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Aktenzeichen / Case Number / N^o du recours : T 174/83
Anmeldenummer / Filing No / N^o de la demande : 78 300 631.5

Veröffentlichungs-Nr. / Publication No / N^o de la publication : 2130

Bezeichnung der Erfindung: Melt processable wholly aromatic polyester
Title of invention: composition containing a phosphorus ester,
Titre de l'invention : process for the preparation thereof, and
moulded articles, films and fibres based thereon.
Klassifikation / Classification / Classement : CO8L 67/00

ENTSCHEIDUNG / DECISION

vom / of / du 21 January 1987

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : CELANESE (respondent)

Einsprechender / Opponent / Opposant : BAYER (appellant)

Stichwort / Headword / Référence : Polyester composition/CELANESE

EPO / EPC / CBE Article 56 EPC

Kennwort / Keyword / Mot clé : "Inventive step"

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt

Beschwerdekammern

Case Number : T 174 /83

European Patent
Office

Boards of Appeal

Office européen
des brevets

Chambres de recours



D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 21 January 1987

Appellant :
(Opponent)

BAYER AG, Leverkusen
Zentralbereich Patente, Marken und Lizenzen
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Representative :

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Decision under appeal :

Decision of Opposition Division of the European
Patent Office dated 20 September 1983 rejecting
the opposition filed against European patent
No. 2 130 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : P. Lançon

Member : A. Nuss

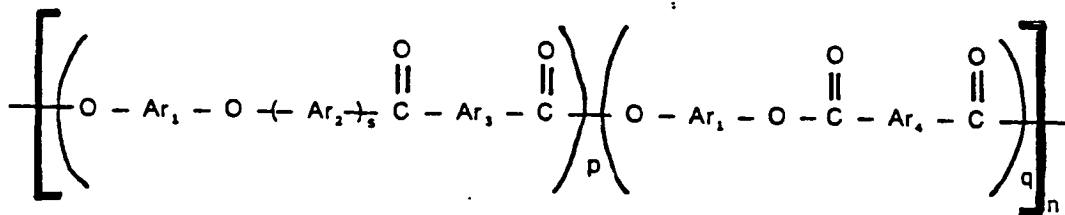
Member : G. D. Paterson

Summary of Facts and Submissions

- I. European patent No. 2 130 was granted on 11 November 1981 on the basis of 21 claims in response to European patent application 78 300 631.5 filed on 15 November 1978, claiming the priority of an earlier application of 17 November 1977 (US 852 384).

Claim 1 is worded as follows, whereby on page 14, line 41 one should read "when s is 1" and in formula II (phosphorus ester) the number defining the recurring units should read m and not n as erroneously indicated.

1. An improved melt processable wholly aromatic polyester composition based on a normally non-melt processable wholly aromatic polyester characterised in that the composition comprises in intimate admixture a blend of (I) an aromatic polyester having a recurring structural formula:



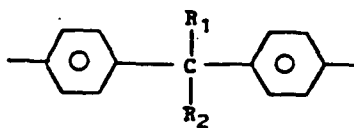
wherein n is an integer of at least 10, Ar₁, is one or more of the following divalent moieties:

(a)

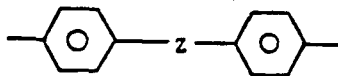


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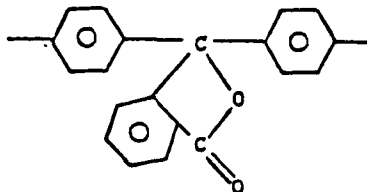
(b)



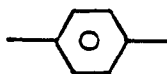
(c)



(d)

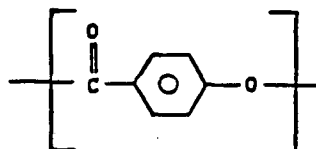


(e)



Wherein R_1 and R_2 which may be the same or different represent hydrogen or a lower alkyl group or together constitute a cyclic hydrocarbon group and Z is sulfide, sulfone, oxy or carbonyl;

