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**D E C I S I O N**  
of 24 November 1993

**Case Number:** T 0776/91 - 3.4.1

**Application Number:** 87305687.3

**Publication Number:** 0251719

**IPC:** H01S 3/02

**Language of the proceedings:** EN

**Title of invention:**  
Solid state laser and method of making

**Applicant:**  
Amoco Corporation

**Opponent:**  
-

**Headword:**  
-

**Relevant legal norms:**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes, after amendments)"

**Decisions cited:**  
-

**Catchword:**  
-



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Boards of Appeal

Chambres de recours

Case Number: T 0776/91 - 3.4.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.1  
of 24 November 1993

**Appellant:**

Amoco Corporation  
200 East Randolph Drive  
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Illinois 60601 (US)

**Representative:**

Laredo, Jack Joseph  
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**Decision under appeal:**

**Decision of the Examining Division of the European  
Patent Office dated 13 May 1991 refusing European  
patent application No. 87 305 687.3 pursuant to  
Article 97(1) EPC.**

**Composition of the Board:**

**Chairman:** G.D. Paterson  
**Members:** U.G.O.M. Himmler  
Y. van Henden

## Summary of Facts and Submissions

I. European patent application No. 87 305 687.3, publication No. 0 251 719, was refused in a decision of the Examining Division on the ground of lack of inventive step having regard to prior art document

D1: US-A-3 220 309.

The application concerns an optically pumped laser formed of solid state components which have complementary fittings which are arranged so that, upon joining the fittings together, the components are automatically arranged along an optical path.

The Examining Division considered that document D1 discloses an optical system comprised of components which have attached thereto complementary configured fittings structured so that said components are automatically arranged with respect to one another along an optical path upon joining the fittings, and that the apparatus of said Claim 1 differed from that disclosed in D1 only in that the components in Claim 1 are those of an optically pumped solid stated **laser**. The Examining Division did not consider this difference as inventive on the basis that there would not be any difficulty in transferring the teaching of document D1, which concerns lens systems, to optically active devices such as laser components.

II. The Applicant filed an appeal against the above decision, and filed an auxiliary request in the form of a set of Claims 1 to 20 and corresponding amendments to the description.

The Appellant submitted the following arguments in the Statement of Grounds of appeal in support of his requests:

Document D1 is directed to a lens mount without specifying the material to be used for the fittings. However, a lens mount is not an active optical system, contrary to the subject-matter of the present application which is directed to an optically pump laser comprising at least one optically active and heat producing component. Therefore, the material used for the fittings and its physical properties in comparison with those of the optical components is of decisive significance. In particular, document D1 gives no hint for using thermoplastic for the fittings. It could not be foreseen that an alignment could be achieved by using thermoplastic fittings in combination with heat producing laser components. It could not be expected that such a structure would fulfil the particular requirements for alignment in lasers where a beam of light is reflected back and fourth between two mirrored surfaces. In support of this argumentation the Appellant filed Affidavits in the names of Mr Arthur Howe and Mr Terence Donahue, together with Exhibits I to IV accompany the Affidavit of Mr Howe.

III. The Board issued a communication reflecting its preliminary opinion that the subject-matter of Claim 1 according to each request did not involve an inventive step having regard to the state of the art in document D1.

In his observations in reply, the Appellant submitted that, contrary to the present invention, D1 is not in fact concerned with providing **automatically constrained** alignment of components of an optical system and is

distinguished both conceptually and as a matter of structure and method.

IV. During oral proceedings which were held on 24 November 1993, it was emphasised on behalf of the Appellant that an important aspect of the invention lies in the use of **prefabricated modules** of laser components, which can be assembled by unskilled persons. Each such module comprises both a laser element or an optical element and a fitting which has a structure of predetermined tolerances so that an automatically constrained, operative alignment of the optical system is guaranteed.

