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D E C I S I O N
of 25 July 2000

Case Number: T 0751/99 - 3.4.2

Application Number: 94927156.3

Publication Number: 0715726

IPC: G02B 6/30

Language of the proceedings: EN

Title of invention:
Polymer microstructures which facilitate fiber optic to waveguide coupling

Applicant:
AlliedSignal Inc.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

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

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0751/99 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 25 July 2000

Appellant: AlliedSignal Inc.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 15 March 1999 refusing European patent application No. 94 927 156.3 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. G. Klein
Members: M. A. Rayner
V. Di Cerbo

Summary of Facts and Submissions

I. The present appeal is made by the patent applicant against the decision of the examining division to refuse European patent application No. 94 927 156.3 (International Publication No. WO 95/06270).

II. The following document was referred to in the decision under appeal:

D1: US-A-4 111 522.

The examining division reasoned that having regard to document D1, the device according to the independent claim then at issue was distinguished from the coupling device of claim 1 by a channel designed so as to withstand a force to axially displace the optical fibre of at least 0.01 Newtons. However, since a retaining force less than 0.01 Newtons risks fibres being pulled out by their own weight or that of the cable (bearing in mind a mass of only 1 gram exerts a gravitational force of approximately 0.01 Newtons), a skilled person would have arrived in an obvious manner to a design withstanding a force of at least 0.01 Newtons. Even if the fibres were not sufficiently clamped, the problem is easily recognised, and the suggested solution cannot be considered inventive, since it consists in a technical reformulation of the underlying problem, i.e. to design the device of document D1 so that fibres withstand a typical dislodging force.

III. A subsidiary request of the appellant for oral proceedings filed with the statement of grounds of appeal resulted in appointment thereof. During the oral proceedings, the appellant filed amended application

documents.

IV. The arguments of the appellant can be summarised as follows:

The teaching of document D1 taken as a whole (see column 4, lines 42 to 47) is that an appropriate waveguide with appropriate fibre retaining strength can only be provided by employment of adhesive. There is no teaching in document D1 of the ability for the appropriate configuration of channel dimensions with respect to fibre dimensions such that sufficient retaining force can be provided without need for adhesives or other retaining mechanism. A skilled person reading document D1 would not have considered there was anything to gain from considering channel dimensions when seeking to improve the handling characteristics of the waveguide, given that the teaching of document D1 infers that the solution to rough handling problems is simply to provide adhesive. A force of at least one Newton is a significantly high force.

V. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of claims 1 to 4 filed during the oral proceedings. Independent claim 1 is worded as follows:

An optical coupling device (10) with an optical waveguide comprising:
a substrate (20);
an optically transmissive waveguide (28) on a surface of the substrate (20);
an optical fibre (32) having a dimension d_1, and;
a channel (12) on the surface of the substrate (20) for

optically aligning and coupling the optical fibre (32) and the optical waveguide (28), wherein the longitudinal axis of the channel (12) is in alignment or substantially in alignment with the waveguide (28) such that on placement of the optical fibre in the channel (12) the light carrying cores of the fibre (32) and the waveguide (28) are in optical alignment or substantially in optical alignment;
characterised in that
the channel (12) has sidewalls (16,18) and a floor (24) contacting the optical fibre and wherein the separation of the sidewalls (16,18) at a cross-sectional depth dimension d_2 in the direction normal to the floor has a width W_1 and the separation of the sidewalls (16,18) adjacent to the floor (24) has a width W_2, wherein W_1, W_2, d_1 and d_2 are selected such that:

a) W_2 is greater than W_1;

b) d_2 is greater than $^1/_2$ d_1;

c) d_1 is greater than W_1 and is equal to or less than W_2, and;

d) W_1 is from about 0.6 d_1, to about 0.99 d_1; and

the channel (12) geometry provides means to withstand a force to axially displace the optical fibre of at least 1 Newtons (N), as determined by a retaining force test.

VI. At the end of the oral proceedings, the appeal board gave its decision.

Reasons for the Decision

1. The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

2. *Amendments*

2.1 Claim 1 has, in comparison with claim 1 as filed, been amended as shown in italic font and quotation marks in the following:

(1) the explicit recitation of *"an optical fibre (32) having a dimension d_1"*,

(2) channel sidewalls and floor "*contacting the optical fibre and*",

(3) the channel *"geometry"* providing means, and

(4) a force to axially displace the optical fibre of at least "*1*" Newtons (N).

