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D E C I S I O N
of 4 February 1998

Case Number: T 0462/96 - 3.4.2

Application Number: 89201390.5

Publication Number: 0345874

IPC: G02B 6/42

Language of the proceedings: EN

Title of invention:
Optoelectronic arrangement having a coupling between an optical transmission fibre and a semiconductor laser diode

Patentee:
Philips Electronics N.V.

Opponent:
Siemens AG

Headword:
-

Relevant legal provisions:
EPC Art. 123(2) and (3), 56, 112(1)(a)

Keyword:
"Inventive step (yes, after amendment)"
"Referral to the Enlarged Board of Appeal (no)"

Decisions cited:
T 0013/84, T 0160/92

Catchword:
-

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Case Number: T 0462/96 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 4 February 1998

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Representative:
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 29 March 1996 concerning maintenance of European patent No. 0 345 874 in amended form.**

Composition of the Board:

Chairman: E. Turrini
Members: A. G. Klein
M. Lewenton

Summary of Facts and Submissions

I. European patent No. 0 345 874 granted on the basis of European patent application No. 89 201 390.5 was maintained in amended form by an interlocutory decision of the Opposition Division.

The Opposition Division in its decision in particular held that the subject-matter of claim 1 of the patent proprietor's then valid main request lacked an inventive step in the sense of Article 56 EPC in view of the contents of the following documents:

JP-A-62 187 807 (hereinafter document D1) and the corresponding Patent Abstracts of Japan, vol. 12, No. 42 (P-663)[2889], 6 February 1988, page 10 P 663 (hereinafter document D1/A); and

JP-A-62 63 906 (hereinafter document D5) and the corresponding Patent Abstracts of Japan, vol. 11, No. 260 (P-608)[2707], 22 August 1987, page 41 P 608 (hereinafter document D5/A).

II. Appeals were filed against the interlocutory decision by both the opponent and the proprietor of the patent, who for the sake of clarity will be referred to hereinafter as the opponent appellant and the proprietor appellant, respectively.

III. Oral proceedings were held on 4 February 1998.

The opponent appellant did not attend the oral proceedings, as announced in his fax letter dated 26 January 1998.

IV. The opponent appellant in his written submissions requested that the patent be revoked.

Auxiliarily, the opponent appellant requested that two questions be referred to the Enlarged Board of Appeal. The first question was whether the Board of Appeal, after grant of a patent, was entitled to formulate, and base its assessment of inventive step on, an objective technical problem which could not be derived from the patent description. The other question was whether the abstract of a Japanese patent document should be considered as a citation of its own, independently of the document of which it is an abridgement ("ob ein japanischer Abstract eigene Aussagekraft hat").

V. The proprietor appellant for his part requested that the patent be maintained in amended form on the basis of a set of claims filed at the oral proceedings of 4 February 1998, of which claim 1, the only independent claim, reads as follows:

"1. An opto-electronic arrangement having a coupling between a first optical element and a second optical element, the arrangement having a holder (14) for the second optical element (4), a holder (16) for the first optical element (15) and an intermediate part (21), the two holders (14,16) being connected to each other by way of the intermediate part (21), the intermediate part (21) and one (16) of the two holders (14,16) forming a first pair of parts (21,16), of which one part (21) has a tubular connection part, whereby, before connection, the other part (16) could slide within the one part (21) in an axial direction to effect axial adjustment of the holder (16) for the first optical element (15) with respect to the second optical element (4), said tubular connection part being secured to the outer surface of the other part (16) by means of laser welding within the cylindrical outer

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surface area of the tubular connection part and from a direction which is substantially perpendicular to said area, and the intermediate part (21) and the other one (14) of the two holders (14,16) forming a second pair of parts (21,14) having opposed touching flat surfaces (20) which, before connection, could slide one (21) over the other (14) in a transversal direction to effect transversal adjustment of the holder (16) for the first optical element (15) with respect to the second optical element (4), said flat surfaces (20) being at right angles to the direction of axial adjustment, one part (21) of the second pair of parts (21,14) has a flat flange portion (24) which extends outside the remainder of the one part (21) and has a uniform height, and the parts (21,14) of the second pair of parts (21,14) are secured to each other by means of laser welding within the outer surface area of the flat flange portion (21) which is parallel to the flat surface (20) constituted by the flat flange portion (24) and from a direction which is substantially perpendicular to said area, wherein one (15) of the first and second optical elements (15,4) is an optical transmission fibre (15) and the other one (4) is a semiconductor laser diode (4), an end face (18) of the optical transmission fibre (15) facing the semiconductor laser diode (4) and being adjusted with respect thereto, characterized in that the tubular connection part of the one part (21) of the first pair of parts (21,16) has an annular end portion (23) which has a wall thickness which is smaller than the wall thickness of the remainder of the tubular connection part, is uniform in the axial direction and extends parallel to the adjacent outer surface of the other part (16) of the first pair of parts (21,16), whereby before connection, the other part (16) could slide both within the annular end portion (23) and within the remainder of the tubular connection part and whereby after connection, the other part (16) extends through

