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**Datasheet for the decision
of 6 May 2019**

Case Number: T 0695/17 - 3.3.05

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Language of the proceedings: EN

Title of invention:
USE OF METHANOL IN THE PRODUCTION OF HYDROGEN AND FUEL,
PROCESSES AND PLANTS FOR THE PRODUCTION OF HYDROGEN AND FUEL

Patent Proprietor:
UPM-Kymmene Oyj

Opponent:
Neste Oyj

Headword:
Methanol for hydrogen and fuel production/UPM

Relevant legal provisions:

RPBA Art. 12(4)

EPC Art. 56

Keyword:

Late-filed evidence - admitted (no)

Inventive step - main and first auxiliary requests (no) -
second auxiliary request (yes)

Decisions cited:

G 0002/88, T 1292/09, T 0971/11, T 0169/12, R 0010/09

Catchword:



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Case Number: T 0695/17 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 6 May 2019

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
20 January 2017 concerning maintenance of the
European Patent No. 2229339 in amended form.**

Composition of the Board:

Chairman E. Bendl
Members: G. Glod
R. Winkelhofer

Summary of Facts and Submissions

I. The appeal of the opponent (appellant) lies from the decision of the opposition division finding that the main request of amended patent EP-B-2 229 339 met the requirements of the EPC. The following documents, among others, were cited in the impugned decision:

D2: Cortright R.D. et al., *Nature*, vol. 418, 29 August 2002 (2002-08-29), pages 964-967, XP002388667, ISSN: 0028-0836

D4: Davda R.R. et al., *Applied Catalysis B: Environmental* 56 (2005), pages 171-186

D5: US 5 718 810 A

D8: CA 1 088 957 A

D10: Wikipedia page "Fischer-Tropsch process" 8.11.2007

D12a:Fr 2 904 830

D14: *Papermaking Science and Technology*, Book 6B, Chemical Pulping, pages B37-B93 (1999)

II. Independent claims 1, 10 and 14 of the request found allowable by the opposition division are as follows:

"1. Use of black liquor for the production of biohydrogen wherein biomethanol is recovered from said black liquor and purified, and said biohydrogen is produced from said purified biomethanol."

"10. A process for producing hydrocarbon biofuel, characterized in that
a) crude biomethanol is recovered from black liquor, purified and reformed to provide biohydrogen and purified biohydrogen is recovered according to the process of claim 6;
b) a biohydrocarbon stream is produced by a process selected from a Fischer-Tropsch reaction of syngas

produced from biomass, a hydrodeoxygenation of biological triglycerides or fatty acids and combinations thereof, wherein

c) said biohydrocarbon stream production of step b) includes at least one process step selected from adjusting the hydrogen to carbon monoxide ratio of syngas, cracking/isomerization of Fischer-Tropsch paraffins, hydrodeoxygenation of said biological triglycerides or fatty acids, hydroisomerization of n-paraffins, and reduction of catalysts; and
d) said purified biohydrogen recovered in step a) is used as a hydrogen source in at least one of the process steps defined in step c) and the biohydrocarbon stream produced is separated into fractions and biofuel is recovered from at least one of said fractions."

"14. A biofuel production facility, characterized in that it comprises

- a Kraft pulp mill (19), which provides black liquor;*
- a recovery unit (12) for recovering of crude biomethanol from said black liquor;*
- a methanol purification unit (13) for purification of said crude biomethanol to produce purified biomethanol;*
- a reforming unit (7) for reforming of said purified biomethanol to produce a gas mixture containing biohydrogen;*
- a hydrogen purification unit (8) for purification of said gas mixture to provide purified biohydrogen; and*
- a biofuel production plant (20), which produces biohydrocarbon based biofuel from said biohydrogen and from biomass."*

III. With the statement of grounds, the appellant filed, *inter alia*, the following documents cited in the present decision:

- D19: T.A. Milne et al. (2002), A Report for the International Energy Agency Agreement on the Production and Utilization of Hydrogen, IEA/H2/TR-02/001, 2002, National Renewable Energy Laboratory
- D20: M. Towers al., Pulp & Paper Canada 108(6), June 2007, T109-112

IV. With its reply of 27 September 2017, the respondent (patent proprietor) submitted 13 auxiliary requests.

Claim 1 of the first auxiliary request is as follows:

"1. Use of black liquor for the production of hydrocarbon biofuel wherein biomethanol is recovered from said black liquor and purified, biohydrogen is produced from said purified biomethanol, and said biohydrogen is used for producing hydrocarbon biofuel."

