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D E C I S I O N
of 7 December 2005

Case Number: T 0500/03 - 3.3.01

Application Number: 96933426.7

Publication Number: 0854904

IPC: C10M 163/00

Language of the proceedings: EN

Title of invention:
Low chlorine, low ash crankcase lubricant

Patentee:
Infineum USA L.P.

Opponent:
Ethyl Corporation

Headword:
Lubricant/INFINEUM

Relevant legal provisions:
EPC Art. 56, 83

Keyword:
"Sufficiency of disclosure (yes)"
"Inventive step (yes) - non-obvious solution"

Decisions cited:
-

Catchword:
-

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Case Number: T 0500/03 - 3.3.01

D E C I S I O N
of the Technical Board of Appeal 3.3.01
of 7 December 2005

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 6 March 2003 revoking European patent No. 0854904 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: A. Nuss
Members: J. Jonk
R. Menapace

Summary of Facts and Submissions

I. The Appellant (Proprietor of the patent) lodged an appeal against the decision of the Opposition Division revoking the European patent No. 0 854 904 (European patent application No. 96 933 426.7), the independent Claim 1 as granted reading as follows:

"A multigraded lubricant comprising a chlorine-containing dispersant, a multifunctional viscosity modifier, and metal detergents prepared by adding to a basestock of lubricating viscosity

at least 1.5 weight percent of a chlorine-containing dispersant that is a reaction product of polyisobutenyl succinic anhydride and an organic amine,
a multifunctional viscosity modifier, and
a metal-containing detergent system that comprises

a metal sulfonate and one or more metal salts of a phenolic organic acid selected from the group consisting of alkyl phenols, sulfurized alkyl phenols, and alkyl salicylic acids in an amount that provides at least 0.0025 gram equivalent % of phenolic hydroxide wherein at least one of the metal sulfonate or metal salts is overbased and the detergent system includes not more than 0.008 gram equivalent % carbonate, and the ratio of the total gram equivalents of phenolic hydroxide to the gram equivalents of metal sulfonate is at least 1.4 to 1,
the gram equivalent ratio of all the organic metal salts to carbonate is at least 0.5 to 1,

wherein the lubricant contains no more than 50 ppm chlorine as determined by neutron activation analysis and no more that 1.2 wt. % sulphated ash as determined by ASTM D874."

II. The opposition was filed against the patent as a whole, and based on the grounds of lack of novelty and inventive step as indicated in Article 100(a) EPC and lack of sufficiency within the meaning of Article 100(b) EPC. It was supported by several documents including:

(1) WO 97/10318 (EP-B-0 874 885)
(2) EP-A-0 704 520,
(3) US-A-5 202 036,
(4) SAE 841208: "Additives-The Right Stuff for Automotive Engine Oils", Roger W. Watson and Thomas F. McDonnell, Jr., Pages 20, 24 and 26 (1984),
(5) Autotrends '94, Exxon Chemical Limited, Paramins Business Center , "Automotive Lubricants - Environmental issues" (1994), and
(9) US-A-5 427 702.

III. The Opposition Division held that the subject-matter of the claims of the main request, the first auxiliary request and the second auxiliary request all filed on 20 February 2003 met the requirement of sufficiency within the meaning of Article 83 EPC and also was novel in the light of documents (1) and (2) under Article 54(3) EPC. However, having regard to its finding that it was unclear whether the specific parameters as claimed could be considered critical in contributing to any effect, it decided that the claimed subject-matter lacked the required inventive step.

IV. Oral proceedings before the Board were held on 7 December 2005.

V. The Appellant defended the patentability of the subject-matter of the patent in suit on the basis of the claims of a main request filed on 7 November 2005, or of a first or second auxiliary request both submitted with letter of 4 July 2003.

Claim 1 of the main request corresponded to Claim 1 as granted, except that with respect to the detergent system the ratio of the total gram equivalents of phenolic hydroxide to the gram equivalents of metal sulfonate (phenolic ratio) of "at least 1.4:1" was restricted to "from 1.4:1 to 2.5:1".

This claim corresponded to Claim 1 of the first auxiliary request before the Opposition Division.

