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D E C I S I O N
of 9 May 1996

Case Number: T 1068/93 - 3.4.2

Application Number: 85114990.6

Publication Number: 0184716

IPC: G02B 6/44, C08G 63/00, D01F 6/00

Language of the proceedings: EN

Title of invention:
Optical communication cable

Applicant:
SUMITOMO CHEMICAL COMPANY, LIMITED, et al

Opponent:
-

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - (yes) after amendment"

Decisions cited:

Catchword:
-

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Case Number: T 1068/93 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 9 May 1996

Appellant: SUMITOMO CHEMICAL COMPANY, LIMITED, et al
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Representative: Henkel, Feiler, Hänzel & Partner
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 5 August 1993 refusing European patent application No. 85 114 990.6 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: W. W. G. Hofmann
L. C. Mancini

Summary of Facts and Submissions

I. The Appellant (Applicant) lodged an appeal against the decision of the Examining Division on the refusal of the application No. 85 114 990.6 (publication No. 0 184 716).

The Examining Division had held that the application did not meet the requirements of Article 56 EPC, having regard to the documents

D2: EP-A-0 017 310
D3: EP-A-0 072 540
D4: US-A-4 183 895
D5: EP-A-0 091 253
D6: GB-A-1 565 724.

Further documents considered during the examination procedure are

D1: US-A-4 374 608 and
D7: DE-A-32 14 732.

II. Oral proceedings were held, at the end of which the Appellant requested that the decision under appeal be set aside and a patent granted on the basis of Claims 1 to 3, filed at the oral proceedings, and the description to be adapted.

III. The wording of Claim 1 according to the sole request on file at the time of the present decision reads as follows:

"1. An optical communication cable comprising

(A) an optical fiber strand,
(B) a tension-resistant material and
(C) a synthetic resin coating layer

wherein said tension-resistant material consists of fiber yarns, said fiber yarns are provided between the optical fiber strand and the synthetic resin coating layer and surround said optical fiber strand in a way that said optical fiber strand is prevented from coming into direct contact with the synthetic resin coating layer,

characterized in that

the tension resistant material consisting of fiber yarns is made of an assembly of fibers obtained by melt spinning an aromatic copolyester showing anisotropy in the molten state and comprising
40 to 70 mole% p-hydroxybenzoic acid residue, 15 to 30 mole% aromatic dicarboxylic acid residue and 15 to 30 mole % aromatic diol residue, wherein the aromatic dicarboxylic acid residue is a terephthalic and/or isophthalic acid residue and the aromatic diol residue is a 4,4'-dihydroxy-diphenyl residue."

Claims 2 and 3 are dependent on Claim 1.

IV. The Appellant's arguments were substantially as follows:

The composition of the tension resistant material as it is now specified in Claim 1, in particular regarding the 4,4'-dihydroxy-diphenyl, is not disclosed in any of the cited documents. This composition is particularly well suited for protecting the optical fibre strand of the optical fibre cable. Since no suggestion regarding this material comes from the prior art, the claimed subject-matter is novel and inventive.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The present Claim 1 is based on the original Claim 1, supplemented with the following features:

- Tension-resistant material consisting of fibre yarns and preventing direct contact between the optical fibre strand and the resin coating layer (see original page 8, lines 13 to 18; page 8, line 26 to page 9, line 5; page 9, lines 10/11).

- Aromatic copolyester comprising 40 to 70 mole% p-hydroxybenzoic acid residue, 15 to 30 mole% aromatic dicarboxylic acid residue and 15 to 30 mole% aromatic diol residue (see original page 6, lines 2 to 5).

- Terephthalic and/or isophthalic acid residue and 4,4'-dihydroxy-diphenyl residue (see original page 4, lines 27/28; page 5, lines 2, 5, 10; page 10, lines 18 to 20).

The specific compounds and amounts mentioned in Claims 2 and 3 are based on page 10, lines 17 to 20.

Thus, no objection arises under Article 123(2) EPC.

3. *Novelty*

3.1 D1, D5, D6 and D7 relate to optical communication cables comprising an optical fibre strand, a tension-resistant material and a synthetic resin coating layer. According to D1, D6 and D7, furthermore, the tension-resistant material consists of fibre yarns provided between the optical fibre strand and the coating layer, surrounding the fibre strand in such a way that direct contact between the fibre strand and the coating layer is prevented.

On the other hand, of these documents, only D5 mentions as tension-resistant material (not in the form of yarns) aromatic polyesters showing anisotropy in the molten state, and, regarding examples of such polyesters, among others refers to a list of prior art documents (see page 8, second paragraph), of which US-A-4 238 598 corresponds to D2 of the present case. As will be shown below, these polyesters according to D2 (and consequently those according to D5) are not identical with the claimed polyesters.

3.2 D2, D3 and D4 describe fibre yarns which, in correspondence with the material specified in Claim 1, are obtained by melt spinning an aromatic copolyester showing anisotropy in the molten state and comprising

p-hydroxybenzoic acid residue, aromatic dicarboxylic acid residue and aromatic diol residue. Of these documents, D2 even mentions ranges for the mole percentages of the three components (20 to 60 mole% for the p-hydroxybenzoic acid residue, 20 to 50 mole% for the dicarboxylic acid residue and 20 to 40 mole% for the diol residue; see page 3, lines 3 to 12, and Claim 1) which interleave with the ranges specified in the present Claim 1.

However, none of the documents D2, D3 and D4 mentions optical communication cables as a possible application for the described fibre yarns, and, moreover, none relates to the same type of copolymer as Claim 1 since 4,4'-dihydroxy-diphenyl as the diol component of the specified three component aromatic copolyester is not mentioned in any of these documents.

3.3 The subject-matter of Claim 1 is thus novel in the sense of Article 54 EPC.

4. *Inventive step*

4.1 D6 is considered as representing the prior art closest to the present subject-matter since not only does it describe an optical communication cable having the same basic construction as that according to Claim 1, ie comprising an optical fibre strand, a synthetic resin coating layer and, in between, a tension-resistant material consisting of fibre yarns and fully surrounding the optical fibre strand (see in particular page 1, lines 24 to 33; page 3, lines 1, 11, 26 and 45 to 55; Claim 1), but, in partial accordance with the problem of the present application, is also concerned with the

function of the tension-resistant material as heat-insulating material between the optical fibre strand and the outer synthetic resin coating (see in particular page 1, line 33; page 2, lines 55 to 60).

According to D6, the fibre yarns can consist of a number of different materials, eg aramids or poly(p-phenylene terephthalamide); see page 3, lines 7 and 47.

Starting from this prior art, the problem underlying the present subject-matter can be seen in providing an optical communication cable which is easy to fabricate and in which less damage, breakage or transmission loss is caused during preparation or handling (see page 2, lines 10, 11, 22 to 24; page 3, lines 1 and 2, of the present description). This problem is solved by the aromatic copolyester defined in Claim 1 since the fibres of this material can be melt spun and, while having good strength, have particularly good heat insulating properties and particularly low moisture absorption. (The heat insulation prevents the heat of the extruded resin coating layer from damaging the optical fibre strand, and - as the Appellant explained - the low moisture absorption prevents both foaming of the extruded resin coating layer under the influence of water evaporating from the tension-resistant material and moisture dependent variations of the length of the tension-resistant yarns.)

4.2 Although it is true that the materials described in D2, D3 and D4 are known to be melt extrudable and to have good tensile strength, thus being applicable as reinforcement in tires, hoses and cabling (see eg D2, page 4, lines 8 to 11; page 10, lines 13 to 16; page 12, lines 14 to 23), the documents D2, D3 and D4

nevertheless relate neither to optical communication cables and their specific problems, nor to the particular polymer specified in Claim 1 (see paragraph 3.2 above).

4.3 Thus it is, firstly, to be doubted that a skilled person, when trying to improve optical communication cables as regards easy fabrication and less damage and transmission loss, would have selected, from all the polymers of good tensile strength known per se, the materials according to D2, D3 or D4, and in particular those materials which come closest to the claimed aromatic copolymers. It is true that he could have expected that these materials would provide, like many other polymers, yarns of good tensile strength and easy fabrication (melt spinning). However, the aspects of heat insulation and moisture absorption are not mentioned in D2, D3 and D4 (in fact, moisture absorption is not mentioned in any of the cited prior art documents), so that the particularly good heat insulating properties and extremely low moisture absorption give rise to a surprising overall performance of the optical cable, which surprising performance is an indication of a non-obvious selection.

But even if a skilled person selected the aromatic three component copolyesters of D2, D3 or D4, he would not arrive at the subject-matter of Claim 1 since 4,4'-dihydroxy-diphenyl residue is not mentioned as such a component. It is credible that this specific component further improves the obtained properties.

Thus, the prior art does not present any suggestions which would lead the skilled person from an optical communication cable as known from D6 (or D1 or D7) to an optical cable as specified in Claim 1, for solving the above-mentioned problems.

Such suggestions also are not derivable from D5 since this document neither describes the claimed polymer, nor relates to a construction of the intermediate stiffening member which could be compared to the wrapping provided by the fibre yarns according to the present Claim 1 (or according to D6).

4.4 For these reasons, the Board comes to the conclusion that the subject-matter of Claim 1 involves an inventive step in the sense of Article 56 EPC.

Claim 1 is therefore allowable.

5. Claims 2 and 3 are allowable due to their dependence on Claim 1.

6. The description is not yet adapted to Claim 1. For having this adaptation performed, the Board makes use of its power under Article 111(1) EPC and remits the case to the Examining Division.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division with the order to grant a patent based on Claims 1 to 3 submitted at the oral proceedings as the sole request, with the description to be adapted.

The Registrar: The Chairman:

P. Martorana E. Turrini