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) [ ] To Chairmen
(D) [X] No distribution

D E C I S I O N
of 25 April 2006

Case Number: T 0122/04 - 3.5.03

Application Number: 93100780.1

Publication Number: 0554714

IPC: H04B 10/18

Language of the proceedings: EN

Title of invention:
Dispersion compensating devices and systems

Patent proprietor:
Corning Incorporated

Opponent:
ALCATEL

Headword:
Dispersion compensating devices/CORNING

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
"Amendments - added subject-matter (yes)"

Decisions cited:
T 0339/89, T 0329/99

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0122/04 - 3.5.03

D E C I S I O N
of the Technical Board of Appeal 3.5.03
of 25 April 2006

Appellant: (Patent proprietor)	Corning Incorporated Houghton Park Corning, NY 14831 (US)
Representative:	Boon, Graham Anthony Elkington and Fife LLP Prospect House 8 Pembroke Road Sevenoaks, Kent TN13 1XR (GB)
Respondent: (Opponent I)	ALCATEL 54, rue la Boétie F-75008 Paris (FR)
Representative:	Vigand, Privat 16 rue Henri Barbusse F-91200 Athis-Mons (FR)
Decision under appeal:	**Decision of the opposition division of the European Patent Office posted 24 October 2003 revoking European patent No. 0554714 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: A. Clelland
Members: F. van der Voort
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. This appeal is against the decision of the opposition division revoking European patent No. 0 554 714 on the grounds that the independent claims of each one of a main and four auxiliary requests contained subject-matter which extended beyond the content of the application as filed (Article 123(2) EPC) and that the patent when based on any one of five further auxiliary requests did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC).

II. The proprietor (appellant) lodged an appeal against this decision and requested that the decision be set aside and the patent be maintained in amended form on the basis of one of ten sets of claims as filed with the statement of grounds of appeal. Arguments and evidence in support of the appellant's view that the requirements of Articles 83 and 123(2) EPC were met, were submitted.

III. In response to the statement of grounds of appeal, the respondent (opponent I) requested that the appeal be dismissed. Arguments and evidence in support of his request were submitted.

IV. The parties were summoned by the board to oral proceedings. In a communication accompanying the summons, the board particularly drew attention to issues concerning the requirements of Article 123(2) EPC and the opposition ground according to Article 100(b) EPC.

V. In response to the communication the appellant filed with a letter dated 10 March 2006 further evidence and arguments as well as revised sets of claims of a main and four auxiliary requests replacing all previous sets of claims on file.

VI. The respondent filed further arguments and evidence in response to the appellant's letter. The appellant then filed a submission including further evidence of experimental results. This reply was in turn commented on by the respondent who requested that the experimental results not be admitted to the proceedings since they were late filed. In a further submission the respondent conditionally requested that a publication by one of the inventors be admitted to the proceedings.

VII. Oral proceedings were held on 25 April 2006 during which the appellant requested that the decision be set aside and the patent be maintained in amended form on the basis of a main request or, alternatively, on the basis of any one of four auxiliary requests, all as filed with letter dated 10 March 2006. The respondent maintained his request that the appeal be dismissed. At the end of the oral proceedings the board's decision was announced.

VIII. Claim 1 of the **main request** reads as follows:

"A silica based dispersion compensating optical waveguide fiber having a refractive index profile tailored to provide a dispersion which is more negative than -20 ps/nm-km at a given wavelength in the range of 1520 nm to 1565 nm, the attenuation of the dispersion compensating waveguide being less than 1 dB/km at the

given wavelength, the dispersion at the given wavelength divided by the attenuation at the given wavelength being more negative than -40 ps/nm-dB, the waveguide including a core region surrounded by and in contact with a clad layer, characterized in that:

(i) the core region has a refractive index profile which includes a central portion (50, 51', 100) having a maximum index of refraction, n_0, surrounded by and in contact with a moat layer (55, 105), having an index of refraction, n_1, surrounded by and in contact with a ring layer (52, 102), having an index of refraction, n_2, and the clad layer (51, 101) having an index of refraction, n_c, wherein $n_0 > n_2 > n_1$ and n_c, and wherein $n_1 < n_c$; and

(ii) the dispersion slope in the wavelength range of 1520 nm to 1565 nm is between 0 and -1.2 ps/nm^2-km."

