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D E C I S I O N
of 5 October 2000

Case Number: T 0258/98 - 3.3.3

Application Number: 91120142.4

Publication Number: 0491191

IPC: C08L 71/12

Language of the proceedings: EN

Title of invention:
Blends of polyphenylene ether resin mixtures and a polyetherimide siloxane copolymer

Applicant:
GENERAL ELECTRIC COMPANY

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - obvious combination of known features"

Decisions cited:
-

Catchword:
-

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Case Number: T 0258/98 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 5 October 2000

Appellant: GENERAL ELECTRIC COMPANY
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 9 October 1997 refusing European patent application No. 91 120 142.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: C. Gérardin
Members: B. ter Laan
A. Lindqvist

Summary of Facts and Submissions

I. The European patent application No. 91 120 142.4, filed on 26 November 1991, claiming the priority of 19 December 1990 of an earlier application in the United States of America (US 629960) and published under No. 0 491 191 on 24 June 1992 (Bulletin 92/26), was refused by a decision of the Examining Division issued in writing on 9 October 1997.

The decision was based on a single set of 16 claims filed on 26 October 1995, of which Claim 1 reads as follows:

"1. A blend composition, comprising, based on the total amount of (a) and (b)

(a) from 50 to 99 weight percent of a mixture of polyphenylene ether resins, wherein the mixture of polyphenylene ether resins includes from 5 to 95 weight percent of a first polyphenylene ether resin having an intrinsic viscosity of not less than about 0.40 dl/g and from 95 to 5 weight percent of a second polyphenylene ether resin having an intrinsic viscosity of not greater than about 0.30 dl/g, based on the first and second polyphenylene ether resins; and

(b) from 1 to 50 weight percent a polyetherimide siloxane copolymer."

Claims 2 to 16 are dependent claims directed to preferred embodiments of the blend compositions as defined in Claim 1. In particular, Claim 10 is drafted as follows:

"10. A blend composition as defined by any preceding claim, comprising from 50 to 99 weight percent of the

mixture of polyphenylene ether resins, from 1 to 50 weight percent of a rubber component, and from 0.1 to 10 weight percent of the copolyetherimide siloxane copolymer, based on said three components, wherein the rubber component is selected from the group consisting of (i) polyalkenylene polymers and (ii) block copolymers of a vinyl aromatic hydrocarbon and/or alkene or posthydrogenated diene compound."

II. The reasons for the decision were lack of novelty of the blend compositions as defined in Claims 1 to 9 and 16 with respect to the teaching of EP-A-290 806 (hereinafter D2) and lack of inventive step of the blend compositions as defined in Claims 10 to 15 with respect to the teaching of D2 combined in particular with the disclosure of EP-A-401 690 (hereinafter D1).

(i) It was first stated that the wording of the claims as amended complied with the requirements of Article 123(2) EPC.

(ii) Regarding the issue of novelty, D2 disclosed blends of polyphenylene either having the required intrinsic viscosity values and polyetherimide siloxane copolymer in the required weight ratio. The fact that the blends according to the application comprised two polyphenylene ether polymers of different intrinsic viscosity could not be regarded as a difference, since it was not possible to distinguish whether the blends had been obtained from one such polymer only or from a mixture of two of them.

(iii) As to the question of inventive step, it had not been demonstrated that the addition of a rubber

component as an impact modifier led to an unexpected effect, so that the technical problem reduced to a mere alternative. The latter, however, was obvious since D1 taught to improve the impact properties of polyphenylene ether compositions by adding block copolymers having an elastomer segment.

III. On 4 December 1997 a Notice of Appeal against that decision was lodged by the Appellant (Applicant) together with payment of the prescribed fees. The arguments submitted in the Statement of Grounds of Appeal filed on 19 February 1998 and during oral proceedings held on 5 October 2000 can be summarized as follows:

(i) It was possible to distinguish between blends obtained from a single polyphenylene ether polymer and blends obtained from a mixture of polyphenylene ether polymers. This clearly appeared from a comparison of the experimental data in Example 1D with Example 2G in the application in suit.

(ii) By using a bimodal composition it was possible to achieve better flow properties, normally associated with low molecular weight materials, combined with better impact and heat distortion temperature properties, normally associated with high molecular weight materials.

IV. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 16 filed on 26 October 1995.

