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**Datasheet for the decision
of 25 June 2007**

Case Number: T 0261/03 - 3.3.03

Application Number: 94304195.4

Publication Number: 0630938

IPC: C08K 5/521

Language of the proceedings: EN

Title of invention:

A flame resistant resin composition

Patentee:

GE PLASTICS JAPAN LIMITED

Opponent:

DEMI Vertriebs- und Beteiligungsgesellschaft mbH

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 83, 84, 123(2), 123(3)

Keyword:

"Extension of subject-matter (no)"

"Clarity (yes)"

"Inventive step (yes)"

Decisions cited:

G 0009/91, T 0201/83, T 0989/93

Catchword:

-



Case Number: T 0261/03 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 25 June 2007

Appellant: DEMI Vertriebs- und Beteiligungsgesellschaft mbH
(Opponent) Kajen 2
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Representative: Patentanwälte
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Respondent: GE PLASITCS JAPAN LIMITED
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Representative: Grever, Frederik
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office dated
16 October 2002 and posted 2 December 2002
concerning maintenance of the European
No. 0630938 in amended form.

Composition of the Board:

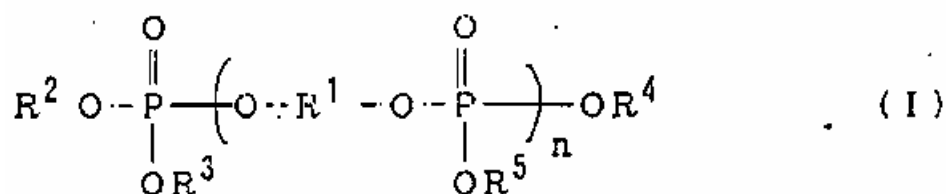
Chairman: R. Young
Members: C. Idez
R. Moufang

Summary of Facts and Submissions

I. The grant of the European patent No. 0 630 938 in the name of GE Plastics Japan Limited, in respect of European patent application No. 94 304 195.4 filed on 10 June 1994 and claiming priority of the Japanese patent application JP 17754193 filed on 25 June 1993 was announced on 1 September 1999 (Bulletin 1999/35) on the basis of 2 claims.

Claims 1 and 2 read as follows:

"1. A resin composition containing (A) 100 parts by weight of a polyphenylene ether resin or a polyphenylene ether resin and a vinyl aromatic hydrocarbon resin; and (B) 0.1-40 parts by weight of an organophosphorus compound of formula I containing 50 ppm by weight or less magnesium as an impurity



where R¹-R⁵ are each selected from the group consisting of C₂₋₁₂ aliphatic hydrocarbon residues, C₆₋₁₄ aryl groups, alkyl-substituted aryl groups, aralkyl groups, and corresponding divalent residues, or any of the above groups substituted with a halogen atom, a hydroxy group, an aryl group, or a halogenated aryl group; R¹ when present in a plurality may be the same or different; two from among R¹-R⁵ may bond together to form a ring;

R¹-R⁵ may be substituted with groups possessing a carbon-carbon unsaturated double bond or triple bond; at least one of R¹-R⁵ possesses an aromatic residue; and n is an integer from 1 to 30.

2. A blow molding resin composition according to Claim 1."

II. A Notice of Opposition was filed against the patent by BASF AG on 26 May 2000 in which revocation of the patent on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC) was requested.

These following documents have been *inter alia* cited during the opposition proceedings.

D1: GB-A-2 043 083;

D3: EP-A-0 501 162

D4: EP-A-0 521 628;

D5a JP-A-57-207641;

D5b: English translation of the main claim and listing of the components of D5a;

D5c: Derwent abstract of D5a;

D5d: English translation of Example 3 of D5a;

D6: Houben-Weyl, Methoden der Organischen Chemie, Volume XII/2, 1964, pages 321-325;

D9: Declaration of Dr. Blundell dated 26.5.2000; and

D10: Information sheet Fyrolflex® RDP; dated 1 Nov 98.

III. By a decision announced orally on 16 October 2002 and issued in writing on 2 December 2002, the Opposition Division decided that the grounds of opposition raised by the Opponent did not prejudice the maintenance of the patent in amended form.

The decision of the Opposition Division was based on a set of Claims 1 to 2 as submitted at the oral proceedings as main request.

Claim 1 of the main request differed from Claim 1 as granted in that the expression "containing 50 ppm by weight or less magnesium as an impurity" had been replaced by the expression "containing magnesium as an impurity in the amount of 50 ppm by weight or less". Claim 2 corresponded to Claim 2 as granted.

According to the decision, the main request met the requirements of Article 123 EPC, since the amendments made in the new claims were supported by page 3, lines 5 to 6 of the patent in suit and by page 3, lines 31 to 32 of the application as filed.

The subject-matter of the main request was considered as novel over D1 and D5, which disclosed all elements of Claim 1 except the magnesium content of the organophosphorus compound.

According to the decision, D1 or D5 read in combination with document D6 made available compositions in which the phosphate additive did not contain magnesium but there was no explicit or implicit disclosure in these documents of compositions in which the amount of magnesium was limited to below 50 ppm. These documents could not also be combined with any later published documents or with the statements made in D9.

