.

12.2 In order carry out the claimed method, a skilled person has to be able to provide a solution comprising sugar and/or a sugar alcohol as impurities, and an alcohol other than a sugar alcohol as a main component at a concentration of 50 weight % or more. The solution has to be contacted with an adsorbent as indicated in the claim. As a result of the method, sugar and/or sugar alcohol has to be removed. The removal of sugar and/or sugar alcohol is a purification step. It is thus a part of the method for producing an alcohol. The claim does not require any minimum level of removal.

12.3 The parties disagreed whether the patent disclosed sufficient information on the nature of the adsorbent to be used, in order to achieve the claimed effect of adsorbing and removing the sugar and/or sugar alcohol, in particular concerning the combination of the adsorbent with the alcohol and the sugar/sugar alcohol.

12.4 The contested patent discloses numerous examples and comparative examples showing that the proportion of sugar and/or sugar alcohol in solutions of different C2-C6 alcohols can be reduced by various adsorbents according to claim 1 of the main request (removal rate between 11 and 99 %), whereas only a lower removal rate (maximum 5 %) was achieved when other adsorbents were used (see the tables 1 and 2, examples 1 to 72 and comparative examples 1 to 12). Even if, as argued by the appellant, there are examples according to claim 1 which lead to a removal rate slightly over 10 % (see the examples 49 or 68 to 71), all of these examples still show that sugar and/or sugar alcohol can be removed as a result of contacting the alcohol solution

comprising these compounds with an adsorbent according to claim 1. The patent itself thus provides examples showing that the effect according to claim 1 can be achieved by the claimed method.

- 12.5 The same conclusion can be drawn from the disclosure of document D32. According to this document, removal of glucose and glycerol from a solution containing 85 % alcohol (and thus more than 50 %, as required by claim 1) has been achieved by adsorption on a strong OH-type strongly basic exchange resin (DIAION SA10AOH) (see Test solutions 2, 5, 8, 11, 14 and 17).
- 12.6 The appellant also referred to example 2 of D3 and argued that this example showed that it was not possible to purify ethanol from an ethanol/glycerol solution by using a zeolite to adsorb the glycerol. Accordingly, the claimed method would not lead to a reduction of sugar and/or sugar alcohol.
- 12.7 This argument is not convincing. According to example 2 of D3, a column packed with H-ZSM-5 zeolite was contacted with a broth comprising 1,3-propanediol, glycerol and other components. The column was then eluted with mixtures of ethanol/water in various ratios. The example shows that glycerol and 1,3-propanediol, initially loaded on the H-ZSM-5 zeolite column, can subsequently be eluted by an ethanol-water mixture. The ratio of ethanol to water has an influence on the elution of glycerol and 1,3-propanediol - a higher ethanol ratio elutes more 1,3-propanediol and less glycerol. The example does not show, however, that sugar and/or sugar alcohol impurities cannot be adsorbed on a H-ZSM-5 zeolite column and removed from a solution comprising 50 weight % or more of an alcohol having 2 to 6 carbon atoms. In particular, the ethanol/

water solution used in example 2 of D3 for eluting the column is different from a solution comprising a sugar and/or sugar alcohol and a non sugar alcohol having 2 to 6 carbon atoms. This example can thus not support the appellant's objection.

- 12.8 The board concludes that the arguments brought forward by the appellant do not support the objection of lack of sufficiency of disclosure, and that the main request meets the requirements of Article 83 EPC.

Novelty (Article 54 EPC)

13. The opposition division acknowledged novelty of the method according to claim 1 in view of the disclosure of documents D1 and D5. They considered that D1 neither disclosed that *"... a concentration of the alcohol other than sugar alcohol in the alcohol solution is 50 weight % or more"* (last paragraph of point 4.2 of the impugned decision), nor a method which comprised *"... a step of contacting an alcohol solution (...) with one kind or a mixture of two or more kinds selected from zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina and alumina ..."* (paragraph 2 on page 13 of the impugned decision). The opposition division also came to the conclusion that document D5 did not disclose a method *"... for producing an alcohol"* (page 9, paragraph 3 of the decision).

