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D E C I S I O N
of 6 July 1999

Case Number: T 0887/95 - 3.3.1

Application Number: 84302342.5

Publication Number: 0157969

IPC: C10M 139/00

Language of the proceedings: EN

Title of invention:
Organo-borate compositions and their use in lubricants

Patentee:
The Lubrizol Corporation

Opponent:
Mobil Oil Corporation

Headword:
Organo-borate composition/LUBRIZOL

Relevant legal provisions:
EPC Art. 54(1), (2), 56

Keyword:
"Novelty (yes) - alleged novelty destroying disclosure not proved"
"Inventive step (yes) - non obvious solution"

Decisions cited:
T 0954/93

Catchword:
-

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Case Number: T 0887/95 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 6 July 1999

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 16 August 1995 concerning maintenance of European patent No. 0 157 969 in amended form.**

Composition of the Board:

Chairman: A. J. Nuss
Members: P. P. Bracke
S. C. Perryman

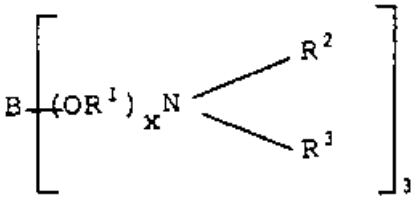
Summary of Facts and Submissions

I. The appeal lies from the Opposition Division's interlocutory decision, announced orally on 27 April 1995, with the reasoned decision being issued on 16 August 1995, that European patent No. 0 157 969 in its amended form was found to be novel and inventive over document

(1) US-A-4 382 006.

The European patent underlying the decision consisted of a set of thirteen claims and pages 1 to 14 of the amended description. The only independent claims read:

"1. A boron containing composition comprising an organo-borate compound of the general formula



(I)

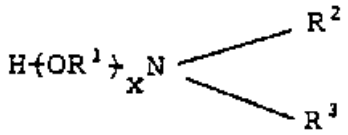
wherein

R^1 is a lower alkylene-based radical,
R^2 is a hydrocarbon-based radical or a radical of the formula $(R^4O)_yH$,
R^3 is a hydrocarbon-based radical,
R^4 is a lower alkylene-based radical, and
x and y are each an integer which is at least 1, and the sum of x + y is at most about 75."

"6. A method for preparing an organo-borate composition according to claim 1 which comprises reacting, at a temperature ranging from about 50°C to about 300°C,

A. at least one boron containing compound selected from boric acid, boron trioxide and boric acid esters of the formula $B(OR)_3$ wherein R is a hydrocarbon based radical containing from 1 to about 8 carbon atoms with,

B. at least three moles, per mole of reagent A, of at least one tertiary amine corresponding to the formula



(III)

wherein

R^1 is a lower alkylene-based radical,
R^2 is a hydrocarbon-based radical or a radical of the formula $(R^4O)_yH$,
R^3 is a hydrocarbon-based radical,
R^4 is a lower alkylene-based radical, and
x and y are each an integer which is at least 1, and the sum of x and y is at most about 75."

"12. An additive concentrate comprising a substantially inert, normally liquid organic diluent and about 10-90% by weight of a composition according to any of claims 1 to 5."

"13. A lubricating composition comprising a major amount of lubricating oil and a minor amount of a composition according to any of claims 1 to 5."

II. With letter received on 1 June 1999 the Respondent (Proprietor) filed a set of claims as a first auxiliary request and one as a second auxiliary request and he confirmed his previous announcement that he would not be represented during oral proceedings before the Board of Appeal, which took place on 6 July 1999.

III. In dealing with novelty, the Appellant argued that the set of claims underlying the contested decision embraces any composition containing measurable amounts of the organo-borane compounds defined in Claim 1. Since in the esterification of boric acid with ethoxylated amines described in document (1) an equilibrium between mono-, di and triamine esters exists and since it is taught in document (1) that boration levels may be as low as 0.05% by weight, he concluded that a skilled person would immediately appreciate that such compositions inevitably contain measurable amounts of organo-borane compounds according to the patent in suit and, consequently, that the claimed subject-matter is not novel over document (1).

In dealing with inventive step, the Appellant submitted that the boron levels given in the examples do not correspond with the theoretically calculated boron levels for the organo-borate compounds defined in Claim 1 and that the analyses provided in the examples do not indicate that the boron is wholly or mainly in the form of such organo-borate compounds. His submission that the nature of the equilibrium reactions and the

difficulty of driving them preferentially to any particular triester was common general knowledge was supported by document

(A) Kirk-Othmer Encyclopedia of Chemical Technology, third edition, Volume 4, pages 110 to 123 (1978).

He also submitted that it had not been made credible that any significant benefit is obtained for compositions across the entire scope of the claims.

Moreover, since it was entirely obvious from document (1) to conduct the esterification by using molar ratios of amine to boric acid of 1.5 or more and since inventive step cannot be based on the discovery of alleged benefits, he concluded that the claimed subject-matter was obvious over the teaching of document (1).

IV. The Respondent contested in his written submissions that the esterification of boric acid with ethoxylated amines is an equilibrium reaction, since the removal of water drives the reaction to completion. Whereas according to the patent in suit the reaction is driven to the triester, insufficient amine is present to drive the reaction to triester according to the methods of document (1).

Additionally, he argued that the range of boration levels set forth in document (1) was purely speculative, since it is not possible to obtain triesters having 0.05% by weight boron using the amines described in document (1). Since nothing in document (1) clearly and unambiguously teaches,

directly or implicitly, molar ratios that would enable the formation of triesters and since the Appellant did not provide any proof that according to the methods described therein compositions embraced within the wording of Claim 1 underlying the contested decision are obtained, he concluded that the set of claims according to the main request was novel.

As far as inventive step is concerned, he argued that the multi-functional (lubricating) properties of the present invention were not suggested in document (1). Moreover, he remarked that the Appellant had not provided any data to support his submissions that it had not been made credible that any significant benefit is obtained for compositions across the entire scope of the claims.

VI. The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 157 969 be revoked.

The Respondent requested by letter of 1 June 1999 as main request that the appeal be dismissed and as auxiliary requests, that the decision under appeal be set aside and the patent be maintained on the basis of the claims filed with letter of 1 June 1999 as first or second auxiliary request.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Article 123(2) and (3) EPC

The Board is satisfied that the contested patent, in its amended form, meets the requirements of Article 123(2) and (3) EPC. Since this was not contested, no detailed reasoning needs to be given.

2.2 Novelty

2.2.1 Document (1) is concerned with ethoxylated amines, which are tertiary amines having one alkyl group and two polyoxyethylene groups attached to the nitrogen, and borated derivatives thereof useful as friction modifying additives for various fluids, eg lubricating oils (column 1, lines 12 to 16, 28 to 31 and 37 to 59). Whereas it is taught that the borated derivatives may be prepared by any means for borating ethoxylated amines, two ways for preparing the borated derivatives are specifically described, namely, (a) by treating the ethoxylated amines with boric acid at 70 to 250°C during 1 to 15 hours, optionally in the presence of a solvent, which may be reactive (eg butanol) or non-reactive (eg toluene) and (b) by transesterifying with a trialkyl borate such as tributylborate, optionally in the presence of boric acid. Moreover, it teaches that generally stoichiometric amounts of boric acid are used, however amounts in excess of this can be used to obtain compounds of varying degree of boration. Finally, it teaches that boration levels can vary in the instant compounds from about 0.05 to about 7 wt.%" (column 2, lines 3 to 14 and 22 to 28).

2.2.2 Although the organo-borate compounds defined in Claim 1 were not specifically mentioned in document (1), the Respondent submitted that they were implicitly disclosed therein, since the reactants (boric acid or an ester thereof and ethoxylated amine) and the reaction conditions of the boration reaction were the same as in the patent in suit and, consequently, the final reaction mixture must in both cases have the same composition. If organo-borate compounds of the general

formula (I) are present in the final reaction mixtures as set out in the patent in suit, they should also be present in the final reaction mixtures according to the methods described in examples 7 to 13 of document (1).