VI. The Appellant considered that the technical problem underlying the patent in suit in the light of document (3) as the closest prior art was the provision of a lubricant formulated with a conventional chlorine-containing dispersant and a multi-functional viscosity modifier having a low chlorine and sulphated ash content and yet still meeting the requirement of satisfactory high-temperature deposit performance upon use. Furthermore, he submitted by referring to the test-results indicated in the patent in suit and those submitted by his letters of 20 December 2002 and 27 January 2005 that this technical problem was solved in accordance with the present claims, in particular by the use of the detergent system having the specified

parameters. He concluded that the claimed solution of the present technical problem was not obvious to the skilled person in view of said document (3) in combination with the teaching of documents (9), (4) and (5) as suggested by the Respondent.

VII. The Respondent (Opponent) maintained his objections concerning lack of sufficiency within the meaning of Article 83 EPC with respect to the calculation of the carbonate content as claimed. He accepted, however, that the subject-matter of the present claims met the novelty requirement under Article 54(3) EPC in the light of documents (1) and (2).

Furthermore, he submitted with respect to the question of inventive step that the Appellant had not demonstrated that the compositions as claimed solved the technical problem underlying the patent in suit within the whole scope of the claims. Moreover, he argued that a skilled person following the teaching of document (3) and having regard to documents (4), (5) and (9) would arrive at compositions within the scope of the claims of the patent in suit. In this context, he noted

- that document (3) disclosed a lubricant comprising a chlorine-containing dispersant and a detergent system meeting the conditions as claimed according to the patent in suit and leading to a low ash contend,

- that document (5) disclosed that a low chlorine content of no more than 50 ppm was desirable, and

– that documents (4) and (9) taught that a it was possible to replace a large part of the chlorine-containing dispersant, namely up to 50%, by a multifunctional viscosity modifier, which replacement would provide a lower chlorine content.

VIII. The Appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the claims as filed with letter of 7 November 2005, or of the claims filed as first or second auxiliary request, both submitted with letter of 4 July 2003.

The Respondent requested that the appeal be dismissed.

IX. At the conclusion of the oral proceedings the Board's decision was pronounced.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Amendments under Article 123(2) and (3) EPC

2.1.1 The subject-matter of Claims 1, 8, 9 and 10 of the patent in suit as granted was restricted with respect to the detergent system by introducing an upper limit of 2.5:1 for the ratio of the total gram equivalents of phenolic hydroxide to the gram equivalents of metal sulfonate (phenolic ratio). This amendment is supported by Claim 3 of the application as filed and reflects the subject-matter of Claim 3 of the patent as granted.

Moreover, Claim 10 of the patent in suit, which related to an additive package concentrate, was further restricted to the use of the additive package concentrate as defined in said claim in a basestock of lubricating viscosity to provide a multigraded lubricant containing no more than 50 ppm chlorine as determined by neutron activation analysis and no more than 1.2 wt.-% sulphated ash as determined by ASTM D874. This amendment finds its support in the subject-matter of Claim 10 as filed and the description on page 4, lines 24 to 26, and page 5, last paragraph, of the application as filed, which corresponds to Claim 10 and the description on page 3, lines 41 and 42, and page 3, line 58 to page 4, line 12, of the patent as granted.

2.1.2 Therefore, the amended subject-matter of the present claims does not contravene Article 123(2) and (3) EPC. In fact, the Respondent did not raise any objection in this respect either.

2.2 Sufficiency within the meaning of Article 83 EPC

2.2.1 The Respondent argued that the patent in suit lacked information concerning the determination of the carbonate content as claimed with respect to the detergent system and, therefore, did not disclose the claimed invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art as required under Article 83 EPC. In this context, he only submitted that to perform the calculation of the carbonate content, it was necessary to know the metal content/metal ratio.

2.2.2 However, according to the patent in suit the amounts of carbonate, sulfonate and phenolic hydroxide present in a lubricant can be inferred from the amounts present in the individual components that are blended to make the finished lubricant, and those amounts are in turn inferred from the charge ratios of raw materials used to make the detergents or by resort to analytical methods that can determine detectable moieties allowing interfering of remaining moieties (see page 9, lines 46 to 50). Furthermore, it is indicated in the patent in suit that the amount of carbonate present in a sulfonate detergent can be inferred from the amount of organic salt and the total amount of metal (see page 9, lines 54 and 55).

2.2.3 In the light of this information and concurring with the Appellant's submissions that in preparing a lubricant falling under the scope of the present claims the metal content/metal ratio would be known and that the carbonate content of a prepared lubricant could be determined by analysis using an acid to form carbon dioxide and measuring the amount of carbon dioxide obtained thereby, the Board finds that the claimed invention is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art without undue burden or inventive activity.

2.2.4 Therefore, and in the absence of evidence to the contrary in support of the Respondent's allegation, the requirements under Article 83 EPC are met.

2.3 Novelty

2.3.1 After examination of the cited documents, the Board has reached the conclusion that the subject-matter of the present claims is novel under Article 54(1) and (2) EPC and also under Article 54(3) EPC in respect of documents (1) and (2). Since during the oral proceedings novelty was accepted by the Respondent, it is not necessary to give detailed reasons for this finding.

2.4 Inventive step

2.4.1 Article 56 EPC states that an invention is held to involve an inventive step if, having regard to the state of the art (in the sense of Article 54(2) EPC), it is not obvious to a person skilled in the art.

2.4.2 For deciding whether or not a claimed invention meets this criterion, the Boards of Appeal consistently apply the problem and solution approach, which involves essentially identifying the closest prior art, determining in the light thereof the technical problem which the claimed invention addresses and successfully solves, and examining whether or not the claimed solution to this problem is obvious for the skilled person in view of the state of the art.

2.4.3 The Board considers, in agreement with the parties to the proceedings, that the closest state of the art with respect to the claimed subject-matter of the patent in suit is the disclosure of document (3).

This document is concerned with lubricants comprising a major amount of an oil of lubricating viscosity and a minor amount, sufficient to minimise undesirable viscosity increases of the lubricant when used in diesel engines, of a composition comprising a combination of (A) an ashless dispersant which comprises at least one chlorine containing reaction product of at least one substituted succinic acylating agent with at least one amino compound, such as a reaction product of polyisobutenyl succinic anhydride with a commercial mixture of ethylene polyamines (see column 4, lines 22 to 29, and columns 47 and 48, Examples 1 to 3), and (B) an overbased metal containing detergent comprising at least one basic alkali or alkaline earth metal salt of at least one acidic organic compound, such as an overbased mixture of at least one sulfonic acid and at least one phenolic hydroxide (see column 33, line 51 to column 34, line 8, and also columns 47 and 48, Examples 1 to 3).

In view of the technical information of this document as a whole, in particular

- Examples 1 and 2 (columns 47 and 48) disclosing the use of a detergent system meeting the detergent system as claimed in present Claim 1, with the exception of the phenolic ratio of 1.4 to 1.5 as claimed,

- the disclosed equivalent ratio of phenolic hydroxide to metal sulfonate of about 1:20 to 80:1, preferably of about 2:1 to 50:1 (see column 38, lines 6 to 8, and column 33, line 51 to column 34, line 8) and

– the indicated sulphated ash content of at least about 0.8% and more generally at least about 1% (see column 44, lines 24 to 28),

the Respondent submitted that the lubricant disclosed in this prior art document only differed from that of present Claim 1 of the patent in suit in that it did not contain a multifunctional viscosity modifier.

However, this submission fails, since document (3) does not disclose the metal-containing detergent system of the lubricant of present Claim 1, which is defined by a number of mandatory parameters, namely, the minimum phenolic hydroxide content of 0.0025 gram equivalent %, the maximum of 0.008 gram equivalent % of carbonate, the phenolic ratio of 1.4 to 2.5, and the minimum gram equivalent ratio of all the organic metal salts to carbonate of 0.5.

Moreover, this document does not disclose lubricants having, as defined in present Claim 1 of the patent in suit, a chlorine content of not more than 50 ppm and, at the same time, a sulphated ash content of no more than 1.2 wt.%.

2.4.4 Having regard to this closest prior art the Appellant contended that the lubricants of present Claim 1 had the advantages that they had a desirable low chlorine and low sulphated ash content together with a satisfactory high temperature deposit performance.

2.4.5 Therefore, the technical problem underlying the patent in suit in the light of the closest prior art document (3) can be seen in the provision of a lubricant formulated with a conventional chlorine-containing dispersant having a low chlorine and sulphated ash content and yet still meeting the requirement of satisfactory high-temperature deposit performance upon use (see also page 3, lines 24 to 28, and page 10, lines 22 to 27, of the patent in suit).

2.4.6 The patent in suit suggests as the solution to this problem a lubricant according to present Claim 1, which is essentially characterised in that it comprises a multifunctional viscosity modifier, a detergent system having the mandatory features as specified, and the indicated low chlorine and low sulphated ash content.

2.4.7 Having regard to the technical information provided by the Appellant, namely, Example 1 of the patent in suit, the test-report filed on 20 December 2002 showing the test results of the Panel Coker Test evaluating the high temperature deposit performance of the lubricants of Example 1 of the patent in suit and Example 2, and the test-report submitted on 31 January 2005 showing the test results of the Panel Coker Test with respect to Example 3 and its corresponding Comparative Example F and Example 4 and its corresponding Comparative Examples G, the Board finds it plausible that the technical problem as defined above has been solved.

Examples 2, 3 and 4 representing lubricants having, as indicated in Attachment 1 submitted by the Appellant on 31 January 2005, different compositions meeting the

requirements of present Claim 1 of the patent in suit, show chlorine contents (ppm) of 43, 37 and 37, respectively, sulphated ash levels of 1.20, 0.79 and 1.12, respectively, and Panel Coker deposit values of 74, 47 and 67, respectively.

The lubricant of Example 1, which has, as indicated in said Attachment 1, the same composition as the lubricant of Example 2, except that it additionally contained the components indicated in present Claim 3 (Claim 6 as granted), passed the Volkswagen Intercooled Turbo Diesel Engine Test with respect to its high temperature deposit performance and shows a chlorine content (ppm) of 43, a sulphated ash level of 1.20, and a Panel Coker deposit value of 70.

Comparative Examples F and G differ, as indicated in Attachment 2 submitted by the Appellant on 31 January 2005, essentially from the respective Examples 3 and 4 in that the applied detergent systems do not meet the required phenolic ratio of 1.4 to 2.5. The phenolic ratio in Example F amounts 0.9 (1.4 in Example 3) giving a high Panel Coker deposit value of 78 (47 in Example 3) and the phenolic ratio in Example G is 2.7 (2.3 in Example 4) leading to a high Panel Coker deposit value of 115 (67 in Example 4).

2.4.8 In this context, the Respondent contended that the comparative Examples F and G did not provide evidence that the detergent system as claimed would contribute to the solution of the above defined technical problem, since the lubricants of these examples contained less detergent than those of the corresponding Examples 3 and 4, namely 3.5 wt.% (Ex. F) versus 4.0 wt.% (Ex. 3)

and 3.7 wt.% (Ex. G) versus 4.9 wt.% (Ex. 4), and because it was known to the skilled person that the use of less detergent would lead to a deterioration of the high-temperature deposit performance.

However, the total amounts of detergent in the Comparative Examples F and G of 3.5 wt.% and 3.7 wt.%, respectively, are in line with the claimed invention indicating a preferred range for the amount of detergent of preferably 0.2 wt.% to 9 wt.% (see the Table on page 9 of the patent in suit) and are even higher than the total amount of detergent of 1.86 wt.% applied in Example 2 of the patent in suit (see Attachment 1 submitted on 31 January 2005). Therefore, and in the absence of any evidence that the low high-temperature deposit level shown by the Examples 3 and 4 in comparison with the Comparative Examples F and G, respectively, would substantially result from the somewhat higher amounts of detergent in the Examples, the Board cannot accept the Respondent's contention.

2.4.9 With respect to the contended lack of effect of the detergent system as claimed to the solution of the above defined technical problem the Respondent also submitted that Comparative Example F, which makes use of a detergent system having a phenolic ratio outside the claimed range and shows a Panel Coker deposit value of 78, apparently still met the requirement of satisfactory high-temperature deposit performance upon use in view of the existing margin of error and Example 2 showing a Panel Coker deposit value of 74.

This submission cannot be accepted by the Board either, since the Examples 3 and 4 in comparison with the Comparative Examples F and G, respectively, credibly show, as indicated under points 2.4.7, last paragraph, and 2.4.8 above, a satisfactory low high-temperature deposit level due to the mandatory phenolic ratio as defined in present Claim 1. The relatively small difference between the Panel Coker deposit values of Example 2 (74 wt.%) and Comparative Example F (78 wt.%) might result from the large differences in composition of the lubricants in question and, in any case, does not represent convincing evidence that the problem underlying the patent in suit has not been solved, or has been solved without the contribution of the detergent system as defined in present Claim 1.

2.4.10 In assessing inventive step, the next question to be answered is whether a skilled person starting from document (3) and by following the suggestions made in the cited prior art as a whole, when trying to solve the technical problem as defined above, would arrive at a lubricant falling within the scope of present Claim 1.

2.4.11 Document (3) discloses - as indicated above under point 2.4.3 - lubricants comprising a major amount of an oil of lubricating viscosity and a minor amount, sufficient to minimise undesirable viscosity increases of the lubricant when used in diesel engines, of a composition comprising a combination of a chlorine containing ashless dispersant and an overbased metal containing detergent. Furthermore, it teaches that by using the disclosed detergent system an undesirable viscosity increase in operation of the lubricant can be reduced and that detergents with different metal ions

give different results (see column 2, line 59 to column 3, line 40).

This document does not suggest, however, the use of a multifunctional viscosity modifier and a metal-containing detergent system of the lubricant having the mandatory parameters indicated in present Claim 1, as well as the presence of the low chlorine content and, concurrently, the low sulphated ash content as defined in present Claim 1.

Therefore, the disclosure of document (3) on its own does not provide an incentive to the skilled person that the technical problem underlying the patent in suit as defined above could be solved by a lubricant in accordance with present Claim 1.

2.4.12 Having regard to document (5) disclosing that a low chlorine content of no more than 50 ppm is desirable and documents (4) and (9) teaching that it is possible to replace a large part of the chlorine-containing dispersant, namely up to 50%, by a multifunctional viscosity modifier (see page 20, left column, last paragraph and column 3, lines 13 to 24, respectively), the Board concurs with the Respondent's submission that a skilled person starting from document (3) and being faced with the problem to provide a lubricant having a low chlorine content would derive from the cited prior art as a whole a clear incentive that a partial replacement of the chlorine containing dispersant by an appropriate amount of a multifunctional viscosity modifier would give a lubricant having a reduced chlorine content.

2.4.13 However, having regard to the Appellant's submissions that the use of a multifunctional viscosity had been found to increase the undesirable high temperature deposits and that the use of higher amounts of a conventional detergent system to reduce or remove said high temperature deposits would have the drawback of increasing the sulphated ash level (see his test-report filed on 20 December 2002, in particular under point 2.6, and also the patent in suit, page 3, lines 7 to 28), and in view of the fact that the prior art as a whole does not suggest the use of the detergent system as defined in present Claim 1, i.e. one having in particular a phenolic ratio of 1.4 to 2.5, rendering it possible to provide a lubricant, which meets the required satisfactory high-temperature deposit performance upon use and the required low sulphated ash content in addition to the required low chlorine content, the Board concludes that the solution of the existing technical problem, as claimed in present Claim 1, was not obvious in the light of the cited documents.

2.4.14 Therefore, the lubricant according to present Claim 1 involves an inventive step within the meaning of Article 56 EPC.

Furthermore, the dependent Claims 2 to 7 relating to particular embodiments of the lubricant of Claim 1, Claim 8 corresponding to Claim 1, but indicating the preferred amount and composition of the dispersant, Claim 9 relating to the use of the components defined in Claim 1 as additives to a basestock of lubricating viscosity to prepare a lubricant as defined in present Claim 1, and Claim 10 relating to the use of the

additive package concentrate as defined in said claim in a basestock of lubricating viscosity to provide a multigraded lubricant according to present Claim 1, derive their patentability from the non-obviousness of present Claim 1.

3. *Auxiliary requests*

3.1 Since the subject-matter of the claims of the main request meets the requirements of the EPC for the reasons set out above, there is no need for the Board to decide on the auxiliary requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent with Claims 1 to 10 filed on 7 November 2005 and a description yet to be adapted.

The Registrar: The Chairman:

N. Maslin A. Nuss