BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 1 August 1996

Case Number: T 0990/92 - 3.3.3

Application Number: 86110649.0

Publication Number: 0213413

IPC: C08K 5/50

Language of the proceedings: EN

Title of invention:
Polycarbonate resin composition and its use in optical applications

Patentee:
Teijin Chemicals, Ltd

Opponent:
Bayer AG, Leverkusen Konzernverwaltung RP Patente Konzern

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (confirmed) - no pointer"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0990/92 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 1 August 1996

Appellant: (Opponent)
Bayer AG, Leverkusen
Konzernverwaltung RP
Patente Konzern
Bayerwerk
D-51368 Leverkusen (DE)

Representative: -

Respondent: (Proprietor of the patent)
Teijin Chemicals, Ltd
1-6-21, Nishishinbashi
Minato-ku
Tokyo (JP)

Representative:
Lehn, Werner, Dipl.-Ing.
Hoffmann, Eitle & Partner
Patentanwälte
Postfach 81 04 20
81904 München (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 15 September 1992 rejecting the opposition filed against European patent No. 0 213 413 pursuant to Article 102(2) EPC.**

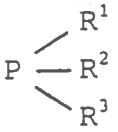
Composition of the Board:

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

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 213 413 in respect of European patent application No. 86 110 649.0 filed on 1 August 1986 claiming a JP priority of 2 August 1985 (JP 169880/85) was announced on 17 January 1990 (cf. Bulletin 90/3) on the basis of 9 claims, independent Claim 1 reading:

"A polycarbonate resin composition comprising a blended mixture of
(A) a polycarbonate resin having a viscosity average molecular weight of from about 13,000 to about 18,000,
(B) 0.0001 to less than 0.02 wt.%, based on the weight of the resin (A), of a secondary or tertiary organic phosphine represented by the following formula:



wherein R^1, R^2 and R^3, independently from each other, represent a C_1-C_{20} alkyl, C_3-C_6 cycloalkyl or C_2-C alkenyl group which may have a substituent such as hydroxy, acetoxy, lower alkylcarboxy, phenyl, or lower alkoxyphenyl, or a phenyl or naphthyl group which may have a substituent such as hydroxy or C_1-C_{10} alkyl, and one of R^1, R^2 and R^3 may represent a hydrogen atom,
(C) 0 to 0.5 wt.%, based on the weight of the resin (A), of a partial ester of a monobasic fatty acid having 10 to 22 carbon atoms with a polyhydric alcohol having 2 to 10 carbon atoms, the amount of the partial ester (C) being 0.01 to 0.5 wt.% when the amount of the organic phosphine (B) is not less than 0.005 wt.%, and said composition containing less than 0.004%, based on the weight of the resin (A), of chloride."

Further, independent Claims 6, 7 and 8 concern the composition of Claim 1 in the form of a molded article, the use of that composition in a molded article for optical applications and a coated article. Claims 2 to 5 and 9 concern preferred embodiments of the subject-matter of the claims referred to.

II. On 4 August 1990 a Notice of Opposition based on Article 100(a) EPC was filed by Bayer AG 5090 Leverkusen.

The opposition was supported inter alia by:

D1 DE-A-3 301 963;

D2 GB-A-1 350 338 (acknowledged on page 3, line 33 of the patent in suit);

D3 US-A-4 131 575;

D4 JP-A-60 113201 (Derwent Abstract);

D5 DE-A-3 332 065; and

D6 DE-A-3 026 503.

It was objected that the claimed subject-matter was not novel over D2 and that it did not involve an inventive step with respect to various combinations of these documents.

III. On 15 September 1992 the Opposition Division rejected the opposition on the grounds that the requirements of novelty and inventive step were both met.

As to inventive step, the Opposition Division considered that both variants of Claim 1, with and without the proviso, whether starting from D2 as closest prior art for both variants or from D3 or D4 for the variant with the proviso, met the requirements of Article 56 EPC, since none of these citations dealt with improved pinhole formation resistance.

IV. On 29 October 1992 an appeal was lodged together with payment of the prescribed fee by the Appellant (Opponent). The Statement of Grounds of Appeal was received on 8 January 1993. With that statement the Appellant provided a translation of D4 as well as a translation of Sho-60-81245 (D7) cited on page 4, line 17 of the patent in suit in order to illustrate the importance of the chlorine content in PC compositions during moulding operations.

(i) The novelty of the composition was also being disputed with respect to Example 2 of D5 as well as Examples II (A) and II (B) in conjunction with Claims 1 and 4 of D6. In view of the reference to light transmittance in D5 and D6 the use of such composition for optical applications, so it was submitted, could no longer be regarded as novel.