14. The appellant contested these findings and argued that document D1 disclosed in step (f) of claim 19 and on page 4, lines 20 to 33 of the description a method according to claim 1 of the main request. According to the appellant, the concentration of 1,3-propanediol (PDO), which was an alcohol other than a sugar alcohol, in the solution was over 70 weight % and thus "50

weight % or more". The appellant argued that calculations based on the contents of solids, water, PDO and others, and the changes thereof, at various points of the process of D1 inevitably led to this conclusion. The appellant elaborated that the eight upstream purification steps performed before step (f) inevitably led to an alcohol concentration in the solution which entered step (f) of over 50 weight %. The appellant considered this finding to be confirmed by the declarations D33, D36 and D39, as well as the submissions of Mr Adkesson during the oral proceedings before the board.

15. The appellant also submitted that claim 1 of the main request was not limited to a method wherein the alcohol solution was contacted with a zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina, alumina or a mixture thereof only, but also encompassed a method wherein the solution was contacted with a mixed ion exchange column, such as disclosed in D1, in particular on pages 14 and 15 as well as in example 7 thereof. According to the appellant, such a mixed bed column was clearly encompassed by the feature "*... comprising a step of contacting an alcohol solution (...) with one kind or a mixture of two or more kinds selected from zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina and alumina ...*" of claim 1. In addition, the appellant submitted, by reference to document D40, that document D1 also disclosed the use of an OH-type strongly basic ion-exchange resin, rather than the resin in its corresponding Cl-form.

16. The appellant furthermore submitted that the claimed method was not novel in view of the disclosure of example I of document D5, since the feature referred to

by the opposition division as a differing feature was also disclosed therein.

17. The respondent counter-argued that D1 did not disclose the features referred to by the appellant. The respondent in particular considered the appellant's calculations of the amount of 1,3-PDO in the composition obtained after step (e) / Example #6 of D1 (over 70 weight % according to the appellant) to be erroneous, alone due to the presence of other impurities, such as glycerol. The respondent argued that neither D1 itself (including the appellant's calculations), nor the declarations D33 and D36, or the submission of Mr Adkesson at the oral proceedings before the board supported the appellant's objection.

18. The respondent also argued that document D5 did not disclose a *"method for producing an alcohol"*.

19. The board comes to the following conclusions:

Document D1

20. The parties disagreed whether document D1 discloses the feature *"... wherein a concentration of the alcohol other than sugar alcohol in the alcohol solution is 50 weight % or more."* The parties also disagreed whether the feature *"... comprising a step of contacting an alcohol solution (...) with one kind or a mixture of two or more kinds selected from zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina and alumina, thereby adsorbing and removing ..."* is disclosed in D1. The parties in particular disagreed whether the wording of claim 1 encompasses a method wherein the solution comprising an alcohol and a sugar/ sugar alcohol is contacted with an ion exchange resin

comprising an OH-type strongly basic ion-exchange resin in combination with a further resin. The parties furthermore disagreed whether the ion exchange resin as disclosed in document D1 is in the OH-form.

21. The board observes the following:

According to claim 1 of the main request, the claimed method requires that the solution comprising sugar and/or sugar alcohol and comprising an alcohol other than sugar alcohol as a main component is contacted with at least one adsorbent "*... selected from zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina and alumina, ...*" or mixtures thereof. It is thus required that contacting happens with adsorbents of specific types.

22. Document D1 does not disclose the use of an OH-type strongly basic ion-exchange resin but a mixed-bed resin. On page 14, line 5 to page 15, line 3, as well as in example 7 (see page 32, lines 18 to 20) D1 discloses a mixed base ion exchange resin which comprises a mixture of resins, one of them being a strong base anion resin (see also claim 19, in particular step f) of D1). This resin is however not an adsorbent in claim 1. Even if claim 1 does not exclude other adsorbents, it requires contacting a feed with a specific type of resin. The board holds that a skilled person would not consider a mixed ion resin to be an OH-type strongly basic ion exchange resin.

23. The method according to claim 1 of the main request is, for that reason alone, novel in view of the disclosure of document D1.

Document D5

24. Example I of document D5 discloses the purification of cane molasses. The method comprises addition of absolute ethanol to the molasses (column 3, line 70) in order to form a suspension. This suspension is subsequently loaded on a column and then eluted with 95% ethanol. Even when accepting, as submitted by the appellant, that the method leads to a separation of ethanol and sugar, the initial absolute ethanol used in the process is not part of an alcohol solution comprising sugar/sugar alcohol and an alcohol other than sugar alcohol as main component, but it is used as solvent. The resulting alcohol contains more impurities than the alcohol at the beginning of the process. This method can thus hardly be considered as a method for producing an alcohol. The method according to claim 1 of the main request is therefore novel over D5.
25. In summary, the board comes to the conclusion that the main request meets the requirements of Article 54 EPC.