Claim 1 of the second auxiliary request corresponds to claim 10 of the main requests except that the wording "*according to the process of claim 6*" is deleted. Claim 5 of the second auxiliary request corresponds to claim 14 of the main request. Dependent claims 2 to 4 and 6 to 9 of the second auxiliary request relate to preferred embodiments.

V. In its communication under Article 15(1) RPBA, the board was of the preliminary opinion that the second auxiliary request was allowable.

VI. Oral proceedings took place on 6 May 2019, during which the appellant withdrew its objection under Article 83 EPC, raised with the grounds of appeal. It was also clarified that the comments in the grounds of appeal concerning the reasoning with respect to D4 in the

impugned decision was not to be understood as an objection of procedural violation.

VII. The appellant's (opponent's) arguments relevant to the present decision can be summarised as follows:

D14, D19 and D20 could be seen as a reaction to the impugned decision that for the first time contained the opposition division's complete reasoning. D14 represented common general knowledge that was not considered by the opposition division for the question of inventive step but only in the context of sufficiency of disclosure. D19 and D20 were only submitted to back up the arguments already presented before the opposition division. They were also a reaction to the auxiliary requests submitted shortly before the oral proceedings before the opposition division. D19 and D20 did not lead to a fresh case but were only intended to fill the gaps. There was case law that admitted documents at this stage of the proceedings since the losing party should be allowed to reinforce its line of attack.

The subject-matter of claim 1 of the main request did not meet the requirements of Article 123(3) EPC.

D4 was closest prior art for the subject-matter of claim 1 of the main request. D4 clearly taught that biomethanol could be efficiently reformed to hydrogen. The skilled person seeking to find an alternative source for methanol would have realised from D5 or D8 that methanol could be obtained from black liquor and would have used it for the production of hydrogen, thereby arriving at the claimed subject-matter. This applied also to the first auxiliary request since D4 also referred to fuel.

D12a was closest prior art for the subject-matter of claim 10 of the main request since it related to the production of a hydrocarbon fuel from biomass. A light fraction that was obtained by a pretreatment of the initial feedstock was used as a feedstock of the vapor-reforming unit. The synthesis gas obtained from it was used to adjust the hydrogen to carbon monoxide ratio of a synthesis gas obtained from wood. The feedstock of the vapor-reforming unit could be obtained by pyrolysis of a ligno-cellulosic biomass feedstock. The light feedstock could also comprise natural gas. It was known from D10 that the patent proprietor planned to produce biodiesel and that biomass gasification and Fischer-Tropsch synthesis were promising routes for producing renewable or "green" transportation fuels. The skilled person looking for environmentally friendly alternative feeds for hydrogen production would have learnt from D4 and D2 that methanol could be efficiently reformed to hydrogen. It was also known that black liquor was an environmentally friendly source of methanol. Therefore, the subject-matter of claim 10 lacked an inventive step in view of D12a in combination with D4 or D2 and common general knowledge. A similar argumentation applied to claim 14 since it only related to a facility suitable for executing the process according to claim 10.

Claim 1 of the second auxiliary request was not identical to claim 10 of the main request. D20 had therefore to be seen as a reaction to the filing of this request and should therefore be part of the proceedings.

VIII. The respondent's (patent proprietor's) arguments relevant to the present decision can be summarised as follows:

D14 was not admitted by the opposition division, which exercised its discretionary power in a reasonable way based on the right criteria. It had not been used before the opposition division in the context of inventive step. D19 and D20 could easily have been submitted before the opposition division since the main request had been on file since December 2013 and the opposition division's preliminary opinion indicated that the requirements of the EPC appeared to be met.