Ar_2 is the p-hydroxy benzoic acid derived moiety



which, when s is 1, is accompanied by substantially equimolar amounts of the divalent moiety Ar_1 and the acid derived moiety as represented by Ar_3 and Ar_4 collectively;

Ar_3 consists essentially of an aromatic dicarboxylic acid-derived moiety consisting of m-phenylene, p-phenylene and naphthylene or a mixture thereof;

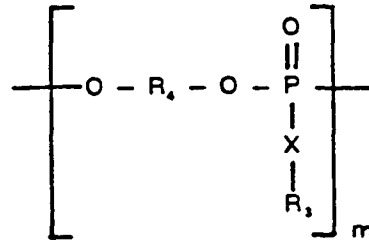
Ar_4 is p-phenylene;

s is 0 or 1;

p is at least 1;

q is 0 when Ar₃ is other than naphthylene and q is at least 1 when Ar₃ is naphthylene, the ratio of p and q being sufficient to yield a normally non-melt processable wholly aromatic polyester; and

(II) a phosphorus ester having the recurring structural formula:



wherein

m is at least 3,

X (which can be the same or different in the various such repeat units) represents a single bond, oxy or sulfide,

R₃ (which can be the same or different in the various repeat units) represents lower alkyl, aryl, haloaryl, haloalkyl, or a mixture thereof;

R₄ (which can be the same or different in the various repeat units) represents arylene, alkylene, haloarylene or a mixture thereof said aromatic polyester constituting from 95 to 60 percent by weight of said blend.

Claims 2 to 17 concern preferred embodiments of the above composition.

Claims 18 and 19 relate to a process for providing such compositions.

Claims 20 and 21 concern a moulded article, a film or fibre manufactured therefrom.

II. The Appellant filed opposition against the European patent in a letter received on 2 August 1982, requesting that it be revoked on the grounds of non-patentability in the light of the state of the art. The opposition was supported by the following documents:

- (1) Chem. Abstracts, 81 (1974), Abstract No. 12 910 C
- (2) Chem. Abstracts, 85 (1976), Abstract No. 22 407 V
- (3) DE-A-2 111 202
- (4) US-A-3 027 349 (incorrectly cited as US-A-3 927 349 in the decision of the Opposition Division)
- (5) US-A-3 761 543

III. The Opposition Division rejected the opposition by a decision of 20 September 1983, which states that the subject-matter of the contested patent was new and involved an inventive step, since none of the documents (1) to (5) disclose a melt-processable aromatic polyester composition which includes the oligomeric compounds specified in Claim 1 of the patent and it had not been proved by the opponent that the melt-processability imparted to the polymers of the disputed patent by the addition of the phosphorus ester of the formula II could have been predicted by combining the teaching of (3) with that of (1) and (2). In the opinion of the Opposition Division, document (3) would rather lead away from the invention.

IV. The Appellant appealed against this decision in a letter received on 4 October 1983 with payment of the appeal fee. The grounds for appeal, received on 12 January 1984, were essentially as follows:

It is known from (3) that by the use of oligomeric phosphorus containing esters instead of the corresponding monomeric compounds, the normally observed molecular weight disintegration does not occur. However, as appears

from the shown examples, even with an average degree of polymerisation of 3.6, the oligomer still reduces the viscosity of the melted aromatic polyester when compared with the untreated polymer. This is precisely what the patentees try to protect again for aromatic polyesters.

It was, however, easy to simply transpose this to the wholly aromatic polyesters of the disputed patent without any inventive step being involved. The prejudice which the Opposition Division derived from document (3) accordingly does not exist. On the contrary, the combination of (3) with (1) and (2) is admissible and leads automatically to the polyester composition of the disputed patent.

- V. In response thereto the Respondent (proprietor of the patent) stated that the patentees had considered the Appellant's letter and did not wish to submit a reply to it.
- VI. In a communication the Board pointed out that the solution claimed in the patent-in-suit appears to be in line with the teaching of document (3) and to be a simple broadening of the solution given in document (3).
- VII. In a letter received on 21 January 1986, the Respondent acknowledged receipt of the communication of the Board and again stated that he did not wish to file any observations.
- VIII. The Appellant requests that the decision under appeal be set aside and the patent be revoked for all designated Contracting States.

