

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 21 February 2020**

Case Number: T 0847/17 - 3.3.06

Application Number: 03782317.6

Publication Number: 1567262

IPC: B01J23/24, B01J35/10, C10G49/04

Language of the proceedings: EN

Title of invention:
HEAVY FEED HYDROPROCESSING USING A MIXTURE OF CATALYSTS

Applicant:
Albemarle Netherlands B.V.

Headword:
HEAVY FEED HYDROPROCESSING/ Albemarle

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - non-obvious modification

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0847/17 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 21 February 2020

Appellant: Albemarle Netherlands B.V.
(Applicant) Barchman Wuytierslaan 10
3818 LH Amersfoort (NL)

Representative: Hoyng Rokh Monegier LLP
Rembrandt Tower, 31st Floor
Amstelplein 1
1096 HA Amsterdam (NL)

Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 2 November 2016
refusing European patent application No.
03782317.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman J.-M. Schwaller
Members: P. Ammendola
C. Brandt

Summary of Facts and Submissions

- I. This appeal was filed by the applicant (hereinafter "the appellant") against the decision of the examining division to refuse European patent application 03782317.6 because the subject-matter of the then pending sole request was obvious in view of the prior art disclosed in D1 (US 6,086,749 A1).
- II. With letter of 21 January 2020 the appellant filed as sole request a set of ten claims, with claims 1 and 7 reading as follows (the differences vis-à-vis the respective claims as originally filed are made apparent):

"1. A process for hydroprocessing a heavy hydrocarbon oil, comprising contacting a heavy hydrocarbon oil in the presence of hydrogen with a mixture of different hydroprocessing catalyst I and hydroprocessing catalyst II, wherein

catalyst I comprises a Group VIB metal component and optionally a Group VIII metal component on a porous inorganic carrier, said catalyst having a specific surface area of ~~at least 100-180~~ m^2/g , a total pore volume of at least 0.55 ml/g, at least 50% of the total pore volume in pores with a diameter of at least 20 nm (200 Å), and 10-30% of the total pore volume in pores with a diameter of at least 200 nm (2000 Å), and

catalyst II comprises a Group VIB metal component and optionally a Group VIII metal component on a porous inorganic carrier, said catalyst having a specific surface area of at least 100 m^2/g , a total

pore volume of at least 0.55 ml/g, at least 75% of the total pore volume in pores with a diameter of 10-120 nm (100-1200 Å), 0-2% of the total pore volume in pores with a diameter of at least 400 nm (4000 Å), and 0-1% of the total pore volume in pores with a diameter of at least 1000 nm (10000 Å) and wherein catalyst II has a pore volume (%) in pores with a diameter of at least 200 nm (2000 Å) which is less than that of catalyst I."

"7. A mixture of different catalysts comprising

a catalyst I which comprises a Group VIB metal component and optionally a Group VIII metal component on a porous inorganic carrier, said catalyst having a specific surface area of ~~at least~~ at least 100-180 m²/g, a total pore volume of at least 0.55 ml/g, at least 50% of the total pore volume in pores with a diameter of at least 20 nm (200 Å), and 10-30% of the total pore volume in pores with a diameter of at least 200 nm (2000 Å), and

a catalyst II which comprises a Group VIB metal component and optionally a Group VIII metal component on a porous inorganic carrier, said catalyst having a specific surface area of at least 100 m²/g, a total pore volume of at least 0.55 ml/g, at least 75% of the total pore volume in pores with a diameter of 10-120 nm (100-1200 Å), 0-2% of the total pore volume in pores with a diameter of at least 400 nm (4000 Å), and 0-1% of the total pore volume in pores with a diameter of at least 1000 nm (10000 Å) and wherein catalyst II has a pore volume (%) in pores with a diameter of at least 200 nm (2000 Å) which is less than that of catalyst I."

Claims 2 to 6 define preferred embodiments of the process of claim 1 and claims 8 to 10 preferred embodiments of the catalyst mixture of claim 7.

III. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the sole set of claims filed with letter dated 21 January 2020.

Reasons for the Decision

1. Admissibility of the new request

Since this set of claims has been filed in reaction to the communication in which the board raised new objections, the board exercising its discretion under Articles 13(1) and (3) RPBA 2007, Article 25(3) RPBA 2020 has decided to admit the request into the appeal proceedings.

