

Internal distribution code:

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

D E C I S I O N
of 25 September 2001

Case Number: T 0272/99 - 3.3.1

Application Number: 91308505.6

Publication Number: 0478214

IPC: C07C 09/38

Language of the proceedings: EN

Title of invention:

Novel peroxy ester, and polymerization initiator and curing agent using the ester

Patentee:

NIPPON OIL AND FATS COMPANY, LIMITED

Opponent:

Akzo Nobel N.V.

Headword:

Peroxy ester/NIPPON OIL

Relevant legal provisions:

EPC Art. 56, 111(1), 123(2), (3)

Keyword:

"Inventive Step (yes) - determination of the closest prior art-skilled person would ignore structural modification described in prior art document for the reason of not addressing technical objectives of patent in suit - could/would approach"

Decisions cited:

T 0002/83, T 0686/92, T 0402/92, T 0298/93

Headnote:

-



Case Number: T 0272/99 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 25 September 2001

Appellant:
(Opponent)

Akzo Nobel N.V.
Velperweg 76
NL-6824 BM Arnhem (NL)

Representative:

Fontijn, Monique
Akzo Nobel N.V.
Patent Department
P.O. Box 9300
NL-6800 SB Arnhem (NL)

Respondent:
(Proprietor of the patent)

NIPPON OIL AND FATS COMPANY, LIMITED
10-1, Yuraku-cho 1-chome
Chiyoda-ku
Tokyo (JP)

Representative:

Crump, Julian Richard John
FJ Cleveland
40-43 Chancery Lane
London WC2A 1JQ (GB)

Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 4 February
1990 concerning maintenance of European patent
No. 0 478 214 in amended form.

Composition of the Board:

Chairman: A. J. Nuss
Members: R. Freimuth
R. T. Menapace

Summary of Facts and Submissions

- I. The Appellant (Opponent) lodged an appeal on 5 March 1999 against the interlocutory decision of the Opposition Division, posted on 4 February 1999, which found that the European patent No. 478 214 in the form as amended during opposition proceedings according to the then pending main request met the requirements of the EPC.
- II. Notice of Opposition had been filed by the Appellant requesting revocation of the patent in suit in its entirety on the grounds of lack of novelty and inventive step. The following documents were submitted *inter alia* in the opposition proceedings:
- (1) Vestsi Akad. Navuk BSSR, Ser. Khim. Navuk, Volume 3, 1979, pages 109 to 112, considered in the form of its english translation,
 - (2) Modern Plastics, 1971, pages 66 to 68,
 - (5) AKZO PVC Symposium 1988, Oosterwijk et al., "The role of highly active peroxides in PVC manufacture", pages 1 to 13,
 - (8) Abstract of JP-A-83-120 613,
 - (12) JP-A-83-120 611, considered in the form of its english translation and
 - (13) Kirk-Othmer, Encyclopedia of Chemical Technology, 1982, Volume 17, pages 74 and 82.
- III. The Opposition Division held that the amendments made to the claims of the patent in suit as granted satisfied the requirements of Article 123(2) and (3)

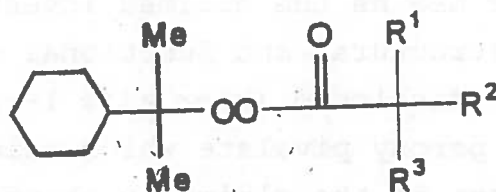
EPC, and that the documents cited did not render obvious the subject-matter of the patent in suit according to the then pending request.

Document (12) was supposed to disclose para-menthane peroxy neo-decanoate and -2-ethyl-hexanoate which differed from the compounds according to the invention only by the presence of one methyl substituent at the cyclohexyl group. Starting from that document as closest prior art in the assessment of inventive step the problem underlying the patent in suit was considered to be the provision of alternative peroxy ester polymerization initiators having high polymerizing and curing speed and yielding a polymer which was not imparted with unwanted odor or color. The peroxy esters claimed were demonstrated to be superior to those of the prior art in respect of yield and odor of the polymer. Document (8) was the only one in the proceedings to address the problem of odor. The polymerization initiators described in this document differed from those claimed in that the former showed a tertiary-octyl group as the side chain in the peroxy ester, the latter however a 1-cyclohexyl-1-methylethyl group. Document (1) disclosing *inter alia* 1-cyclohexyl-1-methylethyl peroxy pivalate, which was no longer covered by the claims as amended, did not give any information about the properties and the use of that compound. Thus, the combination of that document with document (8) thereby arriving at the subject-matter claimed could only derive from an *ex post facto* analysis.