D4 did not disclose black liquor, biomethanol or purification. D4 clearly taught carbohydrates as feed for renewable hydrogen while methanol was only used as a model compound. The problem to be solved was to provide an environmentally friendly process for the efficient provision of hydrogen. The combination with D5 or D8 was based on hindsight since D5 taught the use of methanol in the papermaking process while D8 was silent about the use of methanol for producing hydrogen. There was only a general reference in D8 about the use of methanol in the chemical industry. Therefore, claim 1 involved an inventive step.

The light fraction used in the process of D12a for vapor reforming was composed of hydrocarbons, so there was no pointer to an alcohol. Neither D2, D4 nor D10 related to black liquor. Consequently, the subject-matter of claim 10 also involved an inventive step.

Claim 1 of the first auxiliary request was even further removed from D4.

Claim 1 of the second auxiliary request was identical to claim 10 of the main request. The wording had to be adapted since the preceding claims had been deleted.

- IX. The appellant requests that the impugned decision be set aside and that the patent be revoked.

The respondent requests that the appeal be dismissed or, in the alternative, that the patent be maintained in amended form on the basis of one of the first to thirteenth auxiliary requests submitted by the reply of 27 September 2017.

Reasons for the Decision

Main request

1. Article 12(4) RPBA

According to Article 12(4) RPBA, the board may hold inadmissible facts, evidence or requests which could have been presented or were not admitted in the first instance proceedings.

The boards usually consider that documents filed together with the statement of grounds of appeal by the appealing party adversely affected by the decision of the first instance are presumed admissible if the introduction of these documents constitutes a legitimate reaction to the reasoning underlying the appealed decision (R 10/09, Reasons 3.2).

In the present case, D14 had been submitted before the opposition division only in support of an Article 83 EPC objection and had not been used in support of an inventive step objection. It was not admitted into the proceedings by the opposition division (Reasons 5.5). The board cannot find the opposition division at error in any way in exercising its discretion since it judged

that D14 did not *prima facie* question the sufficiency of disclosure and was not relevant for that point. Moreover, the appellant did not even contest that the right criteria had been used in a reasonable way without exceeding the proper limits of discretion.

According to T 971/11 (Reasons 1.3), a document which would have been admitted into appeal proceedings if it had been filed for the first time at the outset of those proceedings should not, however, be held inadmissible for the sole reason that it was already filed before the department of first instance and not admitted. In the present case, the situation differs from the one described in T 971/11 in that the impugned decision was completely in line with the provisional opinion of the opposition division. The main request had been on file since December 2013, and the preliminary opinion of the opposition division was issued nine months before the oral proceedings. The appellant was well aware at that time that the opposition division did not concur with its position, so there were clear reasons to reinforce its case already at that time. Furthermore, D14 does not directly relate to the reasoning given in the decision of the opposition division, which is fully based on the patent proprietor's reasoning and does not contain a surprising element, but is rather used for new inventive step objections against claims 1 and 10.

D19 and D20 were filed for the first time with the statement of grounds of appeal. As indicated for D14, the main request had been on file since December 2013. At the latest the case should have been reinforced after having received the preliminary opinion of the opposition division. The opposition division's reasoning in the impugned decision does not contain any

surprising interpretations compared to the preliminary opinion and the proprietor's submissions, so it does not trigger the necessity for additional documents. D19 and D20 do not supplement the inventive step attacks raised during opposition proceedings, but are used for new inventive step attacks against claims that have been on file for a long time.

The claims of the second auxiliary request that were filed one month before the oral proceedings before the opposition division are identical to claims 10 to 18 of the main request including the necessary formal adaptations and do not lead to a new situation.

There was thus no unexpected development during the opposition proceedings that would legitimate filing D14, D19 and D20 for the first time at the appeal stage. Appeal proceedings are not meant to be a second chance for the opponent to file new attacks; they are for reviewing the first-instance decision. In line with T 169/12 (Reasons 3.4), the board sees no exceptional reasons that would justify the submission of D14 with respect to inventive step, D19 and D20 for the first time at the appeal stage.

Therefore, there are no good reasons for considering/ admitting D14, D19 and D20 into the proceedings.