(ii) The subject-matter of Claim 1 of the patent in suit was a polycarbonate (PC hereinafter) resin composition comprising a blended mixture of (A), (B) and optionally (C) containing less than 0.004% of chloride. Such a wording did not exclude the presence of further ingredients used in the prior art together with phosphines, such as epoxides as in D2 or oxetanes as in D5 or D6. The subject-

matter of Claims 1 to 9 would thus have been obvious in view of the teaching contained in D7 in conjunction with that of D2 and/or of D5 and/or of D6.

V. In several counterstatements the Respondent (Patentee) maintained its previous position concerning the issue of inventive step. As to the new line of argument against novelty, the Respondent pointed out that neither D5 nor D6 made any reference to the chlorine content, so that this feature was undoubtedly novel.

VI. During oral proceedings held on 1 August 1996 the Appellant argued that the reference to a chloride in Claim 1 was somewhat inconsistent with the description of the patent specification. This led the Respondent to submit three new sets of claims to be considered as main and auxiliary requests, which should furthermore overcome any objection of lack of novelty and/or inventive step.

The main request was based on a set of 9 claims, of which only Claim 1 differs from that as granted by:

(i) replacing "containing" in the last sentence by "having an overall content of",

(ii) replacing "chloride" by "chlorine", and

(iii) adding a disclaimer at the end reading:

"wherein said polycarbonate resin composition does not comprise any oxetane compounds".

VII. The Appellant conceded that following these amendments in Claim 1 novelty was no longer at issue, and that clarity was not disputed. As to inventive step, however, the Appellant maintained its objection based on D5 alone or in conjunction with D7 or one of the documents D2 and D4.

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

The Respondent requested that the appeal be dismissed and the patent be maintained on the basis of the main request or on the basis of auxiliary requests 1 or 2 respectively, all submitted during oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

No objection arises having regard Article 123 EPC against the amendments in Claim 1.

2.1 Amendment (i) is supported by page 11, line 4 of the application as filed corresponding to page 5, line 16 of the patent specification, and thus meets the provisions of Article 123(2) EPC. Nor is this amendment objectionable under Article 123(3) EPC, since it does not affect the general definition of the polycarbonate resin composition of Claim 1 as granted and, thereby, adds nothing to the protection already conferred by Claim 1 as granted.

2.2 Amendment(ii), i.e. the replacement of chloride by chlorine, is in substance merely the correction of an error of transcription in the printing of the granted patent, as may be seen not only from the text accompanying the communication under Rule 51(4) EPC, but also from a comparison of the English version with the translations of Claim 1 into German and French.

The same printing error occurred on page 6, line 56 of the patent specification.

2.3 Amendment (iii) excludes by way of disclaimer the combinations of phosphines with oxetanes mentioned in D5 and D6 alleged to destroy novelty of the claimed subject-matter. This amendment is thus not objectionable either.

3. As the novelty of the claimed subject-matter was no longer disputed by the Appellant and since the Board shares that opinion, no reasoning is called for here.

4. The patent in suit concerns a polycarbonate resin composition and its use in "optical applications". In the light of the introductory statement in the patent specification (page 2, lines 21 to 39) and the tests carried out to evaluate the properties of the moulded articles, e.g. the measurement of birefringence, the measurement of transmittance and the number of pinholes formed in a vacuum deposited aluminium film (page 7, lines 8 to 33; page 9, Table 1), these optical applications must be understood as pertaining to optical articles such as lenses, prisms, Fresnel lenses and substrates for information recording devices suitably coated with a protective layer for the prevention of scratching or for antihaze and antiglare purposes. For such applications, the polycarbonate resin composition should have a specific spectrum of

properties, in particular resistance to hydrolysis, heat and colour stability as well as resistance to degeneration responsible for pinhole formation.

4.1 On the basis of the above specific applications and the properties they require, document D4 must be regarded as the closest state of the art. This citation relates to shaped articles for optical uses having a faultless surface, more specifically to lenses, prisms and discs with excellent surface characteristics, which according to the final use may further be subjected to a finishing process, in particular to coating or metal deposition on one side thereof (page 1, paragraph 2; page 5, paragraphs 2 to 4). These articles are produced by shaping with a polycarbonate resin composition containing 0.01 to 0.2 part by weight of a monoglyceride of a saturated monovalent carboxylic acid having 16 to 22 carbon atoms for 100 parts by weight of a polycarbonate having an average molecular weight from 12000 to 19000 (page 1, claim). In view of the reference to a process of preparation of the polycarbonate by polymerisation involving a bisphenol and phosgene (page 3, paragraph 3, first sentence), it is evident, as explained in the patent specification (page 2, lines 40 to 42), that the PC resin has a chlorine content higher than 40 ppm and that, at the usual moulding temperatures of 300°C or more, acidic substances are generated which, besides a corrosion effect on the moulds, tend to cause degeneration of the thin film applied on the surface of the moulded articles.