- IV. At the oral proceedings before the Board, held on 25 September 2001, the Respondent (Proprietor of the Patent) defended the maintenance of the patent in suit in amended form on the basis of a single claim submitted during those oral proceedings as main request and subsidiarily on the basis of a set of two claims

submitted on 21 December 1999 as second auxiliary request. The sole claim according to the main request read as follows:

"1.A 1-cyclohexyl-1-methylethyl peroxy ester represented by the formula:



wherein R¹ is H and R² and R³ independently stand for an alkyl group, provided that R² and R³ each stand for an alkyl group of 1 to 5 carbon atoms and the sum of the carbon atoms of R² and R³ is in the range of from 2 to 6; or wherein said peroxy ester is one member selected from the group consisting of 1-cyclohexyl-1-methylethyl peroxy neo-hexanoate, 1-cyclohexyl-1-methylethyl peroxy neo-nonanoate, 1-cyclohexyl-1-methylethyl peroxy neo-decanoate and 1-cyclohexyl-1-methylethyl peroxy neo-tridecanoate."

The claims according to the auxiliary request were directed to a polymerization initiator and a curing agent for an unsaturated polyester both containing 1-cyclohexyl-1-methylethyl peroxy neo-decanoate.

- V. The Appellant argued during appeal proceedings that the amendments made to the claim according to the main request contravened the requirements of Article 123(2) EPC and that the claimed subject-matter was not inventive.

The claim as amended according to the main request represented a fresh combination of features thereby changing the disclosure of the patent in suit beyond its original content.

In respect of inventive step, the Appellant brought forward that it was established case law that the closest prior art document was that which corresponded to a similar use as the claimed invention requiring the minimum of structural and functional modifications. Document (1) disclosed *inter alia* 1-cyclohexyl-1-methylethyl peroxy pivalate which belonged to the subject-matter of the claims as granted, but was no longer covered by the present claims as amended. Though that document did not address any polymerization method as the claimed invention, the association to use the peroxides described in document (1) for that purpose was forced upon any person skilled in the art. Therefore, document (1) could be considered to represent the closest prior art.

At the oral proceedings before the Board, the Appellant submitted furthermore that document (5) described on page 5, first and penultimate paragraph α -cumyl peroxy neo-decanoate, called Trigonox 99, and a specific tert.-octyl peroxy neo-decanoate both to be used as polymerisation initiator. The former compound was taught to generate unwanted odor which was caused by the presence of aromatic decomposition products of the aromatic hydroperoxide moiety thereof. The Appellant deduced from this teaching that the latter compound comprising an aliphatic and not an aromatic hydroperoxide moiety did not generate any unwanted odor. Therefore document (5), in particular the tertiary-octyl peroxy neo-decanoate, could also be considered to represent the closest prior art and starting point in the assessment of inventive step.

The problem underlying the patent in suit was to provide further polymerization initiators without generating odor or color. The prevention of unwanted color, however, was not an actual problem since the final polymers were colorless irrespective of which individual peroxyester was used.

The solution provided were 1-cyclohexyl-1-methylethyl peroxyesters derived from mono- or di- α -branched aliphatic carboxylic acids other than pivalic acid. In view of common general knowledge such as reflected by documents (2) and (13) this solution was obvious as numerous mono- or di- α -branched aliphatic carboxylic acids other than pivalic acid were widely used for preparing peroxyesters. Furthermore, the 1-cyclohexyl-1-methylethyl hydroperoxide moiety in peroxyesters was described in document (1).

