

Internal distribution code:

- (A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

**Datasheet for the decision
of 19 October 2017**

Case Number: T 0386/13 - 3.3.01

Application Number: 08797600.7

Publication Number: 2180784

IPC: A01N25/04, A01N25/30,
A01N25/22, A01N43/40

Language of the proceedings: EN

Title of invention:

STABLE EMULSION FORMULATION HINDERING INTERACTION ACROSS THE
WATER-OIL INTERFACE

Patent Proprietor:

Dow AgroSciences LLC

Opponent:

Croda International Plc

Headword:

Herbicide ester emulsions/DOW

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - main, auxiliary requests I and II (no) -
auxiliary request III (yes)

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0386/13 - 3.3.01

D E C I S I O N
of Technical Board of Appeal 3.3.01
of 19 October 2017

Appellant:

(Opponent)

Croda International Plc
Cowick Hall
Snaith
Goole
East Yorkshire
DN14 9AA (GB)

Representative:

Karfopoulos, Alexis Theo
Croda International Plc
Intellectual Property Department
Cowick Hall
Snaith
Goole, E York DN14 9AA (GB)

Respondent:

(Patent Proprietor)

Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis IN 46268-1054 (US)

Representative:

Weickmann & Weickmann PartmbB
Postfach 860 820
81635 München (DE)

Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted on 21 December
2012 rejecting the opposition filed against
European patent No. 2180784 pursuant to Article
101(2) EPC.**

Composition of the Board:

Chairman A. Lindner
Members: J. Molina de Alba
 L. Bühler

Summary of Facts and Submissions

I. The present appeal lies from the decision of the opposition division to reject the opposition filed against European patent No. 2 180 784.

II. Claim 1 as granted read as follows:

"1. A stable oil-in-water emulsion which comprises:

- a) a discrete oil phase comprising an oil-soluble ester herbicide;
- b) a continuous aqueous phase comprising water, and water soluble or water dispersible ingredients;
- c) a first polymeric surfactant comprising an ABA block copolymer having a hydrophilic portion of polyethylene oxide (PEG) and a hydrophobic portion of 12-hydroxystearic acid in an amount from 1 g/L to 200 g/L, and a second polymeric surfactant comprising a polyalkylene glycol ether in an amount from 1 g/L to 200 g/L; and
- d) optionally, other inert formulation ingredients."

III. The following documents are referred to below:

(1) WO 02/067682

(2) US-A-2003/0069135

(3) A. Knowles, "New Delopments in Crop Protection Product Formulation", Agrow Reports, DS243, May 2005, pages 23-26 and 61-64

IV. In the decision under appeal, the opposition division held that the patent as granted did not add subject-matter and that its underlying invention was sufficiently disclosed. In addition, the division considered the emulsion of granted claim 1 to be novel and to involve an inventive step, document (3) being the closest prior art.

V. With the statement of grounds of appeal, the appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

VI. In its response dated 16 August 2013, the respondent (patentee) requested that the appeal be dismissed and filed five claim sets as auxiliary requests I to V. Auxiliary requests I to III are discussed in the present decision.

Claim 1 of auxiliary request I differs from granted claim 1 in that the oil-soluble ester herbicide has been specified to be one which can react or interact with ingredients in the continuous aqueous phase to cause hydrolysis of the oil-soluble ester herbicide.

Claim 1 of auxiliary request II differs from granted claim 1 by the specification that the water soluble or water dispersible ingredients are active ingredients.

Claim 1 of auxiliary request III differs from granted claim 1 in that the oil-soluble ester herbicide is specifically a triclopyr ester.

VII. On 14 October 2013, an anonymous third party filed observations and cited five additional documents.

VIII. In a communication sent as an annex to the summons to oral proceedings, the board gave its preliminary opinion *inter alia* on inventive step. In this respect, the board noted (see point 7.2) that document (1) was closer to the invention than document (3) because the former dealt specifically with the problem of chemical stability in emulsions of an oil-soluble ester herbicide. In addition, the board questioned the suitability of example 1 in the patent to show that the distinguishing feature, i.e. the surfactant system defined in granted claim 1 as component c), was responsible for the reduction of ester herbicide hydrolysis. As a result, the problem to be solved had to be reformulated in a less ambitious way, and the use of the surfactant system of granted claim 1 would be obvious in the light of point 3.2 of document (3).