Concerning inventive step, document D1 was considered as the closest state of the art. Starting from D1 the technical problem to be solved was seen in the preparation of compositions based on the teaching of D1, which can be processed into articles having a

satisfactory surface. According to the decision, nothing in the documents cited or in the general knowledge of the skilled worker suggested that the discoloration was related to the presence of residual magnesium in the phosphorus compound. The Opposition Division considered the arguments of the Opponent that a skilled person would link the surface discoloration with catalyst residues in the phosphate and that it would be led to minimise the amount of catalyst residue, as being based on hindsight. According to the decision, even if the link with magnesium would have been found, this would not have necessarily led to the idea of reducing the magnesium content, since document D4 also disclosed phosphates which were entirely free from magnesium.

The Opposition Division did not also accept the further argument of the Opponent that the skilled person putting the teaching of D1 into practice would use the product Fyrolflex® which was commercially available in 1993, and which, according to the Opponent, contained 5 ppm of magnesium, since there was no evidence that there was a quasi "one-way-street" situation and that the magnesium content of Fyrolflex® was below 50 ppm prior to the priority date of the patent in suit.

- IV. By a letter received at the EPO on 17 January 2003, ROMIRA GmbH informed the EPO that in view of a transfer of business from BASF AG to DEMI Vertriebs- und Beteiligungsgesellschaft mbH (in the following "DEMI") the status of opponent in the opposition proceedings concerning the European patent No. 0 630 938 had changed to DEMI.

V. A Notice of Appeal was filed on 7 February 2003 by DEMI (Appellant) with simultaneous payment of the prescribed fee.

In the Statement of Grounds of Appeal filed on 9 April 2003, the Appellant argued essentially as follows:

(i) In granted Claim 1, the organophosphorus compound was defined as "containing 50 ppm by weight or less magnesium as an impurity."

(ii) In amended Claim 1, the organophosphorus compound was defined as "containing magnesium as an impurity in the amount of 50 ppm by weight or less".

(iii) According to the decision of the Opposition Division this second expression would exclude compositions in which the organophosphorus compound were free of magnesium and would restore the novelty over D1 and D5.

(iv) The second expression however still encompassed the case where no magnesium was present.

(v) If one would follow the argumentation of the Opposition Division, this would imply that the scope of protection would vary with the improvement of the analytical techniques.

(vi) Such uncertainty would be contrary to Article 84 EPC.

(vii) Furthermore, the formulation of Claim 1 excluding the case where magnesium was missing represented an unallowable extension (Article 123(2) EPC).

VI. With its letter dated 12 June 2003, the Appellant submitted experimental results in order to show that the claimed magnesium content had no influence on the colour stability or on the bleeding of articles molded from PPE compositions. It also submitted the following document:

D15: Fundamentals of Colorimetry.

VII. With its letter dated 15 August 2003, the Respondent (Patent Proprietor) contested the admissibility of the appeal filed by DEMI.

VIII. By an interlocutory decision dated 24 November 2005, the Board decided that the appeal filed by DEMI was admissible.

IX. In a communication of the Board issued on 26 September 2006 and annexed to the summons to oral proceedings scheduled to take place on 24 January 2007, the attention of the Parties was drawn to issues concerning the allowability of Claim 1 of the main request under Article 123(2) EPC, the clarity of Claim 1 of the main request and the interpretation of the claims in view of the limitation of the magnesium content in the organophosphorus component of the claimed composition.

X. With its letter dated 21 December 2006 the Respondent submitted a first, a second and a third auxiliary requests.

The first auxiliary request corresponded to the claims as granted.

Claim 1 of the second auxiliary request read as follows:

"A resin composition containing (A) 100 parts by weight of a polyphenylene ether resin or a polyphenylene ether resin and a vinyl aromatic hydrocarbon resin; and (B) 0.1 to 40 parts by weight of tetraphenyl resorcine bisphosphate containing 2 to 50 ppm by weight of magnesium as impurity."

Claim 2 was directed to a blow molding resin composition according to Claim 1.

Claim 1 of the third auxiliary request read as follows:

"A resin composition consisting essentially of (A) 100 parts by weight of a polyphenylene ether resin or a polyphenylene ether resin and a vinyl aromatic hydrocarbon resins; and (B) 0.1 to 40 parts by weight of tetraphenyl resorcine bisphosphate containing 2 to 50 ppm by weight of magnesium as impurity."

Claim 2 was directed to a blow molding resin composition according to Claim 1.

The Respondent also argued essentially as follows:

- (i) According to the Statement of Grounds of Appeal, the appeal was based on Articles 84 and 123(2) EPC.

- (ii) It would appear that the Appellant, in its letter dated 12 June 2003, had also referred to Article 56 EPC. No objection under Article 54 EPC had been raised in the Statement of Grounds of Appeal or in the subsequently filed letter.

- (iii) Article 84 EPC was not a ground for opposition. Article 84 might play however a role when the claims had been amended during opposition proceedings.

- (iv) The wording present in granted Claim 1, i.e.

"an organophosphorus compound containing 50 ppm by weight or less magnesium as an impurity", had been changed into "an organophosphorus compound containing magnesium as an impurity in the amount of 50 ppm by weight or less."

- (v) This formulation had been selected to avoid any misunderstanding i.e. to make the claim clearer. Although the original claims already excluded the possibility that the magnesium content be 0 ppm, this wording made clearer that some magnesium must be present.

