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Datasheet for the decision of 10 January 2022

Case Number: T 1460/21 - 3.4.02

Application Number: 12807624.7

Publication Number: 2729834

IPC: G02B6/028, G02B6/02, G02B6/036

Language of the proceedings: EN

Title of invention:
NON-LINEAR FIBER RESISTANT TO PERTURBATIONS

Applicant:
OFS FITEL LLC

Headword:

Relevant legal provisions:
EPC Art. 83, 84, 111(1)
RPBA 2020 Art. 11

Keyword:
Sufficiency of disclosure - (yes)
Claims - clarity (yes)
Remittal to the department of first instance - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1460/21 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 10 January 2022

Appellant: (Applicant)	OFS FITEL LLC 2000 Northeast Expressway Norcross, GA 30071 (US)
Representative:	Zimmermann, Tankred Klaus Schoppe, Zimmermann, Stöckeler Zinkler, Schenk & Partner mbB Patentanwälte Radlkoferstrasse 2 81373 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 24 March 2021 refusing European patent application No. 12807624.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Bekkering
Members:	A. Hornung
	C. Almberg

Summary of Facts and Submissions

I. The applicant appealed against the decision of the examining division refusing European patent application No. 12807624.7 on the basis of Article 97(2) EPC because the requirements of Articles 83 and 84 EPC were not fulfilled.

II. The applicant requested that the decision under appeal be set aside and a patent be granted on the basis of the claims according to a main request or an auxiliary request, both requests filed with the statement of grounds of appeal.

III. Claim 1 of the main request reads as follows:

"A fiber comprising the following features associated to a wavelength of 1550 nm and/or 1580 nm:
an inner core having an inner core radius and an inner core index;
an outer core having an outer core radius and an outer core index, the outer core index being lower than the inner core index, wherein the outer core radius is between about 2.5 microns to about 3.8 microns;
an inner cladding, having an inner cladding radius and an inner cladding index, the inner cladding index being less than the outer core index; and
an effective index of the fiber, the effective index being greater than the inner cladding index and less than the outer core index;
wherein the fiber has a low perturbation sensitivity factor to scaling equal or less than about 21.8 ps/nm/km along the entire length of the fiber;

wherein the difference between the effective index of the fiber and the inner cladding index is about 0.010;
wherein the difference between the inner core index and the outer core index is between about 0.018 and about 0.022;
wherein the fiber comprises a small effective area less than about 15 sq. microns,
wherein the fiber has a step-index profile,
wherein the inner core radius is between about 0.7 microns to about 1.6 microns;
and
wherein the difference between the outer core index and the inner cladding index is between about 0.015 to about 0.033."

Reasons for the Decision

1. Main request - Sufficiency of disclosure

The invention as claimed is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 83 EPC).

1.1 Appealed decision

According to the appealed decision, the invention as claimed is not disclosed in a manner sufficiently clear and complete for it to be carried out by the skilled person (Article 83 EPC). The examining division's reasons are as follows:

1.1.1 Point 18 of the appealed decision:

The examining division found that the exemplary fiber design of figure 2 (dashed line) had a dip at the center

of the fiber which could not be associated with the general fiber design of figure 1 having a conventional refractive index step profile. Based on this finding, the examining division concluded that "the single experimental embodiment is not sufficiently disclosed" because "its materials, absolute refractive indices and dopants nature and concentrations are not specified in the description". The examining division viewed this lack of information as "an undue burden for the skilled person" (highlighted in the original).

1.1.2 Point 20 of the appealed decision:

The "design space for obtaining the claimed fiber properties" cannot be derived from the design space defined in figures 8 to 13 because, on the one hand, "this design space is the result of the simulations with the theoretical profile (dashed line including an index dip at the center of the core) of Figure 2" and, on the other hand, the actual embodiment as claimed corresponds to the solid line of figure 2, representing actual values of a fiber fabricated allegedly according to the theoretical fiber profile (dashed line).

