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Datasheet for the decision of 16 July 2014

Case Number: T 1269/10 - 3.4.02

Application Number: 02727577.5

Publication Number: 1497686

IPC: G02B6/44, G02B6/16

Language of the proceedings: EN

Title of invention:
METHOD FOR CONTROLLING MICROBENDING INDUCED ATTENUATION LOSSES IN AN OPTICAL FIBER

Applicant:
Prysmian S.p.A.

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step (yes - amended claims)

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Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1269/10 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 16 July 2014

Appellant: (Applicant)	Prysmian S.p.A. Viale Sarca 222 20126 Milano (IT)
Representative:	Bottero, Claudio Porta, Checcacci & Associati S.p.A. Via Trebbia 20 20135 Milano (IT)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 15 January 2010 refusing European patent application No. 02727577.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	A. G. Klein
Members:	F. J. Narganes-Quijano
	B. Müller

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 02727577.5 (based on International application No. PCT/EP02/04507 published with the International Publication No. WO 03/091781).

In its decision the examining division held that the subject-matter of the claim requests then on file did not involve an inventive step (Article 56 EPC 1973) with regard to the disclosure of document

D1: US-A-5104433.

II. With the statement setting out the grounds of appeal the appellant requested that the decision under appeal be set aside and a patent be granted.

III. In response to a communication annexed to a summons to oral proceedings before the Board, the appellant, with the letter dated 26 May 2014, submitted a new set of claims 1 to 13, and with the letter dated 4 June 2014 amended pages 3, 5 to 7, 9, 12, 17 to 20, 33 and 40 of the description replacing the corresponding documents of the application as filed.

In view of the amendments to the application documents, the oral proceedings were cancelled.

IV. Claim 1 of the present request of the appellant reads as follows:

"Method for controlling attenuation losses caused by microbending on the signal transmitted by an optical

fiber comprising an internal glass portion, which comprises:

a) determining a hardening temperature of a first polymeric material in a Dynamic Mechanical Analysis (DMA) curve by intersecting a line tangent to the inflection point of the DMA curve with a line determined by interpolating the points of the DMA curve in a plateau region of a rubbery state;

b) determining an equilibrium tensile modulus of said first polymeric material as the lowest value of a storage modulus E' in said DMA curve in a temperature range between 10 and 100°C, said DMA curve being obtained by measuring at a frequency of 1.0 radian/second the storage modulus E' of test samples approximately 35 mm long, approximately 12 mm wide and having a thickness in the range of 0.02 mm to 0.4 mm, during a temperature sweep including: cooling the test samples to about -60°C or about -90°C and increasing the temperature at about 2°C/minute until a temperature of 100°C to 120°C is reached;

c) selecting a first polymeric material having a hardening temperature lower than -10°C and an equilibrium tensile modulus lower than 1.3 MPa as determined above;

d) providing a first coating layer of said selected first polymeric material to surround said glass portion; and

e) providing a second coating layer of a second polymeric material to surround said first coating layer."

The request of the appellant includes dependent claims 2 to 13 all referring back to the method of claim 1.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The Board is satisfied that the application documents amended according to the present request of the appellant satisfy the formal requirements of the EPC. In particular, present claim 1 is based on claims 1 and 3 as originally filed, together with Figure 2, the paragraph bridging pages 4 and 5, and the passages on page 8, line 6 to page 9, line 15, and on page 38, line 19 to page 40, line 1 of the application as originally filed; present dependent claims 2 to 13 are respectively based on the passage on page 9, lines 32 and 33, and on dependent claims 4 to 14 of the application as originally filed (Article 123(2) EPC).

As regards the description, its content has been brought into conformity with the invention as presently claimed (Article 84, second sentence, and Rule 27(1) (c) EPC 1973), and the pertinent prior art has been appropriately acknowledged in the introductory part of the description (Rule 27(1) (b) EPC 1973).

3. *Inventive step*

3.1 Claim 1 is directed to the provision of a first and a second polymeric coating layer on a glass portion so as to form an optical fiber. According to the claimed method, the attenuation losses caused by microbending on the signal transmitted by the resulting optical

fiber are controlled by selecting for the first coating layer a polymeric material having a hardening temperature lower than -10° C and an equilibrium tensile modulus lower than 1.3 MPa.

In its decision the examining division held with regard to claim 1 of the requests then on file that the claimed method did not involve an inventive step over the disclosure of document D1. This document discloses an optical fiber having a first and a second polymeric coating layer and teaches to select the polymeric material of the first coating layer with an equilibrium modulus in the range of about 70 to 150 psi and a glass transition temperature below about -40°C so as to provide suitable resistance to microbending over a predetermined temperature range (column 4, lines 36 to 40 and lines 55 to 58, together with column 8, lines 9 to 55). According to the examining division, this disclosure, together with the curve 48 shown in Figure 4 of the document and representing the logarithm of the modulus versus temperature for the polymeric material of the first coating layer, implied that the hardening temperature of the polymeric material, as determined with the method now defined in claim 1 and disclosed in the description of the application in suit with reference to Figure 2, could be estimated as having a value between -10° C and -20° C, and that the equilibrium tensile modulus of the polymeric material would be about three times the value of the shear modulus given in the document, and therefore would be between 1.4 and about 3 MPa (1 MPa = 145,0377 psi). The examining division further held that it was known to the skilled person that a low tensile modulus of the first coating layer reduced the stress on the fiber and therefore reduced losses caused by microbending of the fiber as acknowledged in the introductory part of

document D1 which referred to first coating layer materials having a modulus of elasticity in the range of about 50 to 200 psi, and therefore an equilibrium tensile modulus in the range of about 1 to 4 MPa. The examining division concluded that the skilled person confronted with the problem of further improving the reduction of attenuation losses caused by microbending of the fiber would select the lowest possible modulus, and in particular a value as low as the value 1 MPa disclosed in document D1, thus arriving at the claimed method (Article 56 EPC 1973).