Document (8) described the individual peroxyester tertiary-octyl peroxy neodecanoate as initiator for polymerizing vinyl chloride without imparting unwanted odor to the polymer produced. The peroxyesters claimed were inferior in polymerization activity to that particular peroxyester as shown in the comparative test report annexed to the Statement of Grounds of Appeal submitted on 6 June 1999.

VI. The Respondent submitted that the amendments made to the claims satisfied the requirements of Article 123(2) EPC and that the subject-matter claimed was inventive.

The claim as amended according to the main request was restricted to the subject-matter of granted claims 2 and 5 which were identical to the corresponding original claims.

In respect of inventive step, the Respondent argued that either document (8) or (5) represented the closest prior art and starting point in the assessment of inventive step. Both documents described tertiary-octyl peroxy neo-decanoate as polymerization initiator and document (8) referred to the absence of odor and color in the final polymer. Document (5) was silent about the absence of odor when using that compound having an aliphatic hydroperoxide moiety. The presence of unwanted odor when using a compound having an aromatic hydroperoxide moiety as reported in document (5) and addressed by the Appellant, did not, however, support the inverse conclusion that the odor is necessarily absent in case of the use of that aliphatic compound.

The problem underlying the patent in suit consisted in providing further polymerization initiators producing polymers in good yield without imparting the polymer with odor and color.

Document (1) disclosed only peroxyesters falling outside of the claim of the main request. Though structurally related to the claimed peroxyesters, that document did not contain any information at all about their properties which would suggest that they were suitable for use as polymerization initiators. Specifically, the particularly advantageous properties of the claimed peroxyesters in terms of their activity and lack of odor and color imparted to polymers were not recognized in the state of the art. Thus, the relevance of document (1) as prior art can only be seen *ex post facto* having knowledge of the patent in suit. Documents (2) and (13) described compounds to be used as polymerization inhibitors which were structurally different to those claimed. Thus, none of the documents cited rendered the subject-matter claimed obvious.

The Respondent disputed the Appellant's conclusion that the claimed peroxyesters were inferior in activity to the individual peroxyester of document (8). The Respondent's results of comparative experiments submitted on 23 August 2001 demonstrated that 1-cyclohexyl-1-methylethyl peroxy neo-decanoate according to the claimed invention was superior when decomposing to the particular peroxyester known from that document. Furthermore document (8) did not provide any information which could lead the skilled person towards the identification of the peroxyesters claimed.

VII. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the appeal be dismissed and the patent be maintained on the basis of either claim 1 as submitted at the oral proceedings as main request or the set of claims 1 and 2 filed on 21 December 1999 as "second auxiliary request" (auxiliary request).

VIII. At the end of the oral proceedings the decision of the Board was given orally.

Reasons for the Decision

1. The appeal is admissible.

Main Request

2. *Amendments (Article 123(2) and (3) EPC)*

Claim 1 as amended results from combining claim 1 as granted with the specific embodiments of dependent claims 2 and 5 as granted which are identical to the

respective claims of the application as filed. For that reason these amendments of claim 1 as granted do not generate a fresh combination of features extending beyond the content of the original application as alleged by the Appellant; thus, they comply with the requirements of Article 123(2) EPC.

The amendments of claim 1 as granted bring about a restriction of the scope of that claim, and therefore of the protection conferred thereby, which is in keeping with the requirements of Article 123(3) EPC.

3. *Novelty*

The Appellant conceded at the oral proceedings before the Board that the subject-matter of the sole claim is novel since the compound 1-cyclohexyl-1-methylethyl peroxy pivalate of document (1) was no longer covered by the claim. Nor does the Board see any reason to take a different view. Novelty not being in dispute, it is unnecessary to go into more detail in this respect.

4. *Inventive step*

4.1 According to the established jurisprudence of the Boards of Appeal it is necessary, in order to assess inventive step, to establish the closest state of the art, to determine in the light thereof the technical problem which the invention addresses and successfully solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art. This "problem-solution approach" ensures assessing inventive step on an objective basis. In this context, the Boards of Appeal have developed certain criteria that should be adhered to in order to identify the closest state of the art to be treated as the starting point. One such criterion is that the "closest prior art" is normally a prior art document disclosing

subject-matter aiming at the same objectives as the claimed invention and having the most relevant technical features in common (see decisions T 686/91, point 4 of the reasons; T 482/92, point 4.1 of the reasons; T 298/93, point 2.2.2 of the reasons; none published in OJ EPO).