The first and second amendments (1) and (2) are supported for example by the figures as filed, the third amendment (3) by the description as originally filed, for example, page 13 line numbered 5; page 22, line numbered 27; page 26 line numbered 7 or page 27, line numbered 11 and the fourth amendment (4) by page 28, line numbered 31.

2.2 Claims 2 to 4 correspond to claims 8 to 10 as filed. The description and claims have also been amended according to Rules 27(1)(b)(c) and 29(1)(7), respectively.

2.3 Accordingly no infringement of Article 123(2) results from the amendments.

3. *Novelty*

3.1 Document D1 relates to a device for coupling two light

conductive fibre cables. With reference to Figures 3 and 4, a support plate 12 has a lateral bar 12' with a spring 17 attached thereto, which resiliently presses holder 4b onto the support plate 12. The holder 4b has a flat guide member formed of substrate 120 on which guide strips 13 are disposed in a parallel relationship and the positioning provides channels 14. Due to elasticity of the material of the guide strips, light conducting fibres 15 and 15' may be easily inserted in the undercut channels 14 and 14', respectively, and are held therein in a stable position. If necessary, an adhesive may be utilized to ensure the attachment of the respective fibres 15 and 15' in their respective channels 14 and 14' (see column 4, lines 14 to 47).

Thus, no channel geometry providing means to withstand a force to axially displace the optical fibre of at least 1 Newtons (N), as determined by a retaining force test, can be found in document D1. The board notices in this respect that the lower limit for the retention force defined in claim 1 was considerably increased as compared to that set out in the claim before the examining division (from 0.01 to 1 N). It can no longer be assumed that a skilled person would have expected the elastic walls of the guide strips disclosed in document D1 to exert such a higher retention force on the inserted fibre.

In addition, the device taught by document D1 achieves the coupling of pairs of optical fibres rather than the coupling of an optical fibre with an optically transmissive waveguide provided on a surface of a substrate within the meaning of claim 1.

3.2 The remaining citations on file do not come closer to

the claimed subject matter than document D1.

The subject-matter of claim 1 is novel within the meaning of Article 54, accordingly.

4. *Inventive step*

4.1 In the introduction of the specification, it is explained that optical waveguide devices are created on independent substrates and often referred to as planar integrated optical devices. However, the propagation of light on a substrate bearing an optical waveguide is usually suitable only for short propagation distances. For longer distances the optical fibre is the medium of choice. An optical coupling device is therefore necessary. A number of ways of coupling are outlined as known in the prior art. The problem addressed by the invention can therefore be seen in providing an improved coupling device with an optical waveguide and an optical fibre. This problem is solved according to the invention by the channel geometry providing the retaining force as claimed, without however attendant disadvantages, such as complexity or requiring use of adhesive, as arise in the various prior art devices discussed in the introductory part of the patent specification.

4.2 Looking in particular at document D1, it is true that it relates to coupling optical fibres, yet the technical teaching given is that if the attachment is to be not just stable but ensured (column 4, line 35 et seq.), then adhesive is to be used. The board considers that such an ensured attachment is required in the case of withstanding a force to axially displace the optical fibre of at least 1 Newtons (N), as determined by a

retaining force test. However, contrary to the teaching of document D1, according to the invention in suit it is the channel geometry and not adhesive which provides this attachment ensuring force. Therefore, since the subject matter of claim 1 runs counter to the teaching of document D1, it could only be considered derivable therefrom using hindsight, any reformulation concerning channel geometry being without technical reason on the face of document D1 and by virtue of the teaching towards adhesive not obvious to the skilled person. The board is therefore convinced of the inventive step of the subject matter of claim 1 having regard to document D1.

4.3 Other prior art documents mentioned in the application file do not come closer to the subject matter of the independent claim than document D1 and thus offer no reason to question the inventive step of this subject matter.

4.4 Accordingly, the subject matter of the independent claim is considered to involve an inventive step within the meaning of Article 56 EPC. The same applies for dependent claims 2 to 4.

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 on the basis of claims 1 to 4 and pages 1 to 7 and 12 to 41 of the description as

filed at the oral proceedings of 25 July 2000 and of the drawings as published

The Registrar: The Chairman:

P. Martorana A. Klein