IX. Oral proceedings were held before the board on 19 October 2017.

X. The appellant's arguments, insofar as they are relevant to the present decision, may be summarised as follows:

In its analysis of inventive step, the appellant started from document (3) as the closest prior art because it disclosed the preparation of stable oil-in-water emulsions on pages 61 to 64 and required the minimum of modification to arrive at the emulsion of granted claim 1 (see statement of grounds of appeal, page 9, paragraph 4). The claimed emulsion differed from that in document (3) only by the presence of water soluble or water dispersible ingredients in the aqueous phase. However, in the light of paragraph [0015] of the patent, this difference did not contribute to the invention with any technical effect and therefore should be ignored when assessing inventive step.

The appellant defined the objective technical problem to be solved as being the provision of an oil-in-water emulsion having improved stability (see statement of grounds of appeal, page 10, paragraph 4), and argued that document (3) itself taught in point 3.2 the stabilisation of oil-in-water emulsions using the surfactant system of granted claim 1. Thus, the fact that said surfactant system provided emulsion stability specifically against the crystal formation associated with ester herbicide hydrolysis was inherent and its discovery could not involve an inventive step. This was even more true considering that chemical and physical instability are not distinct problems, as confirmed by paragraph [0002] of the patent, and that granted claim 1 did not refer to a particular aspect of stability.

The appellant saw an alternative starting point in document (1), which was directed to the provision of chemically stable emulsions of an ester herbicide (see statement of grounds of appeal, passage bridging pages 11 and 12). The subject-matter of granted claim 1 differed from the teaching of document (1) by its specific surfactant combination, defined as component c). This, however, was suggested on page 11 of document (1) so that the skilled person would have arrived at the emulsion of granted claim 1 as the result of routine experimentation.

As a further point, the appellant submitted that the experimental evidence provided in example 1 of the patent was restricted to a single ester herbicide and that the comparative formulation A was not as close to the invention as the closest prior art. Hence, the effect shown in the patent was not credible for the whole breadth of granted claim 1.

With respect to claim 1 of auxiliary request I, the appellant considered that the situation regarding inventive step was the same as for granted claim 1, because the discovery of how the surfactant combination suggested in document (3) stabilised emulsions could not represent a basis for the acknowledgement of an inventive step.

In connection with claim 1 of auxiliary request II, the appellant noted that document (1) foresaw the addition of co-herbicides in the passage bridging pages 4 and 5.

Concerning claim 1 of auxiliary request III, the appellant asserted that the selection of triclopyr ester as the herbicide was arbitrary because it had not been shown that it was linked to any technical effect.

XI. The respondent's arguments, insofar as they are relevant to the present decision, may be summarised as follows:

The respondent considered document (3), in particular the commercial formulations disclosed in table 3.2.1 therein, to be the closest prior art (see respondent's letter of 18 August 2017, page 7, paragraph 4). The emulsion of granted claim 1 differed from that contained in document (3) by its combination of surfactants, which, as taught in paragraph [0009] of the patent, formed a rigid interface between the two emulsion phases and hindered hydrolysis of the oil-soluble ester herbicide. This effect was evidenced by the comparative tests in example 1 of the patent, where an emulsion according to claim 1 (formulation B) exhibited a drastic reduction of ester herbicide hydrolysis compared to a formulation A, from which

formulation B differed by its surfactant system and inert ingredients.

In light of the above, the respondent defined the problem to be solved as the provision of an oil-in-water emulsion comprising an oil-soluble ester herbicide, where hydrolysis of the ester herbicide was minimised (see respondent's letter of 18 August 2017, page 7, last paragraph). In the respondent's view, the skilled person faced with this problem would not have contemplated the use of the surfactant combination in granted claim 1 as a possible solution, because that combination was disclosed in document (3) only for physical stabilisation, not for preventing hydrolysis of oil-soluble components by a reduction of the interaction between phases.

