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**Datasheet for the decision
of 16 October 2023**

Case Number: T 0712/21 - 3.3.06

Application Number: 13721788.1

Publication Number: 2838978

IPC: C10L1/18, C10L1/188, C10G3/00

Language of the proceedings: EN

Title of invention:
PROCESS FOR PRODUCING BIOFUEL AND BIOFUEL COMPONENTS

Applicant:
UPM-Kymmene Corporation

Headword:
UPM-Kymmene/Biofuel

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 123(2)

Keyword:
Novelty - (yes)
Inventive step - non-obvious alternative
Sufficiency of disclosure - (yes)
Claims - essential features - clarity (yes)

Decisions cited:

Catchword:



Beschwerdekammern
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Case Number: T 0712/21 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 16 October 2023

Appellant: UPM-Kymmene Corporation
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Representative: Hoffmann Eitle
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 19 October 2020
refusing European patent application No.
13721788.1 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman J.-M. Schwaller
Members: S. Arrojo
J. Hoppe

Summary of Facts and Submissions

- I. The applicant filed an appeal against the decision of the examining division to refuse European patent application No. 13 721 788.1 for non-compliance with the requirements of Articles 84 and 56 EPC in view of documents **D1** (US 2011/0166396 A1), **D2** (Mikulec et al., "*Production of Diesel Fuels from Waste Triacylglycerols by Hydrodeoxygenation*", 44th Int. Petroleum Conf., 2009) or **D3** (US 2007/0010682 A1).
- II. In its preliminary opinion, the board concluded that the main and 1st to 3rd auxiliary requests did not appear to meet the requirements of Article 56 EPC at least in view of the teaching of D3.
- III. With a submission dated 21 April 2023, the appellant filed additional arguments and new auxiliary requests 4 to 7.
- IV. During the oral proceedings, which took place on 16 October 2023, the appellant withdrew all the previously filed requests and filed a new main request with 12 claims. In this respect, the Board notes that in the handwritten renumbering of the claims, the appellant made a typographical error and jumped from claim 9 to claim 11, resulting in the last claim erroneously being numbered 13 instead of 12. In the present decision, the Board will use the correct numbering (i.e. claims 1 to 12).
- V. Claim 1 of the new main request filed at the oral proceedings, on which the present decision is based, reads as follows:

"1. A process for producing biofuel or biofuel components, comprising:

- feeding of biological material comprising tall oil, tall oil fatty acids, tall oil derivative(s) or mixtures thereof into a reactor system, which comprises a catalytically active guard bed phase and a catalytically active main reaction phase and wherein the feed material is contacted, in at least one catalyst bed of said phases, with a combination of hydrodeoxygenating (HDO) and hydrodewaxing (HDW) catalysts, wherein the HDO catalyst is selected from the group consisting of NiMo, CoMo, and a mixture of Ni, Mo and Co, and the HDW catalyst is a NiW catalyst,
- treating the feed material catalytically with hydrogen in the reactor system to cause hydrodeoxygenation, isomerization and cracking of feed material components to provide a hydroprocessing product, whereby the temperature is in the range of 280 to 450°C, the pressure is from 10 to 250 bar, the WHSV is between 0.1 to 5 and the H₂/feed ratio is in the range of 1,300 to 2,200 N/l and
- recovering at least a fraction of the hydroprocessing product as biofuel or biofuel components, wherein the combination of HDO and HDW catalysts comprises mixture(s) of the catalysts and, wherein said mixture(s) is/are provided by physically mixing HDO and HDW catalyst particles or by adding HDO and HDW catalyst metals onto the same support material."

Reasons for the Decision

1. New main request - Admittance

- 1.1 This request was filed during the oral proceedings before the Board, so its admittance is governed by the provisions in Article 13(2) RPBA 2020.
- 1.2 Claim 1 is a combination of claims 1, 2 and 3 of the former main request, wherein the alternative of a combination of HDO and HDW catalysts comprising "layers" in the former claim 2 has been deleted, so that only the alternative "mixture(s)" is defined.
- 1.3 The decision of the examining division is essentially based on an alleged non-compliance with the requirements of Article 84 EPC. While the examining division also concluded that the invention did not meet the requirements of Article 56 EPC in view of documents D1, D2 and D3, the only document discussed in the reasoning was D2.
- 1.4 As stated at the oral proceedings, the Board is not convinced that the objections under Article 84 EPC or the inventive step reasoning based on document D2 justify the refusal of the application.
- 1.5 As also indicated at the hearing, the invention as defined in the former main request (i.e. the one filed with the statement of grounds of appeal) is not considered to be inventive in view of the content of D1. However, neither the appealed decision nor the preliminary opinion of the Board contained a reasoned argument based on document D1, which was formally cited without going into its specific content and/or without giving reasons as to why it would render the invention obvious. This objection can therefore be considered to have been raised for the first time by the Board at the oral proceedings.