the annular end portion (23) into the remainder of the tubular connection part, the height of the flat flange portion (24) of the one part (21) of the second pair of parts (21,14) is substantially the same as the wall thickness of the annular end portion (23), and the laser welds by which the first pair of parts (21,16) are secured to each other are applied within the cylindrical outer surface area of the annular end portion (23)."

VI. The arguments put forward by the opponent appellant against the maintenance of the patent can be summarized as follows.

The protection conferred by claim 1 was extended in an inadmissible way since the present claim merely stated that one of the first and second optical elements was an optical transmission fibre and the other one was a semiconductor laser diode, whereas claim 1 of the patent as granted definitely specified that the first element was the transmission fibre and that the second was the semiconductor laser diode.

The subject-matter of claim 1 also lacked an inventive step in view of the device disclosed in Figure 1 of document D5 and in the corresponding abstract D5/A. To reinforce the medium portion of intermediate part 7 which was not intended for welding, in order to achieve sufficient mechanical stability, would indeed lie well within the frame of normal technical skill.

In a communication of the Board pursuant Article 11(2) of the Rules of Procedures of the Boards of Appeal issued on 31 October 1997 in Annex to the summons to attend oral proceedings the Board expressed the provisional opinion that the technical problem solved by a greater thickness of the medium portion of the intermediate part, as compared to the design disclosed

in document D5, was to increase the mechanical stability of the intermediate part. The Board also indicated that from the translations of documents D5 and D1 produced by the proprietor appellant with its notice of appeal it appeared to emerge that these documents actually pointed at a different solution to this technical problem than the one set out in claim 1.

In response, the opponent appellant submitted that the Board thus took into consideration a new definition of the technical problem which was not disclosed in the patent. This not only took him largely by surprise but also clearly affected his position in the procedure. The Board's conduct also jeopardised the principle of legal certainty since third parties should be able to rely upon the declaration made in the patent as to the technical problem solved by the subject-matter covered by the claims.

Concerning the teaching of document D5, the opponent appellant submitted that the claimed subject-matter was obvious from the abstract of document D5 only, which had to be considered as a citation as such, i.e. independently of the actually content of the whole document.

Since both the question of the admissibility of a new definition of the technical problem solved by an invention and the question of whether a Japanese abstract could be cited independently of the document it summarises were of fundamental importance, they should be referred to the Enlarged Board of Appeal.

VII. The proprietor appellant for his part submitted that the amendments brought to claim 1, in particular in the definition of the first and second optical elements, did not introduce any arrangement of features which was not already covered by claim 1 as granted.

With respect to the question of inventive step he pointed out that no prior art document disclosed any coupling design for an opto-electronic arrangement comprising for the axial and radial alignment of a fibre with respect to a semiconductor laser diode an annular end portion and a flange which exhibited a same, reduced thickness.

As evidenced by the translations in English filed with his statement of the grounds of appeal (hereinafter D1/T and D5/T), document D1 taught to provide a tubular connection part with tapered end sections and to perform the welding operation along an oblique direction, whilst document D5 instructed not to modify the tubular connection part and to perform the welding operation also in an oblique direction, directly through the end edge.

In contrast, providing an annular end portion of reduced thickness as proposed by the invention resulted in the heat developed in the device by laser welding being dissipated symmetrically and uniformly around the laser welds, which effectively contributed to minimising relative displacements, during welding, of the parts to be welded and thus to maintaining the accuracy of the coupling. Due to the fact that the other part slided both within the annular end portion and within the remainder of the tubular connection part, axial alignment within a sufficiently large span was achieved while weakening of the device was minimal.

The skilled person would not have contemplated designing the annular end portion and flat flange portion of reduced thickness in the way defined in claim 1 because the machining of the claimed structure called for an additional deburring operation, and thus led to a predicatable, disadvantageous increase in the manufacturing difficulty and cost.

