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D E C I S I O N
of 8 August 2001

Case Number: T 0080/97 - 3.3.6

Application Number: 91301780.2

Publication Number: 0447092

IPC: C10G 65/08

Language of the proceedings: EN

Title of invention:

Method of producing food grade quality white mineral oil

Patentee:

Atlantic Richfield Company

Opponent:

BASF Aktiengesellschaft, Ludwigshafen

Headword:

Food grade white oil/ATLANTIC RICHFIELD

Relevant legal provisions:

EPC Art. 56, 113(1)

Keyword:

"Inventive step - no (solution of the technical problem implicitly suggested in the prior art)"

"Right to be heard - yes (decision taken in oral proceedings not attended by the patentee)"

Decisions cited:

G 0004/92, T 0341/92

Catchword:

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Case Number: T 0080/97 - 3.3.6

D E C I S I O N
of the Technical Board of Appeal 3.3.6
of 8 August 2001

Appellant: BASF Aktiengesellschaft, Ludwigshafen
(Opponent) -Patentabteilung - C6-
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Representative: -

Respondent: Atlantic Richfield Company
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 20 November
1996 concerning maintenance of European patent
No. 0 447 092 in amended form.

Composition of the Board:

Chairman: P. Krasa
Members: G. Dischinger-Höppler
C. Rennie-Smith

Summary of Facts and Submissions

I. This appeal is from an interlocutory decision of the Opposition Division to maintain European patent No. 0 447 092 in amended form, the only independent Claim 1 reading:

"1. A method for the production of food grade quality white mineral oil from naphthenic feedstock containing at least 15% by weight of aromatic carbons without solvent extraction or acid treatment and without a hydrocracking step in a continuous process wherein the feedstock is subjected to a plurality of hydroprocessing steps in series characterised in that

- (i) said feedstock is subjected to three stages of hydrogenation;
- (ii) the first stage hydrogenation is conducted at a temperature in the range of 288°C to 299°C (550°F to 750°F) and with a hydrogen partial pressure of at least 8.2 MPa gauge (1200 psig) but less than 13.7 MPa gauge (2000 psig);
- (iii) the feed to the second step comprises liquid product from the first step; and
- (iv) the feed to the third step comprises liquid product from the second step."

The amendments with respect to Claim 1 as granted consist in the addition of the features "containing at least 15% by weight of aromatic carbons" and "and without a hydrocracking step".

II. The notice of opposition was based on lack of inventive step and on the following documents:

(1) US-A-4 325 804 and

(2) US-A-2 300 038.

During the opposition proceedings, the Proprietor (Respondent) not only filed the above amended claims but also cited further documents, *inter alia*

(3) US-A-4 263 127 and

(6) E.F. Gallei et al., "The BASF-Process for Preparation of Technical and Food- or Medicinal-Grade White Oils by Catalytic Hydrogenation", BASF Bulletin, pages 167 to 183.

The Opponent (Appellant) objected to the added feature concerning the minimum amount of aromatic carbons under Article 123(2) EPC and raised the new ground that the claimed subject-matter lacked novelty over document (3).

III. In its decision, the Opposition Division held that the amendments made to Claim 1 as granted complied with the requirements of Article 123(2) and (3) EPC. Further it was held that the claimed subject-matter was novel over the process of document (3) and inventive over the process of documents (1) to (3) since they gave no hint of obtaining food-grade white oil from highly aromatic naphthenic feedstock without the energy or labour intensive hydrocracking or solvent extraction steps suggested in the prior art.

IV. With its statement of grounds of appeal, the Appellant filed *inter alia* the following document

(8) Römpf Chemie Lexikon, 9. edition, Vol. 3,
page 2354, headword "Kracken",

whereas the Respondent with its letter of reply filed document

(11) A. Sequeira, "Lubricating Oils 1: Manufacturing Process", in the Encyclopaedia of Chemical Processing and Design, Vol. 28, pages 347 to 377, New York, 1988.

V. Oral proceedings were held before the Appeal Board on 8 August 2001, in the absence of the Respondent as announced by a letter of 26 June 2001.

VI. The Appellant orally and in writing maintained its previously raised objections under Articles 123(2) and 54 EPC. It also maintained its objection under Article 56 EPC and argued in this respect essentially that the claimed subject-matter was not inventive over document (3) which was the closest prior art, in particular when taken in combination with the process disclosed in document (2). The Appellant in particular argued that the exclusion of a hydrocracking step from the process of Claim 1 was not apt to distinguish this process from that of document (3), since the step of the process of document (3) called "hydrocracking" was not a real hydrocracking step as understood by common general knowledge evidenced by document (8).