Reasons for the Decision

1. The appeal is admissible.

Procedural matter

2. As it appears from the wording of the claims considered by the Examining Division (cf. point I above) and the reasons for the decision (cf. point II above), the grounds for the refusal of the application were based on objections of (1) lack of novelty of the binary blends comprising (a) a mixture of polyphenylene ether resins and (b) a polyetherimide siloxane copolymer, as defined in Claims 1 to 9 and 16, and (2) lack of inventive step of the ternary blends comprising (a) a mixture of polyphenylene ether resins, (b) a polyetherimide siloxane copolymer and (c) a rubber component, as defined in Claims 10 to 15. Although the specific issue of the inventive step of the binary blends was not dealt with in the impugned decision on the ground that "Since claims 1-9 and 16 lack novelty the question of inventive step only arises for claims 10 to 15", it is clear that the question had been discussed in the course of the examination proceedings. This appears from the communication of 27 June 1995, which contained a full reasoning of that issue based successively on D2 and D1 as representing the closest state of the art (cf. points 6.2 and 6.3); this also appears from the Statement of Grounds of Appeal which contained arguments supporting the inventiveness of the binary blends and further referred to the comments of 24 October 1995 concerning the substantive issues.

In its introductory statement during oral proceedings the Board pointed out that the rubber component in the ternary blends was nothing more than an optional ingredient, which was also present as such in the compositions of D1 to be considered for the assessment of inventive step. Consequently, as further explained by the Board, the inventiveness of the binary blends would not call for any argument not already considered when dealing with the ternary blends, so that there was no obstacle to a simultaneous discussion of the issue of inventive step of both compositions. This was not disputed by the Appellant.

Wording of the claims

3. The Board concurs with the Examining Division that the wording of the amended claims is adequately supported by the application as originally filed. It is therefore not necessary to consider the matter in further detail.

Novelty

4. Document D2 describes polymer blends comprising a polyphenylene ether resin and 1 to 40% by weight of a siloxane polyetherimide copolymer (Claims 1 and 18). The intrinsic viscosity of the polyphenylene ether is greater than 0.1 dl/g and preferably ranges from 0.4 to 0.6 dl/g (page 3, lines 3 to 5). There is no explicit disclosure or teaching of using a mixture of two polyphenylene ether polymers, let alone a mixture of such polymers having the intrinsic viscosities set out in Claim 1 of the application in suit.

4.1 The question which arises, however, is whether a blend composition obtained from a mixture of two

polyphenylene ether polymer as defined in the application in suit can be distinguished from a blend composition obtained from a single polyphenylene ether polymer, in other words whether the latter composition could represent an implicit disclosure of the claimed subject-matter.

4.2 As argued and demonstrated by the Appellant on the basis of experimental data, this cannot be the case.

First, the determination of the molecular weight distribution of a polyphenylene ether component, which can be suitably carried out by gel permeation chromatography, would reveal a bimodal or a monomodal distribution depending on the number of polyphenylene ether polymers (cf. reply of 30 April 1996, page 1, paragraph 2).

Secondly, the comparison of the experimental data referring to composition 1D, Table I and composition 2G, Table II in the application in suit, which are comparative compositions consisting respectively of a single polyphenylene ether resin having an intrinsic viscosity of 0.40 dl/g and a mixture of two polyphenylene ether resins having intrinsic viscosities of 0.40 and 0.26 dl/g, shows that these compositions differ substantially in their flame retardancy performance as well as in their processability (cf. Statement of Grounds of Appeal, page 2, first full paragraph).

Thirdly, in the same respect, the experimental results in Table 3 of the application in suit clearly show that, other compositional features being equal, compositions based on a mixture of two polyphenylene

ether resins having different intrinsic viscosities (cf. compositions 3A to 3F) exhibit not only improved processability, but also improved mechanical properties over compositions based on a single polyphenylene ether resin (cf. compositions 3G to 3I).

4.3 It is thus evident that a clear distinction between the claimed subject-matter and the prior art compositions can be established by means of simple experiments, for instance by determining the molecular weight distribution or by carrying out the specific tests required for the measurement of the properties reported in Tables I to III of the application in suit. It follows that the prior art compositions cannot be equated with the blend compositions according to Claim 1 and that, consequently, there can be no question of implicit disclosure.

