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D E C I S I O N
of 12 December 2000

Case Number: T 0358/99 - 3.3.3

Application Number: 92303862.4

Publication Number: 0511846

IPC: C08F 8/32

Language of the proceedings: EN

Title of invention:
Aminated olefin polymers

Patentee:
MITSUBISHI CHEMICAL CORPORATION

Opponent:
Exxon Chemical Patents Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 111(1), 123(3)

Keyword:
"Decision re appeals - exercise of power"
"Amendments - opposition proceedings - change of claim
category"

Decisions cited:
-

Catchword:
-



Case Number: T 0358/99 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 12 December 2000

Appellant:
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 11 February 1999
revoking European patent No. 0 511 846 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: C. Idez
J.-C. De Preter

Summary of Facts and Submissions

- I. The mention of the grant of European Patent No. 511 846 in respect of European patent application No. 92 303 862.4 filed, on 29 April 1992 and claiming priority of the earlier Japanese patent application JP 98821/91, was published on 2 October 1996 (Bulletin 1996/40) on the basis of 18 claims.

Claim 1 read as follows:

"An aminated olefin polymer which is such a modified α -olefin polymer, the α -olefin polymer comprising at least one α -olefin of 2 to 20 carbon atoms polymerized and having an olefinic unsaturated bond solely at its terminus, that the α -olefin polymer has been modified to have an amino group introduced into the olefinic unsaturated bond solely at the terminus".

Dependent Claims 2 to 8 referred to preferred structural embodiments of the polymer as defined in Claim 1 and dependent Claims 9 to 18 were drafted as product-by-process claims specifying the process features for its manufacture. In particular Claim 13 read as follows:

"The aminated olefin polymer according to Claim 1, wherein said amino group has been introduced into the olefinic unsaturated bond at the terminus by a reaction of the unsaturated α -olefin polymer with a borane, followed by a reaction with an amination reagent".

- II. On 19 June 1997 a Notice of Opposition was filed by Exxon Chemical Patents Inc. requesting the revocation of the patent in its entirety on the grounds of added

subject-matter (Article 100(c) EPC) as well as lack of novelty and lack of inventive step (Article 100(a) EPC). The following documents were cited in support of the opposition:

D1: EP-A-353 935,

D2: US-A-3 821 302 and

D3: US-A-3 794 586.

With its letter of 26 November 1998, the Opponent indicated, that for the case where the novelty of the subject-matter of the granted patent would be acknowledged over D1, he would raise an objection under Article 100(b) EPC.

III. The Opposition Division revoked the patent in a decision dated 11 February 1999.

It was stated therein that, whilst the ground under Article 100(c) EPC did not prejudice the maintenance of the patent, the subject-matter of Claim 1 of the patent as granted and that of Claim 13, which had become the basis of an auxiliary request submitted on 15 January 1999, was not novel in view of document D3.

IV. On 9 April 1999 an appeal was lodged by the Appellant (Patentee) against this decision, the prescribed fees being paid at the same time.

(i) In the Statement of Grounds of Appeal filed on 10 June 1999, the Appellant withdrew the previous requests and submitted a new set of Claims 1 to 12 as main request as well as three auxiliary requests.

Claim 1 of the main request reads as follows:

"A process for producing an aminated olefin polymer which comprises subjecting an α -olefin polymer comprising at least one α -olefin of 2 to 20 carbon atoms and having an olefinically unsaturated bond solely at its terminus to a reaction with a borane followed by a further reaction with an amination reagent thereby to aminate the polymer solely at its terminus".

Dependent Claims 2 to 12 refer to preferred embodiments of the process according to Claim 1.

(ii) In substance the Appellant argued that the subject-matter of these claims was not only novel over D1 and D3, but also involved an inventive step over D1, D2 and D3.

(iii) According to the Appellant novelty was given over D3, since this document only disclosed the reaction of an epoxide modified polyolefin with a polyamine in order to obtain an hydroxy-substituted polyamine.

Novelty was also given over D1, since D1 only described the reaction of an olefin polymer modified with carboxylic groups (i.e acid, ester or anhydride groups) with nucleophilic reactants, such as amines.

(ii2) According to the Appellant inventive step should also be acknowledged for the following reasons. Whilst the patent in suit was concerned with a process for producing aminated olefin polymers having excellent adhesion, printability and

compatibility in polymer blends, the prior art documents concerned the preparation of lubricating oils, which was based on specific amination techniques, which could not suggest the process as now claimed.

V. Following a communication by the Board on 2 August 2000 informing the parties of its intention to summon them to oral proceedings, the Respondent (Opponent), which so far had not reacted at all, briefly replied on 15 August 2000 that it considered the withdrawal by the Appellant of its former main request (originally granted set of claims) and its former auxiliary request filed with its letter of 13 January 1999 to be binding. Provided the scope of the claims of the patent in suit would not be extended beyond the content of the main request filed by the Appellant with its letter of 9 June 1999 (received on 10 June 1999), it indicated that it did not wish to take any further part in the appeal proceedings. On that basis, it withdrew its request for oral proceedings.

VI. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of Claims 1 to 12 filed as main request on 10 June 1999, alternatively that oral proceedings be arranged, in which the main request and the three auxiliary requests should be considered.

Concerning the substance of the appeal case, the Respondent did not formulate any request.

Reasons for the Decision

1. The appeal is admissible.

Procedural matters

2. As is appears from the Summary of Facts and Submissions, with the exception of its letter of 15 August 2000 the Respondent did not take an active part in the appeal proceedings. The Respondent's position can, however, be interpreted in the light of
 - (i) the claims, on which the first instance's decision was based, which were product claims held not to be novel over the prior art;
 - (ii) the claims on file before the Board, in particular the claims of the main request filed as Annex 1 to the Statement of Grounds of Appeal, which are now formulated as process claims;
 - (iii) the arguments presented by the Appellant, which concern not only the issue of novelty, but also the question of inventive step together with a discussion of documents D1 to D3;
 - (iv) the Appellant's request that the patent be maintained on the basis of the claims as amended in the main request; and
 - (v) the Respondent's statement that, provided "the scope of the claims of the patent in suit will not be extended beyond the scope of the main request filed as Annex 1 to the letter of 9 June 1999, "..., we do not wish to take any further part in the appeal...".

In the Board's view, this can only be interpreted as the request by the Respondent that the opposition be withdrawn, provided the patent in suit is not maintained beyond the scope of the claims according to the main request now on file. Since, as will appear hereinafter, novelty of the process claims can be acknowledged, there is no obstacle to the Board to make use of its power pursuant to Article 111(1) EPC and also decide the issue of inventive step on the basis of the arguments provided by the Appellant (Article 113(1) EPC).

Wording of the claims

3. No objection arises having regard to the wording of the claims of the main request.

3.1 Claim 1 has been reformulated as a process claim for the preparation of an aminated olefin polymer as defined in Claim 1 as granted on the basis of the process features mentioned in Claim 13 as granted, which was drafted as a product-by-process claim. According to established case law (cf. Case Law of the Boards of Appeal of the European Patent Office, 3rd edition 1998, page 220, first paragraph) a change from a product claim, including a product-by-process claim, to a process claim for manufacturing the product is generally unproblematical under Article 123(3) EPC.

The same applies to dependent Claims 2 to 12 which have also been redrafted as process claims on the same basis.

3.2 With respect to Claim 1 as originally filed the present main claim also differs by the insertion of the word "solely" to specify that the amination of the polymer only occurs at its terminus. This amendment was held to be allowable under Article 123(2) EPC by the Opposition

Division and the Board sees no reason to deviate from this opinion, particularly in view of the statement of problem and the solution proposed in the application as originally filed (cf. page 2, lines 27 to 30).

- 3.3 Furthermore, the definition of the process is clear, concise and adequately supported by the description, so that the various requirements of Article 84 EPC are also complied with. In particular, the reaction of the unsaturated α -olefin polymer with a borane, followed by a reaction with an amination reagent, is a correct representation of the two step method chosen for introducing an amino group into the olefinic unsaturated bond at the terminus of the unsaturated polymer (cf. page 15, lines 4 to 11; Example 2).

Documents

4. The three documents considered in the opposition proceedings can be summarised as follows.
- 4.1 D1 is directed to the preparation of a lubricating oil additive by reaction of a carboxylic group modified polyolefin, which is defined as a copolymer of ethylene and a higher α -olefin, with a nucleophilic agent, such as an amine (cf. page 4, lines 1 to 8; page 4, lines 36 to 43; page 12, line 1 to page 14, line 14). The polymer before modification with the carboxylic reactant is said to contain a high degree of terminal ethenylidene-type unsaturation, a low amount of terminal ethenyl unsaturation and possibly some internal monounsaturations (cf. page 5, lines 5 to 12).
- 4.2 D2 describes a multifunctional oil additive prepared by reacting an aliphatic polyamine with an unsaturated ketone obtained by the mild oxidation of a long chain terminal olefin, in particular an olefin polymer (cf. column 1, line 42 to column 2, line 28). This

oxidation is most conveniently effected at temperatures ranging from 150°F to 480°F by the use of air or other oxygen-containing gas mixtures in the presence of a suitable catalyst, such as oxides of manganese, selenium and chromium as well as metal salts of aliphatic carboxylic acids having one to five carbon atoms (cf. column 2, lines 31 to 44).

- 4.3 D3 relates to a lubricating oil composition containing a hydroxyalkyl-substituted polyamine additive prepared by reacting in the absence of oxygen and generally in the absence of catalyst (i) a polyolefin epoxide obtained by oxidizing a polyolefin having a terminal double bond, with (ii) a polyamine at a temperature of 15 to 180°C (cf. Claim 1 in conjunction with column 2, lines 31 to 38 and lines 55 to 60).

Novelty

5. Following the drafting of Claim 1 as a process claim it is evident from the above discussion that the objection of lack of novelty can no longer be maintained. In particular, it is clear that none of the documents discloses a two step process involving the reaction of a polyolefin with a borane followed by an amination reaction, let alone a combination thereof with the structural feature of a terminal unsaturation. Thus, novelty of the claimed subject-matter according to the main request can be acknowledged.

Problem and solution

6. Following the change of claim category the patent in suit concerns a process for the preparation of aminated olefin polymers.

- 6.1 As explained in the introduction of the patent in suit (cf. page 2, lines 11 to 30), many attempts have been made to introduce a variety of functional groups into α -olefin polymers in order to improve their properties. Amino groups have been introduced, which proved to be very useful in view of their high reactivity; other functional groups have been introduced in terminal position in order to confer specific properties to the polymers. The various methods reported, which aimed at the introduction of an amino group solely at a terminus of a polyolefin, proved to be in practice complex or limited to certain polymers.
- 6.2 The method described in D3, which is the only document specifically concerned with the amination of a polyolefin having a double bond in terminal position and which, for this reason, qualifies as the closest state of the art, belongs to the latter category. As mentioned above (cf. point 4.3), following the first step or oxidation step, which gives rise to an alkylene epoxide having an oxygen content corresponding to the calculated theoretical value, the amination reaction is carried out; although unproblematic, that reaction results in any case in the formation of secondary hydroxy groups and, depending on the relative molar amounts of the reactants, in the introduction of more than one amino group per molecule (cf. column 3, line 50 to column 3, line 2; Examples 1 to 8).
- 6.3 There is thus a need for a process allowing to introduce in a controlled manner an amino group into an olefin polymer having an olefinic unsaturation solely at its terminus. Accordingly the technical problem underlying the patent in suit may be seen in the definition of such an improved process.

- 6.4 According to the patent in suit this problem is solved by a two step process involving the reaction of an unsaturated α -olefin polymer with a borane, followed by the reaction with an amination reagent, as specified in Claim 1.
- 6.5 The examples in the patent in suit provide evidence that this sequence of reactions proceeds not only easily, but also specifically in that the amino groups are introduced solely at the end of the polymer chain.

Obviousness

7. It is evident from the above prior art discussion that the claimed subject-matter would not have been obvious to a person skilled in the art.

First, regarding the modifying agents, no document mentions the possibility to use a borane.

Secondly, concerning the structure of the aminated polyolefins, D1 and D2 clearly deal with different products. On the one hand, the polyolefins considered in D1 are polymers which not only contain a terminal unsaturation within the terms of the patent in suit, e.g. arising solely from the polymerisation of the monomer(s), but also an internal unsaturation. On the other hand, the preliminary oxidation of the polyolefin in D2 does not affect the terminal unsaturation, but gives rise to the corresponding unsaturated ketone which is then converted to an imine (Schiff base derivative) by reaction with an aliphatic amine; before the Opposition Division already, both parties agreed that this sequence of reactions had nothing to do with the process features now required.

For these reasons, the prior art documents relied upon by the Respondent, whether considered in isolation or in combination, would not represent an incentive for a skilled person to envisage a solution along the line of the process as now claimed, which therefore involves an inventive step.

By the same token, the preferred embodiments to which the dependent Claims 2 to 12 are directed also involve an inventive step.

8. In view of this finding, the main request of the Appellant must be allowed. It is, therefore, not necessary for the Board to consider the merits of the three auxiliary requests.

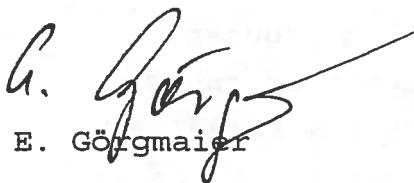
9. Although the claims according to the main request have been found to comply with the requirements of the EPC, the patent cannot be maintained on that new basis at this stage, because the description needs to be adapted to the change of claim category. To that end the case has to be remitted to the Opposition Division.

Order

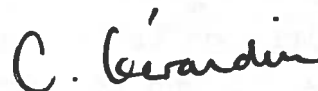
For these reasons it is decided that:

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 Claims 1 to 12 filed as main request on 10 June 1999, after any necessary consequential amendment of the description.

The Registrar:


E. Görgmaier

The Chairman:


C. Gérardin