Claim 1 of the **first auxiliary request** reads as follows:

"A combination of an optical transmission fiber and a silica based dispersion compensating optical waveguide fiber, serially connected to one another, said transmission fiber being optimized for low dispersion operation at a wavelength in the range from 1290 nm to 1330 nm, wherein the dispersion compensating optical waveguide fiber has a refractive index profile tailored to provide a dispersion which is more negative than -20 ps/nm-km at a given wavelength in the range of 1520 nm to 1565 nm, and an attenuation of less than 1 dB/km at the given wavelength, the dispersion at the given wavelength divided by the attenuation at the given wavelength being more negative than -40 ps/nm-dB,

the waveguide including a core region surrounded by and in contact with a clad layer, characterized in that:

(i) the said core region has a refractive index profile which includes a central portion (50, 51', 100) having a maximum index of refraction, n_0, surrounded by and in contact with a moat layer (55, 105), having an index of refraction, n_1, surrounded by and in contact with a ring layer (52, 102), having an index of refraction, n_2, and the clad layer (51, 101) having an index of refraction, n_c, wherein $n_0 > n_2 > n_1$ and n_c, and wherein $n_1 < n_c$; and

(ii) the dispersion slope of the dispersion compensating fiber in the wavelength range of 1520 nm to 1565 nm is between 0 and -1.2 ps/nm^2-km."

Claim 1 of the **second auxiliary request** reads as follows:

"A silica based dispersion compensating optical waveguide fiber having a refractive index profile tailored to provide a dispersion which is more negative than -20 ps/nm-km at a given wavelength in the range of 1520 nm to 1565 nm, the attenuation of the dispersion compensating waveguide being less than 1 dB/km at the given wavelength, the dispersion at the given wavelength divided by the attenuation at the given wavelength being more negative than -40 ps/nm-dB, the dispersion vs. wavelength curve of the waveguide having no zero crossing in the wavelength range 1290 nm to 1565 nm, the waveguide including a core region surrounded by and in contact with a clad layer, characterized in that:

(i) the core region has a refractive index profile which includes a central portion (50, 51', 100) having a maximum index of refraction, n_0, surrounded by and in contact with a moat layer (55, 105), having an index of refraction, n_1, surrounded by and in contact with a ring layer (52, 102), having an index of refraction, n_2, and the clad layer (51, 101) having an index of refraction, n_c, wherein $n_0 > n_2 > n_1$ and n_c, and wherein $n_1 < n_c$; and

(ii) the dispersion slope in the wavelength range of 1520 nm to 1565 nm is between 0 and -1.2 ps/nm^2-km."

Claim 1 of the **third auxiliary request** reads as follows:

"A combination of an optical transmission fiber and a silica based dispersion compensating optical waveguide fiber, serially connected to one another, said transmission fiber being optimized for low dispersion operation at a wavelength in the range from 1290 nm to 1330 nm, wherein the dispersion compensating optical waveguide fiber has a refractive index profile tailored to provide a dispersion which is more negative than -20 ps/nm-km at a given wavelength in the range of 1520 nm to 1565 nm, and an attenuation of less than 1 dB/km at the given wavelength, the dispersion at the given wavelength divided by the attenuation at the given wavelength being more negative than -40 ps/nm-dB, the dispersion vs. wavelength curve of the waveguide having no zero crossing in the wavelength range 1290 nm to 1565 nm, the waveguide including a core region surrounded by and in contact with a clad layer, characterized in that:

(i) the said core region has a refractive index profile which includes a central portion (50, 51', 100) having a maximum index of refraction, n_0, surrounded by and in contact with a moat layer (55, 105), having an index of refraction, n_1, surrounded by and in contact with a ring layer (52, 102), having an index of refraction, n_2, and the clad layer (51, 101) having an index of refraction, n_c, wherein $n_0 > n_2 > n_1$ and n_c, and wherein $n_1 < n_c$; and

(ii) the dispersion slope of the dispersion compensating fiber in the wavelength range of 1520 nm to 1565 nm is between 0 and -1.2 ps/nm^2-km."

Claim 1 of the **fourth auxiliary request** reads as follows:

"An optical transmission system comprising an optical source (1, 11a, 21, 28) operating at a given wavelength in the range of 1520 nm to 1565 nm, an optical detector (5, 27, 35), an optical transmission fiber (2, 12, 22, 31), said transmission fiber being optimized for low dispersion operation at a wavelength in the range from 1290 nm to 1330 nm, an optical fiber amplifier (3, 13, 25, 32), and a dispersion compensating optical waveguide fiber (4, 14, 24, 29, *[sic]* the optical amplifier and the dispersion compensating fiber being connected serially between the optical source and optical detector, wherein the dispersion compensating optical waveguide fiber is a silica based dispersion compensating optical waveguide fiber having a refractive index profile tailored to provide a dispersion which is more negative than -20 ps/nm-km at

a given wavelength in the range of 1520 nm to 1565 nm, the attenuation of the dispersion compensating waveguide being less than 1 dB/km at the given wavelength, the dispersion at the given wavelength divided by the attenuation at the given wavelength being more negative than -40 ps/nm-dB, the waveguide including a core region surrounded by and in contact with a clad layer, characterized in that:

(i) the core region has a refractive index profile which includes a central portion (50, 51', 100) having a maximum index of refraction, n_0, surrounded by and in contact with a moat layer (55, 105), having an index of refraction, n_1, surrounded by and in contact with a ring layer (52, 102), having an index of refraction, n_2, and the clad layer (51, 101) having an index of refraction, n_c, wherein $n_0 > n_2 > n_1$ and n_c, and wherein $n_1 < n_c$; and

(ii) the dispersion slope of the dispersion compensating fiber in the wavelength range of 1520 nm to 1565 nm is between 0 and -1.2 ps/nm^2-km."

Reasons for the Decision

1. *Amendments - claim 1 of the main request*

1.1 Claim 1 defines a dispersion compensating optical waveguide fiber having, *inter alia*, the following combination of properties:

i) the attenuation is less than 1 dB/km at the given wavelength; and

ii) the dispersion slope in the wavelength range of 1520 nm to 1565 nm is between 0 and -1,2 ps/nm^2-km.

1.2 The board notes that claim 5 of the patent as granted includes this combination of properties of the waveguide. Further, the board notes that, in the course of the opposition proceedings, opponent I (respondent) raised objections under Article 123(2) EPC in respect of features which were already part of the claims as granted. These objections were adopted by the opposition division and discussed in substance with the proprietor at the oral proceedings before the opposition division (see the minutes, point 3.3). Hence, the granted version of the patent was challenged by the opposition division under Article 123(2) EPC. In the course of the appeal proceedings, the board, first in the communication accompanying the summons and then during the oral proceedings, considered a further objection under Article 123(2) EPC, which specifically concerned the above-mentioned combination of two properties of the waveguide fiber. The appellant argued that in the application as filed, when considered as a whole, there was a clear and unambiguous basis for this combination of properties of the waveguide fiber.

In particular, even though the two properties were originally separately claimed in independent claims 1 and 2, respectively, a skilled person reading the application as a whole would have no reason to believe that these properties were mutually exclusive but would rather understand that they could be combined. This followed from the opening sentence of the application as filed, in which it was stated that the invention related to a low-attenuation transmission system. A

threshold of 1 dB/km was clearly a numerical characterisation of the attenuation which the dispersion compensating fiber needed to have in order to be usable in such a system. Within this field of invention, according to one embodiment the dispersion slope was in the range from 0 to -1,2 ps/nm^2-km (page 5, lines 41 and 42 of the application as published; hereinafter, description pages referred to are always those of the application as published). Further, the skilled person would read the paragraphs starting at page 7, line 27, to page 8, line 30, as being connected, thereby interrelating an attenuation of less than or equal to 1 dB/km (page 7, line 47) to a dispersion slope between 0 and -1,2 ps/nm^2-km (page 8, line 22).

The appellant further argued that at page 8, lines 21 and 22, it was stated that the range of the dispersion slope was limited to about 0 to -1,2 ps/nm^2-km by bend-edge and that, since bend-edge is directly related to attenuation, this implied that within the wavelength range at issue the attenuation is accordingly low (cf. page 8, line 57, to page 9, line 11).

It was therefore clear to the skilled person, who would focus on what was actually described rather than on claim dependencies, that the above-mentioned combination was already envisaged in the application as filed. Present claim 1 did not therefore contain subject-matter which extended beyond the application as filed.

1.3 In the board's view, the decisive question in judging whether claimed subject-matter extends beyond the

content of the application as filed is whether or not it can be directly and unambiguously deduced from the application as filed. A clear distinction must be made between the question of whether the subject-matter was disclosed in the application, be it explicitly or implicitly, and the question of whether it was, at the most, rendered obvious to a person skilled in the art reading the application, see decisions T 339/89, points 8 and 9 of the reasons, and T 329/99, point 4.5 of the reasons (both not published in OJ EPO).

1.4 In respect of the above-mentioned combination of properties of the dispersion compensating waveguide fiber, the board notes that throughout the description as filed these two properties are consistently presented separately.