4.2 The patent in suit relates to peroxy esters useful as polymerization initiator (patent specification page 3, line 19) and having a tertiary alkyl hydroperoxide moiety and a mono- or di- α -branched aliphatic carboxylic acid moiety. The objectives to be achieved, as indicated in the patent in suit, consist in yielding polymers which are not imparted with unwanted odor or color (patent specification page 2, lines 21 to 30). In relation to these objectives and to the relevant technical features in common, a selection among the documents cited in the proceedings must be made as to which is to be considered as the "closest prior art". The Appellant and the Respondent concurred that this selection was to be made among either documents (8), (5) or (1), since those documents referred to similar compounds for the same use. However, the parties had divergent views as to which of those documents should be treated as the closest prior art.

4.2.1 Document (8), which the Respondent considered as the closest piece of prior art, relates to a peroxyester used as polymerization initiators. That document stresses that polymerization using that initiator yields a polymer having excellent color tone and being free from emission of odor, which represent the main objectives of the patent in suit as indicated above. Document (8) is directed to the compound tertiary-octyl peroxy neo-decanoate, which is a peroxyester consisting of a tertiary alkyl hydroperoxide moiety, i.e. tertiary-octyl, and a di- α -branched aliphatic carboxylic acid moiety, i.e. neo-decanoic acid.

Therefore, the exclusive structural difference between this peroxyester and those claimed in the patent in suit consists in substituting the one tertiary alkyl group, namely 1-cyclohexyl-1-methylethyl, for the other, namely tertiary-octyl.

Thus, document (8) relates to the same purpose and aims at the same objectives as the claimed invention, i.e. to polymerization initiators preventing the polymer produced from being imparted with unwanted odor and color, and a single structural modification of the peroxyester referred to in that document is required to arrive at the structure of the claimed peroxyesters.

- 4.2.2 Document (5), which the Respondent and the Appellant considered as alternative closest piece of prior art, relates to peroxyesters used as polymerization initiators and is directed *inter alia* to the compound named 2,4,4-trimethylpentyl-2-peroxy neo-decanoate (page 5, penultimate paragraph), which is a tertiary-octyl peroxy neo-decanoate as in document (8). However, document (5) does not address at all the problem of color in the polymer produced and is silent about preventing the generation of odor when using that particular peroxyester.

Though relating to the same purpose as the claimed invention, namely to polymerization initiators, document (5), thus, does not address the objectives of the claimed invention, i.e. to prevent the polymer produced from being imparted with unwanted odor and color. The Board concludes therefore that document (5) represents prior art which is further away from the patent in suit than document (8).

4.2.3. Furthermore, document (5) is directed *inter alia* to the polymerization initiator α -cumyl peroxy neo-decanoate, called Trigonox 99 (page 5, first paragraph). Document (12) relates also to that particular peroxyester as polymerization initiator. While the polymers produced show an excellent color tone according to the latter document, the former document reports the generation of a distinct odor when using this peroxyester, which is at variance with the objective of the patent in suit to prevent the generation thereof. The structural difference between the α -cumyl peroxy neo-decanoate of documents (5) and (12), and the 1-cyclohexyl-1-methylethyl peroxyesters claimed in the patent in suit is found exclusively within the hydroperoxide moiety: the α -cumyl group in the peroxyester of the state of the art comprises an aromatic substituent, whereas the 1-cyclohexyl-1-methylethyl group of the claimed invention does not.

Thus, documents (12) and (5), with respect to that particular peroxyester, do not address the objective of the claimed invention of preventing the generation of odor, but rather report the opposite effect, and a fundamental structural modification of the hydroperoxide moiety of the peroxyester is required to arrive at the structure of the claimed peroxyesters. Therefore, those documents cannot represent the closest prior art.