4.2 In the light of these serious shortcomings the technical problem underlying the patent in suit may thus be seen in the provision of a PC moulding

composition which ensures not only excellent transparency, but also excellent resistance to degeneration, e.g. to hydrolysis and pinhole formation, and thereby a desirably long durability.

4.3 According to the patent in suit this problem is solved by a PC resin composition comprising (A) a polycarbonate, (B) an organic phosphine and, optionally, (C) a partial ester of a monobasic fatty acid, wherein the chlorine content of the resin (A) and the amounts of the ingredients (B) and (C) have to meet specific requirements, as indicated in Claim 1. According to the wording thereof two variants can be distinguished, one wherein the ester (C) is optional (variant 1) and one wherein the ester (C) is compulsory (variant 2).

4.4 In view of the experimental results in Table 1 of the patent in suit, in particular Comparative Examples 2 to 9, which show that only thin films applied on the surface of articles moulded with PC resin compositions within the terms of the patent in suit do not undergo degeneration, as evidenced from the number of pinholes on the surface of an aluminium film, the Board is satisfied that the above defined technical problem is effectively solved. This conclusion applies to both variants.

5. It remains to be decided whether the claimed subject-matter would have been obvious to a skilled person having regard to the teaching of the documents relied upon by the Appellant.

5.1 Even if document D4 mentions, in general terms, the possibility of using additionally effective amounts of convention ingredients, such as heat stabilizing agents, anti-oxidants, ultraviolet absorbing agents or

dyes (passage bridging pages 4 and 5), this general statement cannot be interpreted as a hint at organic phosphines, let alone as an incentive to consider the fatty ester as an optional ingredient.

Both the definition of the fatty acid, e.g. 16 to 22 carbon atoms, and the amount of monoglyceride, e.g. 0.01 to 0.2 percent by weight, must be regarded as essential features of the PC compositions according to this citation. On the one hand, acids with less than 16 carbon atoms would not be suitable because of the poor repeatability in the yield of moulded articles having good properties (page 4, lines 12 to 15); by contrast, esters derived from acids containing only 10 carbon atoms are most suitable according to the patent in suit. On the other hand, whereas the amount of ester is strictly limited to 0.2 percent by weight, preferably less than 0.1 percent by weight, in order to avoid accumulation of fatty component on the inner surfaces of the mould and, thereby, to ensure good transcribing properties (page 4, lines 19 to 30), amounts up to 0.5 percent by weight are still within the scope of the patent in suit.

All these considerations show that document D4 could not have lead or even pointed the way to a PC composition as claimed in the patent in suit, neither from a qualitative, nor from a quantitative point of view.

5.2 Document D7 relates to a PC resin composition which overcomes the problem of mould corrosion by chlorine species during moulding operations. Since chlorine compounds, which are the direct consequence of methylene chloride being used in the preparation of the polymer, can only be eliminated with lengthy and costly operations which would be prohibitive, the authors have

found a practical range for the amount to chlorine in the PC resin wherein its detrimental effects can still be suppressed (page 1, paragraph 3 to page 3, paragraph 2).

According to the teaching of this citation a non corrosive PC resin composition is prepared by compounding 0.001 to 0.5 percent by weight of a partial ester derived from an aliphatic monocarboxylic acid and a polyfunctional alcohol in a PC having a chlorine content of 15 to 150 ppm (page 3, paragraph 3; page 4, paragraphs 2 and 5). The partial ester should preferably derive from an aliphatic monocarboxylic acid having 10 to 24 carbon atoms (page 5, paragraph 1). Like in the case of document D4, various additives such antioxidants, heat stabilizing agents, mould releasing agents and flame retarding agents, all unspecified, may be compounded in option (page 5, paragraph 5). The moulded articles are said to have an excellent appearance and to exhibit good dimensional precision (page 7, table, column test result: rating 0; paragraph "Effect of the invention").

Document D7 thus teaches that the effects of chlorine in PC resins can be neutralized by well-known partial esters provided the chlorine content is within certain limits; in that respect, the use according to feature (A) in Claim 1 of the patent in suit of a PC resin containing less than 0.004 percent by weight must be regarded as obvious. However, since this citation is no more explicit than D4 regarding the other additives, it is evident that it cannot suggest the other features of the claimed subject-matter, in particular the use of a phosphine and the amount thereof.

