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March 26, 2024

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PATENT NUMBER: *10379301*
ISSUE DATE: *August 13, 2019*

Certified by

Performing the Functions and Duties of the
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I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter or application data sheet.

I hereby appoint Practitioner(s) associated with the following Customer Number:

Customer Number: 32047

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Please direct all correspondence in this case to the address associated with:

Customer Number: 32047

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee or obligated assignee.

Applicant Name	Global Technology Inc.
Applicant Address	No.88,Qiushi Rd., Wangchun Industrial Park, Ningbo, China 315176
Signature Chao Hung Tsai	Date 2016/03/14
Name and Title (of individual signing on behalf of assignee or obligated assignee)	
VP of RD / Chao-Hung TSAI	

AOI_NDCal 4-24cv09041_ 00001946

Declaration for United States Patent Application

TITLE OF APPLICATION: MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE

As a below named inventor, I hereby declare that:

This declaration is directed to:
[V] the attached application, or
[ ] United States Application No. or PCT Application No. _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I have reviewed and understand the contents of the application, including the claims, and I am aware of the duty to disclose to the Office all information known to the person to be material to patentability as defined in 37 C.F.R. § 1.56 (attached hereto).

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

JIAN-HONG LUO Full name of sole or first inventor	
Sole or first inventor's signature	Date 12/24/2016

DONG-BIAO JIANG Full name of additional inventor, if any	
Additional inventor's signature	Date 12/24/2016

Peng NIE Full name of additional inventor, if any	
Additional inventor's signature	Date 12/24/2016

XIAO-LIANG DING Full name of additional inventor, if any	
Additional inventor's signature	Date

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§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

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Doc code: Oath
Document Description: Oath or declaration filed

PTO/AIA/02 (07-13)
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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE

This statement is directed to:

☑ The attached application,

OR

☐ United States application or PCT international application number _____ filed on _____.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

XIAO-LIANG DING

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Ningbo		China

Mailing Address (except for a deceased or legally incapacitated inventor):

No.88,Qiushi Rd., Wangchun Industrial Park, Ningbo, China 315176

City	State	Zip	Country
Ningbo			China

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☑ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased.
- ☐ Inventor is under legal incapacity.
- ☑ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ☑ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: CHAO-HUNG TSAI

Date (Optional):

Signature: Chao-Hung Tsai

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: Global Technology Inc.

Title of Person Executing This Substitute Statement: Vice President

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City: Ningbo | State: | Country: China

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

No.88,Qiushi Rd., Wangchun Industrial Park, Ningbo, China 315176

City: Ningbo | State: | Zip: | Country: China

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

ABSTRACT

The present disclosure provides a multi-channel parallel optical receiving device, including a carrier, a light receiving chip, a plurality of optoelectronic diodes disposed on a top surface of an end of the carrier, an optical fiber connector disposed in another end of the carrier, and an arrayed waveguide grating disposed on the top surface of the carrier. The plurality of optoelectronic diodes is electrically connected to the light receiving chip, and an input end of the arrayed waveguide grating is connected to the optical fiber connector for receiving an optical signal from the optical fiber. The optical signals are divided into multi-channel optical signals in parallel. The top surface of an output end of the arrayed waveguide grating is at a predetermined angle, causing the multi-channel optical signals to be reflected by the top surface and to photosensitive surfaces of the optoelectronic diodes arranged in parallel.

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CLAIMS

What is claimed is:

1. A multi-channel parallel optical receiving device, comprising: a carrier and an light receiving chip; a plurality of optoelectronic diodes disposed on a top surface of an end of the carrier, and the plurality of optoelectronic diodes electrically connected to the light receiving chip; an optical fiber connector disposed in another end of the carrier; an arrayed waveguide grating further disposed on the top surface of the carrier; and an input end of the arrayed waveguide grating connected to the optical fiber connector for receiving an optical signal from the optical fiber;

wherein the optical signals are divided into multi-channel optical signals in parallel by the arrayed waveguide grating based on their wavelengths, the top surface of an output end of the arrayed waveguide grating is at a predetermined angle, causing the multi-channel optical signals reflected by the top surface to be reflected to an photosensitive surface of the plurality of optoelectronic diodes arranged in parallel.

2. The multi-channel parallel optical receiving device according to claim 1, wherein the plurality of optoelectronic diodes are disposed on a same circuit board.

3. The multi-channel parallel optical receiving device according to claim 1, wherein the amount of the optoelectronic diodes is equal to the amount of optical paths divided by the arrayed waveguide grating.

4. The multi-channel parallel optical receiving device according to claim 1, wherein the predetermined angle of the top surface of the output end of the arrayed waveguide grating is 41 to 46 degrees.

5. The multi-channel parallel optical receiving device according to claim 4, wherein the predetermined angle of the top surface of the output end of the arrayed waveguide grating is 42 degrees.

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6. The multi-channel parallel optical receiving device according to claim 1, wherein a first lens, for coupling the optical fiber, is disposed between the input end of the arrayed waveguide grating and the optical fiber connector.