4.2.4 Document (1), which the Appellant considered as the closest piece of prior art, is directed to peroxyesters which may comprise *inter alia* a 1-cyclohexyl-1-methylethyl group as hydroperoxide moiety and *inter alia* pivalic acid as di- α -branched aliphatic carboxylic acid moiety. That pivalic acid moiety is structurally

related to those di- α -branched aliphatic carboxylic acid moieties comprised in the claimed peroxyesters, but it is not covered by the claims of patent in suit as amended.

The Appellant and the Respondent concurred on the matter that document (1) lacks completely any information about the use of the peroxyesters described therein as polymerization initiator and about any property thereof which would suggest that they were suitable for this use. However, the parties had divergent views on the matter whether or not the association to use the peroxyesters of document (1) for that purpose was forced upon the skilled person based on common general knowledge. A decision of the Board on this controversial issue is not necessary since document (1) in any case does not address the aims of the patent in suit of not imparting the polymer produced with unwanted odor and color. Neither the Appellant nor the Respondent challenged this finding.

Thus, irrespective of the structural closeness of the peroxyesters proposed in document (1) to those claimed, the lack of addressing the objectives aimed at in the claimed invention, i.e. the absence of odor and color, already disqualifies that document to be considered as closest prior art.

4.2.5 For these reasons, in the Board's judgement, document (8) represents the prior art closest to the patent in suit and thus, the starting point in the assessment of inventive step.

4.3 In view of the closest state of the art, i.e. document (8), the technical problem underlying the patent in suit consists in providing further peroxyesters to be used as polymerization initiators

yielding polymers which are not imparted with unwanted odor and color (patent specification page 2, lines 21 to 30).

4.4 As the solution to this problem, the patent in suit proposes the peroxyesters as defined in the sole claim as amended (see point IV above) which are characterized by the presence of a 1-cyclohexyl-1-methylethyl group as hydroperoxide moiety.

4.5 The specification of the patent in suit demonstrates in the examples, e.g. examples 8, 9, 10, 12 and 13 of table 2 on page 9, that the claimed peroxyesters are suitable as polymerization initiators and achieve the objectives of the patent in suit in yielding polymers without generating unwanted odor and color.

For these reasons, the Board is satisfied that the problem underlying the patent in suit has been successfully solved. This finding has never been disputed by the Appellant.

In view of the above, any purported superiority in polymerization activity of the claimed peroxyester initiators compared to others of the state of the art is not relevant in the present case, since the problem underlying the patent in suit does not consist in providing improved peroxyesters, but rather in providing merely further peroxyesters to be used as initiators, i.e. the less ambitious problem resulting from an objective comparison with the closest state of the art (see point 4.3 above). It is thus not necessary to deal with the Appellant's and the Respondent's fresh test reports which present comparisons carried out under different experimental conditions and which report experimental results for polymerization activity showing gross differences.

4.6 Finally, it remains to be decided whether or not the proposed solution to the problem underlying the patent in suit is obvious in view of the cited state of the art.

4.6.1 Document (8), i.e. the closest prior art document (see point 4.2 above), is directed to the peroxyester tertiary-octyl peroxy neo-decanoate. It does not give any incentive to structurally modify the tertiary-octyl hydroperoxide moiety by transforming it into the 1-cyclohexyl-1-methylethyl group in order to provide further peroxyester polymerization initiators which prevent the generation of odor and color. Thus, document (8), on its own, does not render obvious the solution proposed by the claimed invention.

To the extent that document (5) refers likewise to the peroxyester tertiary-octyl peroxy neo-decanoate, the same conclusion necessarily applies.

4.6.2 Though document (1) refers to peroxyesters which may comprise *inter alia* a 1-cyclohexyl-1-methylethyl group as hydroperoxide moiety, that document does not address the technical problem underlying the patent in suit of avoiding the generation of odor and color as set out above in detail (see point 4.2.4). The Appellant never disputed this finding. Document (1) cannot give any hint on how to solve these technical objectives since a person skilled in the art would not take the teaching of that document into consideration at all when looking for a solution to the problem underlying the patent in suit of providing further peroxyester polymerization initiators without generating unwanted odor and color.

