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Bezeichnung der Erfindung:

Improved lubricating compositions

Title of invention:
Titre de l'invention:

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C10M 149/02

ENTSCHEIDUNG / DECISION

vom / of / du 16 October 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /

Titulaire du brevet :

Exxon Research and Engineering Company

Einsprechender / Opponent / Opposant:

Amoco Corporation

Stichwort / Headword / Référence :

Lubricating compositions/EXXON

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Art. 54 and 56

Schlagwort / Keyword / Mot clé:

"Novelty (confirmed)"

"Inventive step (confirmed) - closest prior art"

Leitsatz / Headnote / Sommaire

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Case Number: T 100 89 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 16 October 1990

Appellant:

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Decision under appeal:

Decision of Opposition Division of the European Patent Office of 18 October 1988, posted on 8 December 1988, rejecting the opposition filed against European patent No. 0 024 146 pursuant

to Article 102(2) EPC.

Composition of the Board:

Chairman: K.J.A. Jahn Members: R.W. Andrews

J. Stephens-Ofner

Summary of Facts and Submissions

- I. European patent No. 0 024 146 in respect of European patent application No. 80 302 627.7, which was filed on 1 August 1980 was granted with eighteen claims on 9 October 1985 (cf. Bulletin 85/41). Claim 1 reads as follows:
 - "A lubricating oil composition comprising:
 - 1. a major amount of lubricating oil;
 - 2. (A) from 1 to 10 wt% of an ashless dispersant compound which is: an ashless nitrogen or ester containing dispersant compound selected from the group consisting of:
 - (i) oil soluble salts, amides, imides, oxazolines and esters, or mixtures thereof, of long chain hydrocarbon substituted mono and dicarboxylic acids or their anhydrides;
 - (ii) long chain aliphatic hydrocarbon having a polyamine attached directly thereto; and
 - (iii) Mannich condensation products formed by condensing about a molar proportion of long chain hydrocarbon substituted phenol with about 1 to 2.5 moles of formaldehyde and about 0.5 to 2 moles of polyalkylene polyamine;

wherein said long chain hydrocarbon group is a polymer of a C_2 to C_5 monoolefin, said polymer having a molecular weight of about 700 to about 5000;

- or (B) from 0.3 to 10 wt% of a nitrogen or ester containing polymeric viscosity index improver dispersant which include
- (a) polymers comprised of C_4 to C_{24} unsaturated esters of vinyl alcohol or C_3 to C_{10} unsaturated mono- or dicarboxylic acid with unsaturated nitrogen containing monomers having 4 to 20 carbons
- (b) polymers of C_2 to C_{20} olefin with unsaturated C_3 to C_{10} mono- or di-carboxylic acid neutralised with amine, hydroxyamine or alcohols
- (c) polymers of ethylene with a C_3 to C_{20} olefin further reacted either by grafting C_4 to C_{20} unsaturated nitrogen containing monomers thereon or by grafting an unsaturated acid onto the polymer backbone and then reacting said carboxylic acid groups with amine, hydroxyamine or alcohol.
- or (C) mixtures of (A) and (B);

and characterised in that the lubricant further contains 0.01 to 5.0 parts by weight, per 100 parts of said lubricating composition, of zinc dihydrocarbyl dithiophosphate and from 5 to 500 parts per million by weight of added copper in the form of oil soluble copper compound."

Independent Claim 16 relates to a concentrate suitable for preparing the lubricating oil composition of Claim 1.

II. On 5 July 1986 a notice of opposition was filed requesting the revocation of the patent on the grounds that its subject-matter lacked novelty and did not involve an inventive step. The opposition was supported by, inter alia, the following documents:

- (1) US-A-3 346 493
- (3) US-A-2 343 756
- (4) US-A-2 552 570
- (5) Canadian Journal of Chemistry, Volume 56, pages 157, 158 and 168, 1978 and
- (6) Tetrahedron, Volume 22, page 2153 to 2161, 1966.

