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**D E C I S I O N**  
of 13 March 1996

**Case Number:** T 0012/93 - 3.3.1

**Application Number:** 89910764.3

**Publication Number:** 0406343

**IPC:** C10M 133/04

**Language of the proceedings:** EN

**Title of invention:**

Long chain aliphatic hydrocarbonyl amine additives having an oxyalkylene hydroxy connecting group

**Applicant:**

CHEVRON U.S.A. Inc.

**Opponent:**

-

**Headword:**

Fuel additives/CHEVRON

**Relevant legal provisions:**

EPC Art. 56, 84, 123(2)

**Keyword:**

"Main request - claim not clear and not supported by the description"

"First auxiliary request - inventive step (yes)"

**Decisions cited:**

G 0010/93; T 0068/85; T 0133/85; T 0409/91

**Catchword:**

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Chambres de recours

Case Number: T 0012/93 - 3.3.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.1  
of 10 March 1996

**Appellant:** CHEVRON U.S.A. Inc.  
1635 Market Street  
Philadelphia  
Pennsylvania 19103 (US)

**Representative:** Rinuy, Santarelli  
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**Decision under appeal:** Decision of the Examining Division of the European  
Patent Office posted 4 August 1992 refusing  
European patent application No. 89 910 764.3  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** A. J. Nuss  
**Members:** P. P. Bracke  
R. E. Teschemacher

### Summary of Facts and Submissions

- I. The appeal lies from the decision dated 4 August 1992 refusing European patent application No. 89 910 764.3 (publication WO 90/02784).
- II. The Examining Division held essentially that Claim 1, as originally filed and reading:

"A long chain aliphatic hydrocarbyl amine additive comprising a long chain aliphatic hydrocarbyl component, a amine component and an oxy-alkylene hydroxy connecting group which joins said aliphatic hydrocarbyl component and said amine component, the connecting group having at least two oxygen atoms, linking oxygen and a hydroxyl oxygen wherein the linking oxygen atom of the connecting group is covalently bonded to a carbon atom of said long chain aliphatic hydrocarbyl component and to a carbon atom of the remainder of the connecting group, and said long chain aliphatic hydrocarbyl component is of sufficient molecular weight and chain length that said additive is soluble in hydrocarbons boiling in a gasoline or diesel range.",

did not meet the requirement of inventive step over documents

- (1) US-A-4 322 220,
- (2) US-A-3 574 576 and
- (3) US-A-4 568 358.

- III. More particularly, the Examining Division held that the claimed additives differed from those described in document (1) only by the fact that the hydrophobic moiety was an aliphatic hydrocarbyl group instead of a phenyl group substituted by one or more aliphatic

hydrocarbyl substituents. Moreover, the problem to be solved could be seen only in the provision of other detergent additives having properties comparable to those known from document (1), in particular with regard to minimising the octane requirement increase (ORI). Since the skilled person had no particular reason to assume that the presence of a phenyl group in the hydrophobic moiety was essential, it being known from document (3) that fuel additives could be made on the basis of several types of hydrophobic moieties and aliphatic hydrocarbyl groups being known hydrophobic moieties in fuel additives (eg from document (2)), the claimed additives were considered to be obviously derivable from the prior art.

- IV. In response to a communication pursuant to Article 110(2) EPC, in which the Board queried whether the gravimetric data presented in the experimental part of the application in suit were suitable to make a minimising of ORI in unleaded fuel credible, the Appellant provided document (4), a paper presented at the "Second International Pacific Conference on Automotive Engineering" in Tokyo (Japan) on 7 to 10 November 1983, and titled "A New Concept in Engine Deposit Control Additives for Unleaded Gasolines", the said paper having been published by the Society of Automotive Engineers of Japan, Inc. in 1983.
- V. In the annex to the summons to attend oral proceedings the Board questioned whether the originally filed Claim 1 would meet the requirements of clarity and support by the description. The Appellant thereupon submitted a first and second auxiliary set of claims.

The first auxiliary set of claims consisted of independent Claims 1, 8, 14 and 15 and dependent Claims 2 to 7 and 9 to 13. The independent claims as amended during the oral proceedings held on 13 March 1996 read:

"1. A long chain aliphatic hydrocarbyl amine additive of the formula:

$R-X-Am$

wherein R is an aliphatic hydrocarbyl component having an average molecular weight of about 700 to about 3 000; Am is a amine component having at least one basic nitrogen atom; and X is a connecting group of the formula selected from

$-O-CH_2CHOH-CH_2-$  and  $-OCH(CH_2OH)-CH_2-$  or mixtures thereof."

"8. A long chain aliphatic hydrocarbyl amine additive selected from the formulas

$R-O-CH_2CHOHCH_2-NH(R_1NH)_pH$  and  $R-OCH(CH_2OH)CH_2-NH(R_1NH)_pH$

wherein R is an aliphatic hydrocarbyl moiety having an average molecular weight of about 700 to about 3 000;  $R_1$  is alkylene of from 2 to 6 carbon atoms and p is an integer from 1 to 6."

"14. An unleaded fuel composition comprising a hydrocarbon boiling in a gasoline or diesel range and from about 30 to about 5 000 parts per million of an additive according to claim 1, 8 or 13."

"15. An unleaded fuel concentrate comprising an inert stable oleophilic organic solvent boiling in the range of 65.6°C to 204°C (150°F to 400°F) and from about 5 to about 50 weight percent of an additive according to claim 1, 8 or 13."

VI. The Appellant submitted essentially that the presence of a phenyl group was an important feature of the additive disclosed in document (1) and that a skilled person seeking to minimise the ORI problem in **unleaded** fuels would not be motivated to replace the hydrophobic moiety in the additives according to document (1) by an aliphatic hydrocarbyl group, since fuel additives having an aliphatic hydrocarbyl component directly linked to an amine component, such as those described in document (2), were found to cause significant ORI when used in **unleaded** fuel.

He further submitted that there was no suggestion in document (3) that replacing the capped polyoxyalkylene group in a deposit control additive designed for use in diesel fuel would result in the fuel-additive performance now required.

VII. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the application as filed - main request - or on the basis of the first or second set of claims submitted during the oral proceedings - auxiliary requests.

#### Reasons for the Decision

1. The appeal is admissible.
2. *Main request*

The Examining Division refused the application in suit only because it considered that the claimed additives were obviously derivable from the prior art. However, according to the jurisprudence of the Boards of appeal in *ex parte* proceedings, the Boards of appeal are not

restricted to examination of the grounds mentioned in the contested decision, but must ensure that all the conditions for patentability under the EPC are met (see G 10/93, OJ EPO 1995, 172, reason 3).

Therefore, in the present case, the Board finds it necessary also to ensure that the set of claims meets the requirements of Article 84 EPC, i.e. the requirements of clarity and support by the description.

- 2.1 According to consistent case law of the Boards of Appeal the requirement of Article 84 EPC that the claims be supported by the description reflects the general legal principle that the **extent of the patent monopoly**, as defined by the claims, should correspond to the **technical contribution to the art**. It is therefore important to ensure that the monopoly given by a granted patent, which is defined by the terms of the claims, corresponds to the invention which has been described in the application (see T 133/85, OJ EPO 1988, 441, reason 5 and T 409/91, OJ EPO 1994, 653, reason 3.3)

Therefore, in the present case, it has to be examined whether the scope of Claim 1 corresponds to the technical contribution to the art.

- 2.1.1 According to Claim 1 the "connecting group" has

"at least two oxygen atoms, linking oxygen and a hydroxyl oxygen wherein the linking oxygen atom of the connecting group is covalently bonded to a carbon atom of said long chain aliphatic hydrocarbyl component and to a carbon atom of the remainder of the connecting group".

Although this wording is repeated almost literally on page 6, lines 12 to 17, of the description, as part of a section describing the invention in general terms, only connecting groups derived from epihalohydrin are disclosed in the other parts of the description.

No additional information is provided in the paragraph headed "The Connecting Group" on page 13, line 32 to page 14, line 19. There it is stated that the connecting group is a diradical wherein the ether (linking) oxygen may be regarded as having been the terminal hydroxyl oxygen of the long-chain alcohol from which the long-chain aliphatic hydrocarbyl component was derived and **the remainder of the connecting group is derived from epihalohydrin** (page 13, lines 33 to 40). A chemical formula is given only for epihalohydrin (page 14, line 6) and the only two structures obtainable by reacting epihalohydrin with an alcohol are mentioned (page 14, lines 6 and 9 to 19). Nor is there any additional information in the paragraph "General Preparation" on page 15, lines 30 to 35, or on page 16, lines 5 to 17, where only the reaction of the aliphatic alcohol with epihalohydrin is related. Moreover, on page 14, lines 22 to 41, as preferred additives, only those having a connecting group derived from epihalohydrin are mentioned. No information is given enabling any other connecting group to be identified. The experimental section describes only the reaction of a polyisobutyl alcohol with epihalohydrin (examples 2 and 5).