The respondent considered that document (1) was a less suitable starting point because, even though it mentioned emulsion stability, it was actually aimed at increasing the herbicidal activity of the specific compound clodinafop-propargyl. This was apparent from the fact that the document contained data on herbicidal activity but no data on chemical stability. In addition, document (1) mentioned the surfactants of the invention on page 11 (see paragraph 2), but it did not disclose them in combination. They were cited within a long list of 23 groups of possible emulsion stabilisers spanning pages 5 to 11, and the only surfactants used in the examples were a combination of Pluronic F-108 and Morwet D-425, which did not correspond to the mixture of the invention. Hence, the skilled person who wanted to reduce the hydrolysis rate of oil-soluble ester herbicides in oil-in-water emulsions, and who started from document (1), would not have considered

the surfactant system defined in granted claim 1 as a suitable solution.

In response to the concerns raised by the board in its preliminary opinion that example 1 of the patent did not seem to show that the surfactant system of claim 1 was responsible for hydrolysis minimisation but rather that this effect was achieved by the pH-buffer contained in formulation B and absent in formulation A, the respondent provided the following explanation:

Apart from the surfactant system, formulations A and B differed only by minor, inert components. This was clear from paragraph [0018] of the patent, where the term "inert" had to be understood as having no effect on emulsion stability (see respondent's letter of 18 August 2017, page 6, paragraph 5). In particular, the pH-buffer in formulation B had been added in order to provide a pH of 7, which was the pH of formulation A. This was necessary in order to test the formulations under conditions that were as similar as possible to provide a reliable comparison. Furthermore, the drastic reduction of hydrolysis shown in example 1 for the formulation according to the invention could not be explained by the presence of a pH-buffer. It had to be due to a reduction of contact between the two phases as a result of a barrier formed by the surfactant system of the invention at the interface. As a result of this mechanism, hydrolysis minimisation was independent of the nature of the ester herbicide and was expected to occur across the whole scope of claim 1.

Turning to the inventive step of the emulsion in claim 1 of auxiliary request I, the respondent maintained that the problem of chemical stability was solved by

the barrier formed by the surfactant system of claim 1 on the water-oil interface.

The respondent had no additional arguments in support of the inventive step of the emulsion in claim 1 of auxiliary request II.

With respect to the inventive step of the emulsion claimed in auxiliary request III, the respondent argued that document (1) suggested neither the herbicide nor the surfactant mixture of claim 1. With respect to the herbicide, it submitted that document (1) did not deal with triclopyr esters and that the formulation of one herbicide cannot be generally extended to other herbicides. Moreover, triclopyr esters are particularly sensitive to hydrolysis, as taught in the patent in paragraph [0004]. Regarding the surfactant mixture, the respondent asserted that the only surfactant mixture suggested in document (1) was the one described in its examples, which was different to the one in claim 1. In addition, document (1) did not teach the formation of a barrier that prevented or hindered interaction across the oil-water interface. Lastly, with reference to document (3), the respondent submitted that none of the commercial emulsions listed in table 3.2.1 contained a triclopyr ester or the surfactant system of the invention.

XII. The final requests of the parties were as follows:

- The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

- The respondent requested that the appeal be dismissed or, alternatively, that the patent be maintained on the

basis of one of the claim sets filed as auxiliary requests I to V with its letter dated 16 August 2013.

XIII. At the end of the oral proceedings, the board announced its decision.

Reasons for the Decision

1. The appeal is admissible.

2. *Inventive step - Article 56 EPC*

2.1 The patent in suit is directed to the stabilisation of oil-in-water emulsions that contain an oil-soluble ester herbicide susceptible of undergoing hydrolysis, e.g. a triclopyr ester. It focuses in particular on the chemical stability of said emulsions, which is promoted by minimising hydrolysis of the ester herbicide (see paragraphs [0004], [0005], [0008] and [0012], and figure 1 in the patent).