2.2.3 However, it is to be noted that whereas in all the examples describing the boronation of ethoxylated amines in the patent in suit the molar ratio of ethoxylated amine to boric acid is 3 to 1, in the examples in document (1) this molar ratio is much lower and varies from 0.67 to 1.87. Since in the reaction for preparing the organo-borate compounds defined in Claim 1 one mole boric acid reacts necessarily with three moles ethoxylated amine (see also Claim 6), the molar ratio is a critical feature of the reaction and, therefore, the Board cannot accept that the reaction conditions of the boronation reaction in the examples of document (1) are the same as in the patent in suit.

2.2.4 In this respect the Respondent argued that the teaching of document (1) is not restricted to the examples but that the general disclosure contained in this document is to be taken into consideration. Since according to document (1) the boration levels may vary from 0.05 to about 7 weight % and boration levels of 0.05 weight % may only be obtained by reacting an ethoxylated amine with boric acid in a molar ratio far above 3 to 1, in his view document (1) also disclosed that the ethoxylated amines are reacted with boric acid in a molar ratio of at least 3.

However, since document (1) is concerned with borated **adducts** (column 1, line 15) and since it is completely silent about the formation of esters, the fact that

boration levels as low as 0.05 weight % are mentioned in document (1) does not prove that any boron-ester is present in such a composition, let alone, that a boron-triester as defined in Claim 1 is present in the final reaction mixture. This is clearly supported by the teaching in document (A), page 114, second and third paragraph, that boric acid esters react with amines to form complexes or, **under specific conditions**, tri(amino)boranes.

2.2.5 Since from the general teaching of document (1) it may not be concluded that organo-borate compounds defined in Claim 1 are obtained by following the processes described therein, the question to be decided in examining novelty is, thus, whether it was the **inevitable result** of conducting any of the processes described in document (1) that a composition is obtained which contains measurable amounts of an organo-borate compound as defined in Claim 1.

2.2.6 The Appellant alleged that such compounds were inevitably formed since in the esterification of boric acid with ethoxylated amines described in document (1) an equilibrium between mono-, di and triamine esters exists and, consequently, at least minor amounts of triamine ester would be formed. This allegation was also supported by the affidavit signed by Mr A. G. Horodysky on 10 April 1995, the inventor of document (1), saying "I can state categorically that the borated tertiary amines of D1 do have the same structure as the borated tertiary amines claimed in claim 1 of the Patent."

According to the jurisprudence of the Board of Appeal

of the EPO each party carries the burden of proof for the facts it alleged (see, for example, T 954/93). It was, thus, upon the Appellant to provide adequate proof that any significant, ie measurable, amount of organo-borates as defined in Claim 1 was present in one of the final reaction mixtures obtained according to any of the examples of document (1). However, no such evidence was submitted to the Board. Therefore, the mere allegation that organo-borate compounds defined in Claim 1 are formed according to the methods described in the examples of document (1), unsupported by evidence of an analysis of the product(s) made in accordance with document (1) to show the presence in these products of organo-borate triesters as now claimed, is insufficient to make it credible that such organo-borate compounds are effectively present in one of the final mixtures according to any of the examples of document (1).

While it is true that there is no evidence of analyses showing that products made in accordance with the methods of the patent in suit actually contain the organo-borate triesters as now claimed, this does not remove from the Appellant as opponent the burden of proof of showing lack of novelty. The Board cannot base its decision on a conjecture as to what experimental evidence might have shown if the party concerned had taken the trouble to provide it.

2.2.7 The Appellant alleged that a proof of the presence of organo-borates as defined in Claim 1 cannot be provided, since any analysis method has an influence on the final reaction mixture.

In the absence of any support of this allegation, the Board cannot accept that it has been made credible that any analysis method would influence the composition of the final reaction mixture, or that some form of experimental verification of the presence of the organo-borate triesters as now claimed is truly a matter of impossibility.

2.3 Inventive step

2.3.1 It has never been contested that document (1) represents the closest state of the art.

Document (1) teaches that the borate derivatives described therein are useful as friction modifying additives for various fluids such as lubricants and that they provide improved oxidative stability and copper corrosion inhibition (column 1, lines 28 to 31 and 37 to 39, and column 2, lines 34 to 36).

2.3.2 Starting from the disclosure of document (1) the problem underlying the invention must be seen in providing multi-functional additives for lubricants functioning as anti-wear, extreme pressure, friction modifying and/or axle efficiency improving materials (see page 2, lines 38 to 42, and page 5, lines 33 to 35).

2.3.3 The patent in suit claims to solve this problem by providing compositions comprising an organo-borate compound as defined in Claim 1.

2.3.4 The Appellant has never contested that with the data provided in the patent in suit it has been made

credible that the tested lubricant compositions effectively solve the problem underlying the invention, as defined above. But he contested that it had been made credible that there is any significant benefit for compositions containing the low amounts of organo-borates, as they are included within the scope of claims 12 and 13.

2.3.5 However, since the claims are directed to a skilled person, it is to be considered how such person would interpret the wording of such claims, taking the content of the patent in suit into consideration.

It is clearly taught on page 6, lines 31 to 35, of the patent in suit that the lubricating compositions contain an amount of the multi-functional organo-borate **compounds** of this invention sufficient to provide said lubricating compositions with anti-wear, extreme pressure, friction modifying and axle efficiency performance properties and that, normally, this amount will range from about 0.1 to about 10.0 percent by weight, and preferably from about 0.1 to about 5.0 percent by weight based on the total weight of the lubricating composition. Therefore, a skilled person would interpret the claims such that, in order to be effective the lubricants must contain at least 0.1% by weight of the organo-borate **compound** and, consequently, that the amount of the composition added to the lubricant is to be adjusted depending upon the concentration of the organo-borate compound in the composition.

2.3.6 Since it was the Appellant who contested that compositions containing the low amounts of organo-

borates which are included within the scope of claims 12 and 13 provide any significant benefit, it was thus on him to provide adequate proof that at the lower limit of the claimed lubricating compositions, ie lubricants containing 0.1% by weight of organo-borate compound, the desired effect is not obtained. In the absence of such proof, the Board accepts that it has been made credible that the problem underlying the invention, as defined above, is effectively solved by the claimed compounds and compositions.

2.3.7 It remains to be decided, whether, in the light of the teachings of document (1), a skilled person seeking to solve the above mentioned problem, would have arrived at the claimed compounds and compositions in an obvious way.

2.3.8 The Appellant essentially argued that, since it was obvious from document (1) to conduct the esterification to obtain boron levels down to 0.05% and since the discovery of alleged benefits does not impart obviousness, there cannot be an invention in doing something that was entirely obvious to do.

However, since the Board came to the conclusion that there is insufficient evidence to show that boration levels of 0.05% by weight mean that organo-borate compounds as defined in Claim 1 are present (see point 2.2.4 above), compositions containing such organo-borates cannot thus be treated as being either known or suggested in document (1) and there could, consequently, not be any suggestion therein that the said organo-borates would have besides the properties known for the borated adducts of document (1) the

multi-functional properties as described above.

2.3.9 Thus, Claim 1 is not obvious in the light of the teachings of document (1).

2.4 Claims 2 to 5, which represent preferred embodiments of Claim 1, and Claims 12 and 13, concerning an additive concentrate respectively a lubricating composition containing a composition according to Claims 1 to 5, and the method Claims 6 to 11 derive their patentability from the same inventive concept.

2.5 Since Claims 1 to 13 and the description underlying the contested decision comply with the requirements of the EPC, the patent may be maintained on the basis of the documents specified in the Appellant's main request.

3. In the light of the above findings, there is no need to consider the first and the second auxiliary request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier A. Nuss