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File Number: T 119/91 - 3.4.2  
Application No.: 85 305 001.1  
Publication No.: 0 168 261  
Title of invention: Connector for high energy beam

Classification: G02B 6/38

**D E C I S I O N**  
of 2 February 1993

Applicant: DAINICHI-NIPPON CABLES, LTD.

Headword:

EPC Articles 54, 56, 113(2) and Rule 67

Keyword: "Inventive step (yes, after amendment)"  
"Reimbursement of the appeal fee (refused)"

**Catchwords**

A general declaration of an Applicant without indication of a well-defined amendment to Claim 1 cannot be considered as a new request relating to a new Claim 1.



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Boards of Appeal

Chambres de recours

**Case Number : T 119/91 - 3.4.2**

**DECISION  
of the Technical Board of Appeal 3.4.2  
of 2 February 1993**

**Appellant :**

DAINICHI-NIPPON CABLES, LTD.  
8, Nishino-cho  
Higashimukaijima  
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**Representative :**

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**Decision under appeal :**

**Decision of the Examining Division of the  
European Patent Office dated 12 June 1990  
refusing European patent application  
No. 85 305 001.1 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. European patent application No. 85 305 001.1 (publication No. 0 168 261) was refused by decision of the Examining Division.

II. The reason given for the refusal was that the subject-matter of Claim 1 as filed with the Appellant's letter of 4 September 1989 lacked an inventive step with respect to the state of the art defined by the documents

(D1) "Patents Abstracts of Japan", Vol. 6, No. 8 (P-98)(886) and JP-A-56-135 811 (English translation provided by the Appellant) and

(D2) "CRC Handbook of Chemistry and Physics", 60th edition, 1979 - 1980, page B-121.

The Examining Division held in particular that -except for two "statements" in Claim 1 - D1 disclosed all the features of the connector defined in Claim 1 (D2 showing that the melting point of quartz was indeed above 1500°C), and that the remaining statements referred to a definition (use of an adhesive) not involving an inventive step and a feature ("for high energy beam") not imposing an unambiguous limitation on the scope of the claim.

III. The Appellant lodged an appeal against the decision.

IV. Oral proceedings were held, at the end of which the Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of Claims 1 to 5 as presented at the oral proceedings. Furthermore, he requested reimbursement of the appeal fee.

V. Claim 1 reads as follows:

"A connector for an optical fibre which can transmit a high energy beam, namely an optical fibre of a diameter of 150  $\mu\text{m}$  to 1250  $\mu\text{m}$ , the connector to be provided at the end of an optical fibre (1a) on which said high energy beam is to be incident, the connector comprising a sleeve (43) with:

- a) a portion of relatively large inner diameter; and
- b) a fibre support portion (43f, 46);

whereby the sleeve can in use be fitted on the end of said optical fibre (1a) so that a gap (43c, 43d) is formed between the inner periphery of said portion of relatively large inner diameter of the sleeve (43) and the outer periphery of said optical fibre (1a) along a desired axial distance from the end face of said optical fibre (1a) to the fibre support portion (43f, 46), and so that said optical fibre support portion (43f, 46) supports the optical fibre (1a) and has an inner diameter which is about equal to the diameter of the optical fibre, the connector being characterised in that at least said optical fibre support portion (43f, 46) is formed of sapphire which has a melting point of 2030°C, a refractive index of 1.76 and which has a transmission such that it transmits therethrough more than 5% of the incident light in a 1mm transmission distance."

Claims 2 to 5 are dependent on Claim 1.

VI. The Appellant argued in particular that with regard to the subject-matter now claimed, the connector described on pages 3 to 5 of the present description and shown in Figure 3 represented the closest prior art. Forming the fibre support portion of sapphire was neither suggested in this prior art, nor in any of the other cited documents and, moreover, was advantageous. Not only did the high melting point of sapphire guarantee good thermal resistivity, but also the coefficient of thermal expansion

was well adapted to that of the optical fibre so that damage could be avoided, and the index of refraction and the degree of transparency allowed the light to be led for some distance in the optical fibre support portion without entering the cladding of the fibre and, on the other hand, allowed the light trapped in the cladding to enter the fibre support portion.

Refund of the appeal fee was justified since the Examining Division had based its decision on a Claim 1 which had no longer been agreed to by the Appellant. In the letter of 10 April 1990, together with a request for an interview, the Appellant had clearly indicated that he contemplated amendments to the claim.