Inventive step (Article 56 EPC)

26. The opposition division came to the conclusion that the provision of a method according to claim 1 of the patent as maintained involved an inventive step.

Document D1 was considered to be closest prior art. A differing feature was seen in that the concentration of the alcohol was at least 50 weight %. A second differing feature was seen in the nature of adsorbent, *i.e.* an OH-type basic ion-exchange resin (alternative "a" in the impugned decision) or an adsorbent selected from zeolite, silica-alumina, and alumina (alternative "b" in the impugned decision), or mixtures thereof. The

division found that both alternatives were inventive.

In the case of alternative "a", a surprising technical effect based on the disclosure of documents D30 and D32 was acknowledged. The technical problem was seen in the provision of a method with improved removal of sugar and/or sugar alcohol impurity from an alcohol other than sugar alcohol. Since D1 did not suggest the use of an OH-type basic ion-exchange resin in order to provide an improved method, and since the skilled person would not consider D5, D6 or D7, presence of an inventive step was acknowledged.

In the case of alternative "b", and in the absence of a particular technical effect, the technical problem was seen in the provision of an alternative method for removing sugar and/or sugar alcohol impurity from an alcohol other than sugar. Inventive step was acknowledged even when considering the additional technical teaching of document D3. According to the opposition division, the skilled person would not consider the technical teaching of documents D5 to D7.

27. The appellant contested the division's findings.

Concerning alternative "a", the appellant argued that document D1 itself already suggested to remove as many impurities as possible before the mixed-bed ion exchange step. The alcohol concentration would consequently increase, and the alleged differing feature of at least 50 weight % alcohol concentration was rendered obvious. The appellant also submitted that the skilled person would consider D6 in order to solve the technical problem, which suggested to decrease the water content in the solvent in order to increase glycerol uptake. The appellant further argued, by

reference to G 2/21, that document D32 should not be considered for the purposes of inventive step, since it was published after the filing date of the contested patent, and since the technical effect allegedly shown therein was not mentioned in the patent. The technical effect could thus not be relied upon, and the technical problem could only be seen in the provision of an alternative, which had been solved in an obvious manner. According to the appellant, the differing features as identified by the opposition division were not connected and had to be dealt with separately.

Concerning alternative "b", the appellant submitted that document D5 was the closest prior art. According to the appellant, all technical features of claim 1 as maintained were disclosed in D5. Even if the technical problem was the provision of a method for purifying alcohol rather than sugar, the suggested solution was obvious, because D5 suggested the separation of sugar and alcohol by the use of Fuller's earth clay, which was a mixture of silica-alumina and a zeolite, and thus an adsorbent according to claim 1 of the main request.

28. The respondent essentially concurred with the conclusions of the opposition division.

Concerning alternative "a", the respondent emphasised by reference to documents D30 and D32 (in particular Test solutions 14 and 15, as well as 17 and 18 of D32), and examples 34 to 38 of the contested patent, that a significant increase in removal rate could only be obtained when the alcohol concentration was at least 50 weight % and an OH-type strongly basic ion-exchange resin was used as the adsorbent.

The respondent submitted that the advantages when using

an OH-type strongly basic ion-exchange resin were already disclosed in the patent as filed, and thus the experimental evidence according to document D32 was to be taken into consideration. The respondent further argued that document D6 did not relate to the purification of biologically produced alcohol, since it made use of substantially pure alcohol as solvent and/or effluent, and that the skilled person would consequently not consider the document in combination with the closest prior art D1.

Concerning alternative "b", the respondent emphasised that D1, rather than D5 as suggested by the appellant, was the closest prior art. When starting from the disclosure of D1, the respondent relied on the arguments and findings of the opposition division.

