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D E C I S I O N
of 29 June 2004

Case Number: T 0351/02 - 3.4.2

Application Number: 95923463.4

Publication Number: 0767923

IPC: G02B 6/42

Language of the proceedings: EN

Title of invention:
PACKED OPTICAL DEVICE

Patentee:
BRITISH TELECOMMUNICATIONS public limited company

Opponent:
Infineon Technologies AG

Headword:

-

Relevant legal provisions:
EPC Art. 56, 114(2)

Keyword:
"Main request: inventive step (no)"
"Auxiliary request: late reintroduction in opposition appeal proceedings of a feature omitted from claims pursued in the examination procedure (inadmissible)"

Decisions cited:

-

Catchword:

-



Case Number: T 0351/02 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 29 June 2004

Appellant: BRITISH TELECOMMUNICATIONS public limited
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 February 2002
revoking European patent No. 0767923 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: A. G. Klein
Members: M. P. Stock
C. Rennie-Smith

Summary of Facts and Submissions

- I. The appellant and patent proprietor lodged an appeal against the decision of the opposition division revoking European patent number 0 767 923 (application number 95 923 463.4).
- II. Opposition was filed against the patent as a whole and based on the ground that the subject-matter of the patent is not new and does not involve an inventive step, see Article 52(1) EPC in connection with Articles 54(1) and 56 EPC, respectively.

The opposition division reasoned that the subject-matter of claim 1 as granted did not involve an inventive step, that a first auxiliary request was not admissible under Article 123(2) EPC and that the subject-matter of claim 1 according to a second auxiliary request did not involve an inventive step.

Reference was made to the following documents:

D1: GB-A-2 184 289

D2: US-A-4,874,217

D3: EP-A-0 589 711

D4: EP-A-0 415 382

D5: JP-A-61 090 108

D6: EP-B-0 121 988

D7: US-A-4,718,746

D8: US-A-5,311,610

D9: US-A-4,615,031

D10: US-A-5,222,170

D11: US-A-4,867,524

D12: EP-B-0 331 336

D13: EP-A-0 168 910

III. In the Grounds of Appeal the appellant requested maintenance of the patent in amended form on the basis of new amended claims 1 to 7. It also filed a translation of document D5. Its arguments can be summarised as follows:

From the translation of D5 it is clear that the nearest prior art is disclosed in D5 and not in D2 as was assumed in the impugned decision. D5 mentions resins, and specifically polyimide, as encapsulating material. Hence, the subject-matter of claims 1 and 7 as amended differ from this prior art in the feature of silicone gel as index matching encapsulant and in the feature of a bore provided by the support member for the fibre.

As indicated in the originally filed description of the contested patent, the use of silicone gel is seen to be surprisingly effective as index matching encapsulant whereas various problems are associated with the materials used in the prior art. Thus, polyimide

disclosed in D5 requires curing at a relatively high temperature giving rise to thermal stresses. The high rigidity of polyimide required in D5 for anchoring the fibre in its groove leads to further thermal stresses during temperature cycling. Silicone gel has a low curing temperature as well as a low rigidity. The coupling efficiency of polyimide is reduced by its refractive index (1.7) which is higher than that of the fibre (1.46), and by the absorption of water by carbonyl groups in the resin. Silicone gel has a refractive index which matches that of the fibre more closely, and does not absorb water from the environment.

In D4 the encapsulant serves to anchor the laser with respect to the planar (or integrated) optical waveguide in the substrate. D4 mentions silicone rubbers as encapsulant materials which are distinct from silicone gel. In any case, a combination of D5 and D4 would not result in the subject-matter of claims 1 and 7 as amended. Indeed, the materials mentioned in D4 are "cast rigidifying" as could be seen from the US patent family member of D4 (US-A-5 091 045) and from the original German version "Vergießen ... mit einem sich verfestigenden Material". Thus D4 teaches away from the use of materials of low rigidity such as silicone gel. Silicone gel has a much lower degree of cross linking than silicone rubbers, leading to improved transmittance and coupling.

The same argumentation holds over a combination of D2 and D4. Neither document indicates the use of silicone gel. Given the dissimilarities in the alignment and laser support mechanisms, such a combination is not considered obvious in any case. The teachings in D2 and

D4 are in effect alternatives to each other. Similarly, a combination of D2 and D5 would not lead to the subject-matter of claims 1 or 7 as amended.

In the decision of the opposition division reference to D8 in combination with D2 and D4 is made for the first time. US-A-5 048 919 (introduced as D14 by the respondent, see below) cited against D8 is also mentioned for the first time. Since D14 is no more relevant than any document already cited, it is requested that the Board disregard this document under Article 114(2) EPC. D8 teaches away from encapsulating electrooptical devices, and is not considered relevant to the contested patent.

IV. The respondent and opponent requested dismissal of the appeal. It cited document D14 mentioned in the impugned decision:

D14: US-A-5,048,919

The respondent's arguments are summarised as follows:

The introduction of D14 at this point does not offend against Article 114(2) EPC. Since claim 1 in accordance with the latest amendment specifies that the encapsulant is silicone gel encapsulant, it is appropriate to cite additional prior art concerning silicone gel encapsulants. Moreover, D14 was implicitly contained in the prior art already introduced into the proceedings, since it is cited and discussed in D8.

The subject-matter of new claims 1 and 7 infringes Article 123(2) EPC. The use of a silicone gel

encapsulant is described in the contested patent only in the context of semiconductor lasers and not for any optical device.

New claims 1 and 7 are also not admissible under Rule 29(1) EPC because they are not cast in the two-part form as would be appropriate.

The subject-matter of claim 1 as amended lacks novelty over D14 according to an analysis of features presented in the order according to annex 1, page 2 of the notice of opposition and supplemented in point 7 by the feature that the encapsulant is a silicone gel encapsulant. In D14, the silicone gel encapsulant 18 forms a protective cap applied to the optical device to seal it from the surrounding environment. The silicone gel encapsulant 18 is also index-matched since it has a refractive index (1.4) close to that of the fibre. Furthermore, the silicone gel encapsulant 18 forms a bond between a facet of the optical device (front facet of laser 11) and fibre 12 (because it fills the entire space between laser and fibre).

It is maintained that D2 represents the closest prior art. However, even starting from D5 in accordance with the line of argument now followed by the appellant, no inventive step can be seen. The subject-matter of claim 1 differs from what is described in D5 by the silicone gel encapsulant and the bore in the support member. For solving the problem of using an encapsulant having a lower curing temperature and rigidity and a refractive index closer to that of the fibre it was obvious for the skilled person to replace the polyimide

used in D5 by a silicone gel described for this purpose in D14.

Moreover, a combination of D5 with D4 was also obvious. D4 describes silicone rubber (Silikonkautschuk) as a material for encasing (Vergussmasse). The term "silicone gel" is not defined in the contested patent. It is only indicated that "Wacker 905" is used. Presumably, SEMICOSIL 905, a product of Wacker-Chemie GmbH is meant, which is related to a silicone gel. An information sheet for this product obtained by the internet is filed and this reveals that SEMICOSIL 905 is a two-component silicone rubber and at the same time a silicone gel ("forms a soft gel on vulcanization"). Therefore the silicone rubber indicated in D4 covers silicone gels. It is then up to the skilled person to select a suitable silicone gel and to provide the support member with a bore.

As a precautionary measure it is noted that the combination of D2, which was considered the closest prior art in the impugned decision, with D4 also leads to claim 1 as amended. The embodiments shown in Figures 3, 4 and 10 of D4 demonstrate coupling of a laser with an optical waveguide through an encapsulation forming a protective cap. The need to replace an integrated waveguide used in D4 by an optical fibre described in D2 cannot prevent the skilled person from considering the combination of D4 with D2.

- V. In preparation for the oral proceedings requested by the parties, the Board inter alia made the following preliminary non-binding comments:

Late-filed documents

Document D14 was cited by the respondent as a reaction to the amended claims filed by the appellant with the grounds of appeal. Therefore the Board intends to use its discretion under Article 114(1) EPC and to admit the document into the procedure.

The SEMICOSIL 905 information sheet is dated "June 1999" (see the last page) which is after the relevant date of the contested patent. However, the document gives an indication that silicone rubber materials mentioned in prior art documents may cover silicone gel materials.

- VI. With a letter dated 29 May 2004 the appellant filed claims according to a new main request and a new auxiliary request and presented observations in support of these requests.

The independent claims according to the main request read as follows:

"1. An optical device package comprising:
a semiconductor laser (10), an optical fibre (30) and a support member (20), said support member providing a bore into which the optical fibre is received and a reference surface (20) in relation to which said semiconductor laser is mounted to effect alignment with the end of said optical fibre received in said bore, wherein a silicone gel encapsulant is applied to the semiconductor laser to form a protective cap (40) which in use is effective to seal the laser from the

surrounding environment, and wherein the silicone gel encapsulant is index-matching and forms a bond between a facet of the semiconductor laser (10) and the end of the optical fibre (30)."

"6. A method of packaging an optical device (10), the method comprising the steps of:

- a) mounting an optical fibre (30) in a bore of a optical fibre supporting member (20) the supporting member having a reference surface;
- b) positioning the optical device in relation to the reference surface so as to thereby effect the optical alignment with the optical fibre and securing the device and the fibre in optically coupled relationship; and
- c) applying a silicone gel encapsulant (40) to the optical device to form a protective cap which in use is effective to form a substantially air-tight seal to seal the optical device from the surrounding environment, the silicone gel encapsulant (40) being index-matching and forming a bond between a facet of the optical device (10) and the end of the optical fibre (30)."

The independent claims according to the auxiliary request read as follows:

"1. An optical device package comprising:
an optical device (10), an optical fibre (30) and a tubular support member (20), said tubular support member providing a bore into which the optical fibre is received and a reference surface (20) in relation to which said optical device is mounted to effect alignment with the end of said optical fibre received

in said bore, wherein an encapsulant forming a protective cap (40) is applied to the optical device to seal the device from the surrounding environment, and wherein the encapsulant is index-matching and forms a bond between a facet of the optical device (10) and the end of the optical fibre (30), and wherein the reference surface is provided by a rim at an end of the bore."

"7. A method of packaging an optical device (10), the method comprising the steps of:
a) mounting an optical fibre (30) in an optical fibre supporting member (20), the supporting member being tubular;
b) positioning the optical device in relation to a rim of the tubular supporting member, so as to thereby effect optical alignment of the optical device with the optical fibre, and securing the device and the fibre in optically coupled relationship; and
c) applying an encapsulant (40) to the optical device to form a substantially air-tight seal, the silicone gel encapsulant (40) being index-matching and forming a bond between a facet of the optical device (10) and the end of the optical fibre (30)."

VII. Oral proceedings took place on 29 June 2004. In the oral proceedings the appellant requested that a patent be granted on the basis of the claims according to the main request or the auxiliary request. During the oral proceedings the appellant indicated that in claim 1 according to the main request reference numeral "(20)" after "reference surface" should be deleted. The respondent requested that the appeal be dismissed. At

the end of the oral proceedings the Board gave its decision.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Amendments

The Board is satisfied that the claimed subject-matter is disclosed in the documents as originally filed and is sufficiently clear to be compared with the cited prior art. Objections raised by the respondent in this respect need not be considered in detail since they are not relevant to the decision.

2.2 Inventive step

2.2.1 Employing the terminology used in claim 1, document D2, see Figures 1 and 2 with column 2, lines 6 to 16, discloses an optical device package comprising: a semiconductor laser (4), an optical fibre (8) and a support member (7), the support member providing a bore (7b) into which the optical fibre is received and a reference surface (provided by upper surface 15 of ledge 6) in relation to which the semiconductor laser is mounted to effect alignment with the end of the optical fibre received in the bore.

2.2.2 Thus the subject-matter of claim 1 differs from what is disclosed in D2, in that a silicone gel encapsulant is applied to the semiconductor laser to form a protective cap which in use is effective to seal the laser from the surrounding environment, and in that the silicone gel encapsulant is index-matching and forms a bond between a facet of the semiconductor laser and the end of the optical fibre. The problem solved by these features is evidently related to protection, sealing, index-matching and bonding of the semiconductor laser and the end of the optical fibre.

2.2.3 A similar problem has been solved in document D4 in which there is described, see Figures 3 and 4 and column 5, line 49 to column 6, line 5, an optical device package comprising a semiconductor laser (32), an optical waveguide (12) and a support member (10), the support member providing the optical waveguide integrated in its surface and a reference surface (36) in relation to which the semiconductor laser is mounted to effect alignment with the end of the optical waveguide, wherein a silicone rubber encapsulant (see column 5, lines 39 to 41) is applied to the semiconductor laser to form a protective cap (30, Figure 1) which in use is effective to seal the laser from the surrounding environment (see column 5, lines 31 to 36), and wherein the silicone rubber encapsulant is index-matching (see column 7, lines 25 to 29) and forms a bond between a facet of the semiconductor laser and the end of the optical waveguide.

2.2.4 The skilled person would recognise that the package known from D2 can be improved in terms of the mentioned problem by employing the teaching of D4. It was hence obvious for the skilled person to select for the encapsulant a suitable silicone rubber according to D4, i.e. a silicone gel, and to accommodate it in the space between the semiconductor laser and the end of the fibre described in D2, thereby arriving at the package defined in claim 1 and the corresponding method defined in claim 6.

2.3 Arguments of the appellant

2.3.1 The appellant has argued that D2 does not disclose a reference surface within the meaning of the contested patent. In D2 the surfaces 15 of ledge 6 or the end face 7a of tube 7 cannot be considered as reference surfaces because the semiconductor laser is not mounted in relation to them to effect alignment with the end of the optical fibre received in the bore, as is defined in the independent claims of the contested patent. In D2 there is coarse alignment by placing the laser on the ledge and then fine alignment in an active manner by distorting the ledge to maximum power output from the fibre. There is no active alignment in the contested patent. The laser is mounted on the reference surface and is automatically aligned.

2.3.2 This argument, however, is not accepted by the Board. The definition of the reference plane does not imply any special feature which would not be present in the package known from D2. There is nothing in the claim which ensures automatic alignment and avoids the need for active alignment. According to the embodiment shown

in Figure 1 of the contested patent, the laser chip on a heatsink is mounted on the rim of a precision ferrule. There is automatic alignment in the axial direction, which is trivial. However, it is not clear how alignment in a radial direction can be obtained without active alignment, as is stated in the patent, page 4, lines 44 to 47. This is also in contradiction to what is described in the patent, see page 4, lines 48 to 53, in connection with tests using the arrangement shown in Figure 1. It is to be noted in this context that the arrangement shown in Figures 2 and 3 does not fall under claim 1 because it discloses a support member providing a groove for receiving the fibre and not a bore.

2.3.3 The appellant made reference to D4, column 6, lines 50 to 57, where it is indicated that the refractive index step at the laser facet should not be changed.

Therefore the laser was sealed under air according to the embodiments shown in Figures 6 and 7 of D4. This would discourage the skilled person from considering the sealing of semiconductor lasers by a gel encapsulant. Moreover, D4 discloses a silicone rubber which is required to be "cast rigidifying" and therefore of high rigidity, especially once cured, whereas the patent uses a gel which is a material of low rigidity.

2.3.4 However, the Board is of the opinion that the skilled person would be aware of various types of semiconductor lasers differing in laser threshold and gain and would be able to select a type which operates under a facet reflectivity lowered by a silicone gel encapsulant. Such a type was evidently considered in D4 for the use

in the embodiment according to Figure 3. As to the rigidity of the silicone rubber used in D4, the skilled person could easily find information about the silicon rubber materials available and select a suitable material in the form of a silicone gel using considerations, e.g. as to its hardness, common in the art.

2.3.5 The appellant put forward the argument that there was no reason to replace the lid in D2, which is hermetically sealed to the substrate and tube, by a gel encapsulation. D4, apart from discouraging the skilled person to seal a laser with a gel, is not related to an optical fibre but to an optical waveguide of the integrated type.

2.3.6 The Board finds this unconvincing. Replacing a lid by an encapsulant is standard practice in the field of semiconductor technology and would be routinely considered by the skilled person not only for integrated devices but also for devices employing fibres as waveguides.

2.4 Therefore taking into due account the essential arguments of the appellant the Board reaches the conclusion that the subject-matter claimed according to the main request does not involve an inventive step in the meaning of Article 56 EPC.

3. *Auxiliary request*

3.1 The auxiliary request was filed with the appellant's letter of 29 May 2004, one month before the oral proceedings. It was therefore filed at a very late

stage of the appeal proceedings. The respondent did not object to the admissibility of the request solely on the grounds of such lateness but for reasons arising from the actual content of the request, namely that the claims differ from those of the main request in such a way that additional searches might be required and the request had been put forward too late for that to be possible.

3.2 The independent claim 1 of the auxiliary request contains a feature at the end of the claim ("and wherein the reference surface is provided by a rim at the end of the bore") which was neither in the claim as granted nor formed any part of the appellant's case as advanced in its grounds of appeal; the same feature also appears in the independent method claim 7. A corresponding feature was present in the application as filed, claim 12 of which read "An optical device according to claim 11, wherein the rim of the ferrule provides the reference surface", but this feature was omitted from the set of claims filed by the appellant (then, the applicant) on 6 April 1998 during the examination proceedings and was not present in the claims of the granted patent.

3.3 The appellant argued that the respondent should have anticipated that such an omitted feature might later be reintroduced but the Board finds that argument unconvincing: if anything, an opponent would consider it less rather than more likely that a feature which has previously appeared but has been abandoned by the applicant or patentee would be reintroduced. Thus, if that happens, an opponent (or, as in this case, a respondent/opponent) can with all the more

justification assert that it has been surprised and that it requires a reasonable time to conduct searches or otherwise prepare to meet the new case presented by the request with a claim containing such a feature. It follows that, if such a request were to be admitted at a late stage of the proceedings, the respondent could well be prejudiced. Accordingly, the Board holds that the auxiliary request is inadmissible.

4. The Board therefore reached the conclusion that the main request cannot be accepted because the subject-matter of claims 1 and 6 is not patentable within the terms of Article 52(1) EPC, and that the auxiliary request is inadmissible under Article 114(2) EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

A. G. Klein