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D E C I S I O N
of 9 January 1998

Case Number: T 0066/97 - 3.4.2

Application Number: 92106248.5

Publication Number: 0508458

IPC: G02B 6/255

Language of the proceedings: EN

Title of invention:
Method for connecting optical fibers

Applicant:
SUMITOMO ELECTRIC INDUSTRIES, LTD.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

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

Decisions cited:
-

Catchword:
-

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Case Number: T 0066/97 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 9 January 1998

Appellant: SUMITOMO ELECTRIC INDUSTRIES, LTD
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 29 August 1996 refusing European patent application No. 92 106 248.5 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: S. V. Steinbrener
L. C. Mancini

Summary of Facts and Submissions

I. The appellant lodged an appeal against the decision of the Examining Division to refuse European patent application 92 106 248.5 (publication No. EP-A-0 508 458).

In their decision, the Examining Division held that the subject-matter of claim 1 as filed by the applicant during the oral proceedings dated 16 July 1996 did not involve an inventive step within the meaning of Article 56 EPC in view of document

D1: Patent Abstracts of Japan, vol. 13, no. 245 [P-881] & JP-A-1 046 708 (in combination with an English translation furnished by the appellant),

when combined with the general knowledge of a skilled person.

II. In addition to the further documents already cited during the examination proceedings, i.e.

D2: EP-A-0 379 938 (being a family member to JP-A-2 195 304 cited in the present application), and

D3: Patent abstracts of Japan, vol. 14, no. 286 [P-1064] & JP-A-2 087 106,

the following documents were referred to in the communication of 18 September 1997 pursuant to Article 12 of the Rules of Procedure of the Boards of Appeal:

D4: Patent Abstracts of Japan, vol. 7, no. 134 [P-203] & JP-A-58 050 507 (cited in the European Search Report),

D5: 16th European Conference on Optical Communication, 16 to 20 September 1990, Amsterdam, pages ECOC'90-601 to ECOC'90-604 (submitted by the appellant with the statement of grounds), and

D6: EP-A-0 462 893 (cited in the European Search Report).

The Board pointed out that the subject-matter of an amended claim 1 additionally comprising the essential feature of avoiding to pass an electric current in the optical fibre surface during the fusion and connection step seemed to be patentable with respect to the prior art identified. In order to expedite the present proceedings, a possible wording for the claims was proposed.

III. With its letter dated 28 November 1997, the appellant agreed to the proposed claim wording and submitted fair copies of the claims.

Eventually, the description was also adapted by filing amended pages 2, 3, 3a, 4 and 5.

IV. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of amended claims 1 to 3 and the amended version of the description. In the event that this request should not be granted, oral proceedings before the Board of appeal were requested as an auxiliary measure.

V. The wording of claim 1 on which the present decision is based, reads as follows:

"1. A method of connecting a pair of hermetic optical fibers having an electrically conductive hermetic layer coated on optical fiber glass, which comprises positioning the optical fibers on respective electrically nonconductive V-shaped grooves, aligning the cores of the optical fibers and fusing and connecting the optical fibers through an aerial discharge without removing the hermetic layer previous to said aligning and fusing and connecting steps and without passing an electric current in the optical fiber surface during the fusion and connection."

Claims 2 and 3 as submitted with the appellant's letter dated 28 November 1997 are appended to claim 1.

VI. The appellant's argumentation in support of its request may be summarised as follows:

Document D1 could not give to a reader skilled in the art any hint to provide electrically non-conductive grooves when splicing the fibres according to a method other than that as described in said document, and in particular according to a method based on hermetic optical fibres as specified in claim 1.

From Figure 3 of the present application and from document D5, it would be derived that removal of the electrically conductive hermetic layer is essential for achieving high break strength and reduced splice loss, respectively. On the other hand, non-removing the hermetic layer simplifies the operation of splicing.