- (vi) If there was a lack of clarity as alleged by Appellant this would have been also the case in the granted claim. The alleged unclarity had hence not been caused by the amendment.
- (vii) Consequently the objection under Article 84 EPC should be disregarded.
- (viii) Concerning inventive step:
 - (viii.1) In its Statement of Grounds of Appeal the Appellant had not raised any objection concerning inventive step.
 - (viii.2) In its further submissions the Appellant had brought forward a completely new argumentation based on the experimental results presented in its letter dated 12 June 2003.
 - (viii.3) It was requested not to admit this argument into the procedure since it had been filed late.
 - (viii.4) This argument was furthermore irrelevant.
 - (viii.5) The present invention dealt with prevention of bleeding of the organophosphorus compound to the surface, of release of gases and of discoloration during molding of the composition.
 - (viii.6) The examples of the patent in suit showed that this problem had been solved

with the claimed compositions. The data in the patent in suit clearly showed that a composition as claimed had better properties as compared with compositions comprising a phosphorus compound with high magnesium content.

(viii.7) The tests made by the Appellant were totally different since they referred to an artificial ageing and the effect of the ageing on the colour of the sheet has been measured.

(viii.8) These tests had hence nothing to do with the objective of the invention.

XI. In its letter dated 22 December 2006 the Appellant argued essentially as follows:

- (i) The objections under Article 123(2) and 84 EPC against the feature "containing magnesium as an impurity in the amount of 50 ppm or less" were based on the interpretation of this feature given by the Patent Proprietor and the Opposition Division according to which the value 0 would be excluded.
- (ii) This interpretation was not derivable from the application as originally filed. In the application as originally filed the skilled person was instructed that the content of magnesium should be as low as possible, i.e. at best 0.

- (iii) According to this interpretation a certain amount of magnesium would be compulsory in order to obtain the results aimed at.
- (iv) This would represent an unallowable extension.
- (v) The lower limit of magnesium was not defined. It would furthermore depend on the method used for its determination. Thus, Claim 1 did not meet the requirements of Article 84 EPC.
- (vi) If, however, it would be considered that the present wording also encompassed the value 0, document D1 read in combination with D6 would be novelty destroying.
- (vii) In any case, if one would consider that the value 0 was excluded, no inventive step could be acknowledged in view of D1.
- (viii) The tests submitted with the letter dated 12 June 2003 showed that the improvement of the colour stability was not linked to the magnesium content of the phosphorus compound.
- (ix) Furthermore, there was no limitation of the magnesium content of the composition.
- (x) The magnesium content of the phosphorus compound was merely arbitrarily chosen in

order to achieve a formal limitation over the prior art.

XII. With its letter dated 19 January 2007, the Respondent submitted four additional auxiliary requests as well as the following documents:

D16: Experimental report dated 18 January 2007 concerning the magnesium content of PPE and HIPS samples;

D17: Copy of an E-mail correspondence dated 18 January 2007 between Mr. Kodaira, Tetsuji of GE Indust. Plastics and Mr. Grever, Frederik of GE Indust. Plastics; and;

D18: Relevant pages of attachment to the E-mail correspondence D17 (in Japanese).

XIII. Following cancellation of the oral proceedings scheduled to take place on 24 January 2007, the Board, in a communication issued on 13 March 2007 and annexed to the summons to oral proceedings scheduled to take place on 25 June 2007, drew the attention of the Parties to issues concerning in particular the allowability of Claim 1 of the second, third, fourth, fifth, sixth and seventh auxiliary requests under Article 123(2) EPC, the interpretation of the claims in view of the limitation of the magnesium content in the organophosphorus component of the claimed composition, the interpretation of the tests submitted by the Appellant with its letter dated 12 June 2003, as well as the effect of the amount of magnesium incorporated in the composition by the phosphorus additive.

XIV. With its letter dated 21 May 2007, the Appellant submitted the following documents:

Annex 1: Internet page "Environmental Measurement I: Gas-Solution Analytical Center Practical Detection Limits", and

Annex 2: US-A-4 554 267.

It also argued essentially as follows:

- (i) The tests submitted with letter dated 12 June 2003 showed that the magnesium content in the phosphorus additive had no influence on the discoloration of the surface of the molded parts.
- (ii) There was no indication in the patent in suit how the magnesium content of the phosphorus additive should be determined. As shown by Annex 1 different methods had different levels of detectability.
- (iii) Auxiliary requests 2 to 7 did not meet the requirements of Article 83, 84, and 123(2) EPC.

XV. With its letter dated 25 May 2007, the Respondent submitted a new main request and seven auxiliary requests.

Claims 1 and 2 of the main request corresponded to Claims 1 and 2 of the second auxiliary request submitted with letter dated 21 December 2006.

It also argued essentially as follows:

- (i) There was no indication in the patent in suit that the magnesium content was linked to other factors such as the type of PPE, of vinyl aromatic hydrocarbon resin, type of phosphorus additive and relative amounts thereof. Thus, the main request should be allowable.
- (ii) Examples 1 and 2 of the patent in suit showed that blow molded articles without discoloration could be obtained when using the phosphate component with 2 and 11 ppm magnesium content.
- (iii) The tests submitted by the Appellant could not be compared with these examples. Furthermore, these tests did not relate to blow-molded articles.
- (iv) There was no suggestion in the prior art that the discoloration of blow molded articles might be associated with the magnesium content of the phosphorus additive.

