

BESCHWERDEKAMMERN  
DES EUROPÄISCHEN  
PATENTAMTS

BOARDS OF APPEAL OF  
THE EUROPEAN PATENT  
OFFICE

CHAMBRES DE RECOURS  
DE L'OFFICE EUROPEEN  
DES BREVETS

Internal distribution code:

- (A) [ ] Publication in OJ  
(B) [ ] To Chairmen and Members  
(C) [X] To Chairmen

**D E C I S I O N**  
of 11 November 1996

Case Number: T 0164/94 - 3.3.1

Application Number: 87305539.6

Publication Number: 0250273

IPC: C10M 135/34

Language of the proceedings: EN

Title of invention:  
Polycyclic thiophene lubricating oil additive

Applicant:  
EXXON CHEMICAL PATENTS INC.

Opponent:  
-

Headword:  
Thiophenes/EXXON

Relevant legal provisions:  
EPC Art. 56  
EPC R. 88

Keyword:  
"Novelty - yes"  
"Inventive step - yes, after amendment of the claims"

Decisions cited:  
T 0020/81; T 0037/82; T 0154/87

Catchword:  
-



Europäisches  
Patentamt

European  
Patent Office

Office européen  
des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Case Number: T 0164/94 - 3.3.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.1  
of 11 November 1996

**Appellant:**

EXXON CHEMICAL PATENTS INC.  
1900 East Linden Avenue  
Linden  
New Jersey 07036-0710 (US)

**Representative:**

Northover, Rober Frank  
Exxon Chemical Limited  
Exxon Chemical Technology Centre  
PO Box 1  
Abingdon  
Oxfordshire OX13 6BB (GB)

**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 29 September 1993  
refusing European patent application  
No. 87 305 539.6 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 29 September 1993, refusing European patent application No. 87 305 539.6, published as EP-A-0 250 273.
- II. The Examining Division essentially held that the use of the antioxidants according to the then pending set of claims in lubricating compositions was not inventive with respect to document (5), ie US-A-2 528 785.

More particularly, it held that the then claimed additives differed from the aminodibenzothiophenes and alkylaminodibenzothiophenes described in document (5) as useful antioxidants in lubricating oils only in that the thiophene compounds contained a condensed polyaromatic group instead of two non-condensed benzene groups. Since it could be expected that these additives would be suitable antioxidants and since no evidence of a surprising effect had been provided, an inventive step could not be accepted.

Additionally, the Examining Division remarked that T 20/81 (OJ EPO 1982,217) and T 37/82 (OJ EPO 1984,71) concerned cases similar to the present one.

In the course of the examination proceedings, the following documents were also cited:

- (1) US-A-3 318 799 and
- (3) US-A-3 124 532.

III. In response to a communication pursuant to Article 110(2) EPC and to a telephone conversation with the Rapporteur of the Board, the Appellant filed by fax on 29 April 1996 a set of 14 claims, containing independent Claims 1, 13 and 14, and Claims 2 to 12, which were directly or indirectly dependent on Claim 1.

The independent claims read as follows:

"1. A lubricating oil composition comprising an organic lubricating oil susceptible to oxidative polymerisation leading to the formation of C-7 asphaltenes, and from greater than 0.1 wt.% up to 10 wt.%, based on total composition weight, of an antioxidant additive containing at least one alkyl- or cycloalkyl-substituted thiophene-containing polycondensed aromatic compound ("thiophene compound") of 2-6 aromatic rings, wherein the alkyl or cycloalkyl group has 2 to 12 carbon atoms to provide solubility of the antioxidant in the lubricating oil composition, said antioxidant containing no amino groups and containing no hydroxyl groups and having the following weight ratios of components:

paraffinic:aromatic	60:40 to 30:70
aliphatic:naphthenic	80:20 to 20:80
thiophenic:non-thiophenic (aromatic+paraffinic)"	10:90 to 70:30

"13. A method of reducing the coking tendency of a lubricating oil susceptible to oxidative polymerisation leading to the formation of C-7 asphaltenes comprising adding to said oil from greater than 0.1 wt.% up to 10 wt.% of an antioxidant additive as defined in any one of the preceding claims."

"14. The use of an antioxidant additive as defined in any one of claims 1 to 12 in a lubricating oil susceptible to oxidative polymerisation leading to the formation of C-7 asphaltenes as antioxidant."