The Respondent did not file any specific request.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. The subject-matter of the disputed patent concerns a melt-processable wholly aromatic polyester composition containing a phosphorus ester.
3. In the Board's view, the closest prior art is document (1) which, like the disputed patent relates to melt processable wholly aromatic polyester compositions with improved workability containing a phosphorus ester. According to this document polyarylates were mixed with 2 to 40% trialkylphosphites to injection-mouldable resin compositions and processed at 300°C.
4. In contrast to the Opposition Division, the Board therefore considers that the technical problem underlying the patent-in-suit with respect to (1) can only be seen in the finding of other additives with the same capacity to improve the workability of wholly aromatic polyesters that have a tendency to be somewhat intractable in nature and to present difficulties if one attempts to melt process them while employing conventional methods.

In order to solve this problem, the patent-in-suit suggests an oligomeric phosphorus ester (formula II) having at least 3 recurring units and claims a composition comprising in intimate admixture a blend of component (II) and an aromatic polyester (I) in conformity with Claim 1 of the patent-in-suit.

5. In view of the results of the examples carried out with a phosphorus ester having about 8 recurring units (cf. Table I on page 12 of the patent-in-suit), the claimed

compositions solve the technical problem satisfactorily. In addition to imparting melt processability to certain normally non-melt processably wholly-aromatic esters, the phosphorus additive enhances the flame retardant properties. This was not in dispute.

6. In the absence of any document which discloses all the features of the claimed composition, the subject-matter of Claim 1 of the patent-in-suit is therefore new. This was not in dispute.
7. It still remains to be examined whether the requirement for inventive step is met by the claimed solution to the technical problem as indicated in paragraph 4 above.
- 7.1 Among the documents relating to aromatic polyester compositions, the attention of the man skilled in the art will certainly focus on document (3) which relates to a polyester composition comprising a polyarylphosphonate and which can be melt moulded (cf. page 7, second paragraph).

Document (3) is primarily concerned with flame-resistant aromatic-polyester compositions. In referring to the known art it states that monomeric phosphoric or phosphonic esters cause deterioration of the physical properties of polyesters and also states that the degree of polymerisation and the melt viscosity of polyesters are reduced by the known esters of phosphorus containing acids. Consequently, melt spinning is difficult to perform, and when performed, the resulting products are inferior in quality (see in particular page 2, paragraph 1).

According to document (3) the problem was to find a phosphorus-containing and flame-resistant agent which reduces the degree of polymerisation of the polyesters

only to a limited extent, with the result that the physical properties of the polymers are only slightly affected by injection moulding or melt spinning (see page 2, second paragraph).

As a solution to this problem, document (3) suggests the inclusion in the aromatic polyester composition of a polyarylphosphonate with a degree of polymerisation of at least 6. The result is that even though the polyester composition includes a phosphorus compound, the degree of polymerisation is lowered very little and there is little deterioration in other physical and chemical properties when it is melted at temperatures suitable for melt spinning (i.e. about 280°C according to examples 8 to 10). It is further stated that when the degree of polymerisation is below 6, the polyaryl phosphonate is not stable, and the viscosity of the polyester incorporated therewith is considerably lowered. (see document (3), in particular page 3, second paragraph; page 4, second paragraph; table III on page 19 and table V on page 22).

In view of this together with the additional finding in document (3) based on the experimental data indicated in table XII on page 34 of the document that the lower the viscosity of the aromatic polyester, the smaller is the degree of polymerisation of the added phosphorus ester, the teaching of this document is actually in line with that of the prior art document (4).