- 1.6 In light of the above considerations, the Board concludes that the appellant should be given an opportunity to overcome the new objections. The admittance of the new main request is therefore justified by exceptional circumstances as required by Article 13(2) RPBA 2020.
- 1.7 In addition, the Board also notes that the amendments made to claim 1 are simple, based on the claims as filed and result in a subject-matter that appears to be clearly allowable. Therefore, the new main request is also considered to fulfil the criteria of the first two levels of convergence according to Articles 12(4) and 13(1) RPBA 2020.
- 1.8 The Board thus exercised its discretion to admit the new main request into the appeal.
2. New main request - Article 84 EPC
 - 2.1 While the claims of this request have been filed for the first time at the appeal stage, the Board notes that the objections raised by the examining division in the appealed decision would still apply to claim 1 at issue.
 - 2.2 The examining division argued that Article 84 EPC was not satisfied because the invention was defined in terms of a result to be achieved, namely hydrodeoxygenation (hereinafter "HDO") and hydrodewaxing (hereinafter "HDW") steps, for which no indication was given as to the extension of the desired reactions. According to the examining division, in order to meet the requirements of Article 84 EPC, the claim should define all the essential features for

obtaining these results, i.e. for carrying out the HDO and the HDW steps.

- 2.3 The objection of the examining division appears to have two different implications:

On the one hand, since the HDO and HDW seek to limit the scope in terms of a result to be achieved, namely a chemical reaction leading to certain products, the claim should also define the degree to which such results are achieved and/or all aspects considered essential for carrying out these chemical reactions. In the absence of such details, the claim would not include all the essential features of the invention, contrary to the requirements of Article 84 EPC (i.e. support by the description) in conjunction with Rule 43(3) EPC.

On the other hand, the above objection also seems to imply that the HDO and HDW features should be considered as unclear under Article 84 EPC, because there is no indication as to how they should be identified, i.e. how much HDO or HDW reactions are required for a process to be considered as falling under these features. In such circumstances, HDO and HDW may be indistinguishable from other hydrotreatment processes.

- 2.4 The Board has however concluded that the subject-matter of claim 1 at issue meets the requirements of clarity and support by the description under Article 84 EPC for the following reasons:

- 2.4.1 First, it is to be noted that HDO and HDW are well-known chemical processes in the field of petrochemistry. Thus, the features relating to these

processes - i.e. *"HDO and HDW catalysts"* or *"treating the material... to cause hydrodeoxygenation, isomerization and cracking"* - should be treated as allowable functional definitions rather than as results to be achieved. In this respect, it should be noted that "result to be achieved" objections usually concern situations where the claim defines a result or effect, but omits the feature(s) required (according to the application or patent) to achieve it. In other words, an objection of essential feature(s) missing should in principle be raised where a claim defines an effect or result which is technically challenging in the sense that a skilled person reading the claim and applying common knowledge would not know how to achieve it without the information provided by the omitted (essential) feature(s). This is not the case with the process of claim 1 at issue, since the claimed subject-matter defines the active metals in the catalysts and the operating ranges necessary to carry out the HDO and HDW reactions, and so claim 1 includes all the essential features of the invention.

2.4.2 In the Board's view the features HDO and HDW also meet the requirement of clarity under Article 84 EPC, and in this respect, it is important to emphasise the differences between lack of clarity and breadth of the claims. A feature may be considered to be unclear if its boundaries are diffuse, leaving the reader in doubt as to whether certain embodiments fall within or outside the scope of protection. This generally occurs when the feature is defined in confusing or incomplete terms (e.g. an ill-defined parameter) and/or when it is inherently unsuited for providing a well-defined scope (e.g. relative terms).