2.2 *Closest prior art*

The parties concurred with the opposition division that document (3) represented the closest prior art. The appellant, nevertheless, proposed document (1) as alternative starting point.

Document (3) deals with the preparation of oil-in-water emulsions of crop protection agents, focusing particularly on their physical stability (see first paragraph of point 3.2 and figure 3.2.3). In this context, the document suggests the use of blends of two

or more surfactants and proposes specifically the mixture Atlox 4912/Atlox G-5000. The fact that this mixture corresponds to the surfactant mixture defined in component c) of granted claim 1 has not been questioned by the parties. In addition, document (3) provides in table 3.2.1 a list of commercially available oil-in-water emulsions of crop protection agents such as the ester herbicides cyhalofop-butyl, fenoxaprop-P-ethyl and fluazifop-P-butyl.

Document (1) deals primarily with the control of weeds in crops using oil-in-water emulsions of the oil-soluble ester herbicide clodinafop-propargyl (see page 1, paragraph 5 and page 23, table B1). However, as a second aspect of its invention, this document underlines the fact that its emulsions are chemically stabilised by a pH-buffer which sets the pH at a value of 4 to 6 (see page 5, paragraph 2 and page 24, paragraphs 2-3). Furthermore, document (1) cites the surfactants in feature c) of present claim 1, albeit not in combination, among those suitable for the preparation of the emulsions (see page 11, paragraph 2).

In the board's judgement, document (1) is a better starting point for the assessment of inventive step because it explicitly deals with the problem of chemical stability of aqueous emulsions containing an oil-soluble ester herbicide that may undergo hydrolysis, while document (3) refers exclusively to the aspect of physical stability of emulsions.

This view was contested by the respondent, who considered document (3) to be closer to the invention because it disclosed commercial aqueous emulsions containing ester herbicides, and because commercial

emulsions are not only physically but also chemically stable. By contrast, argued the respondent, the skilled person would not have considered the passages in document (1) stating that a pH-buffer conferred chemical stability on the emulsions to be reliable. The reason for this would be that, in a field as competitive as the present one, if such an effect had indeed been observed, evidence would have been provided. However, document (1) contained no evidence of chemical stability. Moreover, the document disclosed a long list of 23 possible sorts of stabilisers spanning from pages 5 to 11 and pH-buffers were only one of those options.

The board cannot agree with the respondent's argument, and in particular with the view, that document (1) does not credibly deal with the aspect of chemical stability for the reasons that follow. Firstly, the document links chemical stability and pH-buffering in several passages (e.g. page 5, paragraph 2 and page 24, paragraphs 2-3) and gives a preferred pH-range, namely 4 to 6. Secondly, all the emulsions illustrated in document (1) (with the exception of example P-2), and the emulsion defined in claim 1 therein, contain a pH-buffer. And lastly, it is well known that hydrolysis reactions are generally pH-dependent, which makes it plausible that hydrolysis can be reduced by pH-adjustment. Therefore, the board considers the teaching in document (1) to be credible that an aqueous emulsion of clodinafop-propargyl may be chemically stabilised by setting the pH at a value of between 4 and 6 with a pH-buffer. By contrast, document (3) discloses measures for improving physical stability only, and even if chemical stability may be implicit in commercial emulsions, the document does not give any hint as to how to achieve it.

In conclusion, document (1) represents the closest state of the art in the present case.

2.3 *Main request (patent as granted)*

2.3.1 *Problem to be solved*

As mentioned above, the emulsion of granted claim 1 differs from those disclosed in document (1) by its surfactant system, defined in claim 1 as component c). According to the patent (see paragraphs [0001], [0005], [0009], [0011], [0019] and example 1), this distinguishing feature confers chemical stability on the emulsion through a reduction of ester herbicide hydrolysis because it forms a barrier that hinders interactions across the oil-water interface. Based on this effect, the problem to be solved can be formulated as the provision of an oil-in-water emulsion of an oil-soluble ester herbicide, said emulsion having an improved chemical stability.

