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# Datasheet for the decision of 18 February 2020

**Case Number:** T 1551/15 - 3.3.02

**Application Number:** 08832886.9

**Publication Number:** 2195403

**IPC:** C10M163/00

**Language of the proceedings:** EN

**Title of invention:**
TITANIUM COMPOUNDS AND COMPLEXES AS ADDITIVES IN LUBRICANTS

**Patent Proprietor:**
The Lubrizol Corporation

**Opponent:**
Infineum International Limited

**Headword:**

**Relevant legal provisions:**
EPC Art. 56

**Keyword:**
Inventive step - (no)

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
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Office européen des brevets

**Beschwerdekammern**

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**Case Number: T 1551/15 - 3.3.02**

# D E C I S I O N
# of Technical Board of Appeal 3.3.02
# of 18 February 2020

| | |
|---|---|
| **Appellant:** (Opponent) | Infineum International Limited<br>P.O. Box 1,<br>Milton Hill<br>Abingdon,<br>Oxfordshire OX13 6BB (GB) |
| **Representative:** | Uexküll & Stolberg<br>Partnerschaft von<br>Patent- und Rechtsanwälten mbB<br>Beselerstraße 4<br>22607 Hamburg (DE) |
| **Respondent:** (Patent Proprietor) | The Lubrizol Corporation<br>29400 Lakeland Blvd.<br>Wickliffe, OH 44092-2298 (US) |
| **Representative:** | D Young & Co LLP<br>120 Holborn<br>London EC1N 2DY (GB) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 5 June 2015 concerning maintenance of the European Patent No. 2195403 in amended form.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | M. O. Müller |
| **Members:** | A. Lenzen |
| | L. Bühler |

## Summary of Facts and Submissions

I. This decision concerns the appeals filed by the patent proprietor and the opponent against the decision of the opposition division (decision under appeal) according to which European patent no. 2 195 403 (patent in suit) in amended form meets the requirements of the EPC.

Both parties are appellants and respondents to the other party's appeal. For the sake of simplicity, they are referred to as patent proprietor and opponent.

II. In its notice of opposition the opponent requested the revocation of the patent in suit in its entirety based on the ground for opposition pursuant to Article 100(a) EPC (lack of novelty and lack of inventive step).

The decision of the opposition division is based on the patent as granted (main request) and sets of claims of auxiliary requests 1 to 3, filed on 20 March 2015. The set of claims of auxiliary request 3, supplemented by an adapted description, was considered to meet the requirements of the EPC.

III. The following documents and experimental evidence, filed during the opposition proceedings, are relevant for the present decision:

D4 WO 2006/105022 A1

D9 EP 0 075 478 A2

EX1 patent proprietor's letter dated 14 October 2011

EX2 patent proprietor's letter dated 23 January 2015

annex A filed with the opponent's letter dated 23 March 2015

IV. With its statement of grounds of appeal, the opponent filed new experimental evidence as annex B.

V. Within its statement of grounds of appeal, the patent proprietor submitted new experimental evidence (points 9 to 16), EX3 in the following.

VI. By letter dated 25 February 2016, the patent proprietor filed new experimental evidence as annex C.

VII. By letter dated 26 February 2016, the opponent filed, *inter alia*, an "annex C", which will be referred to as annex D in the following in view of the patent proprietor's submission of 25 February 2016.

VIII. On 21 November 2019, the board issued a communication pursuant to Article 15(1) RPBA.

IX. Oral proceedings before the board were held on 18 February 2020.

X. The **patent proprietor** requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or, in the alternative, that the patent be maintained in amended form based on the sets of claims of auxiliary requests 2 or 3, filed on 20 March 2015, or auxiliary requests 4 or 5, filed by letter dated 25 February 2016.

The **opponent** requested that the decision under appeal be set aside and that the patent in suit be revoked in its entirety.

XI. In this decision, the "parts per million by weight" concentration is, outside of quotations, abbreviated as "ppm".

XII. The opponent's arguments, in as much as they are relevant for the present decision, can be summarised as follows:

D4 was the closest prior art. The opponent's experimental data, in particular the comparison of composition 17 to compositions 13, 14 and 16 in annexes B and D, showed no synergistic interaction between titanium isopropoxide and a borated dispersant in as much as the stability towards oxidation of the lubricating composition was concerned. Although the titanium and boron levels in composition 17 did not exactly match those of compositions 14 and 16, the comparison was meaningful because titanium had a greater antioxidant effect than boron. Thus, the opponent's data showed that the effect alleged by the patent proprietor was not achieved over the whole breadth of the claims. Consequently, the objective technical problem was merely the provision of an alternative lubricating composition. The provision of such an alternative was obvious in view of D9, teaching that borated hydrocarbyl vicinal diols, which were borate esters according to the claims, had antioxidant activity and could be used for this purpose in lubricating compositions. The subject-matter of auxiliary request 4 and all higher ranking requests thus lacked inventive step.

As regards auxiliary request 5, D4 taught that detergents could be incorporated into lubricating compositions preferentially in an amount of 0.3 to 3.0 wt.-%.

XIII. The patent proprietor's arguments, in as much as they are relevant for the present decision, can be summarised as follows:

D4 was the closest prior art. The lubricating composition of the main request and auxiliary requests 1 to 5 was distinguished from D4 in that a) the range linked to titanium was a selection from a broader range disclosed in D4 and b) the lubricating composition further comprised a borate ester or a borated dispersant in an amount of at least 70 ppm. The subject-matter of auxiliary request 5 was further distinguished from D4 with regard to the amount of detergent. The patent proprietor's experimental data, in particular compositions 6 and 13 in annex C, showed a synergistic interaction between titanium ethylhexoxide and a borated dispersant with regard to the oxidation stability of the lubricating composition. The opponent's comparison of compositions 13, 14, 16 and 17 in annex B was not valid because compositions 14 and 16 contained amounts of titanium and boron different from those of composition 17. The objective technical problem was the provision of a lubricating composition having a synergistically improved stability towards oxidation. Even if the objective technical problem were to be considered as the provision of a lubricating composition having merely an improved (i.e. not synergistically improved) stability towards oxidation or as the provision of merely an alternative lubricating composition, the solution would still not be obvious based on D4 or a combination of D4 with D9.

D4 taught the use of boron compounds as anti-wear agents and as dispersants but not as antioxidants. Moreover, D4 taught a number of different specific classes of antioxidants. Starting from D4, the skilled person would therefore have included one of the compounds specifically identified in D4 as antioxidants, but they would not have turned to D9. Moreover, D9 was published over 20 years before D4 was filed, and the skilled person would not have turned to D9 when seeking to modify the teachings of D4. To get to the subject-matter of auxiliary request 5, the skilled person would have had to make a further selection from D4, namely the amount of detergent. This was indicative of an inventive step.

## Reasons for the Decision

Auxiliary request 4

1. Claim 5 of auxiliary request 4 reads as follows:

"*A lubricating composition comprising:*

*(a) an oil of lubricating viscosity;*
*(b) 75 to 150 parts per million by weight of titanium in the form of an oil-soluble titanium-containing material selected from the group consisting of titanium-modified dispersants, a titanium alkoxide, tolyltriazole oligomers salted with or chelated to titanium, titanium citrate, and titanium compounds derived from glycols, each of the foregoing having a number average molecular weight of less than 20,000;*
*(c) an antioxidant other than a Ti-containing antioxidant;*

*(d) a metal containing detergent other than a Ti-containing detergent; and*
*(e) at least 70 parts per million by weight of boron in the form of a soluble boron compound wherein the soluble boron compound is a borate ester or a borated dispersant; and*

*wherein the composition contains less than 150 parts per million by weight of molybdenum.*"

2. Inventive step (Article 56 EPC)

2.1 D4 (paragraph [0002]) relates to lubricant compositions containing a soluble titanium-containing material, having beneficial effects on properties such as deposit control, oxidation and filterability in, for instance, engine oils. Both parties agreed that D4 was the prior art closest to the claimed subject-matter of auxiliary request 4.

2.2 The patent proprietor argued that the lubricating composition of claim 5 was distinguished from D4 as follows.

(i) The lubricating composition of claim 5 comprised 75 to 150 ppm of titanium. This was a selection from the broader range disclosed for titanium in D4.
(ii) The lubricating composition of claim 5 further comprised a specific soluble boron compound, i.e. a borate ester or a borated dispersant, in an amount of at least 70 ppm.

In the patent proprietor's favour, it is assumed in the following that this is correct.

2.3 The parties disagreed as to whether there was a synergistic interaction between titanium and boron over the entire breadth of claim 5 in as much as the stability of the lubricating composition towards oxidation was concerned.

2.3.1 In this context, both parties discussed the experimental data of the patent in suit and the experimental evidence submitted during the opposition and appeal proceedings. The patent proprietor submitted EX1, EX2, EX3 and annex C. The opponent submitted annex A, annex B and annex D (annex D is a tabular summary of the results in annex A and annex B).

In these experimental data, different lubricating compositions are analysed with respect to their stability towards oxidation. The compositions are maintained in air at a certain temperature until an oxidation event is detected by heat flow. The elapsed time, the oxidation induction time (OIT), is taken as a measure of the oxidation stability of the lubricating composition. Higher OITs indicate higher stability and *vice versa*.

2.3.2 In relation to these experimental data, both parties offered three different methods of assessing the presence/absence of synergy between titanium and boron. In its communication pursuant to Article 15(1) RPBA, the board indicated its preliminary view that the presence/absence of synergy should be assessed by comparing the OIT of the lubricating composition containing both titanium and boron to the "predicted OIT". Put more simply, the following should be compared:

(a) the actual contribution of the combination of titanium and boron to oxidation stability

with

(b) the sum of the individual contributions of titanium and boron to oxidation stability with - for the determination of the individual contributions - the levels of titanium and boron being the same as the levels in the lubricating composition containing both titanium and boron

This will be explained with the following data taken from annex C (compositions 1, 2, 4 and 6 are lubricating compositions which differ essentially only in their titanium and/or boron levels).

| | Ti (ppm) | B (ppm) | OIT (min) |
|---|---|---|---|
| composition 1 | 0 | 0 | 85 |
| composition 2 | 80 | 0 | 156 |
| composition 4 | 0 | 89 | 109 |
| composition 6 | 80 | 89 | 191 |

The contributions to oxidation stability of the combination of titanium and boron, titanium alone and boron alone can be calculated by subtracting the OIT of composition 1, not containing any titanium or boron, from the OITs of compositions 6, 2 and 4, respectively. This gives a contribution of 106 min (= 191 min - 85 min) for the combination of titanium and boron (i.e. (a) above). Each of titanium and boron alone contributes 71 min (= 156 min - 85 min) and 24 min (= 109 min - 85 min), respectively. The sum of these individual contributions (i.e. (b) above) amounts to 71 min + 24 min = 95 min. The combination of titanium and boron contributes more to oxidation stability (106 min)

than the sum of the individual components alone (95 min). This indicates synergy between titanium and boron in composition 6.

Using this method for assessing the presence/absence of synergy was also the patent proprietor's position at the time annex C was filed (see letter dated 25 February 2016, page 3, paragraph 6). However, during the oral proceedings, the patent proprietor contested this method for being too simplistic. Although it did so without providing evidence for this allegation and without offering any alternative method or giving preference to one of the other two methods which the board had preliminarily rejected in its communication. The patent proprietor's submission is therefore a groundless allegation which cannot be retained in the further analysis of inventive step. Thus, for the assessment of the presence/absence of synergy, the above method will be used in the following.

2.3.3 Of the various lubricating compositions analysed by both parties, the following ones contain the levels of titanium and boron required by claim 5:

(a) compositions of examples 4, 5, 11, 19, 20 and 27 of the patent in suit
(b) composition "S010-0113-11-10" in EX1
(c) compositions 17 and 21 of annex B
(d) compositions 6 and 13 of annex C

In its communication pursuant to Article 15(1) RPBA (point 3.9), the board had explained that the data in the patent in suit and EX1, i.e. (a) and (b) above, could not be taken into account for assessing the presence/absence of synergy owing to a lack of

appropriate comparative data. This was not contested by the patent proprietor during the oral proceedings.

Composition 17 of annex B

For assessing the presence/absence of synergy, the following data of annex B are relevant.

| | Ti (ppm) | B (ppm) | OIT (min) |
|---|---|---|---|
| composition 13 | 0 | 0 | 71.2 |
| composition 14 | 80 | 0 | 195.05 |
| composition 16 | 0 | 89 | 85.5 |
| composition 17 | 91 | 82 | 193.6 |

Compositions 13, 14, 16 and 17 are lubricating compositions which differ essentially only in terms of their titanium and/or boron levels. Titanium and boron were incorporated in the form of **titanium isopropoxide** and a **borated dispersant**, respectively.

The contribution of the combination of titanium and boron to oxidation stability is 122.4 min (= 193.6 min - 71.2 min).

Ignoring for a moment that the levels of titanium and boron in compositions 14 and 16, respectively, are not the same as in composition 17, the sum of their individual contributions amounts to (195.05 - 71.2) min + (85.5 - 71.2) min = 138.15 min. The actual contribution observed (122.4 min) is lower than the predicted one (138.15 min). Thus, there is no synergistic interaction between titanium and boron in composition 17.

The patent proprietor argued that the above comparison was not valid precisely because the levels of titanium and boron in compositions 14 and 16 were not the same as in composition 17. More specifically, the content of titanium in composition 17 was 11 ppm higher than in composition 14 and the content of B was 7 ppm lower than in composition 16. The board did not find this argument convincing. It was common ground between the parties that as a general rule titanium compounds contribute much more to oxidation stability of the lubricating composition than boron compounds (as can also be derived from a comparison of the OITs of compositions 13, 14 and 16 above). In view of this, the predicted OIT of a composition containing a combination of titanium and boron at the levels of compositions 14 and 16 (i.e. a composition containing 80 ppm of titanium and 89 ppm of boron) should actually be even lower than that of composition 17 (a composition containing 91 ppm titanium and 82 ppm boron). As set out above, the opposite is true, i.e. the predicted OIT is higher than the actual one. The board therefore accepted that there is no synergy between titanium and boron in composition 17.

Composition 21 of annex B

This composition comprises 84 ppm of titanium and 90 ppm of boron. Titanium and boron were incorporated in the form of **titanium isopropoxide** and **2-ethylhexyl borate**, respectively. In its communication pursuant to Article 15(1) RPBA (page 13, last paragraph), the board explained that titanium and boron appeared to act synergistically

in this composition. This was not contested by either party during the oral proceedings.

Compositions 6 and 13 of annex C

Both of these compositions contain 80 ppm of titanium and 89 ppm of boron. Titanium and boron were incorporated in the form of **titanium ethylhexoxide** and a **borated dispersant**, respectively. As is clear from point 2.3.2 above, titanium and boron interact synergistically in composition 6. An analogous calculation applies to composition 13 of annex C. The opponent did not contest that synergy was present in these compositions.

In summary, the data available show that a synergistic interaction between titanium and boron can be observed for the combination of (i) **titanium isopropoxide** and **2-ethylhexyl borate** and (ii) **titanium ethylhexoxide** and a **borated dispersant**. Yet, at the same time, the combination of (iii) **titanium isopropoxide** and a **borated dispersant** does not show the desired synergistic interaction. It must be concluded that the alleged synergistic effect is not achieved over the entire breadth of claim 5, i.e. for every possible combination of titanium-containing material and boron compound. It can therefore not be taken into account for the assessment of inventive step.

2.4 The objective technical problem would therefore have to be formulated merely as the provision of an alternative lubricating composition.

In the following, it is nevertheless assumed in the patent proprietor's favour that the objective technical

problem would have to be formulated in a more ambitious manner, namely as the provision of a lubricating composition having increased stability towards oxidation. It is shown even in this case that an inventive step still cannot be acknowledged.

2.5 There would have been no reason for the skilled person to have stuck only with the antioxidants mentioned in D4 when trying to provide a lubricating composition with an improved stability towards oxidation. There is also no reason to assume that they would have not gone any further than prior art with publication dates close to the filing date of D4. They would have also considered other prior art, irrespective of publication date, such as D9. D9 teaches that borated hydrocarbyl vicinal diols, i.e. borate esters as is clear from the structures shown in D9 at the top of page 7, may be used as anti-oxidant ingredients in lubricating compositions (D9: claim 1). The skilled person would therefore have incorporated such a compound into the compositions of D4 when trying to improve its stability towards oxidation. Since the only remaining distinguishing feature, i.e. the amount of borate esters in claim 1, is not linked to an unexpected technical effect, the selection of the corresponding range of at least 70 ppm of boron does not require any inventive skills either.

Thus, starting from D4 and taking into account the teaching of D9, the skilled person would have arrived at the subject-matter of claim 1 without the need of any inventive skills.

Auxiliary request 4 is therefore not allowable.

Main request and auxiliary requests 2 and 3

3. This section discusses the requests that rank higher than auxiliary request 4, i.e. the main request and auxiliary requests 2 and 3 (no auxiliary request 1 was pending before the board).

4. Inventive step (Article 56 EPC)

Claims 6, 6 and 5 of the main request and auxiliary requests 2 and 3, respectively, relate to lubricating compositions similar to the one of claim 5 of auxiliary request 4. They differ from the latter only in that they allow a broader range of titanium to be contained in the lubricating composition:

- main request, claim 6: "*at least 25 parts per million by weight of titanium*"
- auxiliary request 2, claim 6: "*at least 50 parts per million by weight of titanium*"
- auxiliary request 3, claim 5: "*75 to 1000 parts per million by weight of titanium*"

Consequently, the subject-matter of claim 5 of auxiliary request 4 is comprised by each of these claims. It follows that none of these requests is allowable owing to the lack of an inventive step found above with regard to auxiliary request 4.

Auxiliary request 5

5. Inventive step (Article 56 EPC)

5.1 Claim 5 differs from claim 5 of auxiliary request 4 in that the lubricating composition comprises (emphases added):

- "***75 to 1000*** *parts per million by weight of titanium*"
- "*a metal containing detergent other than a Ti-containing detergent,* ***wherein the amount of the detergent is from 0.3 to 3.0 percent by weight***".

Assuming in favour of the patent proprietor, that the range of 75 to 1000 ppm of titanium is still a selection from a broader range disclosed in the closest prior art D4, the lubricating composition of claim 5 differs from D4 as follows.

(i) The lubricating composition of claim 1 comprises 75 to 1000 ppm of titanium. This is a selection from a broader range disclosed for titanium in D4.

(ii) The lubricating composition further comprises a specific soluble boron compound, i.e. a borate ester or a borated dispersant, in an amount of at least 70 ppm.

(iii) The lubricating composition further comprises 0.3 to 3.0 wt.-% of a metal containing detergent other than a Ti-containing detergent.

5.2 As regards possible effects linked to the distinguishing features above, the patent proprietor referred to its submissions regarding the higher ranking requests. It did not assert a surprising technical effect to be linked to the amount of detergent.

With the reasoning above under points 2 and 4 applying *mutatis mutandis*, the objective technical problem can again be formulated as the provision of a lubricating composition having increased stability towards oxidation.

5.3 For distinguishing features (i) and (ii), the reasoning under points 2 and 4 above applies *mutatis mutandis*. As regards distinguishing feature (iii), D4 (paragraph [0064]) teaches that detergents may preferentially be incorporated in amounts of 0.3 to 3.0 wt.-% into its lubricating compositions. Thus, starting from D4 and taking into account the teaching of D9, the skilled person would have arrived at the subject-matter of claim 5 without the need of any inventive skills.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.

2. The patent in suit is revoked.

The Registrar: The Chairman:

N. Maslin M. O. Müller

Decision electronically authenticated