On the contrary, features with generally accepted meanings shouldn't be considered unclear just because they are broadly defined. The confusion between breadth and lack of clarity arguably results from the minor ambiguities found at the edge of the scope defined by broad technical terms. For instance, one could question whether the term "furniture" encompasses household accessories or decorative elements. Similar ambiguities can arise with simple terms like "window," which might be difficult to distinguish from certain elements like patio doors with a framed glass.

In the present case, it is undisputed that the terms "HDO" and "HDW" have a generally accepted meaning in the underlying technical field. Therefore, although it may be argued that the scope of these features could overlap with that of similar processes (e.g. does a hydrotreating process fall within or outside the scope of HDO?, or does a hydroisomerisation step fall within or outside the scope of HDW?), such challenges arise not due to a faulty or incomplete definition, but because language can't comprehensively capture every detail of real-life objects or processes, an issue which becomes more pronounced when features are broadly defined.

The Board therefore considers that the basic question to be asked is whether the vagueness of the scope of protection is the result of an incorrect, incomplete or relative feature, or whether it is simply the result of the inherent ambiguity of technical terms. In the present case, the Board concludes that the features HDO and HDW would be clear to a person skilled in the art and that any ambiguity in distinguishing them from other similar processes should be attributed to the inherent limitations of technical language.

The Board also notes that the above conclusions are consistent with, and to some extent explain, the well-established practice of giving technical terms their broadest reasonable technical meaning when assessing patentability.

2.5 The requirements of Article 84 EPC are therefore met.

3. New main request - Article 83 EPC

Since, as explained in the discussion of Article 84 EPC, the steps defined in claim 1 relate to processes which are well-known and common in the underlying technical field, the Board has no reason to doubt that the person skilled in the art would be able to reproduce the invention as defined in the claims. The requirement of sufficiency of disclosure under Article 83 EPC is therefore met.

4. New main request - Article 123(2) EPC

4.1 Claim 1 at issue is based on claim 1 as filed with the following amendments (highlighted by the Board):

*"1. A process for producing biofuel or biofuel components, comprising:
- feeding of biological material comprising tall oil, tall oil fatty acids, tall oil derivative(s) or mixtures thereof into a reactor system, which comprises a catalytically active guard bed phase and a catalytically active main reaction phase and wherein the feed material is contacted, in at least one catalyst bed of said phases, with a combination of hydrodeoxygenating (HDO) and hydrodewaxing (HDW) catalysts, wherein the HDO catalyst is selected from*

the group consisting of NiMo, CoMo, and a mixture of Ni, Mo and Co, and the HDW catalyst is a NiW catalyst,
- treating the feed material catalytically with hydrogen in the reactor system to cause hydrodeoxygenation, isomerization and cracking of feed material components to provide a hydroprocessing product, whereby the temperature is in the range of 280 to 450°C, the pressure is from 10 to 250 bar, the WHSV is between 0.1 to 5 and the H₂/feed ratio is in the range of 1,300 to 2,200 N/l and
- recovering at least a fraction of the hydroprocessing product as biofuel or biofuel components, wherein the combination of HDO and HDW catalysts comprises mixture(s) of the catalysts and, wherein said mixture(s) is/are provided by physically mixing HDO and HDW catalyst particles or by adding HDO and HDW catalyst metals onto the same support material."

- 4.2 The first amendment ("comprising tall oil...") is based on claim 4 as filed. The second amendment ("wherein the HDO catalyst...") is based on the general disclosure on page 6, lines 21-23 of the application as filed. The third amendment ("whereby the temperature...") is based on the general disclosure in the passage extending from page 14, line 22 to page 15, line 6, and the last amendment ("wherein the combination of HDO and HDW...") is based on claims 2 and 3 as filed, wherein the alternative "layers" has been deleted.
- 4.3 The subject-matter of claims 2 to 12 respectively correspond to that of claims 5 to 15 as filed.
- 4.4 The requirements of Article 123(2) EPC are therefore met.
5. New main request - Article 54 EPC