Consequently, document (1) does not render obvious the proposed solution to the technical problem underlying the patent in suit.

The Appellant's objection of obviousness based on document (1) leaves aside the established jurisprudence of the Boards of Appeal that, when assessing inventive step, the decisive question is not whether the skilled person could have arrived at the invention, in the present case by incorporating a 1-cyclohexyl-1-methylethyl group as hydroperoxide moiety in the peroxyester, but whether he would have done so with the reasonable expectation of providing peroxyesters yielding polymers without generating unwanted odor and color (see for example decision T 2/83, OJ EPO 1984, 265, point 7 of the reasons). Thus, as is clear from the preceding considerations, the latter condition has not been met since the decisive fact remains that document (1) does not address these objectives. Hence, the skilled person would ignore document (1) when seeking a solution to the problem underlying the patent in suit.

4.6.3 Documents (2) and (13) do not address the technical problem underlying the patent in suit of avoiding the generation of odor and color either. Therefore, those documents cannot give any hint on how to solve these technical objectives.

The numerous peroxyesters described in documents (2) and (13) never comprise a 1-cyclohexyl-1-methylethyl group as hydroperoxide moiety. Hence, those documents do not point to the claimed solution which is characterized by the presence of that group in the peroxyesters.

Consequently, those documents do not render obvious the proposed solution to the technical problems underlying the patent in suit either.

4.6.4 The same conclusion applies to document (5), to the extent as it refers to the peroxyester α -cumyl peroxy neo-decanoate, and document (12). The latter document reports an excellent color tone of the polymers produced when using this particular polymerization initiator, which is one of the objectives aimed at in the patent in suit. However, the former document points to the disadvantage of generating a distinct odor when using this particular peroxyester, which is at variance with the objective of the patent in suit to prevent the generation thereof. Thus, the skilled person would ignore the peroxyester α -cumyl peroxy neo-decanoate when aiming at a solution to the problem underlying the patent in suit.

That peroxyester described in documents (5) and (12) comprises as hydroperoxide moiety the α -cumyl group and not a 1-cyclohexyl-1-methylethyl group. Hence, those documents do not point to the claimed solution which is characterized by the presence of the latter group in the peroxyesters.

Therefore, those documents do not render obvious the proposed solution to the technical problems underlying the patent in suit as well.

4.6.5 The Appellant not relying on further documents in order to object to the absence of an inventive step, the Board is satisfied that none of the aforementioned documents in the proceedings, either individually or in combination, renders the proposed solution obvious.

4.7 For these reasons the Board concludes that the subject-matter of the sole claim of the patent in suit as amended involves an inventive step within the meaning of Articles 52(1) and 56 EPC.

5 *Remittal*

Having so decided, the Board has not, however, taken a decision on the whole matter, since substantial amendments to the description are required in order to bring it into conformity with the sole remaining claim of the patent in suit as amended according to the main request. Under these circumstances the Board considers it appropriate to exercise its power conferred on it by Article 111(1) EPC to remit the case to the Opposition Division for the sole purpose of properly adapting the description of the patent in suit to the present single claim. When doing so, the Opposition Division should consider in particular whether the amendments made to the claim during the appeal proceedings are adequately reflected throughout the description of the patent in suit.

Auxiliary Request

Since the subject-matter of the claim according to the main request is novel and inventive for the reasons set out above, there is no need for the Board to decide on the auxiliary request.

Order

For these reasons it is decided that:

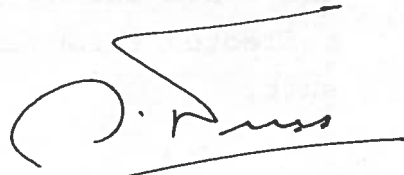
1. The decision under appeal is set aside.
2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of claim 1 as submitted at the oral proceedings on 25 September 2001 (main request) and a description yet to be adapted.

The Registrar:



N. Maslin

The Chairman:



A. Nuss