VII. The Respondent, in writing only, supported the opinion set out in the contested decision and submitted the

following further arguments:

- The hydrocracking in document (3) was a so-called "lube hydrocracking" which is conventional in the art as illustrated by new document (11) and quite different from the "fuel hydrocracking" referred to in document (8). Moreover, in order to arrive at the claimed subject-matter, a double selection must be made from the prior art temperature and pressure ranges and document (3) did not teach a naphthenic feedstock.

- Concerning inventive step, the Respondent argued that the claimed subject-matter was not obvious from either of documents (2) or (3) since for highly aromatic feedstock document (2) called for a solvent extraction stage as was confirmed by document (6); and document (3) required a hydrocracking stage. Further, it was impossible to obtain food grade white mineral oil from highly aromatic feedstock by the two-stage process of document (2), whilst the addition of a third hydrogenation stage would not be considered by a skilled person since it requires an additional expensive reactor.

VIII. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested in writing that the appeal be dismissed and that the patent be maintained.

Reasons for the Decision

The Board confirms the findings of the Opposition

Division that the amendments made to the claims during the opposition proceedings complied with the requirements of Article 123(2) and (3) EPC, and that the subject-matter of these claims was novel over the cited prior art (Article 54 EPC) although, as will become apparent from the following paragraphs, it does so for different reasons than those in the contested decision. Since the appeal succeeds on the issue of lack of inventive step of the claimed subject-matter (Article 56 EPC), it is not necessary to consider these issues in detail here.

1. *Technical background*

1.1 The patent in suit relates to a method for producing food grade quality white mineral oil from naphthenic feedstock. In this context, food grade quality means a product with only a trace of aromatic content. According to the patent in suit, such a trace is defined as amounting to only about 0.3% by weight or less of aromatic constituents in the white mineral oil product (column 1, lines 7 to 12, column 4, lines 33 to 37 and Claim 3). In contrast to the original claims which were unlimited in this respect (see original application, Claims 1 and 2), present Claim 1 now calls for a feedstock containing at least 15% by weight of aromatic carbons. This value is the lower limit of respective ranges which can be found e.g. in Claim 3 of the original application and of the patent in suit, and on page 4, lines 3 to 6 of the application as filed (column 3, lines 12 to 15 of the patent in suit).

1.2 According to the patent in suit, several prior art processes are known which achieve food grade white mineral oil. However, these processes require expensive

and labour intensive steps like acid treatment, neutralization and absorption stages (column 1, lines 32 to 43). Another process, known from document (1), uses a series of hydroprocessing steps and requires an initial hydrocracking step, followed by three hydrogenation stages. The hydrocracking is said to be disadvantageous because of its high energy consumption and high conversion of feedstock into low-boiling non-white oil products (column 1, lines 44 to 51).

1.3 Accordingly, the object of the patent in suit consists in providing an economical process which overcomes these disadvantages of the prior art (column 1, lines 52 to 54).

2. *Closest prior art*

2.1 Both parties consider document (3) as the closest prior art. It pertains to a process very similar to that of document (1) for obtaining food grade white mineral oil, by using the same initial hydrocracking step followed by two hydrogenation stages. Thus, unlike document (1) which uses four catalytic hydroprocessing steps in total (Claim 8, column 1, line 61 to column 2, line 21 and Example 1), the process of document (3) is limited to three such stages (see Claim 1, column 1, line 54 to column 2, line 2 and the Example in column 12). The Board, therefore, also considers document (3) as a suitable starting point for assessing inventive step of the present three-stage hydrogenation process.