- IV. In response to a telephone conversation with the Rapporteur of the Board, the Appellant confirmed by fax on 27 November 1996 that the final compound in Claim 2 should read "naphthenobenzo-thiophene".
- V. The Appellant essentially argued that the problem to be solved was to provide antioxidants which have acceptable oil solubility and which do not require a complicated synthetic route for their preparation. It could not have been foreseen that the polycondensed thiophenes according to Claim 1 would have an acceptable solubility and would have comparable, and in some cases even improved, antioxidant activity in relation to some of the best commercially available antioxidants.
- VI. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 14 filed by fax on 29 April 1996.

### Reasons for the Decision

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

Claim 1 is a combination of the features of original Claims 1, 4 and 10 and the features described on page 4, lines 9, 10, 14 and 15, page 5, lines 20 to 26, and page 10, lines 8 to 14, of the application as filed. Claim 13 is a combination of the features of

original Claims 1 and 14 and the features described on page 10, lines 8 to 14, of the application as filed. The subject-matter of Claim 14 essentially corresponds to the one defined in original Claim 15.

Present Claims 2, 3, 5 to 9, 10 and 11 correspond to original Claims 2, 3, 5 to 9, 10 and 11 respectively. Claims 4 and 12 correspond to the subject-matter described on page 5, lines 35 and 36 and page 10, lines 8 to 14 respectively of the application as filed.

The final compound in Claim 2 was correctly mentioned on page 7, lines 24 and 25 of the application as filed.

From this it follows that the amendments comply with the requirement of Article 123(2) EPC.

3. *Novelty*

In a declaration by Dr Ghazi B. Dickakian, which was signed on 25 June 1992 and filed during the examination proceedings by letter of 31 July 1992, it was stated that

- (i) it is unlikely that the heavy cycle gas oil fractions of the type described in document (1) contain any significant quantity of polynuclear aromatic compounds containing the thiophene group, and it is extremely unlikely that they contain alkyl- or cycloalkyl-substituted derivatives of such compounds within the limits set out in the then pending Claim 1 and
- (ii) he did not find in the solvent extracts from lubricating oils of the kind described in document (3) substituted polynuclear thiophene compounds as claimed in the then pending Claim 1.

Since there is no reason for the Board to contest this statement, it accepts that neither document (1) nor document (3) discloses the subject-matter of the present claims.

Having examined the remaining prior art cited in the European Search Report, the Board has reached the conclusion that the claimed process is also not disclosed in any of those documents.

Since the Examining Division acknowledged the novelty of the claimed additives in respect of claims which were even broader in scope than the present ones, it is not necessary to give detailed reasons for this finding.

4. *Inventive step*

4.1 The Board considers document (5) to represent the closest state of the art. This was also the view of the Examining Division and the Appellant. This document is also mentioned in column 2, lines 48 to 55, of the patent application as published.

4.2 Document (5) relates to the use of aminodibenzothiophenes and alkylaminodibenzothiophenes for improving the characteristics, especially the stability, of lubricating oils (column 1, lines 1 to 4, and column 4, line 68 to column 5, line 3), and teaches that these aminodibenzothiophenes and alkylaminodibenzothiophenes may generally be prepared from dibenzothiophene by an alkylation reaction step, followed by a nitration- and a reduction-reaction step (column 1, lines 46 to 49, and column 2, lines 19 to 24).

4.3 In view of these known oil additives, the Board is satisfied that the problem underlying the present invention is the provision of inexpensive and effective antioxidant additives which are readily soluble or miscible in a wide variety of lubricating oils (column 3, lines 6 to 32, of the published patent application).

4.4 The application in suit claims to solve this problem using the lubricating oil compositions according to Claim 1.

4.5 By a comparison of the data presented in Figure 3 with those presented in Figures 1 and 2 it has been made credible in the application in suit that cracker bottom distillate fractions described in Examples 5 to 7 have effective properties for reducing the rate of C<sub>7</sub>-asphaltenes. Since the Board has no reason to doubt that the cracker bottom distillate fractions mentioned in Examples 5 to 7 effectively contain at least one "thiophene compound" as defined in Claim 1, the Board finds that it has been made credible that the "thiophene compounds" according to Claim 1, which can be obtained inexpensively as a by-product of oil refining and which are sufficiently soluble in lubricating oils, are indeed effective antioxidant additives.

4.6 The only remaining question to be decided is whether a skilled person would have expected that the "thiophene compounds" according to Claim 1 would solve the technical problem as defined above.