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Reasons for the Decision

1. The appeal is admissible.

2. *Compliance of the amendments brought to the patent with the requirements of Article 123(2) and (3) EPC*

As compared to claim 1 in the version as granted, present claim 1 was amended in substance only by the inclusion of additional features to specify that the laser welding within the outer surface area of the tubular connection part and of the flat flange portion is performed "from a direction which is substantially perpendicular to said area", and that after connection, that part which is welded to the annular end portion extends through it and into the remainder of the tubular connection part. These features were unambiguously disclosed in the originally filed Figures 1 to 3 and they also clearly limit the scope of claim 1.

The remaining amendments brought to claim 1, such as the shifting of the features relating to the laser welding from the characterising portion of the claim into its preamble in order to take due account of the nearest prior art disclosed in document D5, do not actually modify the technical content and scope of the claim.

In this respect, the opponent appellant objected to the replacement of the expression in claim 1 as granted "the first optical element (15) is an optical transmission fibre (15) and the second optical element (4) is a semiconductor laser diode (4)" by the expression "one (15) of the first and second optical

elements (15, 4) is an optical transmission fibre (15) and the other one (4) is a semiconductor laser diode (4)". From the remaining portion of both claim 1 as granted and present claim 1, it is however clear that the first and the second optical elements are each received in a respective holder, and the two holders are connected to each other by way of the intermediate part. One holder is connected to the intermediate part through a tubular connection part and the other through a flat flange portion. Neither claim 1 as originally filed nor present claim 1 specify which holder receives which optical element, nor which holder is connected via a tubular connection part and which is connected via a flat flange portion, nor even whether said tubular connection part is formed onto a holder or onto the intermediate part. As a result, claim 1 as granted in fact already covered all imaginable combinations of the optical elements, holders, and locations for the tubular connection part and flat flange portion. Thus, when considered in the whole context of the claim, the amendment brought to the definition of the first and second optical elements only clarifies the full extent of the scope of the claim, without changing its substance. Incidentally, the opponent appellant did not identify any particular arrangement corresponding to the amended definition, which was not yet covered by claim 1 as granted.

The statement of the invention in the description has been adapted to present claim 1, and a few evident mistakes corrected.

For these reasons the amendment brought to the patent comply with the requirements of Article 123(2) and (3) EPC.

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3. *Patentability*

3.1 The subject-matter of claim 1 is undisputedly novel. As a matter of fact, none of the opto-electronic arrangements disclosed in the prior art documents on the file comprises a tubular connection part having an annular end portion with a wall thickness smaller than the wall thickness of the remainder of the tubular connection part and a flange portion of a substantially same wall thickness.

3.2 Both parties also agreed to consider that the closest prior art was constituted by the arrangement disclosed both in document D5 and in the corresponding abstract D5/A, which comprises the features set out in the preamble of claim 1. In this known arrangement holder 8 (see Figure 1) for an optical transmission fibre 9 is laser welded to the upper tubular connection part of intermediate part 7 whilst holder 6 for a semiconductor laser diode 2 is laser welded to a flat flange portion provided at the lower end of intermediate part 7. According to one option disclosed in both documents D5 and D5/A laser welding is performed in a direction perpendicular to the outer surface area of the tubular connection part and flat flange portion (direction marked "α" in the figures).

In this prior art arrangement the thickness of intermediate part 7 from the upper tubular connection part to the lower part where the flange portion is provided is constant, and is substantially the same than the thickness of the flat flange.

Thus, the opto-electronic arrangement of claim 1 is distinguished from the above nearest prior art arrangement essentially in that there is an annular end portion at the end of the tubular connection part which

has a wall thickness which is smaller than the wall thickness of the remainder of the tubular connection part, and is uniform in the actual direction to such an extent that after connection the other part connected to it extends through the annular end portion into the remainder of the tubular connection part, in that the height of the flat flange portion is substantially the same as the wall thickness of the annular end portion, and in that the laser welds are applied within the cylindrical outer surface area of the annular end portion, as set out in the characterising portion of claim 1.

3.3 The technical problem solved by the invention as objectively defined in consideration of the nearest prior art and of the distinguishing features set out in claim 1 - namely a smaller thickness of the annular end portion and of the flat flange portion where laser welding is performed and a greater thickness of the remainder of the tubular connection part into which the corresponding holder extends after a connection - in the Board's view is to be seen in achieving either a reduction of the laser power required for the welding operations without substantial weakening of the remainder of the tubular connection part or, alternately, an increase of the mechanically stability of said remainder without any increase of the laser energy required for the welding operations.

3.4 The formulation of the technical problem cannot by itself provide any positive contribution for the assessment of inventive step, because document D5 already explicitly discusses the effect of the thickness of intermediate part 7 on its mechanical strength and on the power required for the laser

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welding operations, and strives at meeting the conflicting requirements of a high mechanical strength and a low laser power (see the translation D5/T, page 5, lines 1 to 6).

To this effect, document D5 teaches that, for a given thickness of intermediate part 7, laser welding power can be substantially reduced from 3 to 4 Joules to 1 to 2 Joules when welding is performed along direction β, which is slantwise and through the end edge of the tubular connection part and of the flat flange portion, rather than along direction α, perpendicularly to the outer surface area of the tubular connection part and of the flat flange, like in the present invention. Document D5 thus points at a different solution to the technical problem underlying the invention.

So does document D1, which is expressly dedicated to the technical problem of increasing the rigidity of an opto-electronic arrangement in which also an intermediate part 4 (see Figure 1) is welded by its ends respectively to laser holder 2 and lens holder 5. For the connection of lens holder 5, the upper end of the tubular connection part of intermediate part 4 is provided with a tapered edge 7, which is welded to the cooperating portion of lens holder 5 along a slanted direction, like in document D5. The provision of a tapered edge 7 allows for a greater thickness and an increased rigidity of intermediate part 4, as compared to the prior art construction illustrated in Figure 2 and which the Examining Division in the second paragraph of point 2.43 of its decision erroneously considered to represent a further embodiment of the invention disclosed in document D1 (see the translation D1/T, page 1, second paragraph and page 4, penultimate paragraph). As concerns the connection at the other end of intermediate part 4 of laser holder 2, said laser holder instead of a flat flange portion comprises a

thick wall of a substantially constant thickness, and a circumferential groove formed at the end of the holder facing intermediate part 4 permits access for welding from a slanted direction as well.

Thus it emerges that documents D5 and D1 both expressly teach to compensate for a greater thickness of an intermediate connection part by directing the laser welding beam obliquely either onto the edge of a tubular connection part and of a flat flange portion, like in document D5, or onto a slanted surface constituted by a taper or a circumferential groove, like in document D1. These documents thus consistently lead away from the solution proposed by the present invention, which consists instead in applying laser welds perpendicularly to the outer surface area of an annular connection portion and of a flat flange portion having an equal thickness which is smaller than the thickness of the remainder of the tubular connection part.

The remaining prior art documents on the file, which were no longer relied upon by the opponent appellant in the appeal proceedure, are not more relevant.

Accordingly, taking also into due consideration the advantage of a uniform thickness of the welded portions and of a perpendicular direction of the welding operation in minimizing parasitic displacements during welding because of a uniform and symmetrical dissipation of heat, and also the greater difficultly to realise the stepped structure set out in claim 1 as compared to the structures disclosed in documents D5 and D1, as convincingly put forward by the appellant opponent, the Board comes to the conclusion that the claimed invention is not suggested in an obvious manner by the prior art on the file.

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4. *Opponent appellant's request to the effect that questions be referred to the Enlarged Board of Appeal*

4.1 The opponent appellant's requests that questions be referred to the Enlarged Board of Appeal as submitted in the letter dated 23 December 1997 followed the communication issued by the Board pursuant to Article 11(2) of the Rules of Procedures of the Boards of Appeal, dated 31 October 1997, to inform the parties of its provisional opinion, stating in particular that the technical problem solved by a greater thickness of the portion of the intermediate part extending between the annular end portion and the flat flange portion was to increase the mechanical stability of the intermediate part (see point 4.2, last paragraph).

With respect to the considerable surprise and considerable prejudice caused by such formulation of the technical problem, as alleged by the opponent appellant, the Board notices that the very same formulation was used by the opponent appellant himself both in the notice of opposition dated 3 November 1994 (see page 4, third paragraph, first sentence) and in the oral proceedings before the Opposition Division held on 9 February 1996 (see the paragraph bridging pages 3 and 4 of the minutes), that it was retained by the Opposition Division in the decision dated 29 March 1996 (see page 10, second paragraph) and taken up again by the opponent appellant in his grounds of appeal dated 23 July 1996 (see the paragraph bridging pages 2 and 3). Accordingly, although the representation of the opponent appellant was taken up by a different patent representative after the filing of the latter grounds of appeal, the allegation of a new and surprising formulation of a technical problem by the Board of Appeal at a late stage of the proceedings does not appear to reflect the actual circumstances of the

present case and for that reason already, referral to the Enlarged Board of Appeal under Article 112(1)(a) EPC of a question directed to the admissibility of a "new" definition of the technical problem is not considered to be required.