After expiry of the time allowed for filing notice of opposition the following documents were cited by the Opponent:

- (10) US-A-4 105 571
- (11) US-A-3 328 298
- (22) American Chemical Society, Chicago Meeting, 26-31 August 1973, pages 694 to 705, and
- (25) US-A-4 176 073.
- III. By a decision delivered orally on 18 October 1988, with, written reasons posted on 8 December 1988, the Opposition Division rejected the Opposition. The Opposition Division held that the subject-matter of the disputed patent was novel in the light of Example M of document (1) since the composition disclosed therein did not contain an ashless dispersant and the concentration of the dispersant present in said composition fall outside the range claimed in the present Claim 1.

The Opposition Division also considered that it was surprising that a lubricating oil composition containing an uncomplexed dispersant and an oil-soluble copper compound was at least as effective as the one containing a complexed dispersant prepared by a tedious process involving heating the components for a period of hours.

The Opposition Division further held that it was not obvious from the state of the art that the combination of an oil-soluble copper compound with a zinc dihydrocarbyl

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dithiophosphate (ZDDP) would effectively counteract the oxidation due to the use of oxidation inducing dispersants.

IV. A notice of appeal was filed against this decision on 8 February 1989 with the payment of the prescribed fee. In his statement of grounds of appeal filed on 18 April 1989 and during the oral proceedings held on 16 October 1990, the Appellant maintained that the claimed subject-matter lacked novelty in the light of disclosure in document (1), particularly having regard to Appendices J and O filed with his statement of grounds. Furthermore, the Appellant argued that the common usage of the expression "ashless dispersant" would include the complexes of document (1). However, even if these complexes are not considered to be ashless, nevertheless the ligand is and meets the requirements of component A(i) of the disputed patent.

The Appellant also contended that the subject-matter of the disputed patent did not involve an inventive step in the light of the combined teaching of documents (10) and (3) since it was obvious to add an antioxidant known from document (3) to the lubricating oil compositions disclosed in document (10). The fact that document (3) was published in 1944 could not be considered as a hindrance to the use of copper since documents (4), (6), (1), (11) and (5) which were published in 1951, 1966, 1967, 1967 and 1978 respectively, also indicate that copper is an antioxidant and/or used as an additive in lubricating oils. Moreover, the use of engines operating under more severe conditions and the requirement of meeting current performance levels in various tests would encourage the skilled worker to look back at known antioxidants.

The Patentee has provided no evidence to prove that the claimed lubricating compositions have an outstanding effect with respect to those disclosed in document (1). In

fact, Appellant's Appendix N clearly shows that the compositions of document (1) are as effective as the present ones.

- IV. During the appeal proceedings the Respondent referred to the following additional documents:
 - (5A) pages 157 to 163 of document (5)
 - (7A) Lubricant Additives, C.V. Smalheer and R. Kennedy Smith, pages 2 to 7, 1967 and
 - (36) SAE Paper No. 700 507, 18-20 May 1970.

In his response to the statement of ground of appeal and during the oral proceedings, the Respondent contended that the analytical data provided by the Appellant and himself did not demonstrate that the disclosure of document (1) anticipates the compositions and concentrates of the patent in suit. The Respondent considered that the complexes of document (1) are not ashless dispersants and are not chemically equivalent to blends of oil-soluble copper compounds and ashless dispersants. Therefore, neither the general disclosure nor the specific disclosure of document (1) destroyed the novelty of the claimed subject-matter.

According to the Respondent, the skilled person would not have combined the teaching of documents (10) and (3), not only because of the age of document (3), but also in view of the internal evidence in the earlier document. Furthermore, the problem of excessive oil thickening referred to in document (22) which the present invention addresses and solves, did not exist at the date of document (3).

With regard to document (1), the Respondent argued that this document disclosed a variety of uses for the metal complexes and did not highlight the copper complexes for

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use in lubricants. In addition the poor result in the L38 engine test would discourage the skilled person from seriously considering the complexes as lubricating oil additives.

V. The Appellant requested that the decision under appeal be set aside and the patent revoked. The Respondent requested that the appeal be dismissed. Alternatively, as an auxiliary request, the Respondent requested that the patent be maintained on the basis of Claims 1 to 17 filed on 7 August 1990.

Claims 1 and 15 of this auxiliary request differ from the corresponding granted Claims 1 and 16 by the fact that the lubricating oil compositions and concentrates additionally contain magnesium and/or calcium containing additives.