29. The board comes to the following conclusions:

The contested patent

30. The contested patent relates to a method for producing an alcohol by separating an alcohol that is the main component in an alcohol solution, from sugar and/or sugar alcohol that are impurities (see paragraph [0001]). Problems mentioned in the patent comprise the decrease in yield and quality when alcohol is produced by a fermentation process and purified by distillation due to the presence of sugar and sugar alcohol in the fermentation broth (see paragraph [0003], lines 31 to 26 and paragraph [0016]). In order to overcome these problems, the patent aims at providing a technique of efficiently recovering high quality alcohol while reducing impurities such as sugar and sugar alcohol contained in an alcohol solution (see paragraph [0003], lines 53 to 54). According to claim 1 of the main

request, the patent provides a method which comprises contacting an alcohol solution comprising sugar and/or sugar alcohol as impurities and comprising an alcohol other than sugar alcohol as a main component, with one kind or a mixture of two or more kinds selected from zeolite, an OH-type strongly basic ion-exchange resin, silica-alumina and alumina, thereby adsorbing and removing the sugar and/or sugar alcohol.

The closest prior art

31. Document D1 is the closest prior art. It relates to the purification of biologically produced 1,3-propanediol (see page 1, lines 5 to 9). Even if, as submitted by the appellant, D5 may have more features in common with claim 1, the document relates to a process for the purification of sugars. It thus focuses on the production of sugars rather than alcohol (see column 1, lines 1 to 7).

The differing feature

32. The parties disagreed as to the differing features between the method according to claim 1 and the disclosure of document D1. As outlined above (see point 21. of this decision), document D1 does not disclose the use of an OH-type strongly basic ion-exchange resin but a mixed bed ion exchange resin (see page 14, line 5 to page 15, line 3 and example 7 on page 32, lines 17 to 20). D1 is also silent on the other adsorbents according to claim 1 of the main request. The differing feature is thus at least the nature of the adsorbent.

The technical problems

33. The patent discloses in paragraphs [0016] to [0018] that sugar impurities are removed from the alcohol solution in that they are adsorbed in an adsorbent. According to paragraph [0018] (see page 4, line 57 to page 5, line 1), the use of an OH-type strongly basic ion-exchange resin is particularly preferred. Also, claim 7 of the patent as granted (corresponding to claim 9 of the application as filed) is directed to a strongly basic ion-exchange resin. Furthermore, the contested patent discloses, in particular in examples 3, 6, 9, 12 and 18 to 27 of Table 1, that the use of the OH-type strongly basic ion-exchange resin SA10A0H leads to a particularly good removal rate. Thus, the patent itself discloses that the use of an OH-type strongly basic ion-exchange resin as a particular type of adsorbent is preferred in the method of the invention. Since the invention aims at reducing sugar and/or sugar alcohol contents, the patent clearly links the use of the specific type of adsorbent with the removal of sugar and/or sugar alcohol.
34. The appellant argued that document D32 could not be relied upon, because the technical effect shown therein was not mentioned in the contested patent as filed.
35. This argument is not convincing. The application as filed discloses that the use of an OH-type strongly basic ion-exchange resin leads to improved removal of sugar or sugar alcohol (see paragraphs [0016] to [0018], claim 9 and examples 3, 6, 9, 12 and 18 to 27 of Table 1). Document D32 discloses experimental data showing a link between the use of an OH-type strongly basic ion-exchange resin and the effect of improved removal of sugar or sugar alcohol. Since the effect is derivable from the application as filed, the respondent may rely upon it for inventive step, even if document

D32 has been filed after the filing date of the contested patent (see G 2/21, headnote II).

36. The board observes that the condition stated by G 2/21 that "*the skilled person ... based on the application as originally filed, would derive said effect as being encompassed by the technical teaching*" (Board's emphasis) is not equivalent to the "gold standard" disclosure required normally for Article 123(2) EPC. It is sufficient that the skilled person is satisfied that the advantageous technical effect is indeed achieved by the claimed solution, on the basis of the teaching of the application, and once the technical effect has been brought to its attention, possibly from another source as the application. It is not required that the technical effect relied on is also disclosed so explicitly and clearly that the skilled person would recognise it only on the basis of the application and without knowing the later evidence.
37. Document D32 shows that the use of the OH-type strongly basic ion-exchange resin SA10AOH leads to better removal rates than the use of a mixed ion exchange resin, which comprises, in addition to the the OH-type strongly basic ion-exchange resin SA10AOH also the strong ion exchange resin SK1BH (see in particular the examples Test solutions 11, 14 and 17 compared to Test solutions 12, 15 and 18). Document D32 thus demonstrates that the use of an OH-type strongly basic ion-exchange resin leads to better results than the use of a mixed ion exchange resin, such as disclosed in document D1. The removal rate of the OH-type strongly basic ion-exchange resin is higher.
38. The board also notes, however, that no particular technical effect has been shown for the other claimed

adsorbents. This was not contested by the respondent.

