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**D E C I S I O N**  
of 21 January 1998

**Case Number:** T 0535/94 - 3.3.3

**Application Number:** 90125464.9

**Publication Number:** 0491985

**IPC:** C08L 67/02

**Language of the proceedings:** EN

**Title of invention:**  
Impact modified polybutylene terephthalate

**Applicant:**  
General Electrical Company

**Opponent:**  
-

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes) - synergistic effect"

**Decisions cited:**  
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**Catchword:**  
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Boards of Appeal

Chambres de recours

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Case Number: T 0535/94 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 21 January 1998

**Appellant:**

General Electric Company  
1 River Road  
Schenectady, N.Y. 12151 (US)

**Representative:**

Grever, Frederik  
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**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 14 February 1994  
refusing European patent application  
No. 90 125 464.9 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** C. R. J. Gérardin  
**Members:** H. H. R. Fessel  
J. A. Stephens-Ofner

## Summary of Facts and Submissions

- I. European patent application No. 90 125 464.9, filed on 24 December 1990 and published on 1 July 1992 with the publication number 0 491 985 (Bulletin 92/27) was refused by a decision of the Examining Division 2.1.02.014 of the European Patent Office dated 14 February 1994.

That decision was based on a set of 9 claims filed on 15 October 1993 of which independent Claim 1 reads as follows:

"Polybutylene terephthalate composition containing an impact modifier, wherein the impact modifier is a mixture of (1) an acrylonitrile and butadiene units-containing polymer and (2) a terpolymer of (a) ethylene, (b) a lower alkylacrylate and (c) a monomer which contains a heterocycle containing one oxygen atom as the hetero-atom."

Dependent Claims 2 to 9 relate to preferred embodiments of the composition claimed in Claim 1.

- II. The only reason for the decision was that the claimed subject-matter lacked inventive step within the terms of Articles 52(1) and 56 EPC with respect to

D1: EP-A-0 022 216;

D2: FR-A-2 311 808;

D3: Polymer, September 1987, Volume 28, pages 1703 to 1711; and

D4: FR-A-2 617 176.

The claimed subject-matter was held to be novel, since none of the cited documents disclosed a poly(butylene terephthalate) (hereinafter PBT) composition containing a mixture of the two modifiers (1) and (2) as defined in Claim 1. The subject-matter was not deemed to involve any inventive step since polymer (1) and terpolymer (2) were respectively known from D1 and D2 to be impact modifiers for PBT and it would have been obvious for a skilled person to combine both teachings when seeking to provide further impact modifier-containing PBT compositions. A more ambitious problem, i.e. a composition having unexpected effects, had not been shown by the Applicant and could thus not be used to evaluate the presence of an inventive step.

III. On 11 April 1994 a Notice of Appeal was filed against that decision together with payment of the prescribed fee. The Statement of Grounds of Appeal was submitted on 6 June 1994. In that statement the Appellant disputed the findings of the Examining Division and provided evidence said to demonstrate an increase of melt viscosity index (MVI) of PBT compositions containing both a terpolymer (2) and an acrylonitrile-butadiene-styrene (ABS) polymer with respect to the compositions containing only one of these additives; in particular the increase resulting from the incorporation of 15 parts by weight of terpolymer (2) into compositions already containing the modifier (1) was surprising, since the latter was known to have a detrimental effect on the melt viscosity index.

IV. The Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the Claims 1 to 9 filed 15 October 1993 and amended page 2 as filed at the same date.

## Reasons for the Decision

1. The appeal is admissible.
2. No objection under Article 123(2) EPC arises as to the amendments of the claims now on file. Claim 1 differs from Claim 1 as filed originally by the deletion of "in an impact modifying amount" and "synergistic" before "mixture of (1).....". These deletions were made in response to an objection raised under Article 84 EPC and do not lead to an amendment of the claimed subject-matter in substance.

Former Claims 9 and 10, now Claims 7 and 8 were amended accordingly by deletion of the term "synergistic".

As to Claims 2 to 6 and 9 they correspond to original Claims 3, 4, 6, 7, 8 and 11 respectively after adjustment of their numbers and appendancies.

3. Novelty was not under dispute since no document describes a ternary composition within the terms of the application in suit.
4. The application in suit relates to impact modified PBT. Such compositions are described in D1 which may thus be regarded as representing the closest state of the art.
  - 4.1 This document discloses mixtures of 65 to 99 parts by weight of PBT and 1 to 35 parts by weight of an ABS graft polymer (Claim 1). However, as specified in the introduction of the application in suit (page 2, lines 2 to 16), the high values of charpy notched impact strength (hereinafter CNI), e.g. higher than 25 J/m<sup>2</sup>, can only be obtained by using high amounts of ABS, which in turn has a detrimental effect on the MVI.

4.2 In the light of this shortcoming the technical problem underlying the application in suit may thus be seen in the provision of PBT compositions having improved viscosity values, without impairing the high toughness properties.

4.3 According to the application in suit this problem is solved by incorporating a modifier (2), as specified in Claim 1.

4.4 The experimental data provided together with the Statement of Grounds of Appeal clearly demonstrate that the above-defined problem is effectively solved by such an addition.

5. It remains to be decided whether this solution was obvious in the light of the teaching of the prior art relied upon in the decision under appeal.

5.1 Although D1 mentions the possibility to incorporate various additives into the mixtures of PBT and ABS (page 6, lines 16 to 21), none of them can be regarded as having a positive effect on viscosity, so that this citation cannot by itself contribute to the solution of the technical problem.

5.2 D2, which is also concerned with PBT compositions having good toughness properties, describes multiphase blends of (i) 60 to 99 % by weight of a matrix resin, which is an aromatic polyester or a polycarbonate, and (ii) a random copolymer characterized by (ii1) a straight or branched chain, (ii2) specific size particles and (ii3) specific traction modulus. A further essential feature of these compositions is (ii4) the ratio of the traction modulus of the matrix resin to the traction modulus of the random copolymer, which should be higher than 10 to 1 (Claim 1).

Although the definition of these polymer components is very broad, Examples 10 and 16 to 18 disclose a mixture of a PBT matrix and a terpolymer ethylene/methyl acrylate/glycidyl methacrylate, the latter being thus a modifier (2) within the terms of the application in suit. From Table 3, page 25 and Table 4, page 2B it clearly appears that the best mechanical properties relevant for high toughness properties are obtained with a polymer matrix which is PBT containing large amounts of reinforcing fillers. It is also said that viscosity may be stabilized by addition of polycarbodiimides (page 15, lines 19/20). It follows that any solution based on the teaching of D2 should comprise a combination of reinforced matrix and polycarbodiimide additive, which obviously does not correspond to the solution according to the application in suit.

- 5.3 The question which now arises is whether a skilled person would have contemplated a combination of the teaching of D1 and D2 in order to solve the technical problem, bearing in mind its two independent aspects, the toughness properties and the viscosity values.

First, the specificity of features (ii1) to (ii4) in D2 makes it doubtful whether a skilled person would even consider such a combination all the more so as neither of the two documents seems to be relevant for the improvement of the viscosity values. In reality, as demonstrated in the Statement of Grounds of Appeal, the addition of a terpolymer (2) gives a very good impact value, which confirms the teaching of D2, but at the same time lowers the MVI coefficient to unacceptable values; this means that a skilled person being aware of that detrimental effect would not have considered a solution along that line, whether the terpolymer (2) is used alone or in combination.

Secondly, as also demonstrated by the Appellant, the use of a combination of ABS modifier (1) and terpolymer (2) results in PBT compositions having higher MVI values than those obtained with one additive only. In the Board's view this synergistic effect was totally unexpected and speaks for the inventiveness of the claimed solution.

5.4 The same conclusion arises whether one considers D3, which deals with the improvement of notch sensitivity of a PBT matrix with special toughening agents in limited amounts, or D4, which describes blends of (a) a saturated polyester resin, such as PBT, (b) a modified polypropylene, (c) an epoxy group containing copolymer corresponding to modifier (2), and (d) a modified ethylenic copolymer rubber, since neither of these documents are concerned with the enhancement of MVI values and, consequently, could assist the skilled person for the solution of the technical problem.

5.5 It follows from these considerations that the claimed subject-matter was not obvious to a person skilled in the art having regard to documents D1 to D4 and, therefore, involves an inventive step.

6. Claim 1 being allowable the same applies to dependent Claims 2 to 9 which are directed to preferred embodiments of the compositions according to Claim 1 and whose inventiveness is supported by that of Claim 1.

**Order****For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The application is remitted to the Examining Division with the order to grant a patent on the basis of the claims on file and a description yet to be amended, especially to delete any hint to a synergistic effect on impact strength.

The Registrar:

  
E. Gorgmaier

The Chairman:

  
C. Gérardin



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