VI. At the conclusion of the oral proceedings the Board's decision to dismiss the appeal was announced.

Reasons for the Decision

- 1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
- 2. The patent in suit relates to lubricating oil compositions consisting of a major amount of lubricating oil and additives designed to improve the performance of the oil.
- In the Board's judgment, the closest prior art may be considered to be represented by lubricating oil compositions comprising major amounts of lubricating oil, ashless dispersants and/or viscosity index (VI) improver dispersants, zinc dihydrocarbyldithiophosphates (ZDDP) and

conventional antioxidants. The Respondent has acknowledged that such lubricating oil compositions were in use at the priority date of the disputed patent.

- During the oral proceedings, the Appellant expressed the 2.2 opinion that document (10) should be regarded as representing the closest prior art in the light of which the technical problem underlying the disputed patent should be formulated. Document (10) discloses a storage stable lubricating oil composition comprising a major portion of lubricating oil, from about 0.01 to about 5.0 parts by weight of ZDDP, from about 0.01 to about 1.0 parts by weight of an ester of a polycarboxylic acid with a glycol, from about 0.1 to about 30 parts by weight of an ashless dispersant and a conventional antioxidant, such as phenothiazine or phenyl-l-naphthylamine (cf. Claim 1 in combination with column 12, lines 3 to 5). However, the problem addressed in this document was to provide a lubricating oil composition having improved anti-wear and anti-friction properties (cf. column 1, lines 5 to 8 and column 15, lines 6 to 38), whereas the problem according to this disputed patent is to retard or inhibit oxidation of a lubricant composition containing dispersant and antiwear additives (ZDDP) without affecting the performance of those additives.
- 2.3 Therefore, in view of the different problems underlying the disputed patent and document (10), this latter document cannot be considered to represent the closest state of the art.
- 2.4 In the light of the prior art referred to in paragraph 2.1 above, the technical problem underlying the disputed patent may be seen in providing an antioxidant the use of which results in an increase in the life of a lubricant

composition containing, as further additives, dispersant and ZDDP without adversely affecting the performance of these additives.

According to the disputed patent this technical problem is solved by incorporating in the lubricant composition an oil-soluble copper compound in the amount of 5 to 500 ppm, based on the weight of the total composition.

In view of the results in Example 1, those of the sequence VD Engine Test for oils EEC11525 and EEC12135 (cf. Respondent's Appendix 2 filed on 2 November 1989) and those of the sequence IIID Engine Test for copper dated 5 June 1989 (cf. Respondent's Appendix 1 filed on 2 November 1989), the Board is satisfied that the above-defined technical problem is solved.

- Jivision and the Respondent with respect to the novelty of the claimed subject-matter having regard to document (1), it is emphasised that, in accordance with the established jurisprudence of the Boards of Appeal, in deciding the question of novelty of an invention, consideration has not only to be given to the Examples but also as to whether the disclosure of the prior art document as a whole is such as to make available to the skilled person as a technical teaching the subject-matter for which protection is sought (cf. Decisions T124/87 "Dupont/Copolymer", OJ EPO 1989, 491, paragraph 3.2, T 12/81 "Diastereomers", OJ EPO 1982, 296, paragraph 5 and T 198/84 "Thiochloroformates", OJ EPO 1985, 209, paragraph 4).
- In the present case, the subject-matter of Claim 1 is a lubricating oil composition comprising four components, viz a major amount of lubricating oil, from 1 to 10 wt% of an ashless dispersant or from 0.3 to 10 wt% of a VI improver dispersant, or mixtures of the two types of

dispersants, from 0.01 to 5.0 parts by weight per 100 parts of said lubricating composition of ZDDP and from 5 to 500 ppm of added copper in the form of an oil-soluble copper compound.