V. During the oral proceedings the Appellant filed a new main and sole request, including a new Claim 1 and independent Claim 12 corresponding to the original Claim 13, as well as a set of subsidiary claims and amended description, Claims 1 and 12 read as follows (the amendments to the originally filed Claim 1 being underlined):

"1. An optically pumped laser which is comprised of solid state components which have previously had attached thereto complementary configured fittings structured so that said components are automatically arranged in operative association with respect to one another along an optical path upon joining said fittings.

12. A method for making an optically pumped solid state laser which comprises:

(a) attaching fittings to the components of said laser, said fittings being structured so that said components are automatically arranged with respect to one another along an optical path within predetermined tolerances upon joining said fittings;

- (b) joining the fittings together thereby placing said components in operative association; and
- (c) bonding said fittings to each other.

VI. At the end of the oral proceedings the decision was announced that the decision of the Examining Division is set aside, that the appeal is allowed, and that the case is remitted to the first instance with an order to grant a patent in accordance with the main request.

### Reasons for the Decision

#### 1. *Amendments (Article 123(2) EPC)*

The feature in the new Claim 1 that the solid state components have "**previously had**" attached thereto fittings is unambiguously derivable from the sequence of the method steps in paragraph (a) of the original Claim 13.

The feature "**in operative association**" has been taken from the original Claim 3 which was cancelled. It is also derivable from the original method Claim 13 for making the laser in paragraph (b) thereof.

Therefore, the Board is satisfied that the current version of Claim 1 complies with Article 123(2) EPC.

The current Claims 3 to 19 correspond to the original Claims 4 to 20.

#### 2. *Inventive step*

2.1 The only issue in the appeal is the question of inventive step.

- 2.2 The closest prior art document is document D1. This document describes a method of assembling an optical system. Lenses, i.e. optical elements, and individual cylindrical spacers, i.e. mounting elements, are alternately fitted together. The spacers define the spacing between neighbouring lenses (distance between flange 8 and lens seat 10 or flange 9 and lens seat 11 in Figure 1 of D1) as the optical adjustment of the lenses. The accuracy of the optical alignment of the lenses is determined by locating surfaces and flanges on the spacers to which the lenses are attached (and subsequently fastened by an adhesive or a cement), as well as by the skill of the person who puts together the lenses and the spacers. The number of necessary spacers is always one less than the number of necessary lenses, because one spacer is always in common with two neighbouring lenses.
- 2.3 Starting from this state of the art the objective problem underlying the invention is to provide a set of optical units which can be assembled by an unskilled person to a complete optical laser system in which each optical unit is automatically aligned.
- 2.4 Contrary to the teaching of D1, according to the present claimed invention, each optical element is attached to its individual fitting specially adapted to this optical element. The fittings are configured in such a way that any misalignment of the optical element with respect to its fitting is compensated by the structure of the complementary configuration. The essence of the invention is thus to provide a set of prefabricated parts, each part consisting of an optical element which has previously been inserted into its individual fitting, and the fitting having a complementary configured structure such that an automatic, operative alignment is achieved by simply putting together the

complementary configured fittings. This concept, and the structure which is necessary to carry it into effect, is not disclosed or suggested in document D1.

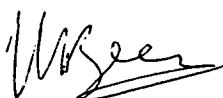
- 2.5 In the Board's judgment, the subject-matter of Claim 1 therefore involves an inventive step.
- 2.6 The same considerations apply to the subject-matter of independent Claim 12, which refers to a method for making an optically pumped laser according to Claim 1.
- 2.7 The dependent Claims 2 to 11 and 13 to 19 concern particular embodiments of invention defined by Claim 1 and Claim 12 respectively and they are, therefore, also allowable.

**Order**

**For these reasons, it is decided that:**

1. The decision of the Examining Division is set aside.
2. The appeal is allowed.
3. The case is remitted to the first instance with an order to grant a patent in accordance with the main request identified in paragraph V above.

The Registrar:



M. Beer

The Chairman:



G.D. Paterson