#### Reasons for the Decision

1. The appeal is admissible.
2. Apart from some rephrasing without changing the sense, present Claim 1 essentially differs from the original Claim 1 only by the addition of the range of 150 to 1250  $\mu\text{m}$  for the diameter of the optical fibre, and by the definition of sapphire (including melting point, refractive index and transmission) as the material for the optical fibre support portion.

The diameter of the optical fibre of 150 to 1250  $\mu\text{m}$  is originally disclosed on page 17, line 21. Sapphire is disclosed in original Claim 8 as well as e.g. in Table 1 on page 12 and on page 15, lines 11 to 14, where the claimed values of the melting point and refractive index are also indicated. The degree of transparency of the

sapphire material is mentioned in original Claim 2, to which Claim 8 refers back, and on page 17, lines 4 to 7, which text relates to the substances shown in Table 1.

The dependent Claims 2 to 4 essentially correspond to the original Claims 3, 6 and 7. The disclosure of Claim 5 is based on original page 11, line 15.

Thus, no objections arise under Article 123(2) EPC.

3. It should be mentioned that the Board does not consider the term "high energy beam" to be objectionable for reasons of clarity (Article 84 EPC). Although there is no sharp borderline between "high" and "low" energy, and care would have to be taken if this feature were essential for establishing a distinction from the prior art, this feature especially in connection with the diameter valves of the optical fibre provides a certain amount of information and there does not appear to be any danger of misinterpretation.

4. Novelty

- 4.1 D1 (cf. the figure and corresponding text) describes a connector for an optical fibre, the connector to be provided at that end of an optical fibre on which the light beam is to be incident. This known connector comprises a sleeve 2 having a portion of relatively large inner diameter (forming a gap between itself and the optical fibre) along a desired axial distance from the end face of the optical fibre, followed by a fibre support portion 2b of smaller inner diameter (about equal to the diameter of the optical fibre) for supporting the optical fibre. (It should be mentioned that the present Claim 1 is directed to a connector, and thus does not comprise the fibre, so that the references to the dimensions of the

fibre only matter insofar as they serve to give information on the construction of the connector.) There is nothing in the known connector which would make it basically unsuited for use in the transmission of "high" energy beams. Since the opening in the fibre support portion is shown to hold the fibre still clad in various heat-resistant cover layers, the inner diameter of the fibre support portion must be larger than 150  $\mu\text{m}$ , thus being suitable for holding fibres of diameters in the range of 150 to 1250  $\mu\text{m}$ .

The optical fibre support portion of the known connector is, however, not formed of sapphire, but of quartz, and thus also does not have the melting point and the refractive index indicated in Claim 1.

- 4.2 On pages 3 to 5 and in Figure 3, the present application contains a detailed acknowledgement of a prior art optical fibre connector. Although neither the citation given on page 3, lines 19 and 20 (JP-U-59-20146 (1984)), nor the Japanese document attached to the Appellant's letter of 18 January 1993 appear to be correct, the described connector must be considered as forming part of the prior art as also emphasised by the Appellant at the oral proceedings.

In full agreement with the features of the pre-characterising part of Claim 1, this connector comprises a sleeve with a portion of relatively large inner diameter along a desired axial distance from the end face of the optical fibre followed by a fibre support portion of smaller inner diameter intended to be about equal to the diameter of the optical fibre. The known connector is intended for use with an optical fibre which can transmit a high energy beam, which type of fibre - as the Appellant

has explained - has a diameter of core and cladding above 150  $\mu\text{m}$ .

The subject-matter of Claim 1 is distinguished from this connector by the fact that the fibre support portion is not formed of copper, but of sapphire which has a melting point of 2030°C, a refractive index of 1.76 and which has a transmission such that it transmits therethrough more than 5% of the incident light in a 1 mm transmission distance.

- 4.3 The further documents cited in the European search report or mentioned by the Examining Division do not come closer to the present subject-matter.

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

5. Inventive step

- 5.1 The Board agrees with the Appellant that the prior art shown in Figure 3 and described on pages 3 to 5 of the present application comes closest to the subject-matter of present Claim 1 since - contrary to D1 - this prior art already relates to the general problem of avoiding damage to the connector and to the optical fibre, caused by insufficient alignment of a high energy laser beam incident on the entrance face of the optical fibre, which problem is also underlying the present application (cf. page 3, line 11 to page 4, line 2, and page 5, lines 14 to 20, of the description).

With regard to this prior art, the specific problem solved by the present subject-matter is to be seen in further improving the protection of the optical fibre against the influences of the high energy beam and, in particular, in

improving the characteristics of the fibre support portion struck by radiation of insufficiently aligned high energy beams (cf. page 19, line 23, to page 20, line 18).

- 5.2 The idea of solving this problem by forming the fibre support portion of sapphire is nowhere mentioned in the prior art cited in the search report, introduced by the Examining Division or acknowledged in the application documents. In fact, there is not even a suggestion in the prior art disclosures which could lead a person skilled in the art towards using such a material since it is nowhere mentioned that transparency and refractive index might be of importance when dealing with the problem of damage caused by a high energy light beam (actually, looking backwards, one can see that the transparency allows the distribution of the irradiated energy over a larger volume, and the high refractive index reduces the amount of light guided in the cladding of the fibre).

Therefore, the advantageous effect achieved by the combination of properties presented by sapphire must be considered unexpected.

- 5.3 For these reasons, the subject-matter of Claim 1 involves an inventive step in the sense of Article 56 EPC, and Claim 1 is consequently allowable under Article 52(1) EPC.

Due to their dependence on Claim 1, Claims 2 to 5 are also allowable.

6. Since Claim 1 is now limited to sapphire as the material for the fibre support portion, the description will need extensive amendments before a patent can be granted.

Therefore, the Board exercises its power under Article 111 EPC and remits the case back to the Examining Division for performing these amendments.

7. Refund of the appeal fee

The Appellant argues that the Examining Division has based its decision on a Claim 1 which had no longer been agreed to by the Appellant, contrary to Article 113(2) EPC, since in his letter of 10 April 1990 he had clearly indicated that he contemplated amendments to the claim.

It appears from the file that, in response to the minutes of the consultation by telephone of 27 October 1989, posted on 29 November 1989, the Appellant wrote a letter, dated 10 April 1990, in which he argued why in his view the objections under Articles 54, 56 and 84 EPC, made by the Examiner, were not correct, and in which he indicated that he would like to discuss these points at a telephone interview. He furthermore added:

"Once document D1 has been put into proper perspective and once the revised objections under articles 54 and 56 can be met, it is necessary to meet the objections under article 84. One solution to the problem was indicated in our letter of 4th September 1989. In the arguments accompanying that letter, it was explained that the transmission of light along optical fibres is classified into two quite distinct types, namely signal transmission and energy transmission. This is not apparently disputed by the Examiner.

Not surprisingly, the diameters of the optical fibres for the different types of transmission are different. Thus, the maximum core diameter of the fibre for signal transmission might be 100  $\mu\text{m}$ . On the other hand, the minimum core diameter for fibre for energy transmission

would be 150  $\mu\text{m}$ . This figure of 150  $\mu\text{m}$  is clearly recited in the specification of the present application."

Subsequently, the Examining Division rejected the request for a (further) telephone interview and refused the application.

The above-mentioned letter of the Appellant may show, as the Appellant has put himself, that he contemplated amendments to Claim 1. This is, however, not sufficient to indicate that he no longer agreed to the Claim 1 valid up to this time. He neither formally withdrew his agreement to the former Claim 1 (in which case the application documents would have been void of any valid main claim), nor filed (or even informally mentioned) a specific, well-defined amendment to the claim. The indication of a well-defined new wording, however, is prerequisite for the possibility to consider a declaration of an applicant as a new request relating to a new Claim 1, in which case the request then normally implies the withdrawal of the former Claim 1.

Therefore, the Examining Division has correctly based its decision on the version of Claim 1, filed with the letter of 4 September 1989, which at the time of the decision was the Claim 1 submitted and agreed by the Appellant in the sense of Article 113(2) EPC. The request for a telephone interview could be refused since appointing or refusing interviews is within the discretion of the Examining Division.

Since no procedural violation can be seen, the request of the Appellant for reimbursement of the appeal fee is refused (Rule 67 EPC).

Order

For these reasons, it is decided that:

1. The appealed decision is set aside.
2. The case is remitted to the Examining Division with the order to grant a patent on the basis of Claims 1 to 5 as presented at the oral proceedings, with the remaining application documents to be adapted.
3. The request for reimbursement of the appeal fee is refused.

The Registrar:

The Chairman:

P. Martorana

E. Turrini