2. Article 56 EPC

2.1 Claim 1

2.1.1 Claim 1 relates to the "use of black liquor for the production of biohydrogen". This use claim is further defined by process steps, so it appears to be a combination of a use and process claim. Contrary to

case T 1292/09 (Reasons 3), the first part does not seem to be in line with the use claim according to G 2/88 (OJ 1990, 93) since no effect is present. Therefore, the claim is rather understood as a process for producing biohydrogen in which biomethanol is recovered from black liquor and purified and further reacted to biohydrogen, which is identical to claim 6. The recovery in the present case is understood, in line with the respondent's view (see reply of 27 September 2017, page 8, second paragraph), as removing a pre-existing component from the black liquor.

- 2.1.2 D4 is the closest prior art since it also relates to the production of renewable hydrogen from biomass. The aqueous-phase reforming provides a possibility to generate hydrogen from carbohydrates found in waste water. Although methanol is not a carbohydrate, D4 also discloses that various alcohols, including methanol, can be converted with water to hydrogen (page 172, paragraph bridging left and right column). Methanol has the best selectivity for hydrogen production (Figure 7).
- 2.1.3 The problem to be solved is to provide an alternative environmentally friendly process for the efficient provision of hydrogen (see also paragraph [0020] of the patent).
- 2.1.4 The problem is solved by the use according to claim 1 characterised in that biomethanol is recovered from black liquor and purified.
- 2.1.5 The skilled person starting from D4 and interested in the efficient provision of hydrogen knows from D4, especially Figure 7, how selective the different

oxygenated hydrocarbons are for hydrogen production. Since the interest lies in using a renewable feed, the skilled person would have searched for such feeds comprising preferably - in view of its selectivity - predominately methanol.

The skilled person would have turned to D5 as it relates to the waste from wood pulping operations. It discloses that methanol can be recovered from black liquor (column 1, lines 41 to 53, in combination with column 2, lines 19 to 25, and column 3, lines 50 to 60). D5 mainly teaches to recycle the methanol in the papermaking process (column 2, lines 13, 14, 24 and 25; column 6, lines 27 to 29, and column 7, lines 54 to 56), but it is not limited to this since it also indicates that methanol could be recycled in other applications. "Recycled" does not mean that methanol has to be reintroduced into the process it originates from but rather that it can be used again in any application. The skilled person thus would have learnt from D5 that methanol of high purity can be obtained from black liquor. There is no reason why the skilled person would not have envisaged using this methanol for the production of hydrogen as taught in D4.

The same conclusion would have been reached when taking the teaching of D8 into consideration since D8 also relates to the recovery of methanol from waste from wood processing. It explicitly discloses that methanol can be purified sufficiently to be used as an industrial raw material (page 1, lines 22 to 29), which would have prompted the skilled person to have considered it in a process as described in D4.

The solution to the posed problem would have been obvious in view of D5 or D8.

2.1.6 The subject-matter of claim 1 lacks an inventive step in view of D4 in combination with D5 or D8 and the main request must fail.

3. Article 123(3) EPC

Since the main request fails for lack of inventive step of claim 1, there is no need to discuss the conformity of claim 1 with Article 123(3) EPC.

First auxiliary request

4. Article 56 EPC

Claim 1 of this request differs from claim 1 of the main request in that the use is now directed to the production of hydrocarbon biofuel, and a step concerning the use of biohydrogen for producing hydrocarbon biofuel is included.

This amendment does not alter the conclusion made for the main request since D4 explicitly discloses that the hydrogen produced can be used for making biofuel via the Fischer-Tropsch process (page 172, right-hand column, point 3 of the upper part of the column). The argumentation made under points 2.1.3 to 2.1.5 remains valid.

Claim 1 of this request also lacks an inventive step in view of D4 in combination with D5 or D8, and the first auxiliary request must therefore also fail.

Second auxiliary request

5. Article 12(4) RPBA

Claim 1 of this request is directed to a process for producing hydrocarbon biofuel and is identical to claim 10 of the main request. The deletion of "according to the process of claim 6" was necessary since that claim was deleted. This does not change the scope of the claim since step a) includes the steps of claim 6 of the main request. Thus, this claim has been on file since December 2013, and the observations made above under Article 12(4) RPBA (point 1) still apply.