With respect to the admissibility per se (i.e. independently of the time point at which it was introduced) of the formulation of the technical problem considered by the present Board and set out above under point 3.2 of the present decision - namely to reduce the laser power required for the welding operation without decreasing the mechanical strength of the elements of the arrangement, or alternatively, to increase said strength without the need for increasing the laser power - the Board wishes to emphasize the following.

Not only is this technical problem evident for the skilled person in the light of the technical features which distinguish the claimed subject-matter from the arrangement disclosed in documents D5 or D5/A, especially the smaller thickness of the welding zones as compared to the remainder of the connection portion, but prior art document D5 expressly discusses the technical relationship between the thickness of the intermediate part, the laser power required for the welding and the mechanical strength of the element, and also strives at proposing an acceptable compromise between conflicting requirements.

The description as originally filed of the present patent also explicitly stated that "the thin flange and connection part of reduced thickness permit of obtaining laser weld connections, which require only a small supply of energy" (see page 8, second paragraph).

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The above definition of the technical problem solved by the invention thus clearly complies with the established practice of the EPO, as exemplified for instance by the decision T 13/84 (OJ EPO, 1986, 253; see in particular point 11 of the Reasons).

4.2 Concerning the second question which in accordance with the opponent appellant's request should be referred to the Enlarged Board of Appeal, namely whether the abstract of a Japanese patent document should be considered in isolation, independently of the corresponding original document, attention is drawn to the decision T 160/92 (OJ EPO, 1994, 35). This decision already ruled that such abstract prima facie forms part of the prior art and that it may be legitimately cited as such if nothing on the file points to its invalidity as prior art (see point 2 of the reasons).

In the present case, the abstract D5/A is fully consistent with, although considerably less explicit than, document D5 and, accordingly, the construction shown in the figures of this abstract, with an intermediate part of uniform thickness, can legitimately be considered to also represent the closest prior art construction. However, with respect to the welding operation, the information in the abstract boils down to propose the alternative between perpendicular welding along direction α or slantwise welding through the edges of the intermediate part along direction β. The abstract D5/A does not address the technical problem which underlies the present invention and the Board cannot identify in its scant description any hint at the combination of features set out in the characterising portion of present claim 1.

Thus, the Board agrees to the opponent appellant's submission that document D5/A can be considered in isolation, in conformity also with the case law of the

Boards of Appeal of the EPO, but such consideration of the abstract alone, if not supplemented, and tainted with, inadmissible ex post facto consideration of the claimed invention, would not in its opinion render the claimed subject-matter obvious.

Accordingly, referring this question to the Enlarged Board of Appeal is not considered necessary either.

5. *Further procedural matters*

5.1 The opponent appellant did not attend the oral proceedings during which the proprietor appellant further modified claim 1 of his main request as compared to the claims submitted in the written procedure.

The preamble of claim 1 has been supplemented with an indication that welding was performed perpendicularly to the surface of the element to be welded. The importance of the technical effect of this feature in terms of the symmetry and uniformity of heat dissipation around the laser welds and the deviation it represents from the teaching of document D5, which instead recommends oblique welding to reduce laser power, have been extensively discussed in the proprietor appellant's statement of the grounds of appeal dated 1 August 1996 (see page 2, third paragraph and page 3, third paragraph).

The other amendment brought to claim 1 in the oral proceedings not attended by the opponent appellant, to specify that, after connection, the part welded to the annular end portion extends into the remainder of the tubular connection part, was explicitly suggested by the opponent appellant in his letter dated 23 December 1997 (see page 4, last paragraph).

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Accordingly, the Board did not consider it necessary to give the opponent appellant a further opportunity to comment on the above amendments.

5.2 In a letter dated 6 February 1998 the proprietor appellant drew the Board's attention to the fact that he had omitted the last page of the description, i.e. page 7, from the pages of description he submitted at the oral proceedings of 4 February 1998 as his main request.

Page 7 attached to his letter indeed only comprises the two last paragraphs of the description of the patent as granted and there is no doubt that the proprietor appellant's intention was to request the maintenance of the patent with a description ending with these last paragraphs.

Accordingly, his request made at the oral proceedings of 2 February 1998 can be corrected under Rule 88 EPC (correction of errors in document filed with the European Patent Office), and page 7 to be attached to the pages of the desciption on the basis of which maintenance of the patent in amended form is requested.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The opponent appellant's requests to the effect that two questions be referred to the Enlarged Board of Appeal are rejected.

3. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of the following documents:

   Claims 1 to 4 and pages 1 to 6 of the description as presented by the proprietor opponent at the oral proceedings, page 7 of the description filed with his letter of 6 February 1998, and Figures 1 to 3 as granted.

The Registrar: The Chairman:

P. Martorana E. Turrini