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**D E C I S I O N**  
of 1 August 1995

**Case Number:** T 0349/94 - 3.3.2

**Application Number:** 89901421.1

**Publication Number:** 0352314

**IPC:** C06B 47/14

**Language of the proceedings:** EN

**Title of invention:**

Explosive compositions using a combination of emulsifying salts

**Applicant:**

THE LUBRIZOL CORPORATION

**Opponent:**

-

**Headword:**

Explosive emulsions/LUBRIZOL

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step (yes) - after amendment"

**Decisions cited:**

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**Catchword:**

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Boards of Appeal

Chambres de recours

Case Number: T 0349/94 - 3.3.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.3-2  
of 1 August 1995

**Appellant:**

THE LUBRIZOL CORPORATION  
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Ohio 44092-2298 (US)

**Representative:**

Crisp, David Norman  
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**Decision under appeal:**

Decision of the Examining Division of the European  
Patent Office dated 13 December 1993 refusing  
European patent application No. 89 901 421.1  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** P. A. M. Lançon  
**Members:** G. J. Wassenaar  
J. A. Stephens-Ofner

## Summary of Facts and Submissions

I. European patent application No. 89 901 421.1 was refused by a decision of the Examining Division. The decision was taken on the basis of two amended Claims 1 (main request and auxiliary request) filed during oral proceedings.

II. The Examining Division held that the subject matter of both the main request and the auxiliary requests did not meet the requirements of Article 56 EPC, having regard to the following documents:

- (1) WO-A-87/03613
- (2) EP-A-0 155 800
- (3) US-A-4 357 184
- (4) Kirk-Othmer, Encyclopedia of Chemical Technology, 3rd edn., volume 8, John Wiley & Sons, New York, 900-915.

In its decision, the Examining Division considered (1), relating to water-in-oil emulsions and disclosing explosive emulsions, to represent the closest prior art. The technical problem underlying the claimed invention was considered the provision of alternative explosive compositions.

The solutions given by the compositions of Claims 1 of the main and auxiliary requests were regarded obvious in view of basic chemical knowledge and (2).

The Examining Division also considered novelty with respect to (1) but left the question of novelty undecided.

III. The Appellant lodged an appeal against this decision. In the Statement of the Grounds of Appeal, the Appellant refuted the arguments of the Examining Division and submitted 6 alternative Claims 1 (main request and auxiliary requests A till E).

Later in the proceedings experimental evidence was filed showing the technical effect of compositions containing a combination of components (A) and (B) compared with compositions containing only (A) or (B).

With a letter dated 5 April 1995, received on 6 April 1995, a new set of Claims 1 to 10 was filed replacing all the existing claims together with amended pages 4, 5, 7-10, 31, 48 and 55 of the description.

With telefax dated 25 April amended pages 8 and 45 were filed.

IV. The new and only independent main claim reads as follows:

"1. An explosive composition comprising a discontinuous oxidizer phase comprising at least one oxygen-supplying component, a continuous organic phase comprising at least one carbonaceous fuel, and an emulsifying amount of

(A) at least one carboxylic salt interaction product of:

(A) (I) a high-molecular weight hydrocarbyl-substituted monocarboxylic acid, or a high-molecular weight hydrocarbyl-substituted polycarboxylic acid, or ester or amide derivative of said polycarboxylic acid or the corresponding anhydride, which ester or amide derivative contains at least one free carboxylic group, the hydrocarbyl substituent of (A) (I) having an average of from 20 to 500 carbons atoms; and

(A)(II) ammonia, at least one amine, at least one alkali or alkaline earth metal, and/or at least one alkali or alkaline earth metal compound; and

(B) at least one carboxylic salt interaction product of:

(B)(I) at least one low molecular weight hydrocarbyl-substituted polycarboxylic acid, or ester or amide derivative of said polycarboxylic acid or the corresponding anhydride, which ester or amide derivative contains at least one free carboxylic group, the hydrocarbyl substituent of (B)(I) having an average of from 8 to 18 carbon atoms; and

(B)(II) ammonia, and/or at least one amine.

- V. The Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the amendments filed on 6 April 1995 and 25 April 1995.

#### Reasons for the Decision

1. The appeal is admissible.
2. *Allowability of amendments*

Present Claim 1 corresponds essentially to original claim 40 with the additional limitation of component B(II) to ammonia or at least one amine, which were both mentioned as B(II) components in original Claim 1. The requirement that the ester or amide derivative contains at least one free carboxylic group follows unambiguously from the original requirement that components A(I) and B(I) form salts. In fact this implicit original requirement has now been expressed explicitly.

Thus the subject matter of present Claim 1 is an embodiment of the application as originally filed.

The features of dependent Claims 2 to 10 are based on subject matter disclosed in original Claims 5, 9, 11, 28, 31, 42, 44, 58 and 64.

Thus the amended claims satisfy the requirements of Article 123(2) EPC.

3. *Novelty*

Although the appealed decision was based on lack of inventive step, three pages were devoted to novelty with respect to (1), yet, the question of novelty remained undecided.