- 5.1 **Document D1** discloses a process for producing diesel fuels from a feedstock containing biological components, said process including a first hydrodeoxygenation step, a second hydrotreatment step and a third hydroisomerisation step. The preferred catalysts are a Mo-only catalyst for the hydrodeoxygenation step (see par. [0028]), Ni-Mo, Co-Mo or Ni-W for the hydrotreatment step (see par. [0034]) and Ni-W for the hydroisomerisation step (see par. [0040]). The process is carried out at temperatures of 200-500°C, pressures up to 200 bar, WHSV of 0,1-10 h⁻¹ and H₂/oil ratios of 200-300 N/l (see paras. [0034] and [0042]). This document also indicates (see par. [0041]) that the hydroisomerisation step "may be carried out in the same reactor and/or same catalyst bed as the previous step(s)". There is however no indication that a guard bed is used or that the catalyst bed comprises a mixture of HDO and HDW catalysts as defined in claim 1 at issue. Moreover, the H₂/feed ratio proposed in D1 is significantly lower than the range according to the invention (200-300 vs. 1300-2000 N/l).
- 5.2 **Document D2** discloses the production of diesel from a mixture containing natural triacylglycerols by means of catalytic hydrodeoxygenation in the presence of a Ni-Mo or Ni-W catalyst (see table 9). The document also includes a diagram (see bottom of page 12) indicating that the feedstock should be exposed to a hydrodeoxygenation and a hydrodewaxing process. However, D2 does not disclose a guard bed, that the Ni-Mo and Ni-W can be used simultaneously as HDO and HDW catalysts, that the catalysts should be combined in the same bed or that the combination should be in the form of a mixture as defined in claim 1 at issue. Moreover, the H₂/feed ratio proposed in table 9 is lower than the

range according to the invention (1000 vs. 1300-2000 N/l).

5.3 **Document D3** discloses a process for the production of diesel range hydrocarbons from a biological oil such as tall oil including a hydrotreatment step (i.e. hydrodeoxygenation or HDO as indicated in par. [0028]) and a stage for converting the n-paraffins into diesel range branched alkanes using isomerisation (see par. [0037]). The HDO step is preferably carried out in the presence of a Ni-Mo/Al₂O₃ or Co-Mo/Al₂O₃ catalyst (see par. [0062]) as proposed in claim 1 at issue. The additional isomerisation stage is considered to fall within the scope of a hydrodewaxing step, not only because this step converts the n-paraffins into diesel range alkanes, but also because the application itself indicates that the catalysts used for isomerisation can be the same as those used for hydrodewaxing (see page 7, lines 1-3). This stage is carried out in the presence of a Pt, Pd or Ni on Al₂O₃ catalyst (par. [0070]). The most preferred pressure and temperature operating conditions are 50 to 100 bar and 270 to 340°C. The WHSV in the exemplary processes is 1 or 2 and the H₂/feed ratio is 900 or 1000 N/l (see examples 5 and 7). D3 does however not disclose the use of an active guard bed, that the H₂/feed ratio should be in the range of 1300 to 2200 N/l, that the HDW catalyst is Ni-W, that the HDO and HDW catalysts are combined in the same bed or that this combination comprises a mixture of the HDO and HDW catalysts as defined in claim 1 at issue.

5.4 It is apparent that none of these documents discloses a process including a guard bed, a step of contacting the feed with a catalyst comprising a mixture of HDO and HDW catalysts or an H₂/feed ratio of 1300 to 2200 N/l

as defined in claim 1 at issue. The subject-matter of claim 1 therefore meets the requirement of novelty under Article 54 EPC.

6. New main request - Article 56 EPC

6.1 Closest prior art

6.1.1 According to the contested decision, document D2 was the closest prior art to the then claimed invention. There was however no clear indication in the decision as to why D2 was closer than D1 or D3.

6.1.2 For the Board, D1 is structurally and functionally closer to the presently claimed invention because the active metals used for the hydrotreatment step (Co-Mo, Ni-Mo or Ni-W) and the hydroisomerisation step (Ni-W) are almost identical to those defined in claim 1 at issue, since all possible combinations fall within the invention except for the embodiment in which Ni-W is used for both steps. Moreover, unlike D2 or D3, document D1 discloses an embodiment in which all the catalysts are combined in the same bed (see par. [0041]) as proposed in the underlying invention.

6.1.3 The subject-matter of claim 1 at issue differs from the disclosure of D1 at least in:

- i) the presence of a guard bed,
- ii) a catalyst combination comprising a mixture of the HDO and HDW catalysts, and
- iii) a H₂/feed ratio in the range of 1300 to 2200 N/l.

6.2 Problem solved by the invention

6.2.1 According to the application (page 1, lines 9-23), the object of the invention is to provide a process for

converting biological feed material into hydrocarbons useful as fuel and/or additives for fuel. In particular, the process is said to alleviate the disadvantages of known processes and to provide acceptable ignition and cold flow properties. The appellant further argued that the process represented a simplification of the prior art, because the HDO and HDW steps were carried out in the same bed.