3.2 Document (1) discloses a lubricating composition comprising a major proportion of a lubricating oil and a minor proportion of a metal complex obtained by reacting a non-acidic acylated nitrogen compound, falling within the terms of an ashless dispersant of the disputed patent, with a complex forming metal compound selected from nitrates, nitrites, halides, carboxylates, phosphates, phosphites, sulphates, sulphites, carbonates, borates and oxides of cadmium, tin, chromium, iron, manganese, nickel, cobalt, zinc and copper at a temperature above about 25°C and below the decomposition point of the reaction mixture (cf. Claim 1 in combination with column 9, lines 17 to 71). According to column 15, lines 1 to 3, the concentration of the metal complexes in the lubricant is from about 0.01% to about 10% by weight. Additionally the lubricating oil compositions may contain extreme pressure and corrosion inhibiting additives, such as ZDDP, in amounts within the range from about 0.1% to about 10% (cf. column 15, lines 73 to 75 in combination with column 16, line 20 and column 17, lines 31 to 41). Examples C, J, M and W describe lubricating oil compositions comprising copper complexes, two of which (J and M) disclose the copper complex in combination with a ZDDP or an adduct of ZDDP with 1,2-hexene oxide.

In the Board's view, the disclosure of this document as a whole makes available to the skilled person a lubricating oil composition containing copper, in the form of an oil soluble compound, in an amount falling within the range specified in the present Claim 1 in combination with an amount of ZDDP also within the claimed range.

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3.3 However, in the Board's judgment, one of the four components of the lubricating oil compositions in accordance with Claim 1, i.e. the ashless dispersant or VI improver dispersant, is not present in the compositions disclosed in document (1) since the metal complexes of this document cannot be equated with the present ashless dispersant or VI improver dispersant.

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Document (7A) clearly draws a distinction between metalcontaining detergents, such as normal and basic salts of sulphonic acids, ashless dispersants and metal-containing dispersants (cf. page 2, first paragraph of the section headed "Detergents" and the section headed "Sulphonates" in the right-hand column; and the first complete paragraph in the left-hand column on page 5). Moreover, from this document it is clear that boron-containing dispersants are recognised in the art as belonging to the class of ashless dispersants (cf. paragraph B in the left-hand column of page 5 in combination with the sentence immediately preceding paragraph A). Similarly, VI improver dispersants are considered in the oil additive field to be specific types of ashless dispersants possessing both dispersant and VI improving properties (cf. penultimate paragraph in the right-hand column of page 5).

Document (25) (published after the claimed priority date of the patent in suit), which refers to a "molybdenum-containing ashless dispersant" in column 2, lines 40 and 41, cannot support the Appellant's contention that the metal complexes of document (1) are, in fact, ashless dispersants. The above-mentioned expression is to be construed as indicating that an ashless dispersant is reacted with a source of molybdenum to yield a complex of the ashless dispersant and molybdenum, i.e. a metal-containing dispersant (cf. column 1, lines 8 to 11).

Respondent's Appendix 5 clearly shows that the IR spectrum of a blend of dispersant and oil-soluble copper compound is different from that of a metal complex prepared from the same dispersant in accordance with document (1). However, in the absence of any ZDDP the former composition is not in accordance with either Claim 1 or Claim 16. On the other hand, Appellant's 31PNMR spectra reported in Appendices O and J demonstrate that a copper-zinc exchange occurs when ZDDP is added to either a blend of dispersant and oil-soluble copper compound or to a copper complex of document (1). However, in view of the fact that 31PNMR spectra can only provide information regarding the chemical environment of phosphorus atoms, the Board considers the Respondent's contention that this zinccopper exchange results in the replacement of copper in the metal complex by zinc to be plausible. Thus, the addition of ZDDP does not result in the formation of an ashless dispersant as required by the present Claims 1 and 16.

Therefore, in the Board's judgment, the subject-matter of Claims 1 and 16 is novel having regard to the disclosure made available to the skilled person by document (1).

- 4. It still remains to be decided whether the proposed solution to the above-defined technical problem is obvious in the light of the cited prior art.
- 4.1 Document (3) describes a lubricant composition comprising a lubricating oil and, in the form of oil-soluble compounds, from 50 to about 500 ppm of copper and from about 0.1 to about 0.5% of sulphur (cf. Claim 1) According to this document the use of copper and sulphur in the claimed proportions inhibits the deterioration of the oil (cf. page 2, left-hand column, lines 18 to 21). This

deterioration is primarily the result of oxidation of the oil accelerated by heat and various metals in contact therewith (cf. page 1, left-hand column, lines 9 to 14). Suitable copper and organic sulphur compounds are listed on page 2, right-hand column, lines 5 to 69.