- 2.1.2 The Appellant submitted that it was usual in the technical field in question for granted patents to be generalisations of what was specifically described in the description and that, by restricting the definition of the connecting group in Claim 1 to that groups derived from epihalohydrin, the protection conferred



here was too restricted, since, for example, additives having connecting groups derived from substituted epihalohydrins would not be embraced. The Appellant would consequently be deprived of fair protection. He also submitted that a skilled person, with his general knowledge, would know which connecting groups were meant in Claim 1. Therefore, in his opinion, he was entitled to a monopoly as defined in Claim 1.

- 2.1.3 The Board agrees that it is not unusual in patents that the matter for which protection is sought is defined in a generalised form, compared to the often more specific description of the invention. However, the permissible extent of such generalisation is a question of degree, which is to be determined in each case having regard to the nature of the invention which has been described (see T 133/85, reason 5, above).

As pointed out above, in the present case, a skilled person could derive from the application as a whole only that a suitable connecting group was one derived from epihalohydrin. He would not receive any further information about other connecting groups to be embraced by Claim 1. Moreover, the Appellant had not provided any additional information to make it credible that, when taking into consideration common general knowledge, a skilled person could define which other connecting group(s) might have been meant to be included by the above definition.

- 2.1.4 Therefore, in spite of the fact that the wording of Claim 1 is repeated almost literally in the description, the Board considers that from the application as a whole a skilled person receives only information about the preparation of additives containing a connecting group

derived from epihalohydrin and their effect on the ORI in unleaded fuels and that, therefore, in accordance with the principle mentioned in point 2.1. above, the technical contribution of the present invention to the art is restricted accordingly.

The Board concludes therefore that Claim 1 is not supported by the description within the meaning of Article 84 EPC.

- 2.2 One of the essential features of the additives according to Claim 1 is the presence of a long-chain aliphatic hydrocarbyl component, which is further defined by a functional parameter, specifying that such component "is of sufficient molecular weight and chain length that said additive is soluble in hydrocarbons boiling in a gasoline or diesel range".
  - 2.2.1 According to the consistent case law of the Boards of Appeal, functional parameters may be allowed for defining features in claims, provided that such features (i) cannot otherwise be defined more precisely without restricting the scope of the invention and (ii) provide instructions which are sufficiently clear for the expert to reduce them to practice without undue burden (see reasons 8.4.2 and 8.4.3 of T 68/85, OJ EPO 1987, 228).
  - 2.2.2 Consequently, in examining whether Claim 1 meets the requirement of clarity according to Article 84 EPC, it has to be decided whether the above-mentioned functional parameter meets both requirements mentioned in 2.2.1.
  - 2.2.3 The requirement that the additive must be soluble in hydrocarbons boiling in a gasoline or diesel range is in fact no more than a rather vague desideratum which does not enable a skilled person actually to define which additives meet this requirement, since neither in

Claim 1 nor in the description is it specified what degree of solubility is meant by "soluble in". Therefore, in the Board's view, the absence of any further information about the solubility requirement alone makes it impossible to reduce the invention to practice without undue burden.

- 2.2.4 The Appellant argued that in the application in suit sufficient information was given in the paragraph headed "The Preferred Long Chain Aliphatic Hydrocarbyl Component" (page 7, line 28 to page 9, line 34) to enable a skilled person to find out which long-chain aliphatic hydrocarbyl components should be used in the preparation of the additives in order to provide the required solubility. He further submitted that such a definition was normal in the field of fuel additives and, as support, he referred to column 2, lines 59 to 63, of document (1), where an analogous definition was given in a granted US patent.

However, the fact that the application in suit lists aliphatic components and amine components which could suitably be used for preparing additives having the required solubility, does not mean that the combination of any aliphatic component with any amine component would automatically result in an additive having that solubility. Consequently, a skilled person would still have to determine the solubility of each additive resulting from each combination of one particular aliphatic hydrocarbyl component with one particular amine, which, in the Board's view, still represents an undue burden for that skilled person. Moreover, in proceedings before the instances of the EPO, questions of patentability are decided solely in accordance with the EPC. Whether the requirements under the EPC are met is a matter to be decided only by the competent EPO instance, in the present case the Board of Appeal. The

argument that, in a different case, an apparently broader definition was accepted in a granted US patent in the same technical field is irrelevant for proceedings before the EPO, since each case must be decided on its own merits.

