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D E C I S I O N
of 2 July 1998

Case Number: T 0411/96 - 3.3.1

Application Number: 88107350.6

Publication Number: 0340330

IPC: H01B 3/22

Language of the proceedings: EN

Title of invention:

Improved electrical insulating oil composition and electrical appliances impregnated therewith

Applicant:

Nippon Petrochemicals Company, Limited

Opponent:

-

Headword:

liquid-liquid extraction/NIPPON CHEMICALS

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes) - non-obvious solution"

Decisions cited:

T 0039/82

Catchword:

-



Case Number: T 0411/96 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 2 July 1998

Appellant:

Nippon Petrochemicals Company, Limited
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Representative:

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 16 October 1995
refusing European patent application
No. 88 107 350.6 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. J. Nuss
Members: P. P. Bracke
W. Moser

Summary of Facts and Submissions

I. The appeal lies from the Examining Division's decision, dispatched on 16 October 1995, refusing European patent application No. 88 107 350.6, published as EP-A-0 340 330, due to lack of inventive step over the teachings of documents

(1) Chemical Abstracts, vol. 109, no. 4, 25 July 1988, page 124, abstract no. 25136f, Columbus, Ohio, US; & JP-A-63 75 090;

(2) EP-A-0 260 702; and

(3) Ullmanns Encyklopädie der technischen Chemie, 4th edition, vol. 2, 1972, pages 489 to 490 and 546 to 547.

II. This decision was based on a set of 4 claims filed with letter of 2 March 1995, with the only independent claim reading:

"1. A process for producing an electrical insulating oil composition which comprises subjecting a by-product oil fraction mainly containing components having boiling points in the range of 260 to 330°C (based on atmospheric pressure) to liquid-liquid extraction with an organic polar solvent, said by-product oil fraction having been formed by alkylating benzene or toluene with ethylene in the presence of an alkylation catalyst to obtain an alkylated product mixture composed of unreacted benzene or unreacted toluene, ethyl benzene or ethyl toluene, polyalkyl benzenes and heavy components and then distilling said alkylated product, wherein said electrical insulating oil composition is recovered as an extract and wherein said liquid-liquid extraction with the organic polar solvent is performed

until said electrically insulating oil composition shows a ratio of the integrated intensity as chemical shift at 120 to 155 ppm of the spectrum measured by ¹³C NMR method to the total integrated intensity at 0 to 155 ppm of said spectrum of 70% or higher."

- III. More particularly, the Examining Division was of the opinion that the electrical insulating oil compositions obtained according to the process described in any of documents (1) and (2) and those obtained according to the process of the application in suit were identical and that the problem underlying the invention could only be seen in providing a further process for preparing a known oil composition.

The Examining Division also observed that the process according to the application in suit differed from the known ones only by the use of a liquid-liquid extraction instead of a distillation. Since it was known from document (3) that a liquid-liquid extraction is similar to a distillation, the Examining Division found that it was obvious to replace the distillation step in the known process by an extraction step.

- IV. The Appellant contested that the oil compositions obtained according to the processes described in any of documents (1) and (2) were identical to the ones obtained by the process according to the application in suit. Moreover, he argued that it was nowhere suggested to replace the distillation step in the process described in any of the documents (1) and (2) by a liquid-liquid extraction step or that by such replacement oil compositions with improved insulating properties could be obtained.

V. The Appellant requested that the appealed decision be set aside and that a patent be granted on the basis of

Claims: Claims 1 to 4 annexed to the appealed decision (filed with letter of 2 March, 1995) and

Description: pages 1 to 4 and 8 to 12, with the text on pages 3a and 3b being inserted in the text of page 3, filed with letter of 5 June 1998 and pages 5 to 7 and 13 to 19 of the application as filed.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

Present Claim 1 is a combination of the process parameters concerning the liquid-liquid extraction step and the way of recovering the electrical oil composition mentioned on page 8, lines 5 to 7 and page 9, line 23 to page 10, line 3 of the application as filed (page 4, lines 11, 12 and 35 to 38 of the published version) with the features described in original Claim 1.

The subject-matter claimed in each of present Claims 2 to 4 corresponds with the one described in each of original Claims 3 to 5 respectively.

The amendments on pages 1 to 4 and 8 to 12 only serve to bring the text of the description into conformity with the wording of Claims 1 to 4 annexed to the appealed decision and to objectively summarise the relevant prior art cited in the European Search Report.

Therefore, the Board concludes that the application with the claims and the description as mentioned under point V (above) does not contain subject-matter extending beyond the content of the application as filed (Article 123(2) EPC).

3. *Novelty*

Having examined the prior art cited in the European Search Report, the Board has reached the conclusion that the process according to the present claims is not disclosed in any of the documents belonging to that prior art.

The Board therefore concludes that the claimed process is novel over the cited prior art, which was not contested by the Examining Division.

4. *Inventive step*

4.1 The Board considers that any of the documents (1) and (2) is representative for the closest state of the art.

4.2 Document (1) relates to a method of preparing electrical insulating oil compositions by distilling a fraction having a temperature of 280 to 310°C (at atmospheric pressure) from a heavy by-product oil formed in alkylating benzene with ethylene in the presence of an alkylation catalyst to produce ethylbenzene, wherein a precise distillation is carried out under reduced pressure so as to give rise to an oil

composition having a ratio of the integrated intensity as chemical shift at 120 to 155 ppm to the total integrated intensity as chemical shift at 0 to 155 ppm of the spectrum measured by ¹³C NMR method of at least 72%.