39. The technical problem is thus the provision of an improved (OH-type strongly basic ion-exchange resin) - or alternative (the other adsorbents) - method for producing an alcohol.

The solutions provided

40. In order to solve these problems, a method according to claim 1 is provided, wherein a solution containing sugar and/or sugar alcohol and an alcohol having 2 to 6 carbon atoms other than sugar alcohol in at least 50 weight % of the solution is contacted with the adsorbents according to claim 1, thereby adsorbing and removing the sugar and/or sugar alcohol.

41. The board is satisfied that the claimed method solves the technical problems stated above.

Inventiveness of the claimed solutions

42. Document D1 does not suggest to use an OH-type strongly basic ion-exchange resin in order to improve the removal rate of sugar and/or sugar alcohol from the solution purified in example 7. The document discloses that a mixed bed polish (CACA configuration) is clearly favoured in the ion exchange purification step (see page 12, lines 10 to 16 and claim 13). It does not suggest an OH-type strongly basic ion-exchange resin, let alone in order to improve the removal rate of sugar and/or sugar alcohol.
43. The appellant submitted, by reference to document D25, that OH-type strongly basic ion-exchange resins were known for strongly retaining glucose. The skilled

person would thus replace the resin used in example 7 of D1 by a OH-type strongly basic ion-exchange resin.

44. This argument is not convincing. The closest prior art clearly states that the mixed bed resin provide the best results (see page 14, lines 9 to 17). The skilled person would thus not - in order to solve the technical problem of providing an improved process - use an OH-type strongly basic ion-exchange resin, either as such or in combination with the other adsorbents according to claim 1 of the main request.
45. The claimed solution to the technical problem of providing an improved method for producing an alcohol, *i.e.* contacting an alcohol solution according to claim 1 of the main request with an OH-type strongly basic ion-exchange resin, thereby adsorbing and removing sugar and/or sugar alcohol from the solution, is thus found to involve an inventive step (Article 56 EPC).
46. Document D1 does also not suggest to use a zeolite, silica-alumina or alumina as an alternative to, or in addition to, the mixed bed ion-exchange resin disclosed in example 7. The document itself does therefore not provide the skilled person with the teaching to solve the problem of providing an alternative method for producing an alcohol by contacting the solution comprising an alcohol and sugar and/or sugar alcohol with one kind or a mixture of two or more kinds selected from zeolite, silica-alumina or alumina, for adsorbing and removing the sugar and/or sugar alcohol.
47. The appellant, by reference to document D5, argued that the skilled person would, in order to avoid the presence of colour forming compounds before a distillation step as disclosed in document D1, remove

sugars from the alcohol solution. The skilled person would thus turn to document D5. This document disclosed clay as adsorbent for removing sugar, which was - according to documents D19 and D20 - a mixture of silica-alumina and a zeolite. In order to solve the technical problem of providing an alternative method for producing an alcohol, a skilled person would thus make use of a mixture of silica-alumina and a zeolite and adapt the method of document D1, example 7 accordingly. The solution provided was thus obvious.

48. This argument is not convincing. Document D5 does not relate to the purification of alcohols. It discloses the recovery of sucrose from molasses (see column 1, lines 7 to 9), in particular the purification of sugars from cane molasses by using absolute ethanol (see example I). The skilled person looking for an alternative to the method for producing an alcohol as disclosed in example 7 of document D1 would not consult document D5. The use of one kind or a mixture of two or more kinds selected from zeolite, silica-alumina or alumina, in the method of example 7 of D1 in order to provide an alternative is thus not obvious for a skilled person.
49. The solution to the problem of providing an alternative method for producing an alcohol, *i.e.* contacting an alcohol solution according to claim 1 of the main request with a zeolite, silica-alumina and alumina, thereby adsorbing and removing sugar and/or sugar alcohol from the solution is thus also based on an inventive step in the sense of Article 56 EPC.
50. The main request does, for these reasons, meet the requirements of Article 56 EPC.

51. In summary, the board concludes that the appellant's reasons do not prejudice the maintenance of the patent as maintained by the opposition division. There is thus no need to consider any of the auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



C. Rodríguez Rodríguez

R. Pérez Carlón

Decision electronically authenticated