XVI. Oral proceedings were held before the Board on 25 June 2007.

At the oral proceedings the discussion firstly focussed essentially (i) on the question of allowability of the main request under Article 123(2) EPC, and (ii) on the

question of the determination of the lower limit of magnesium set out in Claim 1 of the main request.

The arguments presented by the Parties in these respects may be summarized as follows:

(a) Concerning point (i):

(a.1) By the Appellant:

(a.1.1) There was no support in the application as originally filed for the lower limit of 2 ppm of magnesium content set out in Claim 1 of the main request.

(a.1.2) The composition of Example 1 of the patent in suit contained specific PPE and HIPS resins in specific amounts.

(a.1.3) The fact that no discoloration was observed at the surface of the blow molded article when the amount of magnesium was as low as 2 ppm in the phosphate additive used in that composition was linked to the specific compatibility of this phosphate additive with the other components of the blends.

(a.1.4) Thus, the value 2 ppm could not be generalized.

(a.2) By the Respondent:

(a.2.1) There was no indication in the patent in suit which could have suggested that the lower limit of 2 ppm would be valid only for the specific composition

disclosed in Example 1 in order to obtain blow molded articles with absence of discoloration at their surface.

(a.2.2) Reference was made to the decision T 0201/83 (OJ EPO 1984, 481) in that respect.

(b) Concerning point (ii)

(b.1) By the Appellant:

(b.1.1) There were several analytical methods (e.g. emission spectroscopy, absorption spectroscopy, mass spectroscopy, or gravimetric methods) which could be applied to determine the magnesium content in the phosphate additive. There were further several methods for preparing the samples to be tested.

(b.1.2) These different methods of determination would give very different results.

(b.1.3) There was however no indication in the patent in suit how the lower limit of 2 ppm of magnesium in the phosphate compound should be determined. Thus, Claim 1 would lack clarity.

(b.1.4) Furthermore, the skilled person would not know whether he was working inside or outside the scope of Claim 1. Thus, the main request did not meet the requirements of Article 83 EPC.

(b.1.5) Magnesium could be incorporated into the composition by other components than the specific phosphate such as talc, clay, mica, or flame retardants

such as magnesium hydroxide (cf. patent in suit paragraph [0021]) as well by the PPE or the HIPS.

(b.1.6) Claim 1 did not however define the total amount of magnesium.

(b.2) By the Respondent:

(b.2.1) The skilled person would know the method in order to determine the lower limit of 2 ppm in the phosphate compound.

(b.2.2) The analytical method relied on in the last submission of the Appellant (cf. Annex 1) would allow to determine such a lower limit.

(b.2.3) It should also be noted that neither for the CIELAB tests submitted by the Appellant nor in document D9 (cited by the Appellant in order to establish that the phosphate Fyrolflex® RDP had a content of 5 ppm Mg before the priority date of the patent in suit) was a method for determining the magnesium content of the phosphate compound mentioned. This showed that there was no difficulty for the skilled person to determine low amounts of magnesium in the phosphate compound.

(b.2.4) Thus, the Appellant had not shown that the magnesium content of the phosphate could not be determined.

(b.2.5) Even if magnesium could be incorporated by other components into the composition, the total content of magnesium was not essential, since it was

the content of magnesium in the phosphate over 50 ppm which caused the discoloration.

(c) The Board, after deliberation, informed the Parties that it considered that the main request met the requirements of Articles 123(2) EPC and 84 EPC and that it was inclined to interpret Claim 1 as not placing an upper limit on the content of magnesium in the composition.

(d) The Appellant having conceded that the subject-matter of Claim 1 was novel over D1, D3, D4 and D5, the discussion moved to the question of assessment of inventive step.

The essential arguments presented by the Parties in that respect may be summarized as follows:

(d.1) By the Appellant:

(d.1.1) The CIELAB measurements carried out on the molded plates (cf. tests submitted with the letter dated 12 June 2003) showed that the amount of magnesium in the phosphate had no influence on the surface appearance of the molded parts.

(d.1.2) Document D1 could be considered as the closest state of the art.

(d.1.3) Starting from D1 the technical problem should be seen in the provision of further flame retardant thermoplastic compositions comprising a PPE and a phosphorus additive and showing reduced plate out of the phosphorus additive at the surface of molded parts.

(d.1.4) The general formula of the phosphorus additives disclosed in D1 encompassed the specific phosphate component according to Claim 1. It was further known (cf. D4 (Examples 3 and 4) and D6) that such phosphorus additives might contain magnesium.

(d.1.5) Thus, the technical problem had been solved by arbitrarily selecting a previously undisclosed phosphorus additive containing a specific content of magnesium among the phosphorus additives already disclosed in general in D1.

(d.1.6) Consequently the subject-matter of Claim 1 of the main request did not involve an inventive step.

(d.2) By the Respondent:

(d.2.1) The tests submitted by the Appellant with its letter dated 12 June 2003 could not be compared with the tests carried out in the patent in suit, since the parts had not been blow molded.

(d.2.2) The CIELAB measurement test did not give any information on the surface discoloration.

(d.2.3) Furthermore there was no indication of the amount of phosphate in the tested compositions, so that it was not clear whether the amount of phosphate was within the claimed amounts according to Claim 1.

(d.2.4) Consequently, these tests were not relevant.

(d.2.5) In contrast the tests carried out in the patent in suit showed the effect of the magnesium content of the phosphate on the surface discoloration of the blow molded parts.

(d.2.6) The documents cited by the Appellant were silent on the amount of magnesium contained in the phosphate additive to be used in the PPE compositions.

