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**D E C I S I O N**  
of 15 April 2003

**Case Number:** T 0568/00 - 3.3.3

**Application Number:** 96304236.1

**Publication Number:** 0747441

**IPC:** C08L 71/12

**Language of the proceedings:** EN

**Title of invention:**

Compositions of poly(phenylene ether) resins and epoxy-functional polyolefins

**Applicant:**

GENERAL ELECTRIC COMPANY

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 123(2)

**Keyword:**

"Amendments (all requests) - added subject-matter (yes)"

**Decisions cited:**

G 0004/92, T 0341/92

**Catchword:**

-



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Boards of Appeal

Chambres de recours

Case Number: T 0568/00 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 15 April 2003

**Appellant:**

GENERAL ELECTRIC COMPANY  
1 River Road  
Schenectady  
NY 12345 (US)

**Representative:**

Szary, Anne Catherine, Dr.  
London Patent Operation  
GE International, Inc.  
Essex House  
12-13 Essex Street  
London WC2R 3AA (GB)

**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office dated 11 August 1999 and  
issued in writing on 17 November 1999 refusing  
European patent application No. 96 304 236.1  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** A. Däweritz  
U. Tronser

## Summary of Facts and Submissions

- I. European patent application No. 96 304 236.1, filed on 6 June 1996, claiming the priority of 7 June 1995 of an earlier application in the United States of America (485250) and published under No. 0 747 441 on 11 December 1996, was refused by a decision of the Examining Division, announced orally on 11 August 1999 and issued in writing on 17 November 1999.

The decision was based on a main request with a set of 4 claims, submitted with a letter dated 4 November 1998, and an auxiliary request containing a single claim, submitted during the oral proceedings on 11 August 1999.

- II. The claims according to the main request read as follows:

"1. A composition consisting of:

(a) a compatibilizing poly(phenylene ether) resin comprising the reaction product of a poly(phenylene ether) resin with a compound selected from the group consisting of maleic anhydride, fumaric acid, N-phenylmaleimide, methyl nadic anhydride, acrylic acid, crotonic acid, methacrylic acid, oleic acid, triethylammonium fumarate, tri-n-butylammonium fumarate, citric acid, malic acid, and agaricic acid, and

(b) a copolymer selected from the group consisting of ethylene-glycidyl acrylate copolymers, ethylene-glycidyl methacrylate copolymers, ethylene-glycidyl methacrylate-vinyl acrylate copolymers, ethylene-glycidyl

methacrylate-methyl acrylate terpolymers,  
and ethylene-ethyl acrylate-glycidyl  
methacrylate terpolymers.

2. The composition of claim 1 further consisting of at least one polyolefin that is selected from the group consisting of low density polyethylene, linear low density polyethylene, medium density polyethylene, polypropylene, polyethylene copolymers, impact modified polypropylene, polypropylene copolymers, and polyoctenomer.
3. The composition of any of the preceding claims further consisting of at least one additive selected from the group consisting of impact modifiers, non-elastomeric metal salts, flow promoters, flame retardants, drip retardants, dyes, pigments, colorants, stabilizers, antistatic agents, plasticizers, fillers, and lubricants.
4. A poly(phenylene ether)-polyolefin copolymer, which is the reaction product of:
  - (a) a compatibilizing poly(phenylene ether) resin comprising the reaction product of a poly(phenylene ether) resin with a compound selected from the group consisting of maleic anhydride, fumaric acid, N-phenylmaleimide, methyl nadic anhydride, acrylic acid, crotonic acid, methacrylic acid, oleic acid, triethylammonium fumarate, tri-n-butylammonium fumarate, citric acid, malic acid, and agaricic acid, and
  - (b) a copolymer of an  $\alpha$ -olefin with a glycidyl ester of an  $\alpha,\beta$ -unsaturated carboxylic acid"

The single claim according to the auxiliary request read:

"A composition consisting of:

- (a) a poly(phenylene ether) resin functionalised with a compound selected from the group consisting of maleic anhydride, fumaric acid, N-phenylmaleimide, methyl nadic anhydride, acrylic acid, crotonic acid, methacrylic acid, oleic acid, triethylammonium fumarate, tri-n-butylammonium fumarate, citric acid, malic acid, and agaricic acid, optionally in combination with a nonfunctionalised poly(phenylene ether) resin, and
- (b) a copolymer selected from the group consisting of ethylene-glycidyl acrylate copolymers, ethylene-glycidyl methacrylate copolymers, ethylene-glycidyl methacrylate-vinyl acetate copolymers, ethylene-glycidyl methacrylate-methyl acrylate terpolymers, and ethylene-ethyl acrylate-glycidyl methacrylate terpolymers; and optionally
- (c) at least one polyolefin that is selected from the group consisting of low density polyethylene, linear low density polyethylene, medium density polyethylene, polypropylene, polyethylene copolymers other than component (b), impact modified polypropylene, polypropylene copolymers, and polyoctenomer; and
- (d) at least one additive selected from the group consisting of impact modifiers other than components (b) and (c), non-elastomeric metal salts of organic acids, flow promoters, flame retardants, drip retardants, dyes, pigments, colorants, stabilizers, antistatic agents, plasticizers, fillers, and lubricants, with the

proviso that the composition is free from polycarbonates, polyamides, polyesters, polyetherimides and polysulfones."

III. In the decision, the main request was refused for lack of clarity (Article 84 EPC) and lack of novelty (Article 54 EPC), the auxiliary request was refused for lack of novelty. The assessment of novelty was based on the disclosures of

D7: US-A-4 816 515 and

D10: EP-A-0 268 486.

Moreover, the main request was deemed not admissible because Claim 4 related to unsearched subject-matter contrary to Rule 86(4) EPC.

Finally, the Examining Division added that a claim to a combination of components (a), (b) and (c) would be novel but would not be based on an inventive step.

IV. On 24 January 2000, a Notice of Appeal against the above decision was lodged by the Appellant (Applicant). The prescribed fee was paid on 27 January 2000.

Annexed to the Statement of Grounds of Appeal, submitted on 24 March 2000, a new main request and a 1<sup>st</sup> auxiliary request were filed, each containing a Claim 1. According to a further request, oral proceedings should be held, before any decision adverse to the Appellant was made.

The claim according to the main request read as follows:

"1. A composition consisting of:

- (a) a compatibilizing poly(phenylene ether) resin comprising the reaction product of a poly(phenylene ether) resin with a compound selected from the group consisting of maleic anhydride, fumaric acid, N-phenylmaleimide, methyl nadic anhydride, acrylic acid, crotonic acid, methacrylic acid, oleic acid, triethylammonium fumarate, tri-n-butylammonium fumarate, citric acid, malic acid, and agaricic acid, optionally in combination with a nonfunctionalised poly(phenylene ether) resin, and
- (b) a copolymer selected from the group consisting of ethylene-glycidyl acrylate copolymers, ethylene-glycidyl methacrylate copolymers, ethylene-glycidyl methacrylate-vinyl acetate copolymers, ethylene-glycidyl methacrylate-methyl acrylate terpolymers, and ethylene-ethyl acrylate-glycidyl methacrylate terpolymers; and optionally
- (c) at least one polyolefin that is selected from the group consisting of low density polyethylene, linear low density polyethylene, medium density polyethylene, polypropylene, polyethylene copolymers other than component (b), impact modified polypropylene, polypropylene copolymers, and polyoctenomer; and

- (d) at least one additive selected from the group consisting of impact modifiers other than components (b) and (c), non-elastomeric metal salts of organic acids, flow promoters, flame retardants, drip retardants, dyes, pigments, colorants, stabilizers, antistatic agents, plasticizers, fillers, and lubricants, with the proviso that the composition is free from polycarbonates, polyamides, polyesters, polyetherimides and polysulfones."

The claim according to the auxiliary request differed therefrom in that components (a) to (c) were mandatory, whilst component (d) was optional (ie the word "optional" occurred only at the end of feature (c)).

In the Statement of Grounds of Appeal, arguments were submitted as to why the subject-matter claimed in the main request and in the 1<sup>st</sup> auxiliary request was novel and involved an inventive step compared to D7 and D10.

V. In reply to a conversation by telephone between the Representative and the Rapporteur held on 24 October 2002, the Appellant confirmed by fax dated and received on the same date, that each of the two requests submitted with the Statement of Grounds of Appeal contained only one claim. Additionally, corrected versions of these claims were filed together with the fax, wherein feature (b) was amended by replacing the word "copolymer" in "ethylene-glycidyl methacrylate-vinyl acetate copolymer" by "terpolymer" (as on page 7, lines 16/17 of the description as originally filed).

VI. In an annex to the summons to oral proceedings to be held on 15 April 2003, the Rapporteur provisionally raised a number of preliminary objections under



Articles 84 and 123(2) EPC and expressed doubts as to inventive step with respect to a document mentioned on page 1, line 12 of the application in suit

D11: US-A-4 454 284

in combination with document D7.

VII. With a letter dated 7 April 2003, the Appellant filed a further main request and four auxiliary requests, each comprising a single claim. In the letter, the Board was informed that the Appellant would not attend the oral proceedings, and a decision was requested on the basis of the amended claims filed therewith and arguments filed therewith or already on file. Thus, it is requested that the decision under appeal be set aside and that a patent be granted on the basis of the new main request or, in the alternative, of one of four new auxiliary requests.

The sole claim of the new main request reads as follows:

"1. A composition consisting of:

- (a) a compatibilizing poly(phenylene ether) resin consisting of the reaction product of a poly(phenylene ether) resin with a compound selected from the group consisting of maleic anhydride, fumaric acid, N-phenylmaleimide, methyl nadic anhydride, acrylic acid, crotonic acid, methacrylic acid, oleic acid, triethylammonium fumarate, tri-n-butylammonium fumarate, citric acid, malic acid, agaricic acid and diaminodiphenylsulfide, optionally in combination with a nonfunctionalised poly(phenylene ether) resin, and

- (b) a copolymer selected from the group consisting of ethylene-glycidyl acrylate copolymers, ethylene-glycidyl methacrylate copolymers, ethylene-glycidyl methacrylate-vinyl acetate copolymers, ethylene-glycidyl methacrylate-methyl acrylate terpolymers, and ethylene-ethyl acrylate-glycidyl methacrylate terpolymers; and optionally
  
- (c) at least one non-epoxy functional polyolefin that is selected from the group consisting of low density polyethylene, linear low density polyethylene, medium density polyethylene, polypropylene, polyethylene copolymers, impact modified polypropylene, polypropylene copolymers, and polyoctenomer."

The claim according to the 1<sup>st</sup> auxiliary request differed therefrom by deletion of the word "optionally" at the end of the paragraph defining component (b).

The sole claims of the 2<sup>nd</sup> and 3<sup>rd</sup> auxiliary requests differed from those according to the main and the 1<sup>st</sup> auxiliary request, respectively, by the deletion of the reference to "diaminodiphenylsulfide" in component (a).

The sole claim of the 4<sup>th</sup> auxiliary request corresponded to the claim according to the 3<sup>rd</sup> auxiliary request except for the end of the definition of component (b), which after the reference to the "ethylene-ethyl acrylate-glycidyl methacrylate terpolymers" read as follows:

", the copolymer containing from 60 to 99.5% by weight of  $\alpha$ -olefin and 0.5 to 40% of a glycidyl ester of an  $\alpha,\beta$ -unsaturated carboxylic acid; and"

VIII. The oral proceedings were held on 16 April 2003 in the absence of the Appellant in accordance with Rule 71(2) EPC.

### Reasons for the Decision

1. The appeal is admissible.

2. *Procedural matters*

2.1 According to the Opinion of the Enlarged Board of Appeals G 4/92 (OJ EPO 1994, 149), a decision against a party, which has been duly summoned but fails to appear at oral proceedings, may not be based on facts put forward for the first time during those oral proceedings (Conclusion 1). However, in the Reasons, point 4, the Enlarged Board also emphasised that, in accordance with Rule 71(2) EPC and in the interests of the proper administration of justice, no party should be able to delay the issue of a decision by failing to appear at the oral proceedings.

2.2 In decision T 341/92 (OJ EPO 1995, 373), the Board was faced with a new main request containing amended claims and with the information that the patent proprietor would not attend the requested oral proceedings. During these oral proceedings, the question of whether the subject-matter of those amended claims complied with Article 123(3) EPC was taken up for the first time by the Board, which came to the conclusion that the main request failed because of violation of the said article. The Board held that the situation differed from that in G 4/92 in that the extension, to which objection had been made, arose solely from a comparison of the wordings of the respective claims according to the granted patent and the main request before the

Board, and therefore not from facts that had only been introduced into the case during oral proceedings. At all events, it was possible to base a decision on a ground discussed for the first time during the oral proceedings which would prevent the patent being maintained as amended, at least if the stage reached in the case was such that the absent - albeit duly summoned - patent proprietor could have expected the question to be discussed and was aware from the proceedings to date of the actual basis on which it would be judged (points 2.3.1 to 2.3.4 of the reasons).

2.3 In accordance with the request of the Appellant in its letter dated 7 April 2003 (see section VII, above) that a decision be made on the basis of the further amended main and 1<sup>st</sup> to 4<sup>th</sup> auxiliary requests filed therewith, and the arguments on file, the oral proceedings were held as scheduled (Rule 71(2) EPC).

2.4 The present situation differs from that in the opposition proceedings underlying the decision referred to above in that the amended claims are to be compared with the wording of the application as originally filed (Article 123(2) EPC). However, it was evident at least from the annex to the summons issued by the Board on 2 December 2002, that at least the question of Article 123(2) EPC would play a role in the oral proceedings (see points 1 and 2 to 2.5 of the annex).

2.5 Consequently, in view of the new wordings of the claims submitted with its letter of 7 April 2003, the Appellant must have expected the above question to be discussed and was to be aware from the proceedings to date of the actual basis on which it would be judged. Hence, the requirements of Article 113(1) EPC are satisfied.

3. Article 123(2) EPC

3.1 Content of the application as originally filed

3.1.1 In the application as originally filed, Claim 1 related to "A composition comprising (A) a poly(phenylene ether) resin comprising a compatibilizing poly(phenylene ether) resin, and (B) an epoxy-functional polyolefin".

3.1.2 Claims 2, 3 and 5 defined three alternatives of the above component (A) so as to comprise a poly(phenylene ether) ("PPE") resin and

(i) a compound having both (i) a carbon-carbon double bond or a carbon-carbon triple bond; and (ii) a carboxylic acid, acid anhydride, acid amide, imido, carboxylic acid ester, epoxy, amino, hydroxyl or carboxylic acid ammonium salt (Claim 2);

(ii) a compound of the formula:  
 $(R^I O)_m R (COR^{II})_n (CONR^{III} R^{IV})_s$ , ie an aliphatic polycarboxylic acid, acid ester or acid amide, with the definitions of the groups R to R<sup>IV</sup> and the indices m, n and s as given in Claim 3, and on page 4, lines 15 to 35;

(iii) a compound containing both (i) an acyl functional group and (ii) a species capable of reacting with an epoxy-functional polyolefin (Claim 5).

According to the description, it was "necessary for at least some of the PPE to be 'compatibilizing PPE'" (page 3, lines 20 to 22).

One way of preparing "an appropriate compatibilizing PPE" was to functionalise PPE by reacting it with at least one compound according to the above group (i). Further compounds useful for preparing "an appropriate compatibilizing PPE" in accordance with the above alternative groups (ii) and (iii) were also to be found in the description (page 3, line 35 to page 6, line 20) and in Claim 4.

In that passage of the description, a still further embodiment concerned

- (iv) an amine-functionalised PPE obtained by means of reactions of an anhydride or epoxy containing PPE with a diamine, or a PPE with an  $\alpha$ -chloro- $\omega$ -aminoalkane or with amine containing disulfides (page 5, lines 7 to 19).

3.1.3 The epoxy-functional polyolefins according to component (B) included copolymers of an  $\alpha$ -olefin with a glycidyl ester of an  $\alpha, \beta$ -unsaturated carboxylic acid, which, preferably, contained "about 60 to about 99.5 % by weight of an  $\alpha$ -olefin and about 0.5 to about 40 % by weight of a glycidyl ester ...". Additionally, a list of suitable copolymers and terpolymers was to be found in the description (page 6, line 21 to page 7, line 1 and page 7, lines 14 to 22).

3.1.4 In the description, mention was also made of a broad variety of further optional components. Thus, on the one hand, polyolefins could be added which were characterised as "non-functionalised" and "non-epoxyfunctional", respectively (see page 7, line 6 and original Claim 7), and, on the other, impact modifiers, flow promoters, non-elastomeric metal salts, reinforcing fillers and fibrous reinforcing materials could additionally be incorporated into the claimed composition (Claims 7 to 9; page 7, lines 1 to 13 and

page 8, line 19 *et seq.*). In the latest versions of the sole claim, the former polyolefin component is denominated as "(c)", and, as in the previous versions of the claims, the latter additives are referred to in this decision as "(d)".

### 3.2 Main request

3.2.1 The latest version of Claim 1 has been amended compared with the original version by the use of the words "consisting of" instead of "comprising" to require the presence of one specific embodiment of each of components (a) and (b) selected from compounds within the scope of the above definitions of components (A) and (B). The wording of this claim allows also the presence of at least one species (c) selected from the list of non-functionalised polyolefins on page 7 (referred to above), but, at the same time, excludes the presence of any other component, irrespective of whether it complies with any one of the above definitions of components (A), (B), (c) or (d) as disclosed in the application as originally filed and contributed to the satisfaction of the need for compatible blends comprising PPE and epoxy-functional polyolefins which were to meet certain requirements (cf. the above sections 3.1.2 to 3.1.4 and application in suit: page 1, line 29 to page 2, line 5).

3.2.2 Thus, the scope of original component (A) has been restricted to the use of a number of "compatibilizing" compounds within the broad scope of the above groups (i), (ii) and (iv) (see section 3.1.2, above). This means, however, that definition (a) in the sole claim refers only to a limited number of species selected from a list of compounds (page 4, lines 3 to 11), four further different compounds (page 4, lines 36 and 37) and one specific sulfide (cf. page 5, line 17). Thus, a number of compounds disclosed in the cited passages was

excluded, *inter alia*: 1,4-phenylene-bis-methylene- $\alpha,\alpha'$ -bismaleimide, maleic hydrazide, fatty oils, as well as unsaturated alcohols and amines, and N,N'-diethyl citric acid amide, all of which were also in compliance with the aims mentioned above. This list of excluded compounds is not exhaustive.

3.2.3 Moreover, reference is made to amine-functionalised PPE prepared according to distinct methods (page 5, lines 8 to 19). However, the application as originally filed did not disclose the use of "diaminodiphenylsulfide" for this purpose. Instead, three different kinds of amine compounds are referred to, which were not taken into account when rewording the claim: ie diamines,  $\alpha$ -chloro- $\omega$ -aminoalkanes and "diaminodiphenyldisulfide", disclosed as an example for "amine containing disulfides" and as used in Example 6 (emphasis added by the Board; see section 3.1.2, above).

3.2.4 The optional component (c) is limited to a selection out of a list of compounds on page 7, lines 6 to 12, excluding "high density polyethylene" and "copolymers of longer chain length olefins".

3.2.5 A distinct disclosure referring to specific compositions which may be said to "consist of" components (a), (b) and, optionally, (c) within the scope of the claim under consideration, and which could therefore serve as a basis for selections of this kind, can only be found in the examples, wherein, in definite amounts, as component (a), one of two types of unmodified PPE, ie "PPE" or "PPE-VV", in combination with PPE either functionalised with 2 % by weight of fumaric acid or 3 % by weight of citric acid or diaminodiphenyldisulfide, was blended with (b) polyethylene-co-12% glycidyl methacrylate ("BONDFAST E") and optionally (c) a "medium impact polypropylene"



("Escorene PD8092"). However, the claim neither contains any corresponding limitation to the constituents of components (a) to (c) in the examples, nor to their respective quantities.

3.2.6 It follows therefrom that, in each of the definitions of components (a) and (c), groups of distinct compounds have been selected from longer lists of compounds and that these selections find no support in the original disclosure. Nor is there any basis to be found in the application as filed as to why certain species contained in the respective lists as originally disclosed have been deleted to create a new pattern of exclusion in the latest version of the claim. Hence, the claim extends beyond the content of the application as filed.

3.2.7 A similar objection arises with respect to component (b) for the following reasons. The original definition of the epoxy-functional polyolefins in (B) has been replaced by a reference to "a copolymer selected from the group consisting of ethylene-glycidyl acrylate copolymers, ethylene-glycidyl methacrylate copolymers, ethylene-glycidyl methacrylate-vinyl acetate copolymers, ethylene-glycidyl methacrylate-methyl acrylate terpolymers, ethylene-ethyl acrylate-glycidyl methacrylate terpolymers". The list of these specific compounds has been taken from page 7, lines 14 to 19, with the exception of the expression "ethylene-glycidyl methacrylate-vinyl acetate copolymers" instead of "terpolymers" (multiple emphasis added by the Board; cf. section V, above).

3.2.8 Furthermore, whilst in the previous version of the claim (dated 24 October 2002), subsequent to a consultation by telephone, the "ethylene-glycidyl methacrylate-vinyl acetate copolymers" had been corrected in handwriting to "terpolymers", as

originally disclosed, the version under consideration refers again to "copolymers" (see sections V and 3.2.7, above).

It is, however, common general knowledge, which formed one basis for the refusal of the application by the Examining Division, that the term "copolymer" concerns polymers of different structures (alternating, random, block and graft copolymers), having the common feature to be derived from more than one monomeric species, as opposed to "bipolymers" which are derived exactly from two monomeric species.

3.2.9 It follows from the above considerations, that the present wording of the claim according to the main request does not comply with the requirements of Article 123(2) EPC.

### 3.3 First auxiliary request

The claim of the 1<sup>st</sup> auxiliary request differs from that of the main request only by the fact that component (c) is mandatory. Therefore, the above findings (see sections 3.2.1 to 3.2.8) are also valid for this request, which must, therefore, also fail.

### 3.4 Second and third auxiliary requests

As these requests differ from the main and 1st auxiliary request, respectively, only by the deletion of the reference to "diaminodiphenylsulfide" from the definition of component (b), the findings set out for these requests, except for that in section 3.2.3, above, are also valid for the claims of the 2<sup>nd</sup> and 3<sup>rd</sup> auxiliary requests.

3.5 Fourth auxiliary request

The claim of this request differs from the claim according to the 3<sup>rd</sup> auxiliary request only by the additional limitation "the copolymer containing from 60 to 99.5 % by weight of  $\alpha$ -olefin and 0.5 to 40 % of a glycidyl ester of an  $\alpha,\beta$ -unsaturated carboxylic acid" in the definition of component (b). On original page 6 (lines 29 to 31), the passage in question referred to "about 60% to about 99.5% by weight of an  $\alpha$ -olefin" (emphasis added). In summary, the above findings in sections 3.2.1, 3.2.2 and 3.2.4 to 3.2.8 are also valid for the claim according to this auxiliary request.

3.6 It follows that none of the claims according to the main request or the 1<sup>st</sup> to 4<sup>th</sup> auxiliary requests complies with the requirements of Article 123(2) EPC.

4. Consequently, neither the main request nor any one of the first to fourth auxiliary requests can be successful.

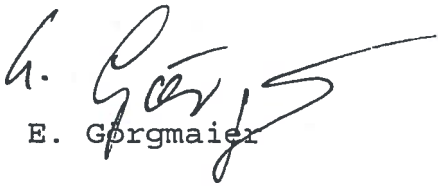
5. In this connection, the fact that all the sets of claims to be considered by the Board at the oral proceedings were defective in respect of a requirement, which is mandatory for consideration by the Board at all stages of the proceedings (ie that of Article 123(2) EPC), meant that there was no basis for reconsideration of the findings and statements concerning novelty and inventive step, as set out in the decision under appeal and in the above Annex to the summons.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

  
E. Gorgmaier

The Chairman:

  
R. Young