2. Compliance with the requirements of Articles 84 and 123(2) EPC

The board is satisfied that the claims 1 to 10 are clear and based on the original application. The board considers it appropriate to also mention that the differences between claim 1 or claim 7 and the respective original claim with the same numbering are based on the original disclosure on page 5, lines 27 to 29, and page 8, lines 9 to 11, of the application as filed.

3. Compliance with the requirements of Articles 83 and 54 EPC

The board is satisfied that the subject-matter of claims 1 to 10 is sufficiently disclosed and novel vis-à-vis the available prior art. No further details need to be given since the application has been refused on the grounds of lack of inventive step only.

4. Compliance with the requirements of Articles 52(1) and 56 EPC

4.1 Inventive step for the subject-matter of claim 7

4.1.1 The board notes that this claim defines the same mixture of catalysts I and II that is used for hydroprocessing heavy hydrocarbon oil in the process defined in claim 1. It is of particular relevance for the present decision that the two catalysts of the claimed mixture are characterised by their "*specific surface area*" (required to be "*100-180 m²/g*" for catalyst I) and some aspects of their pore volume distribution (hereinafter **PVD**). In particular, even though the PVDs of the two catalysts are required to be different (at least) in that in catalyst II the percentage of pore volume that is present in pores with diameter of at least 200 nm (hereinafter **the PV(>200)**) must be less than the PV(>200) of catalyst I, a specific range for the PV(>200) - of "*10-30%*" of the total pore volume - is only required for catalyst I.

4.1.2 Closest prior art

The board concurs with the examining division that D1 describes mixtures of catalysts suitable for hydroprocessing heavy oil and, thus, represents a suitable starting point for the assessment of inventive step.

The examining division considered the claimed catalyst mixture to represent an obvious alternative to those described in D1 (in particular in the sentence bridging columns 32 and 33), essentially because the mixture of the present application "although not explicitly disclosed in D1, appears to be consistent with the properties mentioned" in the sentence bridging columns 32 and 33 of D1 and, hence, a skilled person would have considered the claimed mixture as "one of many potential arbitrary options within the confines" of the sentence bridging columns 32 and 33 of D1.

The appellant disputed this reasoning by submitting, *inter alia*, the following two distinct lines of argument:

- (A) The technical problem actually solved over D1 was based on the surprising technical advantages (allegedly) proved by the experimental comparison described in Table 3 of the application, wherein mixtures of catalysts according to claim 7, which contained
- 50% by weight of a certain catalyst I characterised, *inter alia*, by a PV(>200) of 24%, and
 - 50% by weight of certain catalysts II, all of which were characterised, *inter alia*, by a PV(>200) of 1%,
- produced hydroprocessing results that were surprisingly better than those that could be predicted from the results separately provided by catalysts I and II.
- (B) Document D1 contained no teaching that rendered obvious the modification of the prior art necessary to arrive at the subject-matter of claim 7. Indeed,

the sentence bridging columns 32 and 33 of D1 described the same PVD for all the catalysts of this prior art and disclosed for all such catalysts a specific surface of at least 200 m²/g, thereby pointing away from the present invention. Moreover, already from the fact that the catalysts generally described in D1 had a pore volume present in pores with diameter in the range of 10-30 nm (hereinafter **the PV(10-30)**) of at least 50%, preferably at least 75%, the skilled reader of D1 would conclude that these catalysts may contain very limited amounts of large pores (i.e. it cannot be predicted or expected to also have e.g. 10% or more of the pore volume in pores with diameters much larger than 30 nm, such as diameters of 200 nm or more). Thus, the reason 7 of the decision under appeal was manifestly at odds with the fact that the actual disclosure in the cited prior not only failed to embrace but actually pointed away from the possibility of modifying this prior art so that

- at least one of the mixed catalyst comprised between 10 and 30 % of PV(>200) in combination with a specific surface area of between 100 to 180 m²/g, and
- the two mixed catalysts differed for their percentages of PV(>200).

Thus, even in case the examining division had correctly identified the technical problem actually solved over the catalyst mixtures of D1 in the less ambitious one of providing an alternative to this prior art, still it had failed to render plausible that the subject-matter of claim 7 was just "one of many potential arbitrary options within the confines" of the sentence bridging columns 32 and 33 of D1 (see reason 8 of the decision).