2.3.2 *Solution to the problem*

The solution proposed in granted claim 1 is an emulsion that contains the surfactant system defined therein as component c).

It remains then to be investigated whether this solution effectively solves the problem posed.

In this respect, the only evidence on file is example 1 in the patent specification. This example discloses a study on the chemical stability of two aqueous emulsions comprising about 30 wt.% triclopyr butoxyethyl ester (oil-soluble ester herbicide), where

the chemical stability was evaluated by monitoring the amount of triclopyr acid resulting from triclopyr butoxyethyl ester hydrolysis. The study revealed that a formulation according to granted claim 1, namely formulation B, exhibited a hydrolysis rate three times slower than that of a comparative formulation A.

Nevertheless, in the evaluation as to whether this example proves that the surfactant system proposed in granted claim 1 effectively solves the problem posed, it cannot be ignored that formulations A and B differ not only by their surfactant systems but also by other components. Particularly relevant is the fact that formulation B contains a pH-buffer absent in formulation A, since document (1) teaches that an ester herbicide may be chemically stabilised by pH-buffering. In other words, the presence of a pH-buffer in formulation B raises doubts as to whether the surfactant system is the component that confers chemical stability on formulation B.

In relation to this issue, the respondent emphasised that the pH-buffer in formulation B had no influence on chemical stability because, as stated in paragraph [0018] of the patent, pH-buffers are inert ingredients. The respondent also argued that the buffer had been added to formulation B only to adjust its pH to that of formulation A in order to test both formulations under the most similar conditions possible. Lastly, the respondent contended that the drastic reduction of hydrolysis observed in formulation B could not be due to pH-buffering but rather to the barrier formed by the surfactant system at the oil-water interface, which hindered interactions between components in the oil-phase and components in the aqueous phase. Consequently, the chemical stability of formulation B

had to be ascribed to its surfactant system, which was representative of feature c) of granted claim 1.

There is an inconsistency between the respondent's argument that a pH-buffer had to be added to test the two formulations under the most similar conditions possible and the fact that formulation B contained, for no apparent reason, a number of ingredients that were absent in formulation A. Those ingredients introduce additional differences between the formulations and do not allow a meaningful comparison to be carried out. Furthermore, in the board's view, the teaching of document (1) that pH-buffering imparts chemical stability to emulsions of an oil-soluble ester herbicide cannot be countered by a mere statement that the stabilisation observed in example 1 cannot be ascribed to the pH-buffer but to the surfactant system. Such an argument could only be accepted if it were supported by empirical evidence. In this context, the respondent's observation that the pH-buffer in formulation B is not one of those listed on page 5 of document (1) (see paragraph 2) does not change the situation, because the essential teaching in document (1) is that the pH needs to be stabilised at a value which minimises ester hydrolysis, irrespective of the specific buffer used for it.

Accordingly, the board concludes that the differences between formulations A and B in example 1 of the patent do not allow chemical stabilisation to be ascribed to the surfactant system of claim 1 and, therefore, the patent does not convincingly show that the solution proposed in granted claim 1 successfully solves the problem posed.

2.3.3 Reformulation of the problem

In view of the above, the problem needs to be reformulated in a less ambitious manner, namely as the provision of a further oil-in-water emulsion of an oil-soluble ester herbicide.

2.3.4 *Obviousness*

Starting from document (1) and faced with the problem as reformulated above, the board considers that the skilled person would have contemplated as an obvious measure replacing the surfactant combination in the examples of document (1) by suitable alternatives. One such suitable alternative would have certainly been the typical mixture for oil-in-water emulsions Atlox 4912/Atlox G-5000 at a concentration of at least 5%, as suggested in point 3.2 of document (3), since both of these surfactants were described in document (1) as being suitable for its invention (see page 11, paragraph 2). Hence, having regard to the fact that the surfactant system Atlox 4912/Atlox G-5000 falls within the definition in feature c) of granted claim 1, the combination of documents (1) and (3) would have led the skilled person to an emulsion as defined in granted claim 1 without the involvement of an inventive step.

Consequently, the main request lacks an inventive step (Article 56 EPC).