2.2.5 Consequently, since the features of the functional parameter do not provide instructions which are sufficiently clear for an expert to reduce them to practice, the Board concludes that Claim 1 is not clear in the sense of Article 84 EPC either.

2.3 Since Claim 1 does not meet all the requirements of the EPC, in particular those of Article 84, the main request is refused.

### 3. *First auxiliary request*

#### 3.1 Amendments

There are no objections under Article 123(2) EPC since the claims do not contain subject-matter extending beyond the content of the application as filed.

In particular, Claim 1 is a combination of the features of original Claims 17 and 9; Claims 2 to 7 correspond to original Claims 18 to 23; Claim 8 is a combination of the features of original Claims 24 and 9; Claims 9 to 13 correspond to original Claims 25 to 29; and Claims 14 and 15 are composed of the features of original Claims 31 to 33 and 35 to 37 respectively.

#### 3.2 Clarity and support by the description

Since in Claim 1 the definition of the connecting group is now restricted to the only two structures obtainable by reacting an epihalohydrin with an alcohol, and the

aliphatic hydrocarbyl component is defined by its average molecular weight, the objections under Article 84 EPC raised against Claim 1 of the main request are no longer valid for Claim 1 of the first auxiliary request.

### 3.3 Novelty

After examination of the cited prior art, the Board has reached the conclusion that the claimed subject-matter is not described 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, it is not necessary to give detailed reasons for this finding.

### 3.4 Inventive step

3.4.1 The Board considers document (1) to be the closest state of the art. This has also been accepted by the Examining Division and the Appellant.

3.4.2 Document (1) is concerned with reaction products of alkyl phenols, epichlorohydrin and amines, which are useful as multi-purpose additives for hydrocarbon fuels, but in particular for controlling the ORI of engines using **unleaded** gasoline (column 1, lines 37 to 44, 48 to 52 and 57 to 63, column 7, lines 45 to 52, and the data presented in Table II).

3.4.3 According to the information provided in the application in suit, problems with the ORI, caused by deposits in the combustion engine, are much more serious in engines that require the use of unleaded gasolines, since,

contrary to the former situation when lead compounds were used as anti-knock agents, it is difficult to provide unleaded gasoline of sufficiently high octane to prevent knocking and the concomitant damage which is caused (page 2, lines 4 to 12).

In view of this, the problem underlying the invention must be seen in the provision of another class of additives which, when used as fuel additive in unleaded fuel, control combustion chamber deposits, thus minimising ORI in internal combustion engines (page 5, lines 5 to 8).

According to the application in suit, this problem is alleged to be solved by the additives of Claim 1.

- 3.4.4 In order to make it credible that this problem was effectively solved by the claimed additives, thermogravimetric analysis (TGA) half-life data were provided in the application in suit, showing that compounds according to the present invention had shorter TGA half-lives than the reference product, polyisobutenyl-32 ethylenediamine, which had a half-life of 900 minutes (Table I on page 32). It was also stated on page 32, lines 5 to 7, that the half-life data for fuel additives correlated to the likelihood that an additive would contribute to ORI, with a shorter half-life representing a more easily decomposable product, ie one which would not be as likely as the chosen reference product to accumulate and form deposits in the combustion chamber (see also page 6, lines 29 to 33).

As support for this statement the Appellant referred to the passage in document (4) starting on the last line of the fourth page up to the second full paragraph of the left-hand column of the fifth page, where it was said in essence that the critical parameter in the contribution

to ORI was the thermal decomposition rate of the additive and that the rate of thermal decomposition of additives could be illustrated by TGA data, as presented in Figure 9.

In the absence of any indication to the contrary, the Board is prepared to accept that half-lives shorter than 900 minutes indicate that ORI is minimised in engine performance.

- 3.4.5 Since in Table I of the application in suit it is shown that additives according to the present invention have significantly shorter TGA half-lives than the reference polyisobutenyl-32 ethylenediamine, the Board concludes that it is credible that the claimed additives are effective at minimising ORI in internal combustion engines.
- 3.4.6 Since the claimed additives differ from those described in document (1) essentially by the presence of a long-chain aliphatic hydrocarbyl moiety instead of an alkylphenyl moiety, it remains to be decided whether, in the light of the teaching of documents (2) and (3), a skilled person would have been motivated to replace the alkylphenyl group in the additives described in document (1) by a long-chain aliphatic hydrocarbyl group.
- 3.4.7 It was the Examining Division's main argument that a skilled person would have been so motivated (see point III above).
- 3.4.8 Document (2) is related to high-molecular-weight aliphatic hydrocarbon N-substituted alkylene polyamine additives providing detergency properties to fuels, such as diesel and gasoline fuels (column 1, lines 55 to 60, and column 5, lines 57 to 65). However, this document, a

