

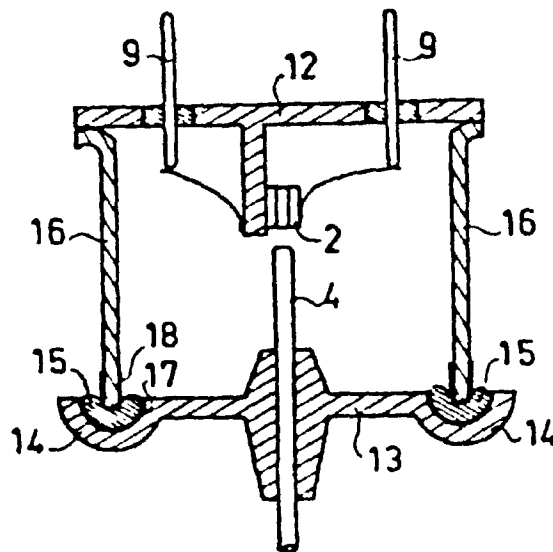
COMMISSIONER'S DECISION

Patentable Subject Matter, cited art: The two part centering structure to obtain and fix the alignment of optical parts and the two parts was held patentable in view of the cited art. Amended claim 1 was refused for not defining the inventive features. Rejection modified.

This decision deals with Applicant's request for review by the Commissioner of Patents of the Examiner's Final Action on application 442,294 (Class 33-53). The application was filed on November 30, 1983, by Thomson-CSF and is entitled ALIGNMENT PROCESS OF AN ELECTRO-OPTICAL DEVICE. The inventors are R. Henry, J.-C. Carballes, E. Duda, E. Grard. The Examiner in charge issued a Final Action on June 23, 1986, refusing to allow the application. By letter dated August 18, 1988 the Applicant withdrew the request for a Hearing.

The invention relates to a process of aligning an optical head housing having a first part supporting an optical solid state device and a second part containing an optical fiber, whereby when the optical elements are aligned, they and the housing parts may be rigidly fixed, as shown by figure 3 reproduced below:

FIG.3



The first part of the housing includes a centering element 16 fixed to a support 12 holding a semiconductor element 2 and its external connections 9. The second part 13 centrally supports optical fiber 4 adjacent element 2, and provides trough means 14 which holds molten solder for covering the immersed end of the centering element. During movement of the centering element for proper optical alignment of elements 2 and 4, the element 16 remains immersed in the trough, and on alignment the molten material is hardened, thus obtaining a sealed housing and aligned optics.

The Examiner refused the application in view of the following references:

British Patent

2,022,280 December 12, 1979 Goodfellow et al  
(United States Patent  
4,357,072 November 2, 1982 Goodfellow et al)

European Patent Application

0,021,473 January 7, 1981 Kock

The British patent provides means for sealing an optical fiber in alignment with a light emitting diode as shown in figure 4 below:

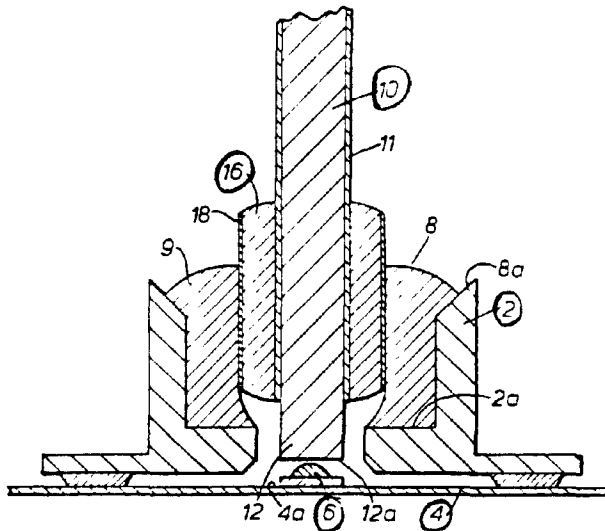
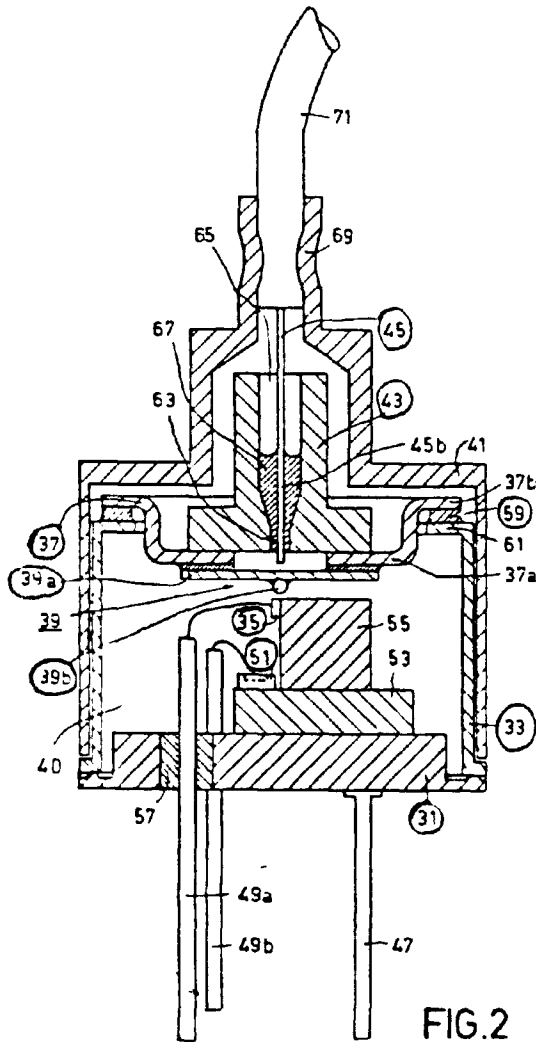


FIG 4.

Diode 6, to be aligned with optic fiber 10, is supported on base 4 which is welded to cover 2. Cupped aperture 8 of cover 2 contains solder 9 and a restriction 2a designed to limit flow of the solder on heating. The metallized coating 11 on the fiber is etched to leave the fiber non-metallized 12 adjacent the diode. On its outer surface, copper collar 16 has a tinned portion 18 for adherence to the solder, and is secured on its inner surface to coating 11. The collar with the fiber attached acts

as a centering element and is placed in a positioning means, not shown, to enable the collar to be moved to align the fiber and the diode. After nitrogen is introduced to obtain an inert atmosphere about the fiber and the diode, solder 9 is melted to adhere to surface 18 of the collar. Upon final optical alignment, the solder is allowed to cool, forming a seal and ensuring alignment, and the positioning means is removed from the collar.

The European Patent shows a multi part device that obtains alignment of an optic fiber and a diode, and fixes the fiber once centered, as shown in figure 2 reproduced below:



The base 31 supports the diodes 35 and 51 and a cover 33, and provides for the connections to the diodes. A centering holder 37 is mounted on cover 33 by means of indium solder 59. The holder has a glass plate 39a attached to it by indium solder, and lens 39b is joined to the plate by epoxy resin. The holder supports block 43 through which the optic fiber 45 is suspended. By pressing on holder 37, plastic deformation of solder 59 occurs to enable the fiber 45 to be aligned with the lens and the diodes, and on alignment block 43 is glued to the holder and the fiber is glued in place.

In taking his Final Action, the Examiner said in part, as follows:

...

The references relate to a dynamic sealing means as in the present case. In other words, the elements to be sealed can be maneuvered, one with respect to the other, while they retain their seal to obtain proper alignment.

The references further disclose that the sealing material, as in the present case, is in a fluid state when maneuvering the elements with respect to each other and is allowed to harden when the desired alignment of the elements has been obtained.

Further Kock discloses a method and a device for aligning a semi-conductor and an optical fibre in a sealed chamber by the presently disclosed and claimed method.

Applicant's letter of December 30, 1985.

United States patent No. 4,357,072 to Goodfellow dated November 2, 1982 was published in Great Britain December 12, 1979 and is citable under Section 28 of the Patent Act.

