BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 561/88 - 3.3.3

Application No.: 81 305 171.1

Publication No.: 0 055 890

Title of invention: Multiphase core/shell polymers

Classification: C08F 291/02

D E C I S I O N
of 27 June 1991

Proprietor of the patent: Monsanto Company

Opponent: BASF Aktiengesellschaft, Ludwigshafen

Headword:

EPC Art. 56

Keyword: "Inventive step (affirmed)"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 561/88 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 27 June 1991

Appellant : (Opponent)
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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 7 September 1988 rejecting the opposition filed against European patent No. 0 055 890 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : F. Antony
Members : H.H.R. Fessel
J.A. Stephens-Ofner

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 055 890 in respect of European patent application No. 81 305 171.1 filed on 30 October 1981 and claiming two US priorities of 3 November 1980 and 30 August 1981 was announced on 22 May 1985 (cf. Bulletin 85/21). The only independent claim, Claim 1, reads as follows:

"1. A multiphase core/shell polymer comprising about 50 to about 90 parts by weight of a crosslinked elastomer core and about 10 to about 50 parts by weight of a rigid thermoplastic carboxyl-group-containing styrene copolymer shell, characterised in that the shell comprises from about 1 to about 25 parts by weight of an interpolymerized C_1 to C_4 monoalkyl maleate or fumarate, from about 20 to about 80 parts by weight of interpolymerized styrene, from 0 to about 79 parts by weight of an interpolymerized C_1 to C_8 alkyl acrylate or methacrylate and from 0 to about 45 parts by weight of an interpolymerized acrylonitrile or methacrylonitrile based on 100 parts by weight of shell interpolymer, the core of the multiphase core/shell polymer has a weight average particle diameter in the range of about 0.3 to about 0.8 μm, the rigid shell has a thickness of at least about 0.025 μm, and the glass transition temperature of the rigid thermoplastic polymer shell is at least 35°C."

II. A notice of opposition by the Appellant was received on 6 February 1986, requesting revocation of the patent based on Article 100(a) and - subsequently withdrawn - also on Article 100(b) EPC. The opposition was supported by

(1) US-A-3 796 771

filed in due time and the following late filed documents:

(2) H.J. Cantow, Zur Bestimmung von Teilchengrößenverteilungen in der Ultrazentrifuge, Makromol. Chem. 70 (1964), 130-149

(3) E. Vollmert, Grundriß der makromolekularen Chemie, E. Vollmert Verlag, 1979, Vol. III, 124-127

(4) H.W. McCormick, Determination of Latex Particle Size Distribution by Analytical Ultracentrifugation, J. Coll. Sci. 19 (1964), 173, 179.

III. By a decision given at the end of oral proceedings held on 20 June 1988, and issued in writing with full reasoning on 7 September 1988, the opposition was rejected.

The Opposition Division held that the claimed subject-matter was new and inventive, for the following reasons:

As to novelty, none of the cited documents disclosed the use of monoalkyl maleates or fumarates as carboxyl group providing component in the shell of the core/shell polymer as specified in the claims of the patent in suit. As to inventive step, it was held that the use of maleates or fumarates instead of acrylic or methacrylic acid as amine reactive moieties resulted in a significant improvement of impact strength, this solving the main part of the problem underlying the invention. To arrive at the claimed solution to this problem would not have been obvious in view of the cited prior art. The controversial question of particle size could therefore be left aside as not decisive for the assessment of novelty and inventive step.

IV. An appeal was lodged against this decision on 5 November 1988 together with payment of the prescribed fee. A statement of grounds of appeal was received on 29 December 1988.

In the said statement the Appellant argued that

(a) the provisions of Article 113(1) EPC were violated by the Opposition Division;

(b) the particle size as claimed was disclosed in (1);

(c) no surprising effect was demonstrated to result from the use of alkyl maleates or fumarates, hence an inventive step could not be based on such a selection out of the list given in column 7, lines 18-42 of (1).

V. The Respondent, in a brief statement in reply, merely contested that the latex used in Example 17 of (1) was of a particle diameter greater than 0.3 μm, and asserted that this point would anyway be irrelevant.

VI. The Appellant requests that the decision under appeal be set aside and the patent be revoked.

The Respondent requests that the appeal be dismissed.

The Appellant's auxiliary request for oral proceedings was in effect withdrawn by his letter dated 27 November 1990.

Reasons for the Decision

1. The appeal is admissible.

2. The Board is satisfied that the subject-matter as claimed is novel with regard to each document cited in the proceedings. Since novelty was not disputed and a shell

comprising interpolymerized styrene and an interpolymerized C_1 to C_4 monoalkyl maleate or fumarate is not mentioned in (1), more detailed arguments need not be given.

3. Following the finding of the Opposition Division and in line with the parties the Board accepts that (1) represents the closest prior art.

The most relevant part of document (1) is Example 17, which in effect discloses a core/shell ratio of about 1/1; viz. a polybutadiene core (an amount of the commercial latex FR-S-2004 corresponding to about 500 parts of solid polybutadiene), and a shell obtained by polymerisation of 400 parts by weight of styrene plus 100 parts by weight of acrylic acid as amine reactive moiety.

As far as the particle size is concerned, numerous arguments were produced by the Appellant to demonstrate that the said commercial polybutadiene latex had a particle size of at least 0.3 μm. These arguments clearly showed that particle sizes in the technical field concerned were either indicated on an average weight or on an average number basis, leading to different figures. The patent in suit specifies the particle size as calculated on a weight basis. Document (1) and a document containing a specification of the said commercial latex are both totally silent on the basis on which the particle size has been calculated, see Example 17 and column 9, lines 13 to 18 of (1). The Board cannot, therefore, accept that (1) teaches the use of core/shell polymers the particle diameter of whose core corresponds to the core diameter as claimed in the patent in suit.

4. In the light of this prior art, the problem underlying the patent in suit may thus be seen in providing a multiphase

core/shell polymer leading to a considerable improvement of the impact strength of a blend thereof with polyamide.

5. According to the patent in suit, it is proposed to solve this problem essentially by a core/shell polymer with a shell comprising about 1 to about 25 parts by weight of an interpolymerized C_1 to C_4 monoalkyl maleate or fumarate, the core having the particle diameter given in Claim 1 and having a core/shell ratio of 9/1 to 1/1.

In view of the results given in Table 2 of the patent in suit, the Board is satisfied that the above defined technical problem is effectively solved, since a comparison of Examples 1 to 7, of which Examples 6 and 7 (as evidenced by Examples IV and V of Table 1), have a core/shell ratio of 1/1.4 and 1.8, respectively, instead of 1/0.6, 0.7 and 1.0, respectively (cf. Examples I to III of Table 1) shows the influence of said ratio on impact strength. The influence of particle size (0.3 versus 0.13 μm) on impact strength is demonstrated by Examples 9 and 11 (cf. Examples VI and VIII of Table 1) on the one hand, and 12 and 13 (cf. Examples IX and X of Table 1) on the other hand, and that of the use of monoethyl maleate instead of methacrylic acid by Examples 1 and 18 (cf. Examples III and XV of Table 1).

While there are certain divergences in some of the other Examples, which are not directly comparable because of variances in more than one parameter, the Board has no doubt, in view of the effect demonstrated in Examples 1 and 18, and of the effect of core diameter and core/shell ratio, that the problem is effectively solved by the claimed combination of features.

6. It remains to be decided whether or not the subject-matter of the patent in suit involves an inventive step with regard to the teaching of the cited documents.

From column 9, lines 12 to 18 of (1) a man skilled in the art would learn that "particle size is not of narrow significance" to that invention, but may "range from as low as about" 0.05 to 0.3 µm or even more. Moreover (1) is silent upon the influence of the core/shell ratio, and upon any likely effect of the selection of a specific amine-reactive moiety from the list given in column 7, lines 18 to 36 of (1) on the physical properties of polyamide blends containing the claimed multiphase core/shell polymers. Thus, from (1) alone it would not be obvious how to solve the problem underlying the patent in suit.

No other document dealing with a multiphase core/shell polymer is in the proceedings before the Board. Document (2) relates to the determination of particle size in ultracentrifuges in general, and (4) to said determination for hard particle polystyrene and soft particle styrene-butadiene copolymer latices in particular, whereas (3) highlights the differences resulting from calculations based on weight average and number average. The general teaching given in (2) to (4) cannot, therefore, provide any incentive to solve the existing problem by core/shell polymer having the characteristics specified in Claim 1 of the patent in suit.

Hence, the Board is satisfied that it would not have been obvious for a person skilled in the art to arrive at the claimed solution of the existing problem. The said solution does, therefore, involve an inventive step.

7. The subject-matter of dependent Claims 2 to 4 are more specific embodiments of the subject-matter of Claim 1 and are, thus likewise patentable.

8. Rule 67 EPC provides for the reimbursement of appeal fees if, in the Board's view, either in response to a request or on its own motion (Article 114(1) EPC), such reimbursement is equitable by reason of a substantial procedural violation, provided that the appeal is allowable.

Since in the present case the appeal is not allowable, the question of substantial procedural violation does not arise.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier F. Antony