2.4 *Auxiliary request I*

The reasons why the emulsion of granted claim 1 is not inventive apply *mutatis mutandis* to that in claim 1 of auxiliary request I, because the latter contains no additional distinguishing features over the closest prior art, since the oil-soluble ester herbicide of

document (1), i.e. clodinafop-propargyl, may undergo hydrolysis and therefore falls within the definition of the oil-soluble ester herbicide in claim 1.

Accordingly, auxiliary request I also has to be rejected for lack of inventive step (Article 56 EPC).

2.5 *Auxiliary request II*

The addition of a water soluble or water dispersible active ingredient to the emulsion of granted claim 1 cannot render the resulting emulsion inventive, because such an addition represents an obvious modification, especially in the light of the passage on page 4, paragraph 1 of document (1), which suggests the addition of co-herbicides that, depending on their solubility, may be dissolved either in the aqueous phase or in the oil phase.

Therefore, the emulsion in claim 1 of auxiliary request II also lacks inventive step (Article 56 EPC).

2.6 *Auxiliary request III*

2.6.1 *Problem to be solved*

Claim 1 of auxiliary request III has been restricted to emulsions that comprise a triclopyr ester as the oil-soluble ester herbicide. This restriction introduces an additional difference with the closest prior art compared to granted claim 1. Irrespective of whether document (1) or the emulsions in table 3.2.1 of document (3) represent the closest prior art, the emulsion in claim 1 of auxiliary request III differs therefrom in both the ester herbicide and the surfactant system.

Taking into consideration these two differences and the fact that the chemical stabilisation of a triclopyr ester shown in example 1 of the patent cannot be ascribed to the surfactant system proposed in claim 1 (see point 2.3.2 above), the objective technical problem to be solved may be formulated as the provision of a further oil-in-water emulsion of an oil-soluble ester herbicide.

2.6.2 *Obviousness*

In the context of the assessment as to whether the emulsion in claim 1 of auxiliary request III is obvious having regard to the prior art, the board notes that none of the documents cited by the appellant in its discussion of inventive step, namely documents (1) to (3), mentions triclopyr esters. However, it was apparent from the patent that triclopyr esters were the most preferred oil-soluble ester herbicides (see paragraphs [0004], [0008] and [0019], and example 1 and granted claim 2).

It therefore follows that, starting from document (1) as the closest prior art, the skilled person had no hint in the cited documents to replace clodinafop-propargyl with a triclopyr ester. Furthermore, even if he had such a hint, in order to arrive at the emulsion of claim 1 of auxiliary request III he would still need to go a step further and replace the preferred surfactant system in the examples of document (1) by the one suggested in point 3.2 of document (3). Such a combination of modifications cannot be seen as obvious with regard to the cited prior art.

Similarly, starting from the commercial emulsions listed in table 3.2.1 of document (3), it was not obvious to the skilled person to prepare an emulsion of a herbicide that had not been listed, such as a tricopyr ester, with a surfactant system that was not specified for any of said listed commercial emulsions.

On this issue, the appellant argued that the selection of triclopyr ester is arbitrary because it does not produce any effect. Therefore it cannot render the emulsion of claim 1 of auxiliary request III inventive. This argument, however, cannot hold because, as noted by the respondent at the oral proceedings, it fails to explain the motivation for the skilled person to select an ester herbicide that is not mentioned in documents (1) to (3) and to then combine it with the surfactant system of the invention.

As a result, the board concludes that the arguments put forward by the appellant do not demonstrate that the emulsion claimed in auxiliary request III is obvious over the prior art.

3. *Further objections*

Upon enquiry by the board at the oral proceedings, the appellant declared that it had no objections under Articles 123(2), 83, or 54 EPC to auxiliary request III or the invention to which it relates. The board sees no reason to raise any of these objections either.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent, with the following claims and a description to be adapted thereto:

Claims 1 and 2 of auxiliary request III filed with letter dated 16 August 2013.

The Registrar:

The Chairman:



M. Schalow

A. Lindner

Decision electronically authenticated