Applicant states in the letter of December 30, 1985 that the present invention relates to a process for aligning an optical fiber and a semi-conductor component. However it is clear from the present disclosure that the electro-optical devices can be a photodiode, emitting devices or a semiconductive laser. Said devices are as in Goodfellow, who discloses diode packages, laser packages, detectors, directional couplers and connectors or as in the cited British publication which discloses semi-conductor lasers and other elements. From the cited reference it is therefor clear that the components or elements are the same or equivalent to the present components.

The present recess 15 is not patentably significant for the following reasons:

Goodfellow discloses that the aperture 8 is cupped so that when the solder is molten it is prevented from flowing out of the cover and patent No. 0,021,473 (Kock) discloses a thick sealing material. By reason of the structures disclosed by Goodfellow and Kock the support of the fiber can be moved along more than two directions. The foregoing is not specifically stated but is evident from the disclosure.

...

In holding the application was not open to the refusal on the grounds the Examiner advanced, the Applicant amended claim 1 and argued in part, as follows:

...  
In comparison with the prior art, in applicant's invention, the semiconductor component 2 is fixed on its support 12, without any excessive precision, and the fiber 4 is fixed on its support 13, machined without any excessive precision also. Then, the two elements are aligned with precision (from 1 to 5 microns); this is due to the fact that one support comprises a centering element (in the form of a cylinder 16 to 21) and that the other support comprises at least one recipient 14 (in the form of a trough) or three recipients 28 (in the form of cups in which penetrate three lugs 29). The centering elements 16, 21 or 29 and the recipients 14 or 28 are also machined without any excessive precision.

Therefore, what is essential in the present invention is that the centering elements must be immersed in these recipients for the adjusting procedure.

UNITED STATES PATENT NO. 4,357,072 (GOODFELLOW)

This patent shows an optical fiber 10 which is provided with a collar 16 having a tinned layer 18 which is aligned relative to a diode 6 by means of a micromanipulator (see column 3, lines 50 and following), the solder annulus 9 being in a cold state, such as represented in fig. 1, and leaving a free passage for the fiber 10. Once alignment is obtained, the annulus is melted (see column 4, lines 5 and following) and the solder adheres, by capillarity, to the collar 16 and the encapsulation cover 2.

Applicant recognizes that, once solder 9 is melted, it is possible, as Goodfellow states, to adjust the position of the fiber 10 as it is shown in figure 4, but this is practically impossible in the case of figure 5. It is to be noted that an optical fiber has a diameter in the range of 100 microns: with such a length of molten solder 9, it is the fiber that will bend if it is displaced.

In any event, in Goodfellow, while the diode 6 is indeed mounted on a support, the fiber 10 is not fixed on a second support and there is no centering elements nor recipients to allow one support to move relative to another support and to subsequently fix them together.

EUROPEAN PATENT APPLICATION 0,021,473 (KOCK)

The semiconductor component 35 of this reference is mounted on a complex support that includes the cover 33 and the flange 61 while the fiber 45 is mounted on a support 43. However, assuming that element 37 constitutes a centering element, it does not penetrate in a recipient (such as trough 14 or cups 28 in applicant's system). Indeed, applicant achieves alignment by adjustingly penetrating the centering element 16 in the recipient 14, whereas Kock monitors the alignment by deforming the thick layer of indium 59. This is entirely different from that described and claimed in applicant's application.

Applicant fails to understand why the Examiner states that the recess 14 (and not 15) is not patentable. If Goodfellow foresees a constriction 2a in the aperture 8 (which, by the way, is not present in fig.5), it is to retain this solder 8 by capillarity. It should be reminded that Goodfellow has previously aligned the optical fiber, the solder annulus 9 being solid and cold.

It is therefore believed that claim 1, patentably distinguishes from any of these two references, taken singly or in combination. It is contended that one would not arrive at applicant's process after having read the teachings of Goodfellow and Kock.

On the other hand, claim 1 has been revised to better define one of the important steps of the present invention, one which is not taught by the prior art, i.e., one mechanical support is moved relative to the other mechanical support by adjusting dynamically the centering element along three directions in the recess in which the material is present prior to be hardened, or in unhardened form.

...

The issue before the Board is whether the application contains patentable subject matter in view of the references cited. Amended claim 1 reads:

A process for aligning an electro-optical device that includes:

- a semiconductor component for emitting or receiving light, said semiconductor component being fixed on a first mechanical support; and

- an optical fiber fixed on a second mechanical support;

said first and second mechanical supports being independent from each other, one of said mechanical supports comprising a centering element while the other of said mechanical supports comprise at least one recess containing a material which can be hardened, said centering element being immersed in said material, the volume of said recess and the volume of said material being such as to allow said centering element to move in said recess along three different directions, said process comprising the steps of:

- moving said one mechanical support relative to said other mechanical by adjusting dynamically said centering element along three directions in said recess, containing said material in unhardened form, to reach an optimum position between said semiconductor component and said optical fiber; and

- hardening said material when said optimum position has been reached.

Both the cited references disclose devices permitting movement in three directions for optically aligning a diode and an optic fiber. They show different means to seal the moveable means in position after optical

alignment is attained, as well as means to fix the optic fiber. The Applicant's invention resides in the general field of these two patents. However, it presents particular structure whereby in the two relatively moveable supports provided, one has a recess for molten material, and the other is so formed and positioned that an end is immersed at all times in the molten material during the alignment procedure. When positioning is attained, the molten material may be hardened thus ensuring alignment and sealing of both the supports and the optic elements. We consider that the Applicant's arrangement relates to an invention that is different from the subject matter of the cited references.

We now look at the claimed subject matter. In reviewing the proposed amendment to claim 1, we note that the Applicant's intent in revising it is to stress that one mechanical support moves relative to the other mechanical support in order to achieve dynamic adjustment of the centering element in three directions of movement in the recess containing the material that is hardened once alignment is obtained. From the description of the invention, we learn that the Applicant's device is a two piece structure, one end of the adjusting or centering part having means immersed at all times in a recess or trough means in the other part during alignment of the diode and the optic fiber, and that the trough means holds molten material that is caused to harden on achieving optical positioning of the diode and optic fiber. In view of the cited references, we think proposed claim 1 does not define clearly the invention that is described.

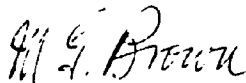
The Applicant's claim 2 as dependent on the proposed claim 1, sets forth that the centering part is tubular, and that the recess formed in the other part has a form appropriate to receive the tubular part so that it is covered by the molten material.

The British patent sets out an arrangement where one mechanical support moves relative to another and achieves a dynamic adjustment of a centering element in three directions of movement in the recess containing the

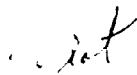
material that is to be hardened. In our opinion, the Applicant's amended claim 1 is directed to the arrangement described in the British patent. The Applicant's claim 2 however, in defining a tubular part which cooperates with a trough containing molten material covering the end of the tubular part, is not found in the British patent.

The European patent provides a two part centering device having one part moveable in three directions and supported at its edges on the other part. However, it does not include any recess for containing hardenable material, nor is there any provision for immersion of a tubular centering element in hardenable material contained in a trough on the other part. In our opinion, this patent does not set forth the features found in the Applicant's specification.

We recommend withdrawal of the refusal of the application for not being directed to patentable subject matter. Regarding the proposed amended claims, we recommend that amended claim 1 should be refused for not patentably distinguishing over the cited British patent, whereas claim 2 as it depends from amended claim 1 should be acceptable over the cited art.



M.G. Brown  
Acting Chairman,  
Patent Appeal Board



S.D. Kot  
Member

I concur with the findings and the recommendation of the Patent Appeal Board. Accordingly, I withdraw the refusal of the application, and I refuse to grant a patent containing amended claim 1. The Applicant has six months within which to appeal my decision to the Federal Court of Canada, under Section 42 of the Patent Act.



J.H.A. Gariépy  
Commissioner of Patents

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Dated at Hull, Quebec  
this 27 th day of February 1989.