3.2 The Board, however, does not find persuasive the line of argument followed by the examining division, at least not as far as claim 1 as presently amended is concerned, for the following reasons:

3.2.1 First, no value of the hardening temperature of the polymeric material of the first coating layer can be clearly and unambiguously derived from curve 48 shown in Figure 4 of document D1 and representing the logarithm of the modulus versus temperature. Indeed, according to the disclosure in column 8, line 56 *et seq*. of document D1 the purpose of Figure 4 is to compare the general shape of the curve of the algorithm of the modulus versus temperature of materials according to the disclosure of the document (curve 48) with the corresponding curve of other materials considered in the prior art (curves 47 and 49) and, in addition, the document fails to disclose any specific polymeric material that would enable the reproduction of curve 48, and it is also silent as to the test conditions to be followed in the determination of the curve. For these reasons, curve 48 constitutes in the technical context of the document a mere qualitative description of the behaviour of the modulus with the

temperature of the polymeric materials of the first coating layer considered in the document, and the document does not contain sufficiently reliable information that would allow a precise determination of a quantitative parameter such as the hardening temperature of the material defined - as now required by the claimed method - as the intersection point of a line tangent to the inflection point of the curve with a line determined by interpolation of the points of the curve in a plateau region of the rubbery state.

In addition, while claim 1 requires that the determination of the hardening temperature is carried out on the basis of the curve of the tensile equilibrium modulus versus temperature obtained by the DMA (Dynamic Mechanical Analysis) method, the curve 48 of document D1 represents the shear modulus and not the equilibrium tensile modulus and, as already mentioned above, the document is silent as to the test conditions. The shear and the tensile modulus are related, as held by the examining division and as also mentioned in the application (page 3, lines 3 to 7 of the description), by a factor of about three, but the actual value of this factor depends on the particular polymeric material and, in addition, also on the temperature via the Poisson's ratio. These facts further preclude a reliable derivation of the value of the hardening temperature of the materials considered in document D1 on the basis of curve 48 of Figure 4. In particular, the fact that the factor of proportionality between the shear and the tensile modulus varies with temperature implies that the curves representing the variation of the tensile modulus and the shear modulus with temperature would - contrary to the view expressed by the examining division in its decision - generally not have the same shape, with the consequence that the

tangent to the inflection point of the curves would be different and the determination of the hardening temperature as defined in claim 1 would give different results for the two curves.

In view of all these considerations, the Board concludes that the estimation by the examining division of the hardening temperature does not allow to establish clearly and unambiguously that the hardening temperature of the polymeric materials of the first coating layer considered in document D1 would be lower than -10° C as required by claim 1.

3.2.2 Second, as held by the examining division, document D1 teaches value ranges of the equilibrium modulus of the polymeric material of the first coating layer between about 1.4 and about 3 MPa. The claimed method, however, requires an equilibrium tensile modulus lower than 1.3 MPa as determined by the specific method defined in the claim, and document D1 teaches expressly against values of the modulus lower than about 1.4 MPa (column 8, lines 51 to 55).

Furthermore, document D1, in its introductory section, refers to first coating layers of the prior art having an equilibrium modulus of elasticity in the range of about 50 to 200 psi (column 2, lines 6 to 21), corresponding to a tensile modulus in the range between about 1 and about 4 MPa. However, this disclosure only acknowledges in general terms the properties of polymeric materials used in the prior art for reducing microbending of the glass fiber and, in addition, this disclosure fails to teach any correlation of the modulus with the temperature characteristics of the material, and in particular with the hardening temperature.

3.2.3 In addition, present claim 1 has been amended with respect to the previous versions of the claim considered by the examining division so that the claimed method further requires the preliminary step of measuring the hardening temperature and the equilibrium tensile modulus of polymeric materials with the specific methods defined in the claim, and the subsequent step of selecting as material for the first coating layer a polymeric material having a hardening temperature and an equilibrium tensile modules within the claimed value ranges. As is apparent from the discussion in paragraphs 3.2.1 and 3.2.2 above, these method steps are neither disclosed nor suggested in document D1.

3.2.4 The Board concludes that document D1 does not anticipate or render obvious the measurement, selection and manufacture method defined in claim 1, nor the technical effect achieved with the claimed method, i.e. reducing the microbending sensitivity, and therefore the attenuation losses caused by microbending, of the resulting optical fiber over a large operating temperature range including relatively low temperatures of operation (page 5, lines 15 to 21, and page 9, lines 18 to 31 of the description).

The remaining documents on file are less relevant than document D1.

3.3 The Board concludes that the subject-matter of claim 1 as well as that of dependent claims 2 to 13 is novel and involves an inventive step over the available prior art (Article 52(1) EPC).

4. The Board is also satisfied that the application documents amended according to the appellant's request and the invention to which they relate meet the remaining requirements of the EPC within the meaning of Article 97(1) EPC. The Board therefore concludes that the decision under appeal is to be set aside and a patent be granted on the basis of the application documents amended according to the present request of the appellant.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent in the following version:
   - claims: claims 1 to 13 filed with the letter dated 26 May 2014;
   - description: pages 1, 2, 4, 8, 10, 11, 13 to 16, 21 to 32, 34 to 39, 41 and 42 of the application as originally filed, and pages 3, 5 to 7, 9, 12, 17 to 20, 33 and 40 filed with the letter dated 4 June 2014; and
   - drawings: sheets 1/8 to 8/8 of the application as originally filed.

The Registrar: The Chairman:

M. Kiehl A. G. Klein

Decision electronically authenticated