4.4 For these reasons the requirement of novelty must be regarded as satisfied.

Problem and solution

5. The application in suit concerns blends of polyphenylene ether resin mixtures and a polyetherimide siloxane copolymer.

5.1 Blends of a polyphenylene ether and polyetherimide siloxane copolymer are disclosed in D2 which the Board, like the Examining Division, regards as representing the closest state of the art. As mentioned above (cf. point 4), the blends disclosed in that citation comprise a single polyphenylene ether resin and a property-improving amount of a polyetherimide siloxane copolymer (cf. Claim 1). In practice 1 to 40% by weight

are added to confer, in addition to the advantageous physical and electrical properties which polyphenylene ether resins inherently possess, a very low flammability (cf. page 2, lines 4 to 10; page 8, lines 30 to 33 and lines 41 to 45; page 10, Table 1, last two columns). As explained in the introduction of the application in suit (cf. original page 1, line 1 to page 3, line 15), in order to further increase the fields of application of these polymer compositions it would be desirable to combine the above combination of properties with an improved processability.

5.2 In accordance with this statement the technical problem underlying the application in suit may thus be seen in the provision of polyphenylene ether resin compositions which exhibit a combination of good flame retardancy and processability.

5.3 According to the application in suit this problem is solved by using a polyphenylene ether resin component in the form of a mixture of a first polyphenylene ether resin having an intrinsic viscosity of at least 0.40 dl/g and a second polyphenylene ether resin having an intrinsic viscosity of at most 0.30 dl/g, as specified in Claim 1.

5.4 When the blends are deemed to also exhibit enhanced impact properties, they further include an impact improving amount of a rubber component.

5.5 The experimental results in the application in suit show (i) that the binary blends according to Claims 1 to 9 and 16 exhibit improved properties of flame retardancy and processability, as indicated by the UL 94 ratings and the melt viscosity, respectively, and

(ii) that the ternary blends according to Claims 10 to 15 additionally possess improved impact resistance, as measured by the Izod impact strength, Dynatup strength and tensile properties.

Obviousness

6. As stated above, D2 teaches that the addition of a polyetherimide siloxane copolymer to a polyphenylene ether resin improves the flame resistance, processability and certain physical properties thereof. Although D2 contains no additional information pointing at compositions within the terms of the application in suit, the above solution must nevertheless be regarded as obvious in view of the teaching of D1.

6.1 This document describes polyphenylene ether-based compositions suitable for a wide range of processing techniques which comprise (a) a polyphenylene ether resin having an intrinsic viscosity of at least 0.38 dl/g, and (b) a polyphenylene ether resin having an intrinsic viscosity no greater than 0.33 dl/g, each of said viscosities being measured in a chloroform solution at 25°C (cf. Claim 1 in conjunction with page 2, lines 1/2). The use of these blends results in a level of increased melt flow which is much greater than one would predict from the calculated melt flow for a single polyphenylene ether resin having an intrinsic viscosity which would be the average of that of two such polyphenylene ether resins. This in turn improves the processability of the compositions without affecting the desirable physical properties of the resins and, more generally, of compositions containing high amounts of these resins (cf. page 2, lines 1 to 9 and lines 32 to 38).

6.2 The impact strength of the compositions may further be enhanced by the addition of 1 to 10 percent by weight of natural or synthetic rubber materials (cf. page 3, lines 43 to page 4, line 10; Examples 1 to 4, Samples 3, 6, 9 and 12), in particular styrene/butadiene block copolymers containing an optionally hydrogenated center block of polybutadiene.

6.3 In the Board's view, this teaching provides a strong incentive for a skilled person to combine the compositional features of D2 and D1 in order to obtain the combination of properties in accordance with the definition of the technical problem (cf. point 5.2 above). The minor differences in the limits of intrinsic viscosity of the polyphenylene ether resins and in the upper limit of the amount of polyetherimide siloxane copolymer cannot be regarded as significant in view of the large overlap of the respective ranges.

6.4 For these reasons, the blend compositions according to Claims 1 and 10 must be regarded as arising in an obvious manner from the prior art and, therefore, do not involve an inventive step.

6.5 The same conclusion applies to the subject-matter of the other dependent Claims 2 to 9 and 11 to 15, which are directed to preferred blend compositions and must fall with Claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier C. Gérardin