It is a merit of the present invention to have found that, when electrically non-conductive grooves are used for the discharge fusion splice, the non-removal of the

hermetic layer gives high break strength together with low splice loss. The results found by the inventors of the present application are opposite to the knowledge of the notorious skilled person.

Reasons for the Decision

1. *Admissibility*

The appeal is admissible.

2. *Articles 84 and 123(2) EPC*

Claim 1 now under consideration is based on original claim 1 including minor amendments of clarifying nature (*inter alia* explicitly specifying the hermetic layer to be electrically conductive as disclosed at page 1, third paragraph of the description as filed) and having two additional "negative" features of disclaimer type inserted at its end after "aerial discharge".

These additional features are disclosed at page 3, second paragraph, page 4, last-but-one paragraph and page 6 of the original application documents. As can be seen from Figure 4 and associated text on pages 5 and 6 of the present application, the last feature of claim 1 relating to the suppression of an electric current in the optical fibre surface during fusion and connection must be regarded as essential for achieving the claimed effect (see item 5.3 below).

The Board considers the use of "disclaimer type" features to be justified in the present case since these features have been originally disclosed (i.e. are **not** genuine "disclaimers" which, in general, are introduced after the filing date to establish novelty

with respect to the closest prior art), have a clear technical meaning and in view of the rather concise original disclosure cannot be expressed in a positive way without a risk of offending against Article 123(2) EPC.

Dependent claims 2 and 3 correspond in substance to original claims 2 and 3. Hence, the Board is convinced that the amended version of claims is clear, supported by the description and admissible under Article 123(2) EPC.

3. *Formal requirements*

In the present case relating to a method of connecting a pair of optical fibres, the one part form of claims appears to be preferable (Rule 29(1) EPC). Moreover, reference numerals are not considered necessary to render the subject matter of the claims more intelligible (Rule 29(7) EPC).

4. *Novelty*

None of the pre-published documents D1 to D5 discloses a method of connecting a pair of hermetic optical fibres without removing the hermetic layer prior to the aligning and fusing and connecting steps. These documents either do not relate to hermetic optical fibres at all (D1 and D4) or the hermetic layer is removed before fusion splicing (D2, D3 and D5).

Since the priority claimed in the present application must be regarded as valid, non-prepublished Document D6 could only fall under Article 54(3) EPC for the "overlapping" contracting states FR and GB, depending on the validity of the multiple priorities claimed in said document. In any case, document D6 does however

not anticipate the subject matter of claim 1 since it suggests an alternative solution relying on the presence of a specific inert gas atmosphere and not on surface current suppression as is the case in the present application.

Thus, the subject matter of claim 1 is considered to be novel with respect to the available prior art (Article 54 EPC). This finding has, in fact, not been challenged during examination proceedings.

5. *Inventive step*

5.1 In the Board's view, a correct application of the problem-and-solution approach should be based on document D2 (or similar documents D3 and D5) as closest prior art, and not on document D1 as has been done by the Examining Division: the former document already relates to a method of connecting **hermetic** optical fibres by an aerial discharge and to the problem of reduced break strength arising in this context due to the interference of the hermetic layer with the fusion process (see D2, column 2, lines 5 to 52). Document D1 does neither make reference to hermetic optical fibres nor, not surprisingly, to any fusion problems caused by the presence of hermetic layers. Therefore, it cannot be considered as a technically realistic starting point (see the decisions cited as examples in "Case Law of the Boards of Appeal of the European Patent Office", EPO 1996, Chapter I, D-3.2: "Choice of the closest starting point").

From document D2, there is known a method of connecting a pair of hermetic optical fibres having an electrically conductive hermetic layer coated on optical fibre glass, which comprises positioning the optical fibres on respective optical fibre holders,

aligning the cores of the optical fibres and fusing and connecting the optical fibres through an aerial discharge (see D2, Figures 1 and 2 and associated text).