6. Article 56 EPC

6.1 D12a is the closest prior art since it relates to the production of a hydrocarbon fuel from biomass. Example 1 discloses the partial oxidation of wood chips to give a syngas having a H₂/CO ratio of 1.34. A recycled charge (p. 17, lines 17 to 21) from the Fischer-Tropsch unit is used to obtain a second syngas having a H₂/CO ratio of 13.7 (p. 30, lines 9/10). These are mixed to obtain a syngas having a H₂/CO ratio of 2.15. After Fischer-Tropsch conversion and hydrocracking, an effluent as shown in Table 3 is obtained. The light feedstock of the vapor-reforming unit could be obtained by pyrolysis of a ligno-cellulosic biomass feedstock (page 6, lines 1 to 6). The light feedstock could also comprise natural gas (page 7, lines 20 to 23).

6.2 The problem to be solved by the claimed invention can be seen as the provision of a more environmentally friendly process for the production of hydrocarbon biofuel (see impugned decision 6.3.6).

6.3 The problem is solved by a process according to current claim 1 characterised in that crude biomethanol is recovered from black liquor, purified and reformed to provide biohydrogen.

6.4 In view of the closest state of the art, the proposed solution is not obvious for the following reasons:

D10 provides some background information about the Fischer-Tropsch process and teaches that biomass gasification and Fischer-Tropsch synthesis can be used for obtaining renewable fuels (page 3, first paragraph). This teaching does not go beyond what is known from D12a. The fact that it is indicated that the patent proprietor planned to produce biodiesel by using waste biomass does not add any additional information. Black liquor and the combination of methanol reforming with Fischer-Tropsch synthesis are not disclosed.

D2 discloses that methanol can be efficiently converted to hydrogen (abstract), but D2 does not relate to hydrocarbons that have less than 10 carbon atoms as present in D12a (see step c) of claim 1). The skilled person trying to solve the posed problem would not have turned to D2 since it relates to different feedstocks. The wood used in D12a is first pyrolysed and purified to get the desired light feedstock, but there is no mention of an alcohol to be used for reforming. In addition, D2 teaches glucose as the most relevant compound to hydrogen production from biomass (page 964, right-hand column, last paragraph and page 966, right-hand column first full paragraph, penultimate sentence).

D4 also does not relate to hydrocarbons that have less than 10 carbon atoms but, as stated above, discusses

the reforming of oxygenated hydrocarbons that can be derived from biomass. D12a discloses that it is possible to obtain a gaseous fraction by pyrolysis of a ligno-cellulosic biomass feedstock (page 6, lines 4 to 6) that is subsequently reformed but does not relate to the reforming of oxygenated hydrocarbons originating from biomass. There is no reason why the skilled person trying to solve the posed problem would have turned to D4. Although D4 mentions biofuel, it relates to different feedstocks than D12a. Furthermore, D4 is completely silent about black liquor. To argue that the skilled person first would have considered D4 when starting from D12a, second would have chosen methanol as feedstock, third would, based on common general knowledge, have taken methanol that was derived from black liquor, and fourth have used it in a process according to D12a instead of the light fraction for obtaining hydrogen is completely based on hindsight.

- 6.5 Consequently, the proposed solution is not obvious.
- 6.6 The arguments presented for claim 1 also apply to claim 5 that is identical to claim 14 of the main request. It contains a combination of a Kraft pulp mill with a recovery unit and methanol purification unit that are combined with a reforming unit, a hydrogen purification unit and a biofuel production plant that has to be directly coupled to the hydrogen purification plant since it has to be able to use the produced biohydrogen in the biohydrocarbon production. It was common ground between the parties that as such the units of the claimed production facility reflect the process steps of claim 1.

6.7 Therefore, the subject-matter of independent claims 1 and 5, and claims 1 to 4 and 6 to 9, dependent on them, meet the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of the second auxiliary request, filed on 27 September 2017, and the description to be adapted.

The Registrar:

The Chairman:



K.Götz-Wein

E. Bendl

Decision electronically authenticated