However, the skilled person is aware that engines, at the application date of this patent (1942), were operated under less severe conditions than those encountered in engines operating at the claimed priority date of the disputed patent (1979), both in respect to load and oil temperature. Thus, the demands on oil additives were corresponding less. For example, document (36) discloses that the break-point with respect to viscosity at a sump temperature of about 143°C was 100 hours, whereas at a sump temperature of 160°C the break-point came at 20 hours (cf. page 3, left-hand column and Figure 5).

In the late 1960's the problem of excessive oil thickening which was considered to be due to rapid oxidation and nitration of the oil as well as base oil volatility, was reported (cf. document (22), second paragraph on page 694). Furthermore, longer drain times and more severe operating conditions required better control of slugde formation and better neutralisation of acidic combustion products. This necessitated the increased use of ashless dispersants and magnesium and calcium additives. These measures tended to promote thickening through oxidation (cf. Figures 2 and 3 of the disputed patent).

Although document (3) refers to an increase in the viscosity of the lubricating oil, it can be seen from the results reported for the underwood test (cf. Table III on page 5) that this increase was only about 15 centipoise.

In view of the different circumstances existing at the application date of document (3) and the priority date of the disputed patent, the skilled person would not consider that the addition of copper in the amounts proposed in document (3) to a modern lubricating oil would solve the problem of providing an improved inhibition of oxidation without adversely affecting the performance of the other additives present in the oil.

The skilled person would be further discouraged from using copper in a lubricating oil by the fact that the laboratory bench test reported in document (22) to simulate the oil oxidation and thickening processes of the sequence IIIC engine test (a problem only arising after the publication date of document (3)) employs an iron bar wrapped with copper wire as a catalyst system (cf. Table III on page 704).

Documents (5)/(5A) and (6) relate to the inhibition of 4.2 hydrocarbon autoxidation by cupric complexes of dialkyldithiophosphoric acid and the antioxidant activity of cuprous di-isopropyldithiophosphate respectively. The autooxidation of tetralin, styrene, cumene and squalene is exemplified without any connection between these compounds and mineral oils being discernable. These documents would provide the skilled person with no indication of how oilsoluble copper compounds would behave in a lubricating oil, particularly in the presence of the other additives. Therefore, the disclosure of these documents, either alone or combined with the disclosure of the other cited documents, would be of no assistance to the skilled person in his search for a solution to the technical problem underlying the disputed patent as defined above.

4.3 Document (4) discloses a lubricant composition comprising a mineral lubricating oil and 0.02 to 3.0% of a cuprous dialkyldithiophosphate as an antioxidant additive (cf. Claim 1 in combination with column 3, lines 43 to 50). Other additives such as zinc methyl cyclohexyl thiophosphate may also be present (cf. column 8, lines 21 to 45 and column 9, lines 27 to 39).

The results of the engine tests, which were carried out under the less severe operating conditions current at the application date of this patent (1947) only provide information regarding bearing corrosion and varnish formation (cf. Examples 13 and 14). Thus, from the teaching of this document, the skilled person would not be able to draw any conclusions with respect to the ability of the compounds disclosed therein to inhibit or retard oil thickening in engines operating under more severe conditions or deduce that the solution to the abovedefined technical problem lies in the use of oil-soluble copper compounds.

Document (11) describes a lubricant composition comprising a lubricating oil and the product of the reaction between an intermediate formed from an epoxide and a dihydrocarbyl phosporothioic acid and a basic compound of aluminium or lead or a metal of Groups I and II of the Periodic Table, for example, copper oxide (cf. Claim 1 and column 4, lines 47 and 48). The products are used to enable the lubricant to operate under extreme pressures and reduce wear (cf. column 1, lines 15 to 19 and 25 to 26).

Although this document demonstrates that it was known in 1967 to add oil-soluble copper compounds to lubricating oil, it is solely concerned with improving the load-bearing properties of lubricating oils by the addition of the above-mentioned reaction products and from the teaching of this document the skilled person could not

make any deductions regarding any possible antioxidant effects of these products. Therefore, it would not provide the skilled person with any indication that the solution to the above-defined technical problem lies in the use of oil-soluble copper compounds.