The latter document starts from the fact that it is already known that due to the low molecular weight of monomeric phosphorus compounds they gradually evaporate when added to polymers (e.g. polyesters) and that moreover these compounds are liable to cause serious deterioration in the physical properties of the polymers. In order to

overcome these major drawbacks document (4) therefore suggests the use of polymeric phosphonic acid esters which may have a quite low degree of polymerisation and which are compatible with a large variety of plastics instead of the volatile monomeric compounds (see col. 1, line 16 ff. and col. 2, lines 42 to 45).

Consequently, the man skilled in the art knew that in relation to polyesters to be subjected to melt-moulding or spinning and in particular to aromatic polyesters, the use of higher oligomeric phosphorus compounds instead of monomeric phosphorus compounds would normally reduce the viscosity of the polyester blend only to a limited extent without substantially affecting the physical properties of the polyester, and that with lower oligomers a more substantial reduction in viscosity of the melt was to be expected, together with alteration in the physical properties of the polyester.

- 7.2 In the present case the technical problem (as already stated) consisted in finding other additives than the monomeric phosphorus compounds mentioned in document (1) with the same capacity to improve the workability of wholly-aromatic polyesters.

Having regard to what is said above, the Board takes the view that when trying to find a solution to this problem the man skilled in the art would have been led quite naturally to apply the known teaching to the wholly aromatic polyesters of the disputed patent. In the present case the claimed solution is entirely in line with the prior teaching and consists merely in a simple broadening of the solution given in particular in document (3), in which there is nothing more than a stricter selection of the oligomer to be combined with the polyester, in view of stricter requirements deriving from the problem to be

solved there. As shown in the Declaration of Dr. Brody, submitted by the Respondent in the course of the opposition proceedings, the skilled man knew, by the time of filing the patent-in-suit, that the melt viscosity of a polymer to be processed must be a compromise between that necessary to give good processability and that necessary to give good physical properties. This applies to polymers in general, and is in fact nothing more than a transcription of the technical information available through document (3).

7.3 The Board is therefore unable to accept the point of view of the Opposition Division that the first complete paragraph on page 3 of document (3) appears to lead away from the invention. This paragraph is merely concerned with the solution to the particular problem raised in this prior art document, placing the limit for an acceptable compromise between the molecular weight and the physical properties of the polymer necessarily at a certain minimum level. This aspect is obviously of no importance in the present case. Apart from this, the Board cannot accept an assertion of prejudice which is merely based on information from one single patent specification (cf. Film coating, T 19/81, OJ 5/1982, 51-56).

7.4 Finally, no evidence has been produced establishing any difference between the results obtained with the polymeric phosphorus esters of the disputed patent and those obtained with the monomeric phosphorus compounds of the closest prior art document (1). In view of the information given in particular in document (3), it is however unlikely that any unexpected effect could have been demonstrated by comparative tests (cf. Shell/Aryloxybenzaldehydes, T 20/81, OJ 6/1982, page 217).

- 7.5 Documents (2) and (5) are further away from the subject-matter of the disputed patent and provide no additional relevant information over what is contained in documents (1) and (4) already discussed above.
- 7.6 In view of the above, and in the absence of any unexpected effect attached to the claimed composition in the judgement of the Board, Claim 1 thus does not involve an inventive step (Article 56 EPC). Claim 1 therefore cannot be allowed under Article 52(1) EPC.
- 7.7 This conclusion differs from that of the Opposition Division. In the opinion of the Board the reason for this is the way in which the Opposition Division defined the problem underlying the alleged invention.
8. Claims 2 to 17 are dependent on the unallowable Claim 1 and therefore fall with the latter (in the absence of any alternative request).
9. Since the claimed composition lacks inventive step, the additional independent claims of ancillary importance, i.e. Claims 18 and 19 (process), 20 and 21 (articles) which wholly rely upon the properties of the composition, do not involve an inventive step either.
- However, in view of the fact that as stated above in detail, the claimed composition does not meet the requirements of the EPC, there is no need to further develop this point.
10. The grounds for maintaining the patent in unamended form accordingly do not support the impugned decision.

Order

For these reasons,

it is decided that:

1. The Decision of the Opposition Division of 20 September 1983 is set aside.
2. European patent No. 0 002 130 is revoked.