(d.2.7) Consequently, there was no suggestion in the prior art that discoloration in blow molded articles made from PPE compositions comprising such phosphate additive might be associated with the magnesium content of the phosphate additive.

XVII. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the main request as submitted with the letter dated 25 May 2007, or, in the alternative, on the basis of one of the auxiliary requests 1 to 7 as submitted with the letter dated 25 May 2007.

Reasons for the Decision

1. The appeal is admissible as already set out in the Board's interlocutory decision (see above, Section VIII).

Main request

2. *Wording of the claims*

2.1 *Articles 123(2) and 123(3) EPC*

2.1.1 No objection under Article 100(c) EPC had been raised by the Opponent (Appellant) against the claims as granted. Consequently, the examination of the allowability of Claims 1 and 2 of the main request under Article 123(2) EPC is limited to that of the amendments carried out in the course of the opposition/appeal proceedings (cf. also G 9/91. OJ EPO 1993, 408).

2.1.2 Claim 1 of the main request differs from Claim 1 as granted in that (i) the organic phosphorus compound has been restricted to the tetraphenyl resorcinol bisphosphate and (ii) in that it has been indicated that the organophosphorus additive contains 2 to 50 ppm by weight of magnesium as an impurity.

2.1.3 Concerning amendment (i), its support is to be found at page 2, lines 55 to 56 of the application as originally filed (cf. EP-A1-0 630 938).

2.1.4 According to granted Claim 1, the organophosphorus compound should contain 50 ppm or less of magnesium as an impurity. The question of the allowability of amended Claim 1 under Article 123(2) EPC boils hence down to the question whether there is a support in the application as originally filed for the lower limit of 2 ppm included now in Claim 1.

- 2.1.5 In that respect, it is noted by the Board that a magnesium content of 2 ppm is disclosed only in Example 1 of the application as originally filed.
- 2.1.6 Example 1 discloses a composition comprising 45 parts by weight of a poly(2,6-dimethyl-1,4-phenylene) ether resin with an intrinsic viscosity in chloroform at 30°C of 0.48 dL/g, 55 parts by weight of a rubber-modified polystyrene resin (HIPS) (Diarex HT644-NAT, product of Mitsubishi Kasei Kogyo), and 10 parts by weight of a tetraphenyl resorcinol bisphosphate with a magnesium content of 2 ppm by weight (cf. page 5, lines 26 to 36; Table 1; Example 1).
- 2.1.7 Consequently, the allowability of Claim 1 under Article 123(2) EPC depends on the answer to the question of whether this value of the magnesium content disclosed only in an individual example can be relevant to the generality of the claimed subject-matter, separately from and irrespectively of the other features of that example.
- 2.1.8 In this connection, it can be deduced, in the Board's view, from the application as originally filed (cf page 2, lines 17 to 40; page 3, lines 6 to 9) that it was essential to keep the magnesium content as an impurity of the organophosphorus component of general formula (I) to 50 ppm or less in order to avoid discoloration of molded parts made from compositions comprising a polyphenylene ether resin and a vinyl aromatic hydrocarbon resin and such organophosphorus compounds.

- 2.1.9 In other words, while the skilled person reading the application as filed would have understood that it was the upper limit of the magnesium content in the organophosphorus compound which was presented as essential to avoid discoloration of the molded parts, it is, in the Board's view, evident that there was no specific requirements concerning the lower limit of the magnesium content of the organophosphorus compound to be used in that respect.
- 2.1.10 Consequently, the skilled person skilled person would have readily recognized that the value 2 ppm in Example 1 for the magnesium content of the tetraphenyl resorcline bisphosphate was not so closely associated with the other features of Example 1 as to determine the effect of that embodiment of the invention (i.e. avoidance of discoloration) as a whole in a unique manner and to a significant degree.
- 2.1.11 Thus, in accordance with the principles set out in the decision T 201/83 (cf. Reasons point 12), the Board sees no obstacle in the introduction into Claim 1 of the lower limit of 2 ppm for the content of magnesium as an impurity in tetraphenyl resorcline bisphosphate.
- 2.1.12 It thus follows that the requirements of Article 123(2) EPC must be considered as met by Claim 1.
- 2.1.13 Since Claim 2 corresponds to granted Claim 2, it thus follows that the requirements of Article 123(2) EPC must be regarded as met by all the claims of the main request.

2.1.14 Since the amendments carried out in Claim 1 evidently result in a restriction of scope of protection in comparison to the scope of protection conferred by Claim 1 as granted, the requirements of Article 123(3) EPC are met by the main request.

2.2 *Clarity*

2.2.1 When amendments are made to a patent during an opposition, Article 102(3) EPC requires consideration as to whether the amendments introduce any contravention of any requirement of the Convention, including Article 84 EPC.

2.2.2 In that respect, the Appellant has submitted that Claim 1 lacks clarity, since there is no indication in the patent in suit how the lower limit of 2 ppm of magnesium in the phosphate component should be determined.

2.2.3 According to the Appellant, different methods such as emission spectroscopy, absorption spectroscopy, mass spectroscopy, or gravimetric methods could be used for determining the amount of magnesium in the phosphate, but they will give very different results. It thus follows, in the Appellant's view, that the claimed subject-matter must be considered as not clearly defined.

