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D E C I S I O N
of 25 April 1994

Case Number: T 0210/91 - 3.3.3

Application Number: 85115298.3

Publication Number: 0197195

IPC: G11B 5/702

Language of the proceedings: EN

Title of invention:
Polyester-polyurethane composition and use thereof

Patentee:
International Business Machines Corporation, et al.

Opponent:
BASF Aktiengesellschaft, Ludwigshafen

Headword:
-

Relevant legal norms:
EPC Art. 56

Keyword:
"Inventive step (confirmed)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0210/91 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 25 April 1994

Appellant: (Opponent)
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Representative:
-

Respondent: (Proprietor of the patent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office dated 23 January 1991 rejecting the oppositions filed against European patent No. 0 197 195 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: H.H.R. Fessel
W.M. Schar

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 197 195 in respect of European patent application No. 85 115 298.3 filed on 3 December 1985 claiming a US priority of 3 April 1985 (US 719402) was announced on 24 May 1989 (cf. Bulletin 89/21). The patent was granted on the basis of 15 claims of which the only independent Claims 1 and 2 read as follows:

"1. A composition comprising a CrO_2 and a thermoplastic polyester-polyurethane being the reaction product of:

a. a hydroxyl-terminated polyester which is a reaction product of difunctional alcohol having hydrolytic stability and a dicarboxylic acid or ester thereof, or mixture thereof, said polyester having a hydroxyl number of about 50 to 260;

b. a chain extender containing a mixture of 1,4-butanediol and 1,6-hexanediol in a weight of about 35:65 to about 65:35;

c. the resultant hydroxyl number of said polyester and chain extender being about 150 to 350;

d. a diisocyanate wherein the relative proportions of (a), (b) and (d) are selected to produce a polyester-polyurethane having a hard segment content of about 32% to 60% by weight and a soft segment molecular weight (Mn) of about 415 to 2250.

2. A magnetic recording composition comprising a substrate and a ferromagnetic CrO_2-loaded binder adhesively coating said substrate, said binder being a thermoplastic polyester-polyurethane being a reaction product of:

a. a hydroxyl-terminated polyester which is a reaction product of a difunctional alcohol having

hydrolytic stability and a dicarboxylic acid, or ester thereof, or mixture thereof, said polyester having a hydroxyl number of about 50 to 260;

b. a chain extender containing a mixture of 1,4-butanediol and 1,6-hexanediol in a weight ratio of about 35:65 to about 65:35;

c. the resultant hydroxyl number of said polyester and chain extender being about 150 to 350;

d. a diisocyanate wherein the relative proportions of (a), (b) and (d) are selected to produce a polyester-polyurethane having a hard segment content of about 32% to 60% by weight and a soft segment molecular weight (Mn) of about 415 to 2250."

The other 13 claims were directed to preferred compositions of those claimed in Claims 1 and 2.

II. Two Notices of Opposition were filed on 20 and 23 February 1990 by Agfa-Gevaert AG (Opponent 01) and BASF Aktiengesellschaft (Opponent 02), respectively, alleging lack of inventive step (Article 100(a) EPC) of the claimed subject-matter.

The oppositions were supported *inter alia* by:

(1) US-A-4 284 750 and
(3) DE-A-3 127 884.

By letter received on 6 December 1990 Opponent 01 informed the Board that its opposition was withdrawn.

III. By decision dated 23 January 1991 the Opposition Division rejected the oppositions. It held the subject-matter of the claims to be novel and considered it to involve an inventive step vis-à-vis documents (1) and (3) or a combination thereof.

The problem addressed in the patent in suit was to provide a composition comprising a magnetic chromium dioxide pigment and a thermoplastic polyester-polyurethane, said composition being specifically designed for use with chromium dioxide in a magnetic recording composition, which would overcome the shortcomings of the known binders, i.e. their tendency to be brittle and to lose cohesive integrity and adhesion to substrates. Nothing in document(1) would suggest that the properties obtained by the patent in suit could be achieved by selecting the specific mixture (b) of the claims as chain extenders. The skilled person would not know from document (1) what features of this polyester-polyurethane polymer had to be modified to get the desired result, and could not get further information from document (3), which gave only examples with iron oxides and did not suggest the hydroxyl numbers required by the urethanes employed pursuant to the patent in suit.