5.3 Document D1 describes a process for the preparation of moulded articles in PC, such as videodiscs, having light transmittance properties and very small optical distortion (page 4, paragraphs 1 and 2; page 10, paragraph 5). This is achieved by a combination of three measures, namely (i) three subsequent washing steps of the PC containing chloride solution, followed by elimination of the polymerisation solvent, (ii) addition of 0.005 to 0.5 percent by weight of an aliphatic or aromatic phosphite, and (iii) control of the various parameters of the injection moulding step, e.g. temperature of the resin composition between 330 and 440°C and mould temperature between 50 and 110°C (Claim 1 in conjunction with page 12, lines 14 to 27). There is no mention of a thin layer of a metal or a metal compound being applied on the surface of either the substrate or the moulded article (compare patent specification, page 2, lines 6 and 34), nor consequently any reference to the problem of pinhole formation resistance.

Since the features mentioned under (iii) broadly correspond to those indicated in the patent in suit (compare patent specification, page 6, line 65 to page 7, line 2; page 7, lines 44 to 46), and since it is reasonable to assume that the purification treatment of PC results in a polymer as required in the patent in suit as regards the chlorine content, the teaching of document D1 reduces to the addition of phosphites to PC within the terms of the patent in suit in order to ensure good optical properties, which is neither the effect aimed at nor the solution proposed in the patent in suit. In fact, as demonstrated in Comparative Example 9 of the patent in suit, phosphites would be unsuitable as additives to PC resin compositions to prevent pinhole formation in an aluminium film upon wet heat-treatment.

5.4 Document D2 is concerned with the stabilisation of aromatic PC resins against discolouration and degradation when exposed at elevated temperatures; this is achieved by addition of 0.005 to 0.5 percent by weight of an aliphatic or aromatic triphosphine, preferably together with 0.01 to 1 percent by weight of an epoxy compound (page 1, lines 37 to 42; page 3, lines 45 to 49; Claims 1 and 2). There is no reference to the chlorine content of the PC resin, nor to a partial ester as a further optional additive.

As is evident from the evaluation tests, e.g. determination of the Yellowness Index number of a PC resin composition after aging for 7 days at 140°C (page 3, lines 9 to 17), colour stability cannot be equated with pinhole formation resistance. The fact that phosphines are disclosed in document D2 as stabilizers of PC resins, wherein the chlorine content is irrelevant, cannot be an incentive for a skilled person to operate along that line in order to achieve, with a specific PC resin, an effect not even contemplated in this citation. It follows that the teaching of D2 cannot contribute to the solution of the technical problem.

5.5 Although documents D5 and D6 played a major role in the Appellant's submissions, their teachings do not go beyond the disclosure of PC resin compositions comprising phosphine stabilizers having good transparency properties.

D5 describes PC resin compositions containing either phosphines alone or a combination of phosphines and oxetane compounds, wherein the additives are present in amounts between 0.01 and 1 percent by weight (Claims 1 and 2; page 12, paragraph 2; page 13, paragraph 1). Similarly, D6 describes the use of solutions of

phosphines in oxetane compounds to stabilize PC resins (Claims 1, 2 and 4; passage bridging pages 10 and 11). Both documents are silent about the chlorine content of the polymer as well as about the resulting pinhole formation, thus about the cause and the effect on the basis of which the problem underlying the patent in suit has been defined.

5.6 In summary, in view of the teachings of documents D4 and D7, which must be regarded as the most relevant citations, a skilled person would have been aware that a limited amount of chlorine in the PC resin could be tolerated, provided that a partial ester was used as the main stabilizer. As according to documents D2, D5 and D6, the beneficial effect of phosphines as additives to PC resins is limited to improved transparency, there would have been no incentive to substitute phosphines for partial esters either completely (variant 1) or partially (variant 2) in order to avoid pinhole formation. But even if, for the sake of argument, such substitution were to be made following the teaching of the latter documents, this would not lead to the specific amounts required in the patent in suit, nor to the desired effect, as it appears from Comparative Examples 2, 3, 5 and 8. For these reasons, the subject-matter as defined in Claim 1 of the patent in suit must be considered as involving an inventive step.

6. Claim 1 being allowable, the same applies to dependent Claims 2 to 5, which are directed to preferred embodiments of the composition according to Claim 1. By the same token Claim 6, which deals with a composition according to Claim 1 in the form of a moulded article for optical applications, and Claim 7, which concerns the use of a composition according to Claim 1 in a moulded article for optical applications, as well as

Claims 8 and 9, which are related to a coated article for optical applications made from a composition according to any of Claims 1 to 7, likewise involve an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of the main request.

The Registrar:

E. Görgmaier

The Chairman:

C. Gérardin