In particular, it appears from said document that the above-mentioned difficulties of splicing hermetic optical fibres can be satisfactorily avoided by removing the hermetic coating before fusion and connection (see D2, column 3, first paragraph).

5.2 The subject matter of claim 1 differs from this prior art in that

- the respective fibre holders are electrically nonconductive V-shaped grooves,

- said aligning and fusing and connecting steps are performed **without** removing the hermetic layer, and

- without passing an electric current in the optical fibre surface during the fusion and connection.

5.3 The claimed method thus aims at a simplification of the prior art process while still guaranteeing high strength connections (see page 3, first and second paragraphs of the present application as filed). Hence, the corresponding technical problem of achieving this object is of standard type and as such cannot contribute to patentability.

The claimed solution consists substantially in leaving the hermetic layer in place during the alignment and fusion steps while keeping the hermetic optical fibres electrically isolated, *inter alia* by utilising electrically nonconductive V-shaped grooves.

5.4 Although the Board considers electrically nonconductive V-shaped grooves as such to be conventional (see document D4 disclosing a ceramic V-groove fibre holder in which the discharge electrodes are directly inserted, i.e. the ceramic holder must be nonconductive to avoid short-circuits; or document D1 relating to a ceramic base for fusion splicing of optical fibres supported by V-grooves, the base being formed of alumina ceramics or, preferably, partially stabilised zirconia, i.e. materials which are clearly nonconductive), the prior art cited in this context does not specifically deal with **hermetic** optical fibres nor address any specific splicing problems due to the presence of a conductive hermetic coating during the fusion process as has already been pointed out above.

Therefore, in view of the technical problem posed a skilled person would not consider this prior art at all or, in any case, would not expect a contribution to the solution of the present problem from this prior art.

However, even if electrically nonconductive V-shaped grooves were taken into consideration for connecting hermetic optical fibres (in accordance with the assumptions of the Examining Division when selecting document D1 as closest starting point), then, in the Board's view, a skilled person would remove the hermetic layer prior to the fusion step. This is because there is no indication in the available prior art that satisfactory splicing of hermetic optical fibres may be carried out **without** such removal. On the contrary, all of the prepublished documents explicitly dealing with hermetic optical fibres, i.e. documents D2, D3 and D5, emphasise the necessity of hermetic layer removal in order to achieve a satisfactory break strength (see D2, column 5, lines 52 to 56; D3, the abstract; D5, page ECOC'90-603, 7. Conclusion).

Finally, as can be seen from Figure 4 and associated text of the present application, the mere provision of electrically nonconductive V-shaped grooves would not be sufficient to guarantee a reliable solution of the above technical problem. Rather, any electric current in the coated optical fibre surface must be avoided during the fusion and connection step. The available prior art is completely silent in this respect.

5.5 In consequence, the Board does not consider the subject matter of amended claim 1 to be obvious from the prior art identified (Article 56 EPC), and claim 1 is thus allowable.

6. *Dependent claims and description*

Dependent claims 2 and 3 concern particular embodiments of the claimed subject matter and are therefore also allowable.

The description has been adapted to the amended version of claims and meets the requirements of Rule 27 EPC. On page 5, the insertion "as shown in Figure 3" has been amended with the appellant's consent to read "as shown in Figure 4".

7. *Auxiliary request*

Since the decision is in accordance with the appellant's request, the auxiliary request for oral proceedings is to be disregarded.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent in the following version:

Description: Pages 1, 6 as originally filed;
Page 2 as filed with the letter of 28 November 1997;
Pages 3, 3a, 4 and 5 as filed with the letter of 17 December 1997, and with correction of the insertion "as shown in Fig. **3**" in the last paragraph of page 5 to read "as shown in Fig. **4**".

Claims: Nos. 1 to 3 as filed with the letter of 28 November 1997.

Drawings: Sheets 1/2 - 2/2 as originally filed.

The Registrar: The Chairman:

P. Martorana E. Turrini