IV. On 9 March 1991 an appeal was lodged together with payment of the prescribed fee by Opponent 02 (Appellant). The Statement of Grounds of appeal was received on 24 May 1991. In its written submission the Appellant argued that a person skilled in the art seeking to improve the compositions known from document (1) would know from document (3) that a mixture of 1,4-butanediol and 1,6-hexanediol in a weight ratio of about 43:57 to 64:36, when used as a chain-extender instead of the individual diols, would provide the desired result. As to the hydroxyl number of the polyester, since compositions meeting that requirement were known from document (1), this feature could not by itself contribute to any inventive step.

V. The Respondent (Patentee) contended that the patent in suit represented a selection invention over the revealed art represented by documents (1) and (3); whereas document (1) did not present any experimental or test results dealing with other magnetic metal oxides than magnetic iron oxide, the compositions claimed in the patent in suit were specifically designed for use with chromium dioxide in a magnetic recording material in order to overcome the various deficiencies, namely tendency to brittleness as well as loss of cohesive integrity and adhesion to substrates, caused by the replacement of iron oxide by chromium dioxide in the compositions according to document (1).

VI. 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.

Reasons for the Decision

1. The appeal is admissible.

2. The Board is satisfied that the subject-matter as claimed is novel over the cited prior art, which has not been disputed. Further details to support the Board's view are therefore not necessary.

3. The patent in suit concerns a composition comprising a CrO_2 and a thermoplastic polyester-polyurethane binder (Claim 1) as well as a magnetic recording composition comprising a substrate coated with the said composition (Claim 2).

3.1 Similar compositions for the same purpose are described in document (1), discussed in the introduction of the patent specification, which the Board, like the Opposition Division, regards as the closest state of the art. More specifically, this citation discloses a thermoplastic polyester-polyurethane composition capable of binding or adhering to magnetic pigments, obtained from (A) a hydroxyl-terminated polyester having an hydroxyl number of from 50 to 250, (B) a chain extender selected from the group consisting of ethylene glycol, propylene glycol, 1,4-butanediol, 1,3-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,4-cyclohexanedimethanol and hydroquinone (di(β-hydroxyethyl) ether, the resultant hydroxyl number of said polyester and chain extender together being from about 130 to 300, and (C) an aliphatic or aromatic diisocyanate in an amount substantially equivalent to the molar quantity of (A) plus (B) (Claim 1).

In principle, any magnetic pigment can be used, in particular iron oxide as well as chromium dioxide (column 3, lines 39 to 43). In practice, however, as reported in the patent in suit (page 2, lines 52 to 57), when making chromium dioxide magnetic recording media, a substantial decay in the media's mechanical properties, such as the modulus, occurs; moreover, the binders tend to become brittle and have a tendency to lose cohesive integrity and adhesion to substrates. These detrimental effects are particularly objectionable, since chromium dioxide is known to confer superior recording performance.

3.2 In view of this prior art shortcoming, the technical problem underlying the patent in suit may thus be seen in the provision of a polyester-polyurethane binder

which, when used in combination with chromium dioxide as magnetic pigment, ensures both high yield strength and high hardness along with high Young's Modulus.

3.3 According to the patent in suit this problem is to be solved by a composition as defined in Claims 1 and 2, i.e. one comprising a polyester-polyurethane having a hard segment content of about 32% to 60% by weight and a soft segment molecular weight (Mn) of about 415 to 2250, which is obtained from a chain extender consisting of a mixture of 1,4-butanediol and 1,6-hexanediol in a weight ratio of about 35:65 to about 65:35.

3.4 With regard to the specification, especially Examples 6 to 10 of the patent in suit, as well as in the light of Figures 6 to 8 in conjunction with Figure 11 of US-A-4 525 424 referred to on page 2, line 58 of the patent in suit, the Board is satisfied that the above problem is effectively solved with the given means.

4. It remains to be decided whether the claimed subject-matter involves an inventive step with regard to the teaching of the documents relied upon by the Appellant.

