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Datasheet for the decision of 2 February 2010

Case Number: T 1372/07 - 3.3.06

Application Number: 97203898.8

Publication Number: 0848294

IPC: G03F 7/038

Language of the proceedings: EN

Title of invention:
Photo-curable resin composition used for photo-fabrication of three-dimensional objects

Patentee:
DSM IP Assets B.V., et al

Opponent:
Huntsman Advanced Materials (Switzerland) GmbH

Headword:
Photo-curable composition / DSM

Relevant legal provisions:
EPC Art. 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step - all requests (no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1372/07 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 2 February 2010

Appellant: Huntsman Advanced Materials (Switzerland) GmbH
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 14 June 2007 concerning maintenance of the European patent No. 0848294 in amended form.**

Composition of the Board:

Chairman: P.-P. Bracke
Members: E. Bendl
J. Geschwind

Summary of Facts and Submissions

I. The appeals are against the decision of the Opposition Division to maintain the European patent 0 848 294 in amended form.

II. The Opponent/Appellant (thereafter called Opponent) filed an appeal against this decision and argued that the requirements of Articles 123(2), 83, 84, 54, 56 EPC and Rule 80 EPC were not met. Inter alia he filed with the grounds of appeal comparative tests A1 to H1 and argued that the claimed process was not inventive over document

D6 = EP-A-0 535 828.

III. The Patent Proprietor/Appellant (thereafter called Proprietor) also filed an appeal, disputed Opponent's objections, referred to the examples filed by the Proprietor in opposition procedure, in particular E3 to E7, and submitted with the grounds of appeal examples E10-E13. In the course of the appeal procedure several sets of claims were submitted, which were, apart from auxiliary requests III, VII and VIII, later-on withdrawn.

IV. The independent claims of the three sets of claims on which the present decision is based read as follows:

Auxiliary request III

"1. A process for photo-fabricating a three-dimensional object consisting of integrally laminated cured resin layers comprising selectively curing a photo-curable

composition comprising an (A) oxetane compound, (B) an epoxy compound and (C) a cationic photo-initiator characterised in that the oxetane compound is a compound comprising two or more oxetane rings and wherein the composition further comprises an ethylenically unsaturated compound which is a radically polymerizable compound and a radical photo-initiator."

"3. A process for photo-fabricating a three-dimensional object consisting of integrally laminated cured resin layers comprising selectively curing a photo-curable composition comprising an (A) oxetane compound, (B) an epoxy compound and (C) a cationic photo-initiator characterised in that the oxetane compound is chosen from the group consisting of

- 3-ethyl-3-hydroxymethyloxetane
- 3-(meth)-allyloxymethyl-3-ethyloxetane
- (3-ethyl-3-oxetanylmethoxy)methylbenzene
- 4-fluoro-[1-(3-ethyl-3-oxetanylmethoxy)methyl]benzene
- 4-methoxy-[1-(3-ethyl-3-oxetanylmethoxy)methyl]-benzene
- [1-(3-ethyl-3-oxetanylmethoxy)ethyl]phenyl ether
- isobutoxymethyl(3-ethyl-3-oxetanylmethyl) ether
- isobornyloxyethyl(3-ethyl-3-oxetanylmethyl) ether
- isobornyl(3-ethyl-3-oxetanylmethyl) ether
- 2-ethylhexyl(3-ethyl-3-oxetanylmethyl) ether
- ethyldiethylene glycol(3-ethyl-3-oxetanylmethyl) ether
- dicyclopentadiene(3-ethyl-3-oxetanylmethyl) ether
- dicyclopentenyloxyethyl(3-ethyl-3-oxetanylmethyl) ether
- dicyclopentenyl(3-ethyl-3-oxetanylmethyl) ether
- tetrahydrofurfuryl(3-ethyl-3-oxetanylmethyl) ether
- tetrabromophenyl(3-ethyl-3-oxetanylmethyl) ether

- 2-tetrabromophenoxyethyl(3-ethyl-3-oxetanylmethyl) ether
- tribromophenyl(3-ethyl-3-oxetanylmethyl) ether
- 2-tribromophenoxyethyl(3-ethyl-3-oxetanylmethyl) ether
- 2-hydroxyethyl(3-ethyl-3-oxetanylmethyl) ether
- 2-hydroxypropyl(3-ethyl-3-oxetanylmethyl) ether
- butoxyethyl (3-ethyl-3-oxetanylmethyl) ether
- pentachlorophenyl(3-ethyl-3-oxetanylmethyl) ether
- pentabromophenyl(3-ethyl-3-oxetanylmethyl) ether
- bornyl(3-ethyl-3-oxetanylmethyl) ether

and wherein the composition further comprises an ethylenically unsaturated compound which is a radically polymerizable compound and a radical photo-initiator."

Auxiliary request VII

"1. A process for photo-fabricating a three-dimensional object consisting of integrally laminated cured resin layers comprising

- curing fixed parts of a photo-curable composition comprising an (A) oxetane compound, (B) an epoxy compound and (C) a cationic photo-initiator; and
- continuously or stepwise moving the light from cured parts of the composition to uncured parts of the composition to laminate the cured parts,

wherein the oxetane compound is a compound comprising two or more oxetane rings, and wherein the composition further comprises an ethylenically unsaturated compound which is a radically polymerisable comound [sic] and a radical photo-initiator."

The oxetane compounds listed in the second part of Claim 3 of auxiliary request VII are identical with the

list given in Claim 3 of auxiliary request III, although the part other than the list of compounds reads as follows:

"3. A process for photo-fabricating a three-dimensional object consisting of integrally laminated cured resin layers comprising
- curing fixed parts of a photo-curable composition comprising an (A) oxetane compound, (B) an epoxy compound and (C) a cationic photo-initiator, and wherein the composition further comprises an ethylenically unsaturated compound which is a radically polymerisable comound [sic] and a radical photo-initiator; and
- continuously or stepwise moving the light from cured parts of the composition to uncured parts of the composition to laminate the cured parts,
wherein the oxetane compound is chosen from the group consisting of"

Auxiliary request VIII

Auxiliary request VIII is identical with auxiliary request VII with the following exceptions: Claims 1 and 2 were deleted; the word "the" was deleted between "moving" and "light" in the renumbered Claim 1.

V. Oral proceedings before the Board took place on 2 February 2010.

VI. **Proprietor's main arguments** with regard to inventive step were as follows:

- D6 is the closest prior art document, but relates to a different problem; this document discloses only three specific oxetanes, none of them is covered by the sets of claims under discussion;

- the examples presented in the patent-in-suit and the tests filed by the Proprietor show an improvement in the properties of the final product;

- therefore it is inappropriate to define the problem underlying the invention of the patent-in-suit as the provision of an alternative;

- in contrast thereto Opponent's tests lead to different results because of the use of a different light source.

VII. **Opponent's main arguments** with regard to inventive step were as follows:

- D6 represents the closest state of the art and shows all the compounds mentioned in the independent claims of the three requests, only the specific examples of the oxetanes do not fall within the present definition, but oxetanes are mentioned in general; consequently, D6 renders the alleged invention obvious;

- the comparative tests submitted by the Opponent show that the invention cannot be carried out over the whole range claimed;

– these tests are suitable for comparison, because the same equipment, in particular the same mercury lamp light, was used for all tests;

– any mercury lamp light source can be used for irradiating the uncured composition, because the claims or the description do not oblige the skilled person to use a specific light source.

VIII. The Proprietor requested that the decision under appeal be set aside and to maintain the patent on the basis of any of the auxiliary requests III and VII filed with letter of 02 December 2009 or auxiliary request VIII filed during oral proceedings.

The Opponent requested that the decision under appeal be set aside and that the European patent no. 0 848 294 be revoked.

Reasons for the Decision

1. **Auxiliary request III - Inventive step**

According to the problem-solution-approach, which is used by the Boards of Appeal of the European Patent Office in order to decide on the question of inventive step, it has to be determined which technical problem the object of a patent objectively solves vis-à-vis the closest prior art document. It also has to be determined whether or not the solution proposed to overcome this problem is obvious in the light of the available prior art disclosures.

1.1 Both parties agreed that **D6** represents the **closest state of the art**. Taking into account the documents cited in the appeal procedure, the Board does not see any reason to deviate from this starting point.

The problem defined in D6, which is a prior art document according to Article 54(2) EPC, is the provision of a method for forming three-dimensional moulding with high dimensional accuracy and improved cure depth. D6 describes a variety of different kinds of components useful for this purpose, among them epoxy acrylates and other ethylenically unsaturated compounds, oxetanes, radical and cationic photo initiators.

1.2 In the second step of the problem-solution approach the **technical problem effectively solved vis-à-vis D6** has to be determined.

1.2.1 According to the patent-in-suit the claimed process aims at providing three-dimensional objects with high toughness and dimensional accuracy.

1.2.2 The Proprietor argued that improved effects with regard to the Young's modulus, toughness and dimensional accuracy could be achieved, as allegedly derivable from Table 2 of the patent-in-suit and from the tests filed by the Proprietor during the opposition and appeal procedure.

1.2.2.1 *First alleged effect: Results described in Table 2 of the patent-in-suit*

Only examples 4 and 5 of the patent-in-suit contain a further ethylenically unsaturated compound and a radical photo-initiator, as required by Claims 1 and 3 of auxiliary request III. These two examples were repeated by the Opponent in a test report filed with Opponent's grounds of appeal. Only one of the repeated examples showed a Young's Modulus suitable for producing a three-dimensional object (example A1, Young's Modulus of 969 MPa), while the other one was not suitable for the intended purpose (example B1, Young's Modulus of 125 MPa) according to Proprietor's criteria for the Young's modulus (see the patent-in-suit, Table 2 and page 21, lines 6-8). In addition both examples A1, B1 were rated as "poorly defined" with regard to dimensional accuracy.

In the oral proceedings the Proprietor did not dispute Opponent's results but rather tried to find an explanation for the different outcome compared to the tests of the patent-in-suit.

1.2.2.2 The explanation given, that the light source used by the Opponent was different and that consequently the tests provided by the Opponent were not suitable to show any effect, cannot be accepted by the Board. Firstly an obligation to use a specific light source is neither specified in the description nor in the claims. Secondly all tests of the Opponent were carried out with the same lamp, i.e. under the same conditions. The allegedly "unsuitable" light source cannot be the reason for results being partly in line with the results shown by the Proprietor (Young's modulus of

example A1) and partly contradicting Proprietor's results (example B1).

1.2.2.3 Thus, Opponent's tests are suitable for comparison with Proprietor's examples and contradict the results of Table 2 of the patent-in-suit. Therefore any alleged effect with regard to the results of this table has not been proven by the Proprietor.

1.2.3 *Second alleged effect: Results of the comparative tests filed by the Proprietor*

A second effect allegedly shown by comparing different experiments filed by the Proprietor during opposition (letter of 04 January 2007) and appeal (letter of 19 October 2007) proceedings was mentioned. The following test combinations were referred to in this respect: (a) E3 + E5, (b) E4 + E6, (c) E6 + E12, (d) E4 + E11 and (e) E5 + E7.

The Board still cannot see any proof for an effect because of the following reasons:

In each of the test combinations (a)-(d) the first composition (i.e. E3, E4, E6, E4) distinguishes from the second composition (i.e. E5, E6, E12, E11) in at least **three** of the **compounds** used and the **content** of the ingredients utilized. Such a high number of differences does not allow to draw conclusions on the reasons of any effect achieved, in particular not whether the addition of an ethylenically unsaturated compound has any impact on the properties of the overall composition.

The combination (e), i.e. E5 + E7, merely differs in the amounts of the components used and the presence of acrylate and radical photo initiator. The Proprietor argued that because of the addition of the two compounds the dimensional accuracy improved from "somewhat defined" (example E7) to "well defined" (example E5).

However, even in this case no effect could be demonstrated, as comparative example C1 provided by the Opponent (letter of 19 October 2007) disclosed ingredients and amounts identical to example E5, with the exception of the utilisation of Epolead PB3600 instead of Poly bd 605E. The dimensional accuracy of example C1, which example falls under the definition of Claim 1, is only rated as "poorly defined". Thus, the alleged effect achieved by the claimed processes may or may not occur, depending on the ingredients of the photo-cure-composition. A **proof** for any alleged effect has consequently not been given.

1.2.4 Furthermore, according to established jurisprudence of the Boards of Appeal the nature of the comparison with the closest state of the art must be such that the said alleged effect is convincingly shown to have its origin in the distinguishing feature of the invention and alleged but unsupported advantages cannot be taken into consideration in respect of the determination of the problem underlying the application

None of the examples cited above directly compares the disclosure of D6 with the patent-in-suit. Again, this means that no effect has been demonstrated vis-à-vis D6.

1.2.5 Thus, the problem of the present invention has to be redefined in a less ambitious way, namely as the provision of an **alternative** process for photo-fabricating a three-dimensional object.

1.3 As proposed **solution** to the problem mentioned above **Claims 1 and 3** of auxiliary request III have been presented by the Proprietor.

1.4 As cited above, document D6 teaches to use compounds having at least one polymerisable unsaturated bond per molecule, a free radical photoinitiator, two or more compounds capable of cationic polymerisation and a cationic photoinitiator for photo-fabricating three-dimensional objects. Among the specific examples cited compounds like epoxy acrylates, further epoxy compounds and oxetanes are mentioned.

The Proprietor could not demonstrate any effect based on the selection of groups of compounds mentioned in the claims. When starting from the teaching of D6, only an arbitrary selection of five classes of compounds had to be made to arrive at the present invention. Even the definition of "specific" oxetanes did not add anything to the teaching of D6, because the compounds still fall within the broad definition "oxetanes", which is already present in D6.

Thus, arbitrarily selecting groups of chemical substances which have in D6 been used for a process aiming at the same purpose as the present invention is not considered to involve an inventive step.

Claims 1 and 3 of auxiliary request III are not considered to meet the requirement of Article 56 EPC.

2. **Auxiliary request VII - Inventive step**

2.1 Claims 1 and 3 of auxiliary request VII contain the additional feature of "continuously or stepwise moving the light from cured parts of the composition to uncured parts of the composition to laminate the cured parts".

2.2 The feature is considered to represent a known step of photo-fabricating three-dimensional objects and has for instance been described in D6, page 2, lines 6-11. No effect has been shown for this additional feature.

2.3 Thus, identical considerations as mentioned for the third auxiliary request apply with regard to inventive step.

3. **Auxiliary request VIII - Inventive step**

3.1 The eighth auxiliary request differs from the seventh auxiliary request in the deletion of Claims 1 and 2 and of the word "the" between "moving" and "light" in renumbered Claim 1.

3.2 Since renumbered Claim 1 corresponds to Claim 3 of auxiliary request III, identical considerations as for the third auxiliary request are therefore of relevance with regard to the requirement of inventive step.

4. **Further requests**

Taking into account that none of the three requests on file meets the requirement of Article 56 EPC, the Board considers a discussion of further objections raised in the course of the appeal procedure not necessary.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar: The Chairman:

G. Rauh P.-P. Bracke