4.1.3 Technical problem solved

The board finds unconvincing line of argument "(A)", that the solved technical problem had to be identified in view of the technical advantages allegedly demonstrated in Table 3 of the application, because the experimental comparison in this Table only relates to examples of the claimed mixture in which the combined catalysts I and II differ substantially in their PV(>200) percentages ("24%" in the sole used example of catalyst I vs. "1%" in both used examples of catalyst II) and in which the two sorts of catalysts I and II are present at a 50/50 by weight ratio. Such experimental comparison is therefore manifestly too limited in comparison with the breadth of claim 7, to possibly constitute any convincing evidence of technical effects plausibly occurring across the whole scope of such very broad claim. In this respect, the board underlines that the wording of claim 7 allows for the two catalysts I and II to only differ in any (even just detectable) very limited extent in their PV(>200) percentages. Moreover, the same claim does not set any minimum for the relative amounts of catalysts I and II in the mixture. Hence the subject-matter of claim 7 embraces, for instance, catalyst mixtures in which the sole difference between the two catalysts I and II might be any minimal inequality among their PVDs apt at producing a detectable difference in the respective PV(>200) percentages, as well as mixtures made almost exclusively of catalyst I or of catalyst II.

The board finds therefore that the examining division correctly identified the technical problem actually solved over D1 by the subject-matter of claim 7, in the provision of further catalysts for hydroprocessing heavy hydrocarbon oil.

4.1.4 Obviousness of the solution

The board finds convincing the line of argument "(B)" that the solution to this problem is not obvious in view of D1 only, for the following reasons.

- (a) In D1 there is no teaching suggestive of mixture of catalysts having different PVDs (as apparent e.g. from claim 1 of D1, which prior art is rather focused on mixtures of catalysts with different densities). Indeed, the portion of D1 identified above - i.e. the sentence bridging columns 32 and 33 which is the only part of D1 providing information as to the PVD of the catalysts - teaches indistinctly certain properties for all catalysts referred to therein.
- (b) This portion of D1 describes in particular that their PV(10-30) is at least 50% and their specific surface area is in the range of 200-600 m²/g.
- (c) In the decision under appeal, the examining division has not even clearly stated, not to mention supported with some evidence or with some sound theoretical reasoning, if it expected or not that at least some of the catalysts that a skilled person would consider suitable for forming the mixtures of D1 - i.e. hydroprocessing catalysts mandatorily having a PV(10-30) of at least 50%, preferably of at least 75% - also possibly comprised between 10 and 30% of PV(>200). Nor has the examining division explained how the specific surface of 100-180 m²/g required for catalyst I in claim 7 could be considered "consistent with the properties mentioned" in the relevant portion of D1 (see reason 7 of the decision under appeal) despite

of the fact that the sentence bridging columns 32 and 33 of D1 requires the specific surface area of the catalysts of D1 to rather be at least 200 m²/g.

- (d) Nor does the board see any reason for disputing the plausibility of the further consideration of the appellant that the catalysts generally described in D1 as having a PV(10-30) of at least 50%, more preferably of at least 75%, may not be predicted or expected to also have a substantial fraction of the pore volume in pores with diameters of more than 200 nm, i.e. diameters that are much larger (e.g. at least one order of magnitude larger) than 30 nm.
- (e) Therefore, and contrary to the finding of the examining division, at least the requirements in present claim 7 that the two mixed catalysts must differ in their PV(>200) percentages and that at least one thereof must have in combination a PV(>200) of between 10 to 30% and a specific surface area between 100 and 180 m²/g, are not "consistent with the properties mentioned" in the sentence bridging columns 32 and 33 of D1.
- (f) Accordingly, the board finds that the claimed mixture has not been proved to be "one of many potential arbitrary options within the confines" of D1 (see point 8 in the decision under appeal).

4.1.5 The board concludes that the modification of the prior art of departure necessary to arrive at the catalyst mixture of claim 7 is neither obvious in view of D1 nor manifestly self-evident. Thus, the subject-matter of this claim complies with the requirements of Article 56 EPC.

5. The same reasoning applies to the preferred embodiments of the catalyst mixture of claim 7 defined in claims 8 to 10, as well as, *mutatis mutandis*, also to the process of claim 1 for hydroprocessing a heavy hydrocarbon oil using the mixture of catalysts defined in claim 7, and the preferred embodiments of the process of claim 1 defined in claims 2 to 6.
6. The board finds therefore that the sole claim request complies with 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 first instance with the order to grant a patent on the basis of
 - claims 1 to 10 of the sole set of claims filed with the letter dated 21 January 2020 and
 - a description to be adapted thereto.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated