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D E C I S I O N
of 11 July 2001

Case Number: T 0688/99 - 3.3.3

Application Number: 91904109.5

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IPC: C08L 71/12

Language of the proceedings: EN

Title of invention:

Polyphenylene ether compositions resistant to environmental stress cracking

Applicant:

General Electrical Company

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 123(2), 54

Keyword:

"Amendments - broadening of claims (yes) (main request)"
"Novelty (no) (auxiliary request)"

Decisions cited:

-

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0688/99 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 11 July 2001

Appellant: General Electric Company
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 12 January 1999
refusing European patent application
No. 91 904 109.5 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: R. Young
Members: A. Däweritz
J. C. De Preter

Summary of Facts and Submissions

I. European patent application No. 91 904 109.5, based on International application No. PCT/US91/00468, filed on 23 January 1991, published under No. WO-A-92/13035 (EP-A-0 521 864) on 6 August 1992, was refused by a decision of the Examining Division, issued in writing on 12 January 1999, for lack of novelty of Claims 1 to 6 and 8 over the disclosure of

D2: FR-A-2 153 409 (referred to as 72.33636).

II. The decision was based on a set of 11 claims submitted with a letter dated 26 June 1998.

Claim 1 read as follows:

"1. A thermoplastic resin blend for molding articles with resistance to environmental stress cracking and having improved melt flow properties, which comprises, in homogeneous admixture

(a) from 5 to 95 weight percent of a polyphenylene ether resin or mixture of polyphenylene ether resins having an average intrinsic viscosity below 0.4 dl/g as measured in chloroform at 25°C; and

(b) from 95 to 5 weight percent of a polystyrene resin or mixture of polystyrene resins having an average intrinsic viscosity of at least 0.97 dl/g as measured in chloroform at 25°C, the polystyrene component being in whole or in part a rubber-modified polystyrene."

Dependent Claims 2 to 11 related to preferred embodiments of the above blend.

In substance, the Examining Division held that the criteria for the novelty of a selection invention were not fulfilled, because the viscosity range for the polyphenylene ether (PPE) was open ended and therefore not narrow, and the lower end point of the viscosity range for PPE disclosed in D2 (corresponding to a degree of polymerisation of 50) complied with the claimed range. Moreover, there was no evidence on file that a composition comprising high impact polystyrene (HIPS) and PPE having a viscosity below 0.4 dl/g was better than a composition made of such components having a viscosity above that limit.

In addition to the above reason for refusal of the application in suit, a remark was made by the Examining Division on the wording of Claim 9 with respect to the requirements of Article 123(2) EPC. It was emphasised that this point was not a ground for the refusal. Further, the Examining Division gave some comments on the question of inventive step.

III. On 25 February 1999, a Notice of Appeal against the above decision was lodged by the Appellant (Applicant). The prescribed fee was paid on the same date.

In the Statement of Grounds of Appeal, submitted on 14 May 1999, the Appellant requested that the above decision be set aside and that a patent be granted on new Claims 1 to 3 submitted therewith (new page 18) and Claims 4 to 11 as referred to above. The new claims differed from the set of claims on which the refusal was based in that in Claim 1 the average intrinsic viscosity (I.V.) of the PPE component (a) had been limited to "from 0.1 to less than 0.4 dl/g".

In respect of these claims the Appellant argued essentially as follows:

- (i) The viscosity range of the PPE was no longer open ended and narrow as compared to the known viscosity range of PPE. The selection was not arbitrary but purposive in view of the examples and the description of the application (page 6, line 29 to page 7, line 1).
- (ii) D2 required at least 50 repeating units in its PPE, i.e. an I.V. of less than 0.4 dl/g, but without any upper limit. In its examples, the PPE had an I.V. of 0.46 dl/g which strongly suggested that PPE having a higher degree of polymerisation and a higher I.V. was preferred.
- (iii) Although the I.V. ranges might be partially overlapping, if accepting the interpretation of D2 by the Examining Division, this fact should not disqualify the invention from being considered a selection invention over D2.
- (iv) The composition of Example 3 was much better than that of Example 5 (based on a PPE with an I.V. of more than 0.4 dl/g) in terms of average time of crack, flexural modulus and flow channel range.

IV. In a communication annexed to a summons to oral proceedings, the following provisional view of the case was expressed.

(i) First, a number of objections under Articles 84 and 123(2) EPC were raised, in particular:

1. The minimum I.V. value of the polystyrene (PS) component (b) of at least 0.97 dl/g as required in the claims appeared to contravene Article 123(2) EPC.
2. The amended wording of the claims appeared to be inconsistent with the description on page 7, lines 1 to 14.

(ii) Secondly, doubts were expressed with respect to patentability, in particular with respect to novelty which appeared to be taken away by the combination of the polymerisation degree of 50, explicitly disclosed in D2 (or US-A-3 819 761, D2a), and the other features in its Claim 1, because an overlap of the I.V. ranges of the application with D2 seemed to be confirmed by examples 8, 11 and 14 of

D1: DE-A-2 222 230 (or GB-A-1 393 728, D1a)

when taking into account the statement on page 8, lines 12 to 18 of D1 (page 3, lines 62 to 70 of D1a).

V. By letter dated 31 May 2001, a new main request and a new auxiliary request were submitted together with further arguments.

(i) Claim 1 of the main request reads as follows:

"1. A thermoplastic resin blend for molding articles with resistance to environmental stress cracking and having improved melt flow properties, which comprises, in homogeneous admixture

(a) from 5 to 95 weight percent of a polyphenylene ether resin or mixture of polyphenylene ether resins having an average intrinsic viscosity from 0.1 dl/g to less than 0.4 dl/g as measured in chloroform at 25°C; and

(b) from 95 to 5 weight percent of a polystyrene resin or mixture of polystyrene resins having an average intrinsic viscosity of at least 0.85 dl/g as measured in chloroform at 25°C, the polystyrene component being in whole or in part a rubber-modified polystyrene."

In the auxiliary request, Claim 1 reads:

"1. A thermoplastic resin blend for molding articles with resistance to environmental stress cracking and having improved melt flow properties, which comprises, in homogeneous admixture

(a) from 5 to 95 weight percent of a polyphenylene ether resin or mixture of two polyphenylene ether resins having an average intrinsic viscosity from 0.1 dl/g to less than 0.4 dl/g as measured in chloroform at 25°C; and

(b) from 95 to 5 weight percent of a polystyrene resin or mixture of polystyrene resins having an average intrinsic viscosity of at least 0.90 dl/g as measured in chloroform at 25°C, the polystyrene component comprising a rubber-modified polystyrene."

In both requests, dependent Claims 2 to 11 related to preferred embodiments of the blend of Claim 1.

(ii) In particular, the Appellant argued that a person skilled in the art would understand that it was not essential that the mixture be restricted to two PPE grades or batches.

D2 required the polystyrene to have an I.V. of greater than 1 dl/g. Contrary thereto, the improved properties could be obtained using a polystyrene having an average I.V. of at least 0.85 or 0.90 dl/g. The lower level of the I.V. of PPE used in D2 was higher than that in the present application.

- VI. By letter of 3 July 2001, the Appellant informed the Board that it would not attend the scheduled oral proceedings on 11 July 2001 and that it requested a decision based on the arguments put forward in the written proceedings.
- VII. The oral proceedings were held on 11 July 2001 in the absence of the Appellant in accordance with Rule 71(2) EPC.
- VIII. In its submissions, the Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 11 of the main request or, alternatively, of the auxiliary request.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. *Article 123(2) EPC*

- 2.1 The definition of component (a) in Claim 1 has been amended to relate not only to a PPE resin (as in originally filed Claim 1) but also to a "mixture of polyphenylene ether resins". The only basis relating to mixtures of PPE resins is found on page 7, lines 4 to 6 and in Examples 2 to 4, 8 and 9.

On page 7, the mixture is limited *expressis verbis* to "two PPE grades or batches". The same is true for all the examples mentioned as disclosed in the tables on pages 14 and 16.

The amended Claim 1 does no longer require a PPE resin or a mixture of two PPE grades or batches to be present as component (a), but it includes the additional information that mixtures of any number of any PPE resins can be used with the only limitation in regard to the average I.V..

- 2.2 An amendment is regarded as introducing subject-matter which extends beyond the content of the application as filed, and therefore unallowable, if the overall change in the content of the application results in the skilled person being presented with information which is not directly and unambiguously derivable from that previously presented by the application, even when account is taken of matter which is implicit to a person skilled in the art.

It follows that Claim 1 does not comply with Article 123(2) EPC.

- 2.3 Since a decision can only be made on a request as a whole, the main request must fail for this reason.

Auxiliary request

3. *Article 123(2) EPC*

The wording of Claim 1 is based on the following parts and passages of the application as originally filed: Claim 1; page 3, lines 32 and 33 (measuring conditions); page 6, line 29 to page 7, line 1 (I.V. of PPE); page 7, lines 5 and 6 (mixture of two PPE resins); page 9, lines 20 to 22 (presence of rubber-modified polystyrene) and page 10, line 7 (I.V. of the polystyrene).

No objections arise with respect to the amendments in the dependent claims which need not be investigated further in this decision.

The Board is satisfied that the claims meet the requirements of Article 123(2) EPC.

4. *Article 84 EPC*

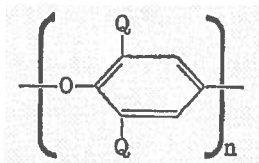
In view of the amendments in Claim 1, the Board is satisfied that the requirements of Article 84 EPC are complied with by this claim.

5. *Novelty*

In the Decision under appeal, the Examining Division ruled that the subject-matter of Claims 1 to 6 and 8 was anticipated by D2.

5.1 Claim 15 of the document relates to a thermoplastic composition having a high impact resistance (cf. Claims 1 and 13 to 15) which comprises

(a) a polyphenylene ether the recurring structural units of which correspond to the formula



wherein each Q is methyl, and which has a degree of polymerisation n of at least 50;

(b) a rubber modified polystyrene, wherein the polystyrene matrix has a viscosity of at least 1.0 dl/g, measured in chloroform at 30°C.

According to page 6, lines 1 to 9, these compositions are highly resistant to aggressive solvents as well (cf. D2a: column 3, lines 64 to 70).

5.2 Other than in Claim 13 of D2, wherein the PPE is defined in terms of a minimum degree of polymerisation of 50, the PPE is defined, in the application in suit, in terms of an intrinsic viscosity of from 0.1 to less than 0.4 dl/g, measured at 25°C in chloroform. These facts give rise to the question whether the PPE of D2 having a polymerisation degree of 50 complies with the limits in Claim 1 under consideration. The Appellant repeatedly argued that the I.V. of the PPE in the examples of D2 was 0.46 dl/g, i.e. outside the range in Claim 1, which statement is not confirmed by D2.

5.2.1 The Examining Division had repeatedly referred to the PPE in Example 18 of D1 to demonstrate that powdery oligo-(2,6-dimethylphenylene-1,4-oxide) having a polym-

erisation degree of 51 showed a specific viscosity of 0.21, i.e. below 0.4 dl/g. The Appellant disputed this statement based on the argument that in D1 the viscosity did not refer to intrinsic viscosity but to η_{sp}/c .

Although this is true, these viscosity values η_{sp}/c correspond almost equally, i.e. without substantial errors, to the intrinsic viscosity (cf. D1: page 8, paragraph 2; D1a: page 3, lines 48 to 70). In view of this fact and the measuring conditions in D1 (25°C in chloroform; page 7, lines 1 to 4 below the formula), which are the same as in the application, further PPE resins disclosed in Examples 5, 8, 11 and 14 of the document confirm the finding that polymerisation degrees of 54, 52, 54 and 47 correspond to intrinsic viscosities in the range of approximately 0.2 dl/g (i.e. η_{sp}/c values of from 0.20 to 0.29), whereas (2,6-dimethylphenylene-1,4-oxide) oligomers and polymers having polymerisation degrees of 32 and 160 correspond to η_{sp}/c values of 0.14 and 0.50, respectively (Examples 1 and 5).

It should be noted that dimethylphenol has a molecular weight of 122,17 and that a polymerisation degree of 100 equals a molecular weight of at least 12 000 (D1: page 3, lines 1 to 4), which also means that a polymerisation degree of 50 equals to a molecular weight of about 6000.

These values are consistent with the statement in the application: number average molecular weights within the range of 3000 to 40 000 correspond to intrinsic viscosities in the range of 0.1 to 0.7 dl/g (page 6, lines 25 to 32) and footnote 1 on page 16: I.V. = 0.46 corresponding to a molecular weight of about 20 000.