2.2.4 In this connection, the Board firstly observes that in the document D9, which has been cited by the Appellant in the course of the opposition proceedings in order to show that a commercial phosphate additive Fyrolflex® RDP which is an oligomeric phosphate ester of

resorcinol exhibited before the priority date of the patent in suit an amount of 5 ppm magnesium, no indication of the method of determination of the amount of magnesium in the phosphate had been mentioned.

2.2.5 The Board further observes that the Appellant itself had not indicated the method according to which it had determined the amount of magnesium (10 ppm) in the phosphate compound used for making the compositions used to manufacture the molded plates referred to in the tests submitted with its letter dated 12 June 2003.

2.2.6 This leads the Board to consider that the skilled person would know which analytical methods are adapted to determine such low amounts of magnesium in the corresponding phosphate compounds. Taking further into consideration that the Appellant has admitted that several methods were at the disposition of the skilled person for determining the amounts of magnesium in the phosphate, the Board can only consider that the skilled person would know which of these usual methods are appropriate for determining amounts as low as 2 ppm in the phosphate compound.

2.2.7 Since, furthermore it had not been shown by the Appellant, which has the onus of the proof, that the different methods which could be used by the skilled person would indeed lead to significantly different results, the Board comes to the conclusion that the fact that the patent in suit does not specify the method for determining the lower limit of magnesium content in the phosphate additive does not result in a lack of clarity of the subject-matter of Claim 1 contrary to Article 84 EPC.

2.2.8 This conclusion further implies a *fortiori* that there cannot be a lack of sufficiency of disclosure in respect to the determination of the lower limit of the magnesium content of the phosphate compound set out in Claim 1.

3. *Novelty*

3.1 Novelty of the subject-matter of Claims 1 to 2 has not been challenged by the Appellant.

3.2 Thus, the Board sees no reason to raise the matter either. Consequently, the subject-matter of Claims 1 and 2 is held to be novel.

4. *Problem and solution*

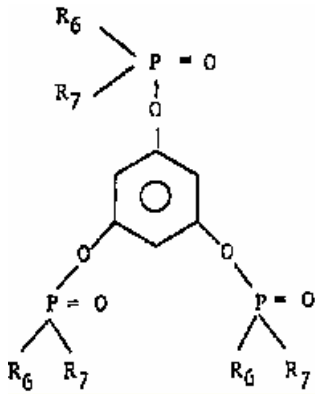
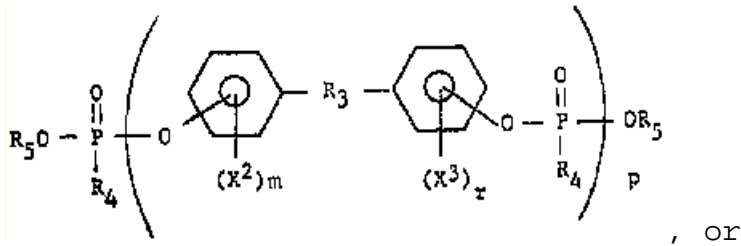
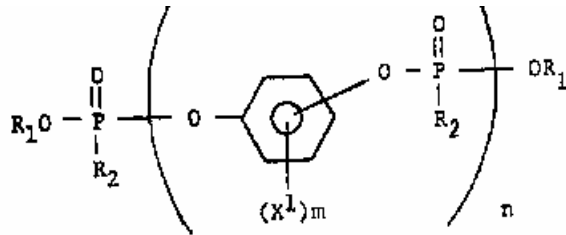
4.1 The patent in suit relates to flame retardant resin compositions comprising a polyphenylene ether resin and an organophosphorus compound.

4.2 Such compositions are disclosed in documents D1 and D5.

4.3 Document D1 relates to a flame retardant thermoplastic composition which comprises:

(a) a normally flammable polyphenylene ether resin with or without a styrene resin, and

(b) a flame retardant amount of a flame retardant agent selected from the group consisting of di- and polyfunctional phosphate compounds having the general formula:



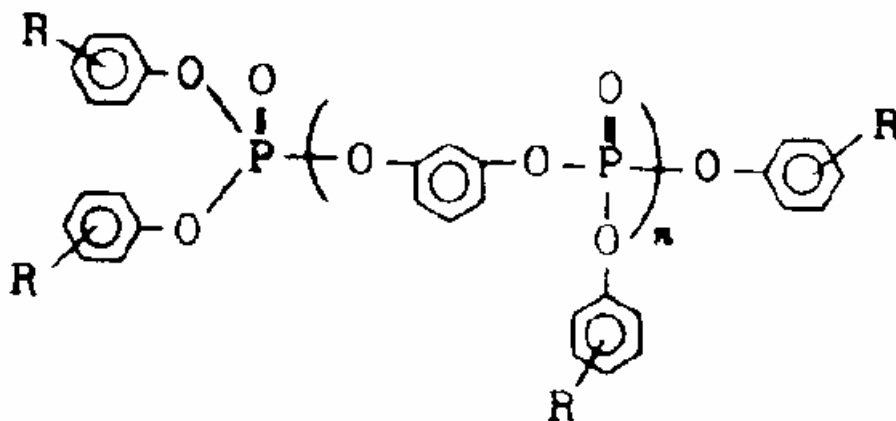
and mixtures thereof, wherein R₁, R₃ and R₅ are, independently, hydrocarbon, R₂, R₆ and R₇ are, independently, hydrocarbon or hydrocarbonoxy, X¹, X² and X³ are halogen, m and r are 0 or integers from 1 to 4, and n and p are from 1 to 30 (Claim 1).