2.2 The three-stage process of document (3) is a hydroprocessing method conducted without solvent

extraction or acid treatment (Example in column 12, lines 6 to 40). The initial hydrocracking step according to the process of document (3) is performed under particular hydrocracking conditions which include a temperature of 700 to 875°C, a hydrogen partial pressure of 1000 to 5000 psig and a particular hydrocracking catalyst (column 2, line 43 to column 7, line 47). These conditions are designed to allow during this step the favouring of ring openings rather than the splitting of chains into lower molecular weight compounds, such that as little as 5% by volume of the product may be material boiling below 600°F (column 7, lines 22 to 31). This step is followed by two hydrogenation steps. The feedstock used in document (3) can be derived from paraffinic or mixed base crude oils, in particular those containing larger amounts of aromatics (column 2, lines 22 to 25 and 36 to 40). Compounds containing naphthenic rings may also be present (column 7, lines 22 to 26). The only example described in document (3) (column 12, lines 4 to 45) is carried on a waxy virgin gas oil feedstock (column 12, line 6) containing 49.1% by weight of aromatics (Table 1) and is hydrocracked at a temperature of 775°F and a hydrogen partial pressure of 2750 psig (column 12, lines 7 to 8). The parties agreed that this amount of aromatics corresponded to an amount of aromatic carbons of at least 15% by weight.

- 2.3 Given the fact that the process of document (3) is similar to that of document (1) and the initial hydrocracking step in its preferred version as represented in the examples is identical (see in document (1), column 12, lines 31 to 39; in document (3), column 12, lines 6 to 14), the technical problem the patent in suit seeks to solve must be seen

to be same as stated in the patent with respect to document (1), namely to provide a process for producing food grade white mineral oil wherein energy consumption and product loss by conversion of feedstock into non-white oil is reduced (column 1, lines 47 to 55).

3. *Technical problem and its solution*

3.1 The feature concerning the absence of a hydrocracking step as introduced into Claim 1 during the opposition proceedings must be interpreted in the context of the disclosure of the patent application as originally filed. The only passage quotable as a basis for this feature is the paragraph bridging the fifth and sixth page of the original application, which reads:

"It is noteworthy that in all these reactions, the use of a relatively high partial pressure of hydrogen and relatively lower temperature **facilitates carrying out the hydrogenation to give the desired reaction product** in reducing the aromatic constituents of the liquid stream **without excessive cracking of the stream to undesired lower boiling range material.**" (emphasis added)

The Board concludes therefrom that what is excluded from the claimed process is the same as is excluded in document (3), namely an excessive splitting of chains into lower molecular weight compounds as generally known in the art, e.g. from document (8), as the main reaction in common fuel hydrocracking rather than the predominant opening of aromatic and naphthenic rings mentioned in document (3), identified in document (11) as "lube hydrocracking" (see page 358, first paragraph). This feature, i.e. the exclusion of a

hydrocracking step cannot, therefore, contribute to the solution of the technical problem to be solved as against document (3) as defined above.

3.2 Document (3) does not explicitly mention that the process be conducted continuously or discontinuously. However, as in the exemplified version of the process of document (3), gas stripping is carried out according to the patent in suit between the hydroprocessing steps (column 3, line 32 to column 4, line 12). In the absence of any other difference in conducting the respective processes, the Board concludes that the process of document (3) will be interpreted by those skilled in the art to be as continuous as that disclosed in the patent in suit.

3.3 During the oral proceedings before the Board, the Respondent agreed that waxy feedstocks are not designated as naphthenic. Further, the Respondent's argument that document (3) did not disclose the use of a naphthenic feedstock could not be refuted in view of the Appellant's confirmation that a feedstock is not necessarily naphthenic just because it contains an undefined amount of naphthenic moieties. Therefore, document (3) contains no unambiguous disclosure of using naphthenic feedstock in its process.

3.4 According to Claim 1 of the patent in suit, the first hydrogenation stage is carried out at a temperature of 550 to 750°F (288 to 399°C) and with a hydrogen partial pressure of at least 1200 psig (8.2 MPa gauge) but less than 2000 psig (13.7 MPa gauge). Both ranges overlap with the lower part of the corresponding ranges for the first stage of document (3) (700 to 875°F, preferably 750 to 850°F and 1000 to 5000 psig, preferably 1500 to

3000 psig; see column 7, lines 34 to 39). Document (3) does not, however, recommend any singling out of values in the lower part of either the temperature or the pressure range. On the contrary, the example in column 12 of document (3) shows conditions (775°F and 2750 psig) clearly outside the claimed ranges.

3.5 Hence, the solution of the above defined technical problem, i.e. to reduce energy consumption and product loss over the process of document (3), can only consist in using naphthenic feedstock and conducting the process at milder conditions than those of the said example of document (3), i.e. at lower temperatures and/or pressures.

3.6 Whilst it is evident that working at milder conditions would save energy, there is nothing on file from which it could be concluded that higher yields of desired product resulted from the claimed process given the fact that the alleged avoidance of excessive cracking in the patent cannot be distinguished from the comparatively insignificant splitting of chains in document (3) (see 3.1 above).