The issue of novelty was hinged on the fact that component (C) of (1) was defined by a hydrocarbyl substituent having an average carbon chain length of from 20 to 500 carbon atoms, which would include minor amounts of compounds of C-18 and lower and thus would overlap with component (B) of the present application, comprising a hydrocarbyl substituents having an average of from 8 to 18 carbon atoms. Since component (A) of the present application is identical with component (C) of (1), the latter prior art component (C) would cover a mixture of both present components (A) and (B).

Although the Board agrees that the prior art component (C) may also include minor amounts of C-18 and lower compounds, it holds that the distribution of compounds with various carbon chain length in the composition of present Claim 1 is essentially different from that of (1). The presence of components (A) and (B) in the composition implies that there are at least two maxima in the distribution of carbon chain lengths; one with a

maximum between 8 and 18 carbon atoms and another with a maximum between 20 and 500 carbon atoms. Such a distribution is not disclosed by (1) requiring for component (C) an average carbon chain length of 20 to 500. Normally such a distribution has only one maximum between 20 and 500. Even if it were accepted that component (C) would also cover a distribution with more than one maximum, there is certainly no disclosure for a maximum between 8 and 18 carbon atoms. Thus the subject matter of the present claims has novelty over (1).

4. *Inventive step*

4.1 In agreement with the Examining Division, the closest prior art with respect to Claim 1 is considered to be document (1) which discloses explosive emulsion compositions comprising at least one oxygen-supplying component, a continuous organic phase comprising at least one carbonaceous fuel and an emulsifying carboxylic salt referred to as component (C) and corresponding to present component (A).

Although said known component (C) is generally a satisfying emulsifier, the Appellant has shown its limits in that at least one explosive composition does not provide a stable emulsion; see experiment 1 in Appellant's letter of 18 January 1995.

4.2 The technical problem underlying the claimed invention is regarded as an extension of the range of stable explosive emulsion compositions; i.e. as suggested by the Appellant and accepted by the Examining Division, as the provision of an alternative composition to that disclosed in (1).

The Appellant has demonstrated by filing comparative examples that at least one explosive composition comprising ammonium nitrate, zinc nitrate, water and Diesel fuel, could be emulsified with the combination of emulsifiers according to present Claim 1, whereas it could not be emulsified with an emulsifier according to (1); see table in Appellant's letter of 18 January 1995.

Thus the Board is satisfied that the said problem is solved by the composition of Claim 1.

4.3 It remains therefore to be decided if, for solving the above stated problem, it would have been obvious to combine the emulsifiers (A) and (B) as now claimed.

4.3.1 As indicated above, present emulsifier (A) is known as component (C) from (1). This document further discloses that although the primary emulsifier (C) is suitable as only emulsifying component, the stability of the emulsion can be further improved by additional stabilizers such as phosphates, glycols, sulphonic acid salts and alkali metal salts of fatty acids (pages 58 to 61). As examples of fatty acids only monocarboxylic acids were cited. Document (1) does not disclose or suggest the use of ammonia or amine salts of low molecular weight hydrocarbyl substituted polycarboxylic acids, i.e. present component (B).

4.3.2 Salts according to present component (B) have in fact not been specifically disclosed in any of the available documents.

Document (2) discloses the use of hydrocarbyl substituted succinic acid amine salts as emulsifier in emulsion explosives. Although the hydrocarbyl backbone sequence is generally indicated to contain from 10 to 500 linked atoms, preference is given to a polymer chain

of 40 to 500 carbon atoms corresponding to an average molecular weight of 400 to 5000 (page 7, lines 1 to 26). In the examples the average molecular weight of the succinic acid group is at least 800. In fact the succinic acid based emulsifiers according to (2) correspond to present component (A). Thus although lower molecular weight polycarboxylic acid salts are not excluded in (2), their use is not recommended and there is certainly no indication that the use of lower molecular weight hydrocarbyl substituted polycarboxylic acid salts in combination with corresponding higher molecular weight compounds would solve the above mentioned technical problem.

Document (3) also discloses the use of hydrocarbyl substituted succinic acid based emulsifiers in emulsive explosives. The polymer chain should thereby likewise contain 40 to 500 carbon atoms (column 5, lines 20 to 31).

Document (4) is an encyclopedic article generally relating to emulsions and discloses a great many emulsifiers for various purposes. Low molecular weight hydrocarbyl substituted polycarboxylic acid derivatives are however not disclosed.

4.3.3 In view of the preceding considerations, the subject-matter of Claim 1 is not rendered obvious by the cited prior art. Consequently, it involves an inventive step in the meaning of Article 56 EPC.

Since the dependent Claims 2 to 10 relate to particular embodiments of Claim 1, the same applies to said claims.

**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 in the following version:

**Description:**

Pages 2, 3, 6, 11, 12, 16 to 24, 26 to 30, 32, 34, 37 to 41, 43, 44, 46, 49 to 54, 57, 58, 60, 62 to 67 as originally filed.

Pages 1, 13 to 15, 25, 33, 35, 36, 42, 47, 59, 61, 68 to 70 filed on 20 October 1992 with the letter of 19 October 1992.

Pages 4, 5, 7, 9, 10, 31, 48, 55, 56 filed on 6 April 1995 with the letter of 5 April 1995.

Pages 8, 45 filed with the telefax dated 25 April 1995.

**Claims:** 1 to 10 filed on 6 April 1995 with the letter of 5 April 1995.

The Registrar:

The Chairman:

P. Martorana

P. A. M. Lançon