- 5.2.2 In view of these findings, the question raised in point 5.2 has to be answered in the affirmative, and Claim 1 of the auxiliary question does not provide any further feature which could delimit its PPE or mixture of PPE resins from the corresponding component (a) in D2.
- 5.3 The polystyrene component (b) of D2 relates to rubber modified polystyrene having an intrinsic viscosity of at least 1.0 dl/g, measured in chloroform at 30°C. The chemical composition of this component is further explained to include rubber and e.g. homo- and copolymers of styrene, chlorostyrene and α -methylstyrene (D2: page 10, line 14 to page 13, line 36).
- 5.3.1 As in Claim 1 of the application in suit, a mixture of different polystyrene components may be mixed together in D2 to obtain any desired rubber content and a matrix intrinsic viscosity of at least 1.0, preferably from about 1.0 to 1.5 dl/g, measured in chloroform at 30°C (D2: page 13, lines 19 to 28; D2a: column 7, lines 49 to 57). A number of rubbers are mentioned on page 11, lines 25, 26 and 30 which correspond to those mentioned on page 9, line 20 *et seq.* of the application in suit.
- 5.3.2 Hence, the styrene components (a) of D2 and of the application in suit cannot be distinguished from each other with respect to their constituents.
- 5.3.3 Moreover, taking into account the Staudinger equation $[\eta] = KM^a$ (D2: page 3, lines 30 to 35; D2a: column 2, lines 48 to 55), it is clear that the polymerisation degrees of the polystyrene component in D2 also meet the definitions in Claim 1 of the application in suit, as will be demonstrated below:

Thus, two polystyrenes PRX-1004 and PRX-1005 having I.V.s of 1.07 and 1.22 are referred to on page 14, lines 28 to 32 of D2 (D2a: column 8, lines 15 to 19). These intrinsic viscosities correspond to \bar{M}_n values of 96 800 and 80 200 and \bar{M}_w values of 382 000 and 489 000 (see Footnotes ** in Examples 1 and 2), respectively. These polymers have higher polymerisation degrees than those polystyrenes referred to in Footnote 6 on page 14 of the application in suit, according to which an I.V. of 0.9 of such polystyrene corresponds to \bar{M}_n and \bar{M}_w values of about 71 700 and 200 000, respectively, or the polystyrene in Footnote 5 having an I.V. of 1.1 dl/g and average molecular weights \bar{M}_n of about 114 600 and \bar{M}_w of about 294 500.

It has to be concluded therefrom that the difference in the measuring conditions of the I.V. of component (b) (D2: "d'au moins 1,0 décilitre par gramme mesurée dans du chloroforme à 30°C" or D2a: "at least 1.0 deciliters/ gram, measured in chloroform at 30°C"; application in suit: "at least 0.90 dl/g as measured in chloroform at 25°C") does not amount to a distinguishing feature of the polystyrene component either, but that the I.V. of the polystyrene component as defined in D2 meets the requirement of at least 0.9 dl/g, measured in chloroform at 25°C. In any case, the Appellant has not provided any facts to the contrary of this finding, but the last paragraph in its letter dated 31 May 2001 rather indicates that it concedes identity of the polystyrenes in D2 and the application.

- 5.4 In D2, PPE and polystyrene are each preferably used in amounts of 20 to 80 % by weight, on a rubber-free basis; the rubber phase preferably makes up 0.1 to 30 % by weight of the total composition, with 4 to 20 % by weight being preferred; 6 to 12 % by weight being preferred even more (page 14, line 34 to page 15, line 33; D2a: column 8, line 20 to 54).

In the application in suit, each of components (a) and (b) makes up 5 to 95 % by weight, wherein component (b) is in whole or in part a rubber-modified polystyrene. The rubber constitutes about 4 to about 30 % by weight of component (b) (page 9, lines 29 to 32).

It follows that the amount of polystyrene, on a rubber-free basis, may vary from 3.5 to 91.2 % by weight of the total composition of (a) and (b), which means that the percentages of components (a) and (b) as defined in Claim 1 under consideration are anticipated by the ranges of PPE and polystyrene disclosed in D2, as well.

6. Consequently, the subject-matter of Claim 1 is not novel over the disclosure of D2 (Article 54(1) and (2) EPC).
7. Hence, the auxiliary request must fail as well.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:


E. Görgmaier

The Chairman:


R. Young