4.1 As indicated above, the thermoplastic polyester-polyurethane compositions according to document (1) are characterised by excellent mechanical and thermal properties, in particular excellent hardness (Table I), high tensile strength values (cf. Table II), good blocking characteristics (cf. Table III) and good mechanical properties (Table IV). According to the specific embodiment illustrated in all the examples, this desirable combination of properties is achieved with compositions comprising the reaction product of (a) a hydroxyl-terminated polyester having a hydroxyl number of from about 50 to about 235, (b) 1,4-butanediol, (c) the resultant hydroxyl number of said polyester and

butanediol being from about 130 to about 300, and (d) methylene bis diphenyl diisocyanate in an amount substantially equivalent to the molar quantity of (a) plus (b).

Further, the choice of the magnetic pigment is not regarded as a critical feature of these compositions, since any magnetic pigment is said to be operable (column 3, lines 39 to 43). Similarly, the list of alternative extenders includes several diols, but mixtures thereof are not exemplified (column 2, line 63 to column 3, line 2; column 4, lines 25 to 31). A possible correlation between the choice of the magnetic pigment and the definition of the extender is not to be found. Nor is there any hint to a possible correlation between the choice of the magnetic pigment on the one hand, and the hard segment content and the soft segment molecular weight, on the other hand.

This means that document (1) cannot provide the elements for the solution of the above-defined technical problem.

4.2 Document (3) discloses a magnetic storage medium or a magnetic recording composition comprising a substrate and a finely dispersed magnetic pigment-loaded polyester-polyurethane binder adhesively coating said substrate.

This document seeks to improve the loading capacity and dispersity of polyester-polyurethane resin binders having at the same time good mechanical properties, such as resistance to abrasion caused by finely dispersed and/or relatively soft pigments, like iron oxides, magnetites or metallic iron respectively alloys (cf. page 3, paragraph 2) as well as low blocking of said coatings or layers, without compounding said resins with non-urethane modifiers.

This problem is said to be solved with a polyester-polyurethane resin being the reaction product of (a) a hydroxyl-terminated polyester having a molecular weight between 1200 and 6000, (b) a mixture of at least two glycols, in particular 1,4-butanediol and 1,6-hexanediol in a molar ratio of 3:2 to 2:3, and (c) a diisocyanate such as methylene bis diphenyl diisocyanate (Claims 1 and 3, Examples 1 to 3).

As magnetic pigments, besides those based on iron, chromium dioxide is mentioned on page 6, lines 23 to 28. By way of comparison, it is shown that load capacity magnetic properties, surface properties and abrasion resistance are improved with regard to the prior art given therein. All the experimental data given in said document concern magnetite; the technical difficulties encountered by using chromium dioxide are not discussed.

No hint is given therein that the drawbacks to be expected by a replacement of magnetite by chromium dioxide could be avoided by using (i) a polyester, (ii) a chain extender consisting of a mixture of 1,4 butanediol and 1,6-hexanediol leading to a hydroxyl number of 150 to 350 together with (iii) a diisocyanate in such amounts as to produce a polyester-polyurethane polyol having a hard segment content of about 32 to 60% by weight and a soft segment molecular weight of about 415 to 2250.

For these reasons, document (3) in isolation cannot lead the skilled person to the composition as defined in the patent in suit.

4.3 It remains to be decided whether a person skilled in the art would combine the teachings given in documents (1) and (3) and whether by such a combination the claimed subject-matter would become obvious.

Both documents are silent as to the specific effects due to the use of chromium dioxide, since both documents concentrate on iron based pigments. Both start from about the same prior art and seek to solve about the same problem by different means. No convincing arguments were provided that a skilled person seeking to solve the above-specified problem would combine the teachings given in these citations without having any knowledge of the patent in suit.

4.4 For these reasons, the claimed subject-matter cannot be derived from the teachings of documents (1) and (3) and, therefore, involves an inventive step.

5. The subject-matter of Claims 1 and 2 being allowable, the same applies to the subject-matter of dependent Claims 3 to 15 which is directed to preferred embodiments of compositions according to Claims 1 or 2 and whose patentability is supported by that of the independent claims.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier C. Gérardin