4.4 D1 is in particular concerned with the problem of plate out of flame retardants in polyphenylene ether resin compositions. Plate-out refers to the tendency of many flame retardant agents to migrate to the surface of the molten resin during molding. In such instances, the flame retardant agent often adheres to the inside surface of the mold which, in turn, necessitates

frequent stoppages for cleaning. The compositions of D1 are said to sharply reduce the incidence of plate-out and, hence, the molding equipment can be used for longer periods of time without cleaning (page 1, lines 37 to 42).

4.5 According to D1, these compositions exhibit higher heat deflection temperatures, as well as enhancements in other properties not related to flame retardancy such as tensile strength and plate-out resistance in comparison with corresponding compositions based on the use of mono-functional, low molecular weight phosphorus containing flame retardant agents, such as triphenyl phosphate (page 1, lines 32 to 36).

4.6 Document D5a (cf. also D5b to D5d) deals with polyphenylene resin compositions having excellent flame retardancy and low tendency of smoking and bleeding in molding process, by compounding a polyphenylene ether resin with a composition consisting of 5-70wt% of triphenyl phosphate and 95-30wt% a resorcinol polyphosphate compound of formula:



- in which R is H or methyl, and n is 1-10) by kneading under heating in an amount of 1-30wt% based on the weight of the whole mixture. A styrene resin could be incorporated in the polyphenylene resin composition.
- 4.7 According to the patent in suit, one of the drawbacks of polyphenylene ether compositions comprising such polyphosphate flame retardants is that the surface of parts molded therefrom might suffer of discoloration (cf. paragraph [0003]). Consequently its aim was to provide flame resistant polyphenylene ether compositions comprising such polyphosphate additive which allow the obtaining of molded articles whose surface suffers no discoloration, which do not bleed and which do not give off gas during molding.
- 4.8 Whilst both documents D1 and D5a disclose flame resistant polyphenylene ether resin compositions comprising a polyphosphate compound as flame retardant which exhibit low plate out (bleeding) when molded, neither of them deals with the problem of discoloration of the surface of the molded parts.
- 4.9 The closest state of the art should normally be represented by a document which deals with the same problem. However, in the absence of such a document, the starting point for evaluating inventive step should be searched for in a document relating to a similar technical problem, or at least to the same or a closely related technical field as the patent in suit (cf. T 989/93 of 16 April 1997, not published in OJ EPO; Reasons, point 12).

- 4.10 Although, in view of the considerations made in paragraphs 4.3 to 4.6, D1 and D5a could be both regarded as meeting the requirements set out in decision T 989/93 to be used as a starting point for the assessment of inventive step, the Board notes that D5a deals with the problem of fuming during processing and furthermore that the compositions disclosed in D5a come closer to those according to the patent in suit than those disclosed in D1, in terms of the phosphate compound (resorcinol polyphosphate), so that document D5a represents, in the Board's view, a more appropriate starting point than document D1.
- 4.11 Thus, starting from D5a, the technical problem may be seen in the provision of a flame resistant polyphenylene ether composition containing a resorcinol polyphosphate allowing the production of molded articles whose surface is free of discoloration.
- 4.12 The solution proposed according to Claim 1 of the main request is to use a tetraphenyl resorcinol bisphosphate containing between 2 and 50 ppm of magnesium.
- 4.13 In this connection, the Board observes that the comparison between Examples 1 and 2 and Comparative Example 1 shows that the use of a tetraphenyl resorcinol bisphosphate having a magnesium content within the claimed range (i.e. 2 ppm for Example 1 and 11 ppm for Example 2) leads to blow molded articles having a surface free of discoloration while the use of such phosphate having a magnesium content outside the claimed range (110 ppm) leads to surface discoloration of the blow molded article.

- 4.14 The Board however notes that the Appellant had submitted that the magnesium content of the phosphate additive had no influence on the surface discoloration of molded articles obtained from PPE/vinyl aromatic resin compositions containing it. This was supported, in the Appellant's view, by the experimental results presented with its letter dated 12 June 2003. Consequently, in the Appellant's view, the technical problem should merely be seen in the provision of further flame retardant thermoplastic compositions comprising a PPE and a phosphorus additive and showing reduced plate out of the phosphorus additive at the surface of molded parts (cf. paragraph XVI (d.1.3 above)).
- 4.14.1 In that respect, the Board firstly observes that the tests carried out by the Appellant relate to the manufacture of plates from compositions comprising a polyphenylene ether resin, a high impact polystyrene resin and a flame retardant additive called Fyrolflex presenting various amounts of magnesium (i.e. 10 pm and 110 ppm).
- 4.14.2 Even if one would consider in view of document D10 that the additive Fyrolflex might be a tetraphenyl resorcinol bisphosphate, the Board, nevertheless, notes that there is no indication in the letter dated 12 June 2003 as to whether the amounts of Fyrolflex used in the tested compositions are within the range defined in Claim 1 of the main request, so that it is at least for this reason questionable whether these compositions are representative of compositions according to the claimed invention, and hence whether the tests are pertinent for demonstrating that the magnesium content of the

tetraphenyl resorcinol bisphosphate is of no influence on the discolouration of the molded articles obtained from the claimed compositions.