- 4.5 As previously mentioned, document (1) discloses a lubricating composition comprising a lubricating oil and an oil-soluble metal complex, for example, a copper complex. The teaching of this document is directed to the use of the metal in complexed form and, therefore, does not contain any teaching which would lead the skilled person in the direction of the proposed solution.
- 4.6 With respect to the Appellant's argument that the age of document (3) would not prevent the skilled person from using copper in view of the publication of documents (4), (6), (1), (11) and (5) in the period from 1951 to 1978, it is considered that, since documents (5) and (6) are not concerned with lubricating oils, they would not ser ve to overcome the skilled person reluctance to return to the teaching of a document published in 1966 in his search for a solution to the problem arising with lubricants during use in more modern engines.

Similarly, documents (4) would not encourage the skilled person to consider prior art published in 1944 since it was published before the advent of the problem of excessive oil thickening in engines operating under modern conditions.

Document (1) which discloses the use of copper in lubricating oils only in the form of complexes and which was published after the advent of the above-mentioned problem, would not provide the skilled person with any incentive to return to the use of uncomplexed copper as taught in the earlier prior art documents.

Document (11), which was published in the same year as document (1), makes no mention of antioxidant activity. Therefore, it would not lead the skilled person to the idea that there is a consistent trend regarding the use of copper as an antioxidant in lubricants stretching back to 1944.

- Therefore, in the Board's judgment, the proposed solution to the problem of providing an improved antioxidant for a lubricating composition, containing as further additives a dispersant and ZDDP, without adversely effecting the performance of these additives is not obvious. Thus, Claim 1 and dependent Claims 2 to 15 are allowable. Claim 16 and dependent Claims 17 and 18, which relate to concentrates suitable for the preparation of the lubricating oil compositions in accordance with Claim 1, are also acceptable by virtue of the allowability of Claim 1.
- 5. Even if one were to consider that document (1) represented the closest state of the art, in the Board's judgment the proposed solution to the technical problem formulated in the light of this document is also inventive.
- A disadvantage associated with the compositions of this document may be seen in the necessity of preparing the metal complexes. Although it is stated that in some instances the metal complexes may be obtained by mixing the reactants at room temperature (cf. column 9, lines 65 to 67), the reaction between the ligand and metal compound is preferably carried out 80°C (cf. column 9, lines 64 to 65). In the absence of any explanation of the expression "in some instances", it must be assumed that the reaction conditions (heating for several hours) illustrated in Examples I to XXIV are normally required to form the metal complexes.

In the light of this, the technical problem underlying the patent in suit may be seen in overcoming the abovementioned disadvantage, while at the same time providing a lubricating oil composition having a performance which meets the standards laid down in certain standard tests.

According to the disputed patent, this problem is solved by a lubricating oil containing the four components specified in Claim 1.

In view of the results of the Sequence III-D (cf. column headed copper) and V-D (cf. oils EEC11525 and EEC 12135)
Engine Tests reported in the Respondent's Appendices 1 and 2 filed on 2 November 1989 and those of the sequence V-D Engine Test given in the Appellant's Appendix N filed on 18 April 1989 (cf. Example A/N), the Board is satisfied that this technical problem is solved.

- By defining the technical problem in this manner, it is unnecessary to consider the question whether the sequence VD Engine Test of the Respondent's Appendix 2 for oils in accordance with document (1), i.e. EEC11549, EEC11561, EEC11562 and EEC12175 and those for oils EEC11525 and EEC12135 falling within the scope of the present Claim 1 are really comparable. Similarly the question whether the complex used in Example B/N (cf. Appellant's Appendix N) was prepared following the disclosure of document (1) may be left unanswered.
- Although, as a skilled person in the field of lubricant additives, the inventor of the compositions of document (1) would have been aware of the use of uncomplexed copper in lubricants disclosed in documents (3) and (4), nevertheless he considered it absolutely essential to add the copper in the form of a complex in order to produce a satisfactory lubricating oil composition. In view of this,

the skilled person would not have considered documents (3) and (4) in his search for a solution to the technical problem as defined immediately above.

In the Board's judgment, none of the other previously discussed prior art documents would have provided any indication which would have led the skilled person to the proposed solution.

- 5.4 Therefore, independent of the chosen starting point, the subject-matter of Claims 1 and 16 involves an inventive step.
- 6. In view of the above, it is not necessary to consider the Respondent's auxiliary request.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

M. Beer

K.J.A. Jahn