US patent, published in 1971 and originating from an application filed in 1965, must be interpreted in its proper context, namely at a time when engines requiring unleaded fuel were not very common. It is not surprising therefore that document (2) is silent about the requirements of additives in unleaded fuels and suggests adding as anti-knock agents the lead compounds (tetramethyl- and tetraethyllead) usual at that time (see column 7, lines 66 to 68). Consequently, this document, whether considered alone or in the light of document (1), cannot be considered to suggest to a skilled person which hydrophobic moiety could suitably be incorporated in an additive for minimising ORI in engines requiring unleaded fuel (see point 3.4.3 above).

Moreover, also document (4) mentions fuel additives containing an aliphatic hydrocarbyl moiety. There it is taught that when the first polybutylene depositing-control (DC) additives were developed, the great majority of gasolines contained lead anti-knock compounds and that ORI was predominantly influenced by lead compounds formed on the combustion chamber surfaces (see second page, left-hand column, first and second paragraph under the heading "2.1 Laboratory Engine Tests"). It was, however, observed that in engines requiring unleaded fuel such DC additives could lead to an increase of ORI in comparison with unleaded gasolines not containing these DC additives. Furthermore, it is also taught in this document (fourth page, last line, to fifth page, left-hand column, first full paragraph) that polybutene additives in unleaded fuels were slowly or incompletely fragmented during combustion, which was believed to result in precursors that eventually oxidised and polymerised, producing deposits that contributed to ORI. This would have led a skilled person away from selecting an aliphatic hydrocarbyl moiety.



Therefore, the Board considers that a skilled person seeking to minimise ORI in engines requiring unleaded fuels would not have considered the additives of document (2).

- 3.4.9 Document (3) is related to hydrocarbyl polyether polyamines as DC additives in diesel fuels (see column 1, lines 18 to 22).

Since this document is concerned neither with fuel additives for engines requiring unleaded fuel nor with the ORI problem, and since the additives described therein do not contain a long-chain aliphatic hydrocarbyl moiety in the sense of the claimed invention, a skilled person would also have been unable to find any suggestion that the claimed fuel additives would minimise ORI in engines requiring unleaded fuels.

- 3.4.10 The Board therefore concludes that the additives claimed in Claim 1 are not obvious in the light of the cited state of the art. For the same reasons, the additives claimed in Claim 8, which is related to a preferred embodiment of Claim 1, are also not obvious.

Claims 2 to 7 and 9 to 13, which directly or indirectly depend upon Claim 1 and Claim 8 respectively and represent embodiments thereof, are, consequently, also not obvious in the light of the cited state of the art.

The unleaded fuel compositions and the unleaded fuel concentrates claimed in Claims 14 and 15 derive their patentability from the patentability of the additives claimed in Claims 1, 8 or 13, expressly referred to therein.

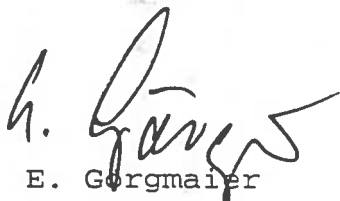
- 3.5 Since the claims according to the first auxiliary request comply with the requirements of the EPC, a European patent may be granted on the basis of this set of claims.
4. In the light of the above findings, it is not necessary to consider the Appellant's second auxiliary request.
5. Since the subject-matter of the claims according to the first auxiliary request is restricted in comparison with the set of claims as originally filed, the description still has to be adapted to the set of claims according to the first auxiliary request. For example, the part in the description relating to lubricating oil compositions, and all references to the use of the claimed additives in fuels other than unleaded, are to be deleted. Moreover, it is questionable whether the term "**alicyclic** hydrocarbyl" on page 7, line 35, of the originally filed application is in conformity with the definition of the additives claimed according to the first auxiliary request, which are restricted to those additives wherein R is an **aliphatic** hydrocarbyl component.

Order

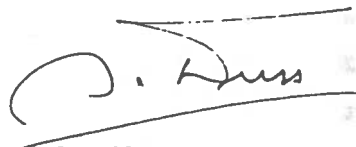
For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent on the basis of Claims 1 to 15 as submitted during the oral proceedings (auxiliary request I) and a description to be adapted.

The Registrar:

  
E. Gorgmaier

The Chairman:

  
A. Nuss