Document (2) is concerned with electrical insulating oil compositions consisting of a fraction A containing components boiling within the temperature range of 268 to 275°C (at atmospheric pressure) and/or a fraction B containing components within the temperature range of 280 to 310°C (at atmospheric pressure), wherein the fractions are recovered by distillation from the heavy by-product oil formed in alkylating benzene with ethylene in the presence of an alkylation catalyst to produce ethylbenzene and wherein the ratio of the integrated intensity as chemical shift at 120 to 155 ppm to the total integrated intensity as chemical shift at 0 to 155 ppm of the spectrum measured by ¹³C NMR method is at least 80% for the fraction A and at least 72% for the fraction B (page 2, lines 46 to 55). The fraction A and the fraction B are obtained by precision fractional distillation under reduced pressure (page 3, lines 28 to 31, 34 and 35).

- 4.3 The oil product to be treated by the claimed process is of the same type as that described in document (1) or (2) since it is a heavy by-product oil, which mainly contains components with boiling points in the temperature range of 260 to 330°C (at atmospheric pressure), formed in alkylating benzene or toluene in the presence of an alkylation catalyst to produce ethylbenzene, and from which subsequently unreacted benzene or unreacted toluene, ethylbenzene or ethyltoluene and most of polyalkylbenzenes from the alkylated product is distilled off (page 2, lines 50 to page 3, line 6).

According to the application in suit the properties of such electrical insulating oils are not always satisfactory, due to the presence of unidentified components, which deteriorate the electrical properties of these oils, such as their compatibility with plastic materials (page 2, lines 33 to 41). Furthermore, on page 2, lines 42 to 44, it is said that the removal of these unidentified components requires extremely precise distillation, which is not economical.

Therefore, the problem underlying the invention must be seen in providing a further method of removing from a heavy by-product oil components which deteriorate the electrical properties of that oil.

The application in suit claims to solve this problem by the process defined in Claim 1, more particularly, by subjecting a by-product oil fraction to liquid-liquid extraction with an organic polar solvent and recovering the electrical insulating composition as an extract (see point II above).

- 4.4 Therefore, the question arises whether it can be accepted that the problem as defined above is effectively solved by the claimed process.
- 4.5 From the data presented in Table 2 of the application in suit for the insulating oils 1 to 14 it follows that electrical insulating oil compositions obtained according to the claimed process have excellent electrical properties, in particular, as far as inhibition of the swelling of polypropylene films, corona discharge properties and the lifetime of the capacitors is concerned.

The Board therefore accepts that it has been made credible that the problem underlying the invention, as defined under point 4.3 (above), is effectively solved by the claimed process.

- 4.6 It remains to be decided, whether, in the light of the teachings of the documents cited in the European Search Report, a skilled person seeking to solve the problem as mentioned under point 4.3 (above), would have arrived at the claimed process in an obvious way.
- 4.7 The Examining Division was of the opinion that a skilled person would have done so, for the reasons described under point III (above).

More particularly, the Examining Division came to the conclusion that from document (3) it was known that liquid-liquid extraction and distillation were both well-known separation techniques and, consequently, that it was obvious to replace the distillation step in the known processes by a liquid-liquid extraction step.

However, the Board must point out that, in the present case, the relevant question is not whether it was suggested in any of the cited prior art documents to use a liquid-liquid extraction technique instead of a distillation technique in order to separate components from the above defined by-product oils. Since it was known, for example, from document (2), that electrically insulating oil composition showing a ratio of the integrated intensity as chemical shift at 120 to 155 ppm to the total integrated intensity as chemical shift at 0 to 155 ppm of the spectrum measured by ¹³C NMR method of 70% or higher exhibit excellent electrical characteristics (page 3, lines 52 to 54), the relevant question is rather whether it was suggested in the prior art that by using a liquid-liquid extraction with an organic polar solvent instead

of a distillation it would be possible to prepare electrically insulating oil compositions having that ratio. It is, however, clear from point 4.2 above that such a suggestion is neither foreshadowed by document (1) nor by document (2).

Since document (3) is only concerned with standard separation techniques and does not disclose the separation of components from the by-product oil fraction, let alone the possibility of obtaining the aforementioned ratio, the Board is satisfied that a skilled person, seeking to prepare electrically insulating oil compositions having the ratio as defined in Claim 1, would not even take the teaching of document (3) into consideration (cf T 39/82, OJ EPO 1982, 419 reasons 7.3).

Since Claim 1 is related to a process of preparing oil compositions, this finding is independent of the issue of whether or not the oil compositions obtained according to the claimed process are different from those obtained according to any of the processes described in documents (1) and (2). Moreover, since the Board came to the conclusion that it was not obvious to replace the distillation step in the known processes in order to remove components deteriorating electrical properties, it is, in the present case, not relevant to examine whether with the claimed process improved properties can be obtained.

4.8 The Board therefore concludes that the process according to Claim 1 is not obvious in the light of the teachings of documents (1) to (3).

Claims 2 to 4, which represent preferred embodiments of Claim 1, derive their patentability from the same inventive concept.

5. Since Claims 1 to 4 and the description as mentioned under point V (above) comply with the requirements of the EPC, a patent may be granted on the basis of the documents specified in the Appellant's request.

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 on the basis of:

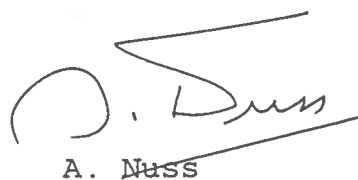
Claims: Claims 1 to 4 filed on 2 March 1995, and

Description: pages 1 to 4 and 8 to 12, with the text on pages 3a and 3b being inserted in the text of page 3, filed on 5 June 1998, and pages 5 to 7 and 13 to 19 of the application as filed.

The Registrar:


E. Görgmaier

The Chairman:


A. Nuss