6.2.2 The application includes three reference examples and one exemplary embodiment. Reference examples 1 and 2 indicate that the treatment of crude tall oil (without purification) with either an HDO or an HDW catalyst does not lead to satisfactory results. In reference example 3, the crude tall oil is treated in a catalytic bed with a mixture of HDO and HDW catalysts, which is said to produce a good distribution of paraffinic hydrocarbons but a non-satisfactory ratio of iso- to n-paraffins or cold flow properties. In examples 1 and 2, a fuel having the desired properties is obtained using a catalyst bed including several layers having different mixtures of HDO-HDW catalysts.

6.2.3 Since it is apparent in view of comparative example 3 that using a mixture of HDO-HDW catalysts as proposed in claim 1 is not sufficient to achieve a fuel with good properties, the Board concludes that the invention does not provide any specific technical effect. The problem solved by the invention is therefore reformulated less ambitiously as the provision of an alternative.

6.3 Non-obviousness of the claimed invention

6.3.1 The question to be asked at this stage is whether the skilled person would contemplate a process as proposed in claim 1 as an alternative to that disclosed in D1.

As pointed out during the oral proceedings, it appears to be obvious in view of the teachings in D1 to combine a Ni-Mo or Co-Mo catalyst with a Ni-W catalyst in the same bed, as this would only require discarding the option Ni-W from the hydrotreatment step and selecting in par. [0041] the option of performing all steps in the same bed. The fact that in D1 the Ni-Mo and Co-Mo are used for carrying out the so-called hydrotreatment step (rather than the HDO step) does not appear to be relevant for the present discussion, because the Ni-Mo and Co-Mo catalysts can still be considered to fall within the concept of an HDO catalyst as defined in claim 1, i.e. the step of contacting the feed with an HDO catalyst merely requires that the catalyst be suitable for promoting at least some HDO reactions.

However, the Board does not see in D1 or in the other cited documents D2 or D3 any suggestion or teaching to consider an alternative where the Ni-Mo or Co-Mo is mixed with the Ni-W in the same bed. In D1 the alternative of combining several catalysts in the same bed is only exemplified in an embodiment (see second part of par. [0041]) in which the HDO catalyst (which is not Ni-Mo or Co-Mo but a Mo only catalyst) is combined with a hydrotreatment catalyst (Ni-Mo, Co-Mo or Ni-W) in a layered configuration, rather than in the form of a mixture, with the HDO catalyst being arranged on the top 20% of the bed and the hydrotreatment catalyst occupying the bottom 80% of the bed. While a layered configuration was contemplated as an alternative for the combination of HDO and HDW

catalysts in claim 2 of the former main request, it has now been deleted in the new main request.

There is no other teaching which would suggest that the catalysts should form a mixture as defined in claim 1 at issue. The Board thus concludes that a skilled person starting from D1 and looking for alternative processes would find no incentive in D1 or in D2-D3 to mix HDO and HDW catalysts in the same bed.

There is also no disclosure nor any incentive in these prior documents to increase the H_2 /feed ratio to the range of 1300 to 2200 N/l, let alone to combine this range with the feature wherein the Ni-Mo or Co-Mo is mixed with the Ni-W in the same bed.

In summary, even if no specific technical effect can be attributed to the invention, the examples at least show that it is possible to carry out HDO and HDW reactions using mixtures of certain HDO/HDW catalysts in the same bed. Since none of the cited documents suggests using mixtures of the catalysts defined in claim 1 to promote HDO and HDW reactions, the alternative is not made obvious by D1 alone or in combination with the other documents D2 or D3.

6.3.2 The same conclusion would be reached if either D2 or D3 were taken as the closest prior art, as these documents are further from the invention than D1 and there would still be no cited document proposing a catalyst mixture as defined in claim 1 at issue.

6.4 The subject-matter of claim 1 is therefore considered to be not obvious from the known prior art, and so involves an inventive step. The same applies to claims 2 to 12 (erroneously renumbered as claims 2 to 9; 11 to

13), all of which depend on claim 1 and therefore include its subject-matter.

7. In view of the above, the Board concludes that the invention defined in the claims of the new main request meets the requirements of the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division with the order to grant a patent based on the claims of the new main request filed during the oral proceedings on 16 October 2023, and a description to be adapted where appropriate.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated