Internal distribution code:

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

Datasheet for the decision of 17 December 2025

Case Number: T 0222/23 - 3.3.09

Application Number: 17709716.9

Publication Number: 3429991

IPC: C07C407/00, C07C409/00, C08F4/34

Language of the proceedings: EN

Title of invention:
STORAGE STABLE AQUEOUS ORGANIC PEROXIDE EMULSIONS

Patent Proprietor:
Nouryon Chemicals International B.V.

Opponent:
ARKEMA France

Headword:
Aqueous peroxide emulsions/NOURYON

Relevant legal provisions:
EPC R. 99(2)
EPC Art. 56
RPBA 2020 Art. 12(2)

Keyword:
Admissibility of appeal -
appeal sufficiently substantiated (yes)
Inventive step - main request and auxiliary requests (no)

Decisions cited:
T 2077/11

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

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

Case Number: T 0222/23 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 17 December 2025

Appellant: (Opponent)	ARKEMA France 420 Rue d'Estienne d'Orves 92700 Colombes (FR)
Representative:	Arkema Patent Arkema France DRD-DPI 51, Esplanade du Général de Gaulle CS 10478 92907 Paris La Défense Cedex (FR)
Respondent: (Patent Proprietor)	Nouryon Chemicals International B.V. Velperweg 76 6824BM Arnhem (NL)
Representative:	Ingrassia, Fisher & Lorenz UK Ltd. Cambridge House Henry Street Bath BA1 1BT (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 21 November 2022 rejecting the opposition filed against European patent No. 3429991 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. Haderlein
Members:	A. Zellner
	L. Basterreix

Summary of Facts and Submissions

I. The opponent lodged an appeal against the opposition division's decision to reject the opposition against the European patent (Article 101(2) EPC).

II. A notice of opposition had been filed *inter alia* on the basis of Article 100(a) EPC for lack of inventive step (Article 56 EPC).

III. The opposition division concluded in the impugned decision in particular that the claimed subject-matter was based on an inventive step starting from the disclosure of document D1 as closest prior art, and that the patent as granted thus also fulfilled the requirements of Article 56 EPC.

IV. Reference is made to the following documents:

D1: WO 02/076936 A1
D6: Submission of the appellant/opponent in appeal case T 2000/11 of 13 March 2012
D12: Avis de l'Anses n°2015-RE-0003 relatif à une analyse de la meilleure option de gestion des risques (RMOA) pour le DINCH, 3 March 2015
D13: Experimental data of the appellant's submission of 10 February 2022
D14: Experimental data on page 3 of the appellant's submission of 10 December 2021

V. Claim 1 of the main request (patent as granted) reads as follows:

"Aqueous emulsion comprising:
- *25-70 wt% organic peroxide, based on the weight of the emulsion,*
- *a cyclohexane dicarboxylate ester, and*
- *water."*

VI. The first claims of auxiliary requests 1 to 8 read as follows (amendments with respect to claim 1 as granted are underlined):

Auxiliary request 1:

"Aqueous emulsion comprising:
- *25-70 wt% liquid organic peroxide, based on the weight of the emulsion,*
- *a cyclohexane dicarboxylate ester, and*
- *water."*

Auxiliary request 2:

"Aqueous emulsion comprising:
- *25-70 wt% organic peroxide, based on the weight of the emulsion,*
- *a cyclohexane dicarboxylate ester, and*
- *water,*
  wherein the cyclohexane dicarboxylate ester is selected from di-alkylcyclohexane-1,2-dicarboxylates, di-alkyl-cyclohexane-1,4-dicarboxylates or dialkyl cyclohexane-1,3-dicarboxylates."

Auxiliary request 3:

"Aqueous emulsion comprising:
- *25-70 wt% organic peroxide, based on the weight of the emulsion,*
- *a cyclohexane dicarboxylate ester, and*
- *water,*
wherein the cyclohexane dicarboxylate ester is selected from di-alkylcyclohexane-1,2-dicarboxylates."

Auxiliary request 4:

"Aqueous emulsion comprising:
- *25-70 wt% organic peroxide, based on the weight of the emulsion,*
- *a cyclohexane dicarboxylate ester, and*
- *water,*
wherein the cyclohexane dicarboxylate ester is selected from di-n-octyl cyclohexane-1,2-dicarboxylate, diisooctyl cyclohexane-1,2-dicarboxylate, di-2-ethylhexyl cyclohexane-1,2-dicarboxylate, di-n-nonyl cyclohexane-1,2-dicarboxylate, diisononyl cyclohexane-1,2-dicarboxylate, di-n-decyl cyclohexane-1,2-dicarboxylate, diisodecyl cyclohexane-1,2-dicarboxylate, di-n-undecyl cyclohexane-1,2-dicarboxylate, diisododecyl cyclohexane-1,2-dicarboxylate, din-octadecyl cyclohexane-1,2-dicarboxylate, diisooctadecyl cyclohexane-1,2-dicarboxylate, di-n-eicosyl cyclohexane-1,2-dicarboxylate, monocyclohexyl cyclohexane-1,2-dicarboxylate, dicyclohexyl cyclohexane-1,2-dicarboxylate din-hexyl cyclohexane-1,2-dicarboxylate, diisohexyl cyclohexane-1,2-dicarboxylate, di-n-heptyl cyclohexane-1,2-

dicarboxylate, diisoheptyl cyclohexane-1,2-dicarboxylate, di-2-propylheptyl cyclohexane-1,2-dicarboxylate, diisoundecyl cyclohexane-1,2-dicarboxylate, di-n-dodecyl cyclohexane-1,2-dicarboxylate, di-n-tridecyl cyclohexane-1,2-dicarboxylate, diisotridecyl cyclohexane-1,2-dicarboxylate, di-n-pentyl cyclohexane-1,2-dicarboxylate, and diisopentyl cyclohexane-1,2-dicarboxylate."

Auxiliary request 5:

"Aqueous emulsion comprising:
- *25-70 wt% organic peroxide, based on the weight of the emulsion,*
- *a cyclohexane dicarboxylate ester, and*
- *water,*

wherein the cyclohexane dicarboxylate ester is di-isononyl cyclohexane dicarboxylate (DINCH)."

Auxiliary request 6:

"Aqueous emulsion comprising:
- *25-70 wt% organic peroxide, based on the weight of the emulsion,*
- *0.1-10 wt% a cyclohexane dicarboxylate ester, based on the weight of the emulsion, and*
- *water,*

wherein the cyclohexane dicarboxylate ester is di-isononyl cyclohexane dicarboxylate (DINCH)."

Auxiliary request 7:

"Aqueous emulsion comprising:
- *25-70 wt% liquid organic peroxide, based on the weight of the emulsion,*

- *0.1-10 wt% a cyclohexane dicarboxylate ester, based on the weight of the emulsion, and*
- *water,*

wherein the cyclohexane dicarboxylate ester is di-isononyl cyclohexane dicarboxylate (DINCH), and wherein the liquid organic peroxide is selected from hydroperoxides, peroxyesters, peroxycarbonates, peroxydicarbonates, diacyl peroxides, dialkyl peroxides, and bis(acylperoxy)alkanes."

Auxiliary request 8:

"Aqueous emulsion comprising:

- *25-70 wt% liquid organic peroxide, based on the weight of the emulsion,*
- *0.1-10 wt% a cyclohexane dicarboxylate ester, based on the weight of the emulsion, and*
- *water,*

wherein the cyclohexane dicarboxylate ester is di-isononyl cyclohexane dicarboxylate (DINCH), and wherein the liquid organic peroxide is selected from peroxyesters and diacyl peroxides."

VII. The appellant's arguments can be summarised as follows:

The opposition division erred in their decision to acknowledge an inventive step starting from the disclosure of document D1 as closest prior art. No improvement was shown over the emulsions disclosed in D1, but rather the contrary, and certainly not over the entire claimed scope. The technical problem of providing an alternative additive for the plasticisers disclosed in D1 was solved in an obvious way, even considering the additional disclosure of the cited

prior art.

VIII. The respondent's arguments can be summarised as follows:

The decision of the opposition division to acknowledge inventive step was correct. Only document D1 was the closest prior art. The use of cyclohexane dicarboxylate esters led to a considerable reduction in droplet growth of emulsions comprising organic peroxides and thus to their stability. Food safety was an essential issue for the claimed emulsions. There was no incentive for a skilled person to use compounds such as DINCH in an emulsion disclosed in D1 in order to provide stable emulsions which could safely be used in the production of polymers which come into contact with food.

IX. The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

X. The respondent (patent proprietor) requested that the appeal be rejected as inadmissible. The respondent further requested that the appeal be dismissed, or that the patent be maintained on the basis of the claims filed as auxiliary requests 1 to 8 with the reply to the statement setting out the grounds of appeal.

Reasons for the Decision

Admissibility of the appeal

1. The respondent argued that the appellant's statement of grounds of appeal merely reiterated the arguments submitted during opposition and indicated disagreement

with the opposition division's findings without engaging with their reasoning. The statement did not explain why the impugned decision was wrong, the statement consequently corresponding to the situation addressed in T 2077/11. The appeal should therefore be considered inadmissible.

2. The board notes that the appellant did submit arguments as to why the contested decision is, in their opinion, erroneous (see in particular points VI.1.2. and VI.2. of the statement setting out the grounds of appeal). Although the statement setting out the grounds of appeal may contain arguments that are identical to arguments brought forward during the opposition proceedings, it does address the issues that led the opposition division to decide to reject the opposition against the contested patent.

3. The respondent referred to decision T 2077/11, in particular to points 1.10 and 1.12 of the reasons. As stated above, however, the statement setting out the grounds of appeal in the present case is neither identical to the grounds of opposition, nor is it essentially equivalent to a simple reference to the grounds of opposition, in contrast to the situation in the cited decision.

4. For these reasons, the board's conclusion is that the statement of grounds of appeal does meet the requirements of Rule 99(2) EPC and Article 12(2) RPBA. The appeal is therefore admissible.

Main request - patent as granted

Inventive step (Articles 100 (a) and 56 EPC)

5. The opposition division concluded that the subject-matter claimed in the main request was based on an inventive step starting from the disclosure of document D1 as closest prior art, and considering the additional technical teaching of in particular document D12. The opposition division - in agreement with the parties - considered a distinguishing feature between the claimed emulsions and the emulsions disclosed in document D1 (examples and claims on pages 9 to 12) to lie in the presence of an additive which prevented droplet growth. The opposition division relied on the disclosure of the patent itself, as well as document D13, and considered two technical effects, namely the prevention of droplet growth and the replacement of additives which were banned in polymerisation compositions. The resulting technical problem was considered to be the provision of aqueous emulsions comprising organic peroxides, which are stabilised and which avoid substances banned for food contact applications. According to the opposition division, it was not obvious to arrive at the claimed subject-matter starting from the available prior art.

6. The respondent essentially concurred with the opposition division's opinion and line of argument and made the following submissions.

6.1 The disclosure of document D1 was the closest prior art.

6.2 The respondent concurred with the appellant that the claimed emulsion differed from the emulsions disclosed in document D1 in that they comprised a cyclohexane

dicarboxylate ester instead of adipate or phthalate esters.

6.3 The respondent argued, by reference to paragraphs [0007] to [0009] of the contested patent, as well as document D13, that cyclohexane dicarboxylate esters were highly effective droplet growth inhibitors in aqueous organic peroxide emulsions, and that they could also be used for the production of polymers which came into contact with food products because they were not subject to legislative bans.

6.4 There was no disclosure in the contested patent, in particular not in paragraph [0015], which could lead to the conclusion that a technical effect could only be achieved for specific types of peroxides.

6.5 As a result, the technical problem was the provision of aqueous emulsions comprising organic peroxides that were stabilised and avoided substances banned for food contact applications.

6.6 The solution according to claim 1 was not obvious to the person skilled in the art because the prior art did not teach or suggest the use of cyclohexane dicarboxylate esters as effective droplet growth inhibitors for aqueous organic peroxide emulsions. In particular, there was no suggestion in D1 that the conclusions drawn for adipates and phthalates would also apply to the cyclohexane dicarboxylate esters of the main request. The same applied with respect to document D6, since the document only referred to adipates and phthalates, and not to cyclohexanes. Inventive step thus had to be acknowledged.

7. The board's conclusions are as follows.

Contested patent

7.1 The patent relates to aqueous peroxide emulsions and their use in the polymerisation of vinyl chloride (see paragraph [0001]). It refers to the problems of sufficient emulsion stability, in particular related to droplet growth leading to layer separation of the emulsion, and the need to provide stable aqueous peroxide emulsions for the production of polymers that come into contact with food products (see paragraphs [0004] and [0007]). According to the contested patent, these problems are solved by an aqueous emulsion according to claim 1 (see paragraph [0008]).