3.7 Nothing on file allows a comparison between the quality of the product obtained according to the patent in suit (containing at most 0.3% by weight of aromatics) and that according to document (3) measured by UV absorbency. Ultimate quality cannot, therefore, be taken into account here.

3.8 Therefore, the technical problem plausibly solved by the claimed subject-matter in view of the process of document (3) boils down to the problem of saving of energy.

4. *Inventive step*

4.1 It remains to be decided whether, in view of the available prior art documents it was obvious for someone skilled in the art to use a naphthenic feedstock as defined and milder conditions in the first hydrogenation step than in the hydrocracking step of document (3) in order to save energy, whilst still expecting to get food grade white oil within the definition of the patent in suit (see 1.1 above).

4.2 Document (2) discloses a process for manufacturing medicinal white oil, also as measured by UV absorbency (page 12, third paragraph), which is not only suitable in the production of food but also for the preparation of medicine. The process consists of two catalytic hydrogenation stages (Example 4) of which the first one is carried out under the same conditions as the first stage in the claimed process, i.e. at 345°C (653°F) and 100 at (1422 psi or 1408 psig).

Document (2) does not explicitly mention whether the feedstock is naphthenic or paraffinic. However, document (6) cited by the Respondent as a description of the process of document (2), mentions naphthenic and paraffinic feedstock as equally suitable without any qualifying or disqualifying distinction (page 175, left-hand column, section 3.3).

4.3 Thus, a skilled person would learn from documents (2) and (6) that mild conditions in the first step of a two-stage hydrogenation process are applicable for naphthenic feedstock in order to obtain medicinal or food grade white oil.

4.4 The Board is aware that the content of aromatics of 11.6% by weight (corresponding to about one half or less of aromatic carbons as agreed by the parties) in the feedstock of Example 4 of document (2) is comparatively low. For highly aromatic feedstock, containing e.g. more than 30% of aromatics, document (2) recommends previous solvent extraction (page 5, lines 1 to 4).

4.5 However, this must be seen in the context of the particular two-stage hydrogenation process of document (2) and cannot be taken as a warning not to apply hydrogenation to highly aromatic feedstock. The same applies to document (6) where in Figure 1 (page 168) a manufacturing route via solvent extraction and dewaxing is combined with two hydrotreating steps. According to document (2), a particular problem with feedstock rich in aromatics consists in the heat produced by the hydrogenation which requires expensive quench zones (page 3, lines 11 to 19). Yet, the solution of this problem is already given in document (2), namely to distribute the liberated hydrogenation heat over two hydrogenation stages. It is explained that this avoids the necessity of quench zones and enables the process to be carried out at milder condition and with higher amounts of aromatics in the feed (paragraph bridging pages 5 and 6). It implicitly follows that the heat can also be distributed over more than two hydrogenation stages, if necessary.

Also, it is evident from document (3) that the aromatic content is further reduced by the second and third hydroprocessing steps (Table I). Thus, it is obvious that a third hydrogenation would further reduce any

aromatic content remaining after the process of document (2).

- 4.6 The Respondent's final argument that the skilled person would not have envisaged an expensive third reactor to regulate heat control in document (2) is not relevant here, since neither document (3) nor the patent in suit indicate that the process is carried out in less than three separate reactors.
5. The Board, therefore, concludes that, for the purpose of saving energy in the process of document (3), the skilled person would try milder conditions in that stage which requires the highest energy consumption on naphthenic as well as paraffinic feedstock as suggested in documents (2) and (6), even if the feedstock is rich in aromatics components, and still expect food grade quality white oil since he would inherently conclude from document (2) that higher amounts of aromatic components can be dealt with by a third hydrogenation stage as in document (3).

For these reasons, the Board finds that the process of Claim 1 does not comply with the requirements of Articles 52(1) and 56 EPC.

6. The present decision against the Respondent was given in its pre-announced absence from the oral proceedings. Since, however, the decision is only based on facts and evidence already put forward during the written proceedings and commented on by the Respondent in writing, its right to be heard under Article 113(1) EPC within the meaning of opinion G 4/92 (OJ EPO 1994, 149) is not violated by rendering this decision in the Respondent's absence (see also T 341/92, OJ EPO 1995,

373, reasons No. 2.3).

Order

For these reasons it is decided that:

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

The Registrar:

The Chairman:

G. Rauh

P. Krasa