The reference in the opening sentence at page 2, lines 3 to 5, to low-attenuation transmission does not necessarily imply restrictions on the attenuation of the dispersion compensating optical waveguide fiber in terms of dB/km, in particular less than 1 dB/km as claimed, since, by definition, the attenuation can also be reduced by reducing the length of the compensating fiber. Further, from the application as filed, it is clear that an attenuation per kilometre exceeding 1 dB/km was not excluded; less than 1 dB/km was merely preferred (see page 7, line 47: "*Preferably, the attenuation of the dispersion compensating fiber is ≤ 1 dB/km*"). Hence, low-attenuation transmission in the context of the application as filed does not necessarily imply an attenuation of less than 1 dB/km. These considerations equally apply to the reference to

low attenuation in relation to bend-edge at page 9, lines 5 to 9.

The sentence at page 5, lines 41 to 42, to which the appellant referred, is part of a separate paragraph which is concerned with the creation of fibers with controlled dispersion slopes in order to provide dispersion flattening. It is silent on attenuation, both in absolute (dB) or relative (dB/km) terms. The summary of the invention on the other hand does not refer to the dispersion slope (see page 5, line 44, to page 6, line 13).

The fibers as illustrated in Figs 5 to 7 and the corresponding examples in Table I, as well as all examples listed in Table II and the dispersion compensating fibers used in SYSTEM EXAMPLE 1 and SYSTEM EXAMPLE 2 and described with reference to Figs 9 to 18 do not constitute embodiments of the optical waveguide fiber as defined in claim 1, since they either fail to comprise both a ring and a moat layer or do not satisfy the requirement that $n_1 < n_c$. For the fibers as illustrated in Figs 8 and 8a attenuation values are neither given nor implied.

The board further sees no reason to conclude, as argued by the appellant, that the paragraphs at page 7, line 27, to page 8, line 4, which relate to attenuation, are connected to the paragraph at page 8, lines 5 to 30, which relates to dispersion slope. On the contrary, whereas the dispersion compensating fiber 4 referred to at page 7, lines 30, 31, 45 and 50, has a dispersion of **-30** ps/nm-km, an attenuation of 0,5 dB/km and, hence, a Figure of Merit of -60 ps/nm-dB, the

dispersion slope range mentioned at page 8, lines 20 to 22, is for a dispersion D_{dcf} = **-60** and no reference is made to the dispersion compensating fiber 4 as referred to in the previous paragraphs.

1.5 As concerns the claims as originally filed, independent claims 1 and 2 each define an optical fiber including one of the above-mentioned two properties without mentioning the other, e.g. claim 1 defines an attenuation of less than 1 dB/km only. The corresponding independent use claims 10 and 11 as filed are drafted in a similar way.

Further, the board notes that claims 8 and 9 as originally filed are, *inter alia*, dependent on claim 1 and define a range for the average dispersion slope S_{dcf} by means of a mathematical equation.

According to claim 8, $0 > S_{dcf} > 2D_{dcf}(S_{tf}/D_{tb})$, in which $-120 < D_{dcf} < -20$ and D_{tb}, which should evidently read D_{tf}, is about 15 ± 5 ps/nm-km. Present claim 1 is however not restricted to a closed range of dispersion values but merely requires that the dispersion is less than -20 ps/nm-km and does not define the dispersion slope value as being dependent on the dispersion value of the dispersion compensating optical waveguide fiber as in claim 8 as filed. Further, with S_{tf} = 0,06 ps/nm^2-km (cf. page 3, line 34, and page 8, line 20), none of the possible combinations of the specific values given in claims 1 and 8 as originally filed results in a dispersion slope equal to -1,2 ps/nm^2-km.

According to claim 9 as originally filed, $S_{dcf} = D_{dcf}(S_{tf}/D_{tf})$, which implies that the highest value, i.e.

closest to zero, of the dispersion slope is -0,06 ps/nm^2-km, namely for D_{dcf} = -20 ps/nm-km (cf. claim 1 as originally filed), S_{tf} = 0,06 ps/nm^2-km (see above) and D_{tf} = 20 ps/nm-km (see claim 8). Present claim 1, however, covers even higher values for the dispersion slope, namely between -0,06 and 0 ps/nm^2-km.

Hence, neither claim 8 nor claim 9 as originally filed provides a basis for the above-mentioned combination of properties of the dispersion compensating optical waveguide fiber as claimed in present claim 1.

1.6 In view of the above, the board concludes that the subject-matter of claim 1 of the main request cannot be directly and unambiguously deduced from the application as filed. The claim thus contains subject-matter which extends beyond the content of the application as filed, thereby contravening Article 123(2) EPC.

2. Since the above-mentioned combination of properties (see point 1.1) is present in claim 1 of each of the four auxiliary requests using the same wording, none of the requests on file can be allowed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano A. S. Clelland