Closest prior art

7.2 The parties agreed that document D1 can be considered the closest prior art. The board sees no reason to differ. The document relates to storage stable aqueous organic peroxide emulsions and refers to the problem of instability of the emulsions due to droplet growth (see page 1, lines 3 to 4 and 18 to 26). The document suggests the use of an ester having an Ap/Po ratio higher than 8 as plasticiser in order to form stable aqueous emulsions containing between 30 and 70 wt% of organic peroxide (see page 2, line 30 to page 3, line 6 and page 6, lines 14 to 17). Preferred ester plasticisers are phthalates and adipates (see page 4, lines 4 to 7 and the examples).

Distinguishing feature

7.3 The parties also agreed that the emulsions according to claim 1 of the main request differ from the emulsions

disclosed in the examples of document D1 in that they contain *"a cyclohexane dicarboxylate ester"*. The board agrees. The emulsions of the examples in D1 contain phthalate and adipate dicarboxylate esters, such as DIDA (see page 9, lines 9 to 12 and tables 1 and 3).

Technical effect and technical problem

7.4 The parties disagreed on the technical effect caused by the distinguishing feature, and on the definition of the objective technical problem. The board notes that the contested patent discloses that the cyclohexane dicarboxylate ester DINCH does inhibit droplet growth of aqueous emulsions containing any of tert-butyl peroxyheptanoate, tert-butyl peroxyneodecanoate or tert-amyl peroxyneodecanoate as peroxide (see the examples). This was undisputed.

The patent also discloses - as argued by the appellant - that DINCH (according to claim 1) is less effective than DIDA (according to D1), in particular over periods of 8 and 12 weeks. It was also undisputed, however, that DINCH as such is responsible for the inhibition of droplet growth (see document D13).

7.5 The appellant argued in this context, in particular with reference to D6, that it was not credible for an effect to occur over the whole claimed range because claim 1 was neither limited to a particular *"cyclohexane dicarboxylate ester"*, nor to a particular *"organic peroxide"*. The board notes that it has not been shown that a stabilising effect occurs only for the specific peroxides used in the examples of the patent but not for others. The same holds true for the feature *"cyclohexane dicarboxylate ester"*. Document D6 (see the examples on pages 5 to 8) does not relate to

these compounds, but to phthalate and adipate diesters. It thus cannot support the appellant's argument that only specific cyclohexane dicarboxylate esters lead to the limitation of droplet formation, whereas others do not. Therefore, there is no evidence that the presence of a cyclohexane dicarboxylate ester other than DINCH in the claimed emulsion does not limit droplet formation.

7.6 It was also undisputed that DINCH is suitable for use in the production of polymers which come into contact with food products (see document D12, paragraph 3.1).

7.7 It is correct, as submitted by the appellant, that document D14 discloses a 99 percentile of the droplet volume distribution (d99) of the organic peroxide in excess of 15 after 4 weeks (see paragraph III.b.1.). The board notes, however, that the value of 15 referred to by the appellant (see paragraph [0013] of the contested patent) refers to a preferred embodiment in which droplet growth is particularly limited. Document D14 therefore does not call into question the droplet growth inhibition effect in general.

7.8 The technical problem can therefore be considered to be the provision of aqueous emulsions comprising organic peroxides in which the emulsions exhibit limited droplet growth during storage and thus a certain stability while avoiding substances banned for food contact applications.

Claimed solution to the technical problem

7.9 The technical problem is solved by the provision of an aqueous emulsion according to claim 1 of the main request, in particular by an emulsion comprising a

cyclohexane dicarboxylate ester.

7.10 As stated above, the board is satisfied that the claimed solution solves the technical problem.

Obviousness of the claimed solution

7.11 It was undisputed that document D1 itself does not refer to cyclohexane dicarboxylate esters. The document does disclose, however, that the use of specific esters as plasticisers can reduce droplet growth in aqueous organic peroxide emulsions, and that emulsions comprising such plasticisers have been found to be more stable upon storage than known emulsions. The document further discloses that such a plasticiser is an ester having a ratio of the number of carbon atoms present in the plasticiser molecule (excluding aromatic carbon atoms) to the number of ester groups in the molecule (Ap/Po, see page 3, lines 17 to 21) of higher than 8 (see page 2, lines 27 to page 3, line 6). The document discloses the use of fatty acid ester plasticisers, preferably those selected from phthalates and adipates (see page 4, lines 4 to 7 and 20 to 24 as well as the examples).

7.12 The respondent argued that the skilled person would not find a suggestion in the prior art to use DINCH, or a cyclohexane dicarboxylate ester in general, as stabiliser in aqueous emulsions comprising organic epoxides, in particular not if the product was intended for use in the preparation of polymers that come into contact with food products.

7.13 This is not correct. It was common ground between the parties that there was a need in the technical field to replace adipates and phthalates as plasticisers in the

preparation of polymers which come into contact with food products. Furthermore, document D1 discloses that an Ap/Po ratio higher than 8 is important for an ester plasticiser in order to form stable aqueous emulsions containing between 30 and 70 wt% of organic peroxide. Accordingly,, in order to reduce droplet growth in aqueous organic peroxide emulsions and provide stable aqueous emulsions comprising organic peroxides while avoiding substances banned for food contact applications, the skilled person would look for an ester plasticiser which, on the one hand, has an Ap/Po ratio higher than 8, and, on the other hand, can be used safely in producing polymers which come into contact with food products. The skilled person would turn to document D12, which is not limited to a particular technical area and which discloses DINCH as a plasticiser ester fulfilling both of these requirements. The document furthermore also discloses that DINCH is useful in stabilising peroxides (see paragraph 3.1.). The skilled person, starting from the disclosure of D1 and in order to solve the technical problem stated above, would thus use DINCH as a component in an aqueous emulsion comprising organic peroxides.

7.14 Finally, the respondent argued that D6, while being a submission of the present appellant in parallel proceedings, was prior art and thus should also be considered when assessing obviousness. The board is not convinced. Firstly, if the subject-matter of a claim is obvious in view of a combination of two documents, it is as a rule immaterial whether it was non-obvious in view of another document, even if the other document were considered prior art. Secondly, as set out in more detail below in the context of auxiliary request 8, D6 shows at most that the use of the different esters does

not always lead to an improvement, but this is not required in order to solve the objective technical problem stated above.

8. The board concludes that the aqueous emulsion according to claim 1 of the main request is not based on an inventive step and that the request therefore does not meet the requirements of Article 56 EPC.

Auxiliary requests

9. Claim 1 of auxiliary requests 1 to 8 does not contain any additional distinguishing features compared to the disclosure of document D1, since this latter document already discloses the use of liquid peroxides falling within the definition of claim 1 of auxiliary requests 1, 7 and 8, the cyclohexane dicarboxylate ester DINCH falling within the definition of auxiliary requests 2 to 8, and an ester in an amount according to claim 1 of auxiliary requests 6 to 8.

10. As a result, the distinguishing feature between the aqueous emulsions claimed therein and the disclosure of document D1 is the same as for claim 1 of the main request, and the requests do not meet the requirements of Article 56 EPC for the same reasons as the main request.

11. The respondent submitted that the combination of the specific plasticiser DINCH and a liquid organic peroxide selected from peroxyesters and diacyl peroxides according to claim 1 of auxiliary request 8 was inventive. The respondent argued, again by reference to document D6, that the skilled person would not replace the plasticiser disclosed in D1 with DINCH in an emulsion comprising a peroxide according to

claim 1 of auxiliary request 8 with any expectation of obtaining an emulsion which was both stable and approved for food contact. According to the respondent, document D6 disclosed that not every combination of plasticiser and ester would lead to a predictable result. The specific combination of features was rather a purposive selection which was not suggested in the document.

12. This argument is not convincing. Document D6 discloses examples of emulsions comprising organic peroxides and dicarboxylate phthalate and adipate esters. The examples show that different combinations lead to different results in terms of droplet growth. No data for a cyclohexane dicarboxylate ester, such as DINCH, are disclosed. The results of D6 are therefore not necessarily transferable to the subject-matter of claim 1 of auxiliary request 8 (see, in particular page 8, paragraph 2 of D6). Furthermore, the examples of D6 show that use of the different esters does not always lead to an improvement (see page 7, lines 1 to 4), but this is not required in order to solve the objective technical problem stated above (see point 7.8 of this decision). Document D6 does not therefore demonstrate that the skilled person would not follow the teaching of document D12 and use DINCH as a component in an aqueous emulsion comprising organic peroxides as disclosed in document D1.

Conclusion

13. Since none of the respondent's requests meets the requirements of Article 56 EPC, none of them is allowable. The patent is to be revoked. It is therefore not necessary to analyse whether any of the other

objections raised by the appellant prejudice the maintenance of the contested patent.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar: The Chairman:

K. Götz-Wein A. Haderlein

Decision electronically authenticated