In addition, the "influence of the refractive index dip in the profile of Figure 2 on the claimed perturbation sensitivity factor" remains unexplained in the application as filed. As a consequence, "[e]ven having implemented a choice in the design space of Figures 8-13, the skilled person still needs to make a selection for this unexplained feature of the index profile". The examining division viewed this choice as "an undue burden for the skilled person". In other words, it would appear that the examining division assumed that the dip in the refractive index profile (dashed line) is a concrete constraint which has to be realized in selecting adequate materials and

dopant concentrations. However, no guidance was to be found in the description or in the figures 8 to 13 about how to achieve the dip in the refractive index profile.

1.1.3 Furthermore, under the introduction "[t]he present application does not comply with the requirements of Article 83 EPC for the following reasons" (see the appealed decision, point 15), the examining division made the following comments:

(a) Point 16 of the appealed decision:

In view of discrepancies in the description of figures 1 and 2 in paragraph [0032], "the quoted statements in §[0032] are unclear" (highlighted in the original).

(b) Point 17 of the appealed decision:

The examining division reported on the applicant's view concerning the alleged discrepancies in paragraph [0032].

(c) Point 19 of the appealed decision:

The patent description lacks information about *relative* refractive index differences, i.e. refractive index differences normalized with respect to the index of refraction of the outer cladding. However, r*elative* refractive index differences are essential to define the guiding properties of optical fibers. In order to convert the *absolute* refractive index differences into relative values, the refractive index of the outer cladding must be known. The examining division conceded that "the skilled person can derive from the application (...) that the [outer] cladding of the claimed fiber is made of pure silica".

1.2 The board is not convinced by the examining division's reasoning for the following reasons:

1.2.1 Concerning point 18 of the appealed decision:

(a) The board acknowledges that figures 1 and 2 show three distinct refractive index profiles. However, the explanations provided by the applicant about why the three curves are distinct are found convincing by the board. In particular, figure 1 shows a very general and mathematical refractive index step profile. This general profile of figure 1 has been optimized by "numerical optimization taking into account performance considerations" (see statement of grounds of appeal, page 6, first paragraph), thereby yielding the experimental fiber design shown as a dashed line in figure 2. As further explained by the applicant, the skilled person "realize[s] the simplification that the optimization has been performed only along the radius of the fiber, instead of performing it on a whole surface of the fiber. This simplification utilizes the symmetries of the fiber and results in having the center of the cartesian coordinate system used in Fig. 2 at the center of the fiber. (...) They also realize that the combination of utilizing the geometrical symmetries and starting the optimization at an unfortunate but common starting value of (0,0) would result in the center dip of Fig. 2" (see statement of grounds of appeal, page 6, fourth and sixth paragraphs).

In view of these explanations provided by the applicant, the board is convinced that (i) the curve of figure 1 served as a very general basis for the two curves shown in figure 2, (ii) the two curves of

figure 2 correspond to the same embodiment and (iii) the dip in the refractive index profile in the dashed line of figure 2 is "just a matter of approximations" (see statement of grounds of appeal, page 6, last paragraph). In other words, the dip in the refractive index profile is an artefact due to the calculation method of the relative refractive index. The board sees no inconsistency between the curves of figures 1 and 2 which would hinder the skilled person to carry out the invention as claimed.

(b) The board further acknowledges that the application does not disclose the "materials, absolute refractive indices and dopants nature and concentrations" of the embodiment whose properties are shown in figures 3 to 5, as stated in the appealed decision, point 18. However, such an explicit disclosure of the "materials, absolute refractive indices and dopants nature and concentrations" is not required for enabling the skilled person to carry out the invention.

Indeed, the invention which has to be carried out is defined in claim 1 *inter alia* in terms of a series of radii and refractive index differences to be chosen within well-defined numerical ranges. Providing a fiber comprising radii and refractive indices as claimed, by selecting adequate materials and doping characteristics, is within the scope of competences of the skilled person. This was not objected to by the examining division.