4.7 Since the claims underlying the appealed decision were not restricted to "thiophene compounds" containing no amino or hydroxy group, the Examining Division found that the then claimed "thiophene compounds" differed from the lubricating oil additives described in



document (5) only in that the thiophene compound contained a condensed polyaromatic group instead of two non-condensed benzene groups. As no evidence had been provided of a surprising effect resulting from the presence of the only differentiating technical feature, an inventive step was therefore not acknowledged.

Present Claim 1 is, however, restricted to lubricating oil compositions requiring the presence of "thiophene compounds", **which contain neither an amino nor a hydroxy group**. Therefore, the main reason for the Examining Division's refusal no longer applies.

4.8 According to document (5), which only discloses that aminodibenzothiophenes and alkylaminodibenzothiophenes are suitable antioxidative additives for lubricating oils (column 1, lines 32 to 37), it is an essential feature of the lubricating oil additives described therein that they contain an amino group. Since this document is completely silent about dibenzothiophenes which do not contain an amino group, it could not suggest the use of a compound which is free of amino groups and, even less, a polycondensed aromatic one containing no amino group. Consequently, document (5), taken alone, could not have led a skilled person looking for antioxidant lubricating oil additives in order to solve the underlying technical problem to the claimed lubricating oil compositions.

4.9 Document (1) relates to heavy cycle gas oil fractions providing outstanding oxidation resistance to mineral oils (column 1, lines 12 to 16 and 24 to 28), and document (3) relates to halomethylated products of complex, high molecular weight aromatic compounds showing extreme-pressure properties in lubricating oils (column 1, lines 8 to 36).

However, since the Board is satisfied that "thiophene compounds" as defined in present Claim 1 are not disclosed in either of documents (1) and (3) (see point 3 above), the use in lubricating oils of antioxidant additives as defined in the present claims cannot be said to be suggested therein.

4.10 Since, consequently, the now claimed solution to the problem underlying the present application was neither described nor suggested in any of documents (1), (3) and (5), or by any combination of their teaching, and since the claimed solutions were also not suggested in any of the other documents cited in the European Search Report, a fact which was not contested by the Examining Division, the Board concludes that neither the lubricating oil compositions of Claim 1 nor the method of reducing the coking tendency of a lubricating oil by the use of such additives (Claim 13), nor the use of such additives in a lubricating oil as antioxidant (Claim 14) were obvious in the light of the cited state of the art.

4.11 The Examining Division found that the then pending claims did not involve inventive subject-matter. The Board, however, is of the opinion that this matter does not have to be investigated in detail, since the achievement of a surprising effect is not a precondition for the existence of an inventive step. All that is necessary for a positive assessment of inventive step, according to Article 56 EPC, is to ascertain that the claimed subject-matter could not be derived from the prior art in an obvious manner (see T 154/87 of 29 June 1989, Reasons, 4.7). Consequently, since the Board has come to the conclusion that the

claimed subject-matter is not obvious in the light of the cited state of the art, the question as to whether any evidence of a surprising effect had been provided, as mentioned in point III of the appealed decision, is not relevant.

Finally, the Board of Appeal decisions referred to by the Examining Division are beside the point, because in T 20/81 the Board held that alleged advantages, which were not properly demonstrated, since a comparison was not suitably made, cannot be taken into consideration in respect of the determination of the problem underlying the invention (Reason 3) and in T 37/82 the Board took the view that, when assessing inventive step, only features contributing to the solution of the problem are to be considered (Reason 3). However, none of these principles is of any importance for assessing inventive step in the present case (point 4.10 above).

5. Claims 2 to 12, which represent preferred embodiments, derive their patentability from that of Claim 1.
6. Since the claims comply with the requirements of the EPC, and in particular with the requirements of Article 56 EPC, a European patent may be granted on the basis of Claims 1 to 14 filed by fax of 29 April 1996.
7. Before a patent can be granted, the description must be adapted to the present claims. More particularly, the first full paragraph on page 7 of the application as originally filed should be adapted to the wording of Claim 1, wherein the substitution of the thiophene compound is restricted to alkyl and cycloalkyl groups having 2 to 12 carbon atoms.

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 1 to 14 filed by fax dated 29 April 1996 with the final compound in Claim 2 reading "naphthenobenzo-thiophene" and a description adapted thereto.

The Registrar:



E. Gorgmayer

The Chairman:



A. Nuss



W. D. ...