- 4.14.3 In any case, it is further evident that no visual evaluation of the discoloration of the surface of the plates has been carried out, so that no conclusion in that respect could be drawn from the comparison between the composition comprising a Fyrolflex with 10 ppm magnesium and the composition comprising a Fyrolflex with 110 ppm magnesium.
- 4.14.4 This finding could not be altered by the argument that the surface of the plates have similar coordinates in the CIELAB system, since no correlation has been established by the Appellant between CIELAB coordinates and the visual evaluation of surface discoloration.
- 4.14.5 Nor could also the arguments (cf. paragraphs XVI (b.1.5) and (b.1.6) above)) that magnesium might be present in other components of the compositions (e.g. PPE resin, PS resin, flame retardants, fillers) than the tetraphenyl resorcinol bisphosphate, and that Claim 1 does not define the total amount of magnesium in the claimed composition be relevant for challenging that the proposed measures, as shown by the examples of the patent in suit, provide an effective solution to the technical problem, since it had not been shown by the Appellant, who has the burden of the proof, that magnesium issuing from other sources than the tetraphenyl resorcinol bisphosphate would also influence the discoloration of the surface of the molded articles.

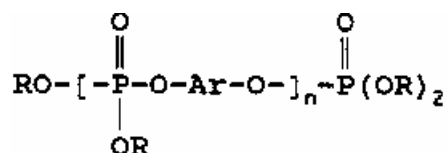
4.15 Under these circumstances, the Board can only consider that the claimed measures provide an effective solution of the problem stated in paragraph 4.11 above. Consequently, the Board sees no reason to deviate from this formulation of the technical problem and, hence, to reformulate the technical problem in less ambitious terms as done by the Appellant.

5. *Inventive step*

5.1 It remains to be decided whether the claimed subject-matter was obvious to a person skilled in the art in view of the prior art relied upon by the Appellant, i.e. documents D1, D3, D4, D5a and D6.

5.2 As indicated above neither D5a nor D1 relate to the problem of discoloration of the surface of the molded articles. Taking furthermore into consideration that these documents are totally silent on the amount of magnesium of the polyphosphate additives used in the PPE compositions disclosed therein, it is evident that neither D5a nor D1 can provide a hint to the solution proposed by the patent in suit.

5.3 Document D4 relates to compositions comprising a combination of (i) at least one hydrocarbon-soluble aryl phosphate of the formula $(RO)_3PO$ wherein each R is, independently, phenyl or an alkyl-substituted phenyl group; and (ii) at least one hydrocarbon soluble aryl polyphosphate of the formula:



wherein each R is, independently, phenyl or an alkyl-substituted phenyl group, Ar is m-phenylene or an alkyl-substituted m-phenylene group, and n is a whole or fractional number from 1 to 4; said combination containing from 2 to 30% by weight of component (i) (Claim 1). According to D4 (cf. Claim 4) the component (ii) can be a tetraphenyl resorcinol bisphosphate.

5.4 While it is true, as submitted by the Appellant, that in Examples 3 and 4 of D4 the resorcinol polyphosphate is prepared in presence of a magnesium catalyst (i.e. magnesium chloride), so that it could not be excluded that the obtained polyphosphate could contain magnesium as an impurity, and that D4 mentions the use of the claimed compositions as flame retardants in PPE compositions (cf. page 14, lines 1 to 3), the Board however notes firstly that D4 does not disclose the amount of magnesium in the component (ii) and furthermore that D4 is totally silent on the effect of the amount of magnesium in component (ii) on the surface appearance of molded articles obtained from PPE compositions containing the claimed combination of components (i) and (ii).

5.5 Consequently D4 is of no assistance for the solution of the technical problem.

5.6 D3 relates to flame resistant thermoplastic moulding compositions containing A) from 5 to 94 % by weight of a polyphenylene ether, B) from 5 to 94 % by weight of a vinyl aromatic polymer, C) from 1 to 30 % by weight of a flame retardant agent and D) from 0 to 60 % by weight of other additives, characterised in that component C)

- is built up from a mixture of C1) at least one phosphorus-containing compound, C2) at least one triazine derivative and C3) polytetrafluoroethylene. (Claim 1).
- 5.7 Even if it would be considered in view of lines 8 to 12 on page 5 of D3 that the general definition of phosphorus flame retardant C1 could encompass tetraphenyl resorcinol bisphosphate, it is in any case evident that D3 is totally silent on the magnesium content of such phosphorus additives, let alone on the influence of such content on the surface appearance of the molded parts obtained from the polyphenylene ether compositions disclosed therein.
- 5.8 Document D6 only discloses the use of magnesium catalysts in the manufacture of triarylester of phosphoric acid (cf. page 322, lines 8 to 12) and does not even refer to the use of such compounds in polyphenylene ether resin compositions.
- 5.9 It is hence clear that D3 and D6 are even less relevant than document D4, and that neither D3 nor D6 can offer to the skilled person a hint to the solution of the technical problem.
- 5.10 Thus, in view of the above, the Board comes to the conclusion that the subject-matter of Claim 1, and by the same token that of Claim 2 does not arise in an obvious manner from the prior art relied upon by the Appellant (Article 56 EPC).
- 5.11 Consequently, the main request of the Respondent is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of the main request (claims 1 and 2) submitted with the letter dated 25 May 2007, and after any necessary consequential amendment of the description.

The Registrar:

The Chairman:

M. Kiehl

R. Young