Claim 1 further defines the maximum value (i.e. 21.8 ps/nm/km) of the perturbation sensitivity factor to scaling of the claimed fiber, the maximum value (i.e. 15 sq. microns) of its effective area and a fixed

relationship between its effective index and the inner cladding index (i.e. the difference between these two indices is about 0.010). Figures 8 to 11 and 13 define a design space for the various variables of the claimed fiber. Figure 12 provides additional information about the influence of the effective area of the fiber. In particular, figures 8 to 11 and 13 show unshaded regions in which the perturbation sensitivity factor is below the maximum value defined in claim 1 (see e.g. paragraph [0056] explaining that the fiber designs deemed suitable in figure 11 achieve low sensitivity of less than about 20 ps/nm/km). By selecting a combination of radii and refractive indices corresponding to these unshaded regions shown in figures 8 to 11 and 13, the skilled person would realize a fiber falling under the scope of claim 1, thereby carrying out the invention.

1.2.2 Concerning point 20 of the appealed decision:

(a) The board, for the reason provided in point 1.2.1 a) above, does not agree with the examining division's statement in point 20 of the appealed decision, according to which the design space of figures 8 to 13 "does not correspond to the actual embodiment as claimed (solid line of Figure 2)". In the board's view, the dashed line and the solid line in figure 2 correspond to the same embodiment. Since the design space of figures 8 to 13 leads to the variables of the claimed fiber, the claimed fiber is disclosed in a sufficiently clear and complete manner.

(b) Since the dip in the refractive index profile in the dashed line of figure 2 is considered to be an artefact (see point 1.2.1 a) above), the skilled person, contrary to the statement in the appealed

decision, point 20, does not need "any information from this design space on [the] influence of the refractive index dip in the profile of Figure 2 on the claimed perturbation sensitivity factor" and does not need to make a selection for this allegedly unexplained feature of the index profile.

1.2.3 Concerning point 16, 17 and 19 of the appealed decision:

(a) The differences between the curves shown in figures 1 and 2, relating to a same embodiment, are not fully explained in paragraph [0032]. However, paragraph [0032] explains that the "experimental fiber design was obtained by numerical optimization taking into account similar performance considerations as shown and described herein with regard to Figures 8 - 12". Moreover, paragraph [0046] discloses that "actual fabricated fiber profiles almost always deviate from the intended profile design, for example, as shown in Figure 2". From these paragraphs the skilled person deduces that the differences between the curves shown in figures 1 and 2 correspond to approximations and artefacts due to the optimization method. Anyway, the alleged lack of clarity in paragraph [0032] does not hinder the skilled person to carry out the invention within the meaning of Article 83 EPC for the reasons given above in points 1.2.1 and 1.2.2.

(b) No objection under Article 83 EPC is raised in point 17 of the appealed decision.

(c) The examining division confirms that the lack of explicit disclosure of the material of the outer cladding can be filled by the skilled person. The board concurs with this.

2. Main request - Clarity

In the appealed decision, point 21, clarity of claim 1 was objected for the reason that it specified "two redundant conditions on the perturbation sensitivity factor". Present claim 1 has been amended by deletion of one of the two conditions, thereby overcoming the clarity objection raised in the appealed decision (Article 84 EPC).

3. Further prosecution

3.1 Since the board is not convinced by the argumentation of lack of sufficiency of disclosure as provided by the examining division and since the lack of clarity objected to by the examining division has been overcome by amendment of claim 1, the appealed decision must be set aside.

3.2 The decision under appeal dealt only with the issues of sufficiency of disclosure and clarity without considering any of the other requirements of the EPC, especially added subject-matter, novelty and inventive step. The significant scope of the pending examination is considered being a "special reason" within the meaning of Article 11 RPBA 2020 to remit the case to the examining division for further prosecution (Article 111(1) EPC).

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 for further prosecution.

The Registrar: The Chair:

L. Gabor R. Bekkering

Decision electronically authenticated