7. The multi-channel parallel optical receiving device according to claim 1, wherein the input end of the arrayed waveguide grating is inserted directly into the optical fiber connector and a graded index lens is disposed in an end where the optical fiber connector and the arrayed waveguide grating connect.

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MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE

Technical Field

The present disclosure relates to fiber optical communications, and, more particularly, to multi-channel parallel optical receiving modules.

Background

The optical receiving module refers to a device used in the field of the fiber optical communication for receiving an optical signal from an optical fiber and converting the received optical signal into an electrical signal. With the corresponding market continuing to grow, the demands of product cost and performance become stricter and stricter. In the current optical communication of the dada center, transmitting speed of a single channel of product and the number of the channels must increase in order to improve the overall performance of the datacenter whose limited physical space puts restraint on density of the products. Hence, in many circumstances, multi-channel paralleling lights need to be enabled in the optical module. The data transmission of the optical modules needs to be implemented by connecting the optical modules, and the optical modules are connected by a jumper, resulting in higher cost.

SUMMARY

The present disclosure overcomes the currently existing technical drawback. The present disclosure provides a multi-channel parallel optical receiving module capable of achieving multi-channel receiving and transmitting. Further, the disclosed module is reliable and could be manufactured with reduced cost.

The present disclosure provides a multi-channel parallel optical receiving module

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including a carrier and a light receiving chip. A plurality of optoelectronic diodes may be disposed in array on a top surface of an end of the carrier, and the optoelectronic diodes may be electrically connected to the light receiving chip. An optical fiber connector may be disposed in another end of the carrier. An arrayed waveguide grating may be further disposed on the top surface of the carrier, and an input end of the arrayed waveguide grating may be connected to the optical fiber connector for receiving an optical signal from the optical fiber. The optical signals may be divided into multi-channel optical signals in parallel by the arrayed waveguide grating based on their wavelengths. The top surface of an output end of the arrayed waveguide grating may be at a predetermined angle so that the multi-channel optical signals may be reflected by the top surface to photosensitive surfaces of the plurality of optoelectronic diodes arranged in array.

With the aforementioned structure, the present disclosure has following features. In the present disclosure, the top surface of the arrayed waveguide grating may be designed to allow for the optical signals emitting from the arrayed waveguide grating to be reflected by the top surface to the photosensitive surfaces of the optoelectronic diodes. Based on such design, after the position of the optoelectronic diodes is determined, only a placement groove or a guiding structure for the arrayed waveguide grating is needed on the carrier to guide the arrayed waveguide grating to be in the position aligning with the optoelectronic diodes. Accordingly, the arrayed waveguide grating may be installed without too much difficulty, and the coupling between the arrayed waveguide grating and the optoelectronic diodes may be no longer necessary. Further, the optoelectronic diodes and the light receiving chip may be disposed on the same surface, simplifying the design of the structure and reducing the length of the bonding wire to enhance the integrity of the entire structure and lower the manufacturing cost of the same.

In some embodiments, the plurality of optoelectronic diodes may be disposed on the same circuit board. With this structure, the position of the optoelectronic diodes may become definitive to simplify and streamline the manufacturing process.

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In some embodiments, the amount of the optoelectronic diodes may be equal to the amount of the optical paths divided by the arrayed waveguide grating.

In some embodiments, the predetermined angle of the top surface of an output end of the arrayed waveguide grating may be 41 to 46 degrees.

In some embodiments, the predetermined angle of the top surface of the output end of the arrayed waveguide grating may be 42 degrees.

In some embodiments, a first lens, for coupling the optical fiber, may be disposed between the input end of the arrayed waveguide grating and the optical fiber connector. With this structure, the first lens may be disposed between the optical fiber connector and the arrayed waveguide grating for a coupling process to be finalized.

In some embodiments, the input end of the arrayed waveguide grating may be inserted directly into the optical fiber connector, and a graded index lens may be disposed in an end where the optical fiber connector and the arrayed waveguide grating may connect. With this structure, the number of the coupling is reduced, which in turn may improve the integrity of the product.

BRIEF DESCRIPTION OF THE DRAWINGS

The present disclosure will become more understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only and thus are not limitative of the present disclosure and wherein:

FIG. 1 shows a an exploded view of a structure of the present disclosure;

FIG. 2 shows an enlarged view of a structure in FIG. 1;

FIG. 3 shows perspective view of a structure of an arrayed waveguide grating;

FIG. 4 shows a perspective view of a structure according to a first embodiment of the

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present disclosure;

FIG. 5 shows a perspective view of a structure according to a second embodiment of the present disclosure; and

FIG. 6 shows a sectional view of an optical fiber connector according to a second embodiment of the present disclosure.

DETAILED DESCRIPTION

In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawings.

As shown in FIG. 1 to FIG. 6, the present disclosure provides a multi-channel parallel optical receiving device which includes a carrier 8 and a light receiving chip 2. A plurality of optoelectronic diodes 3 may be disposed on a top surface of an end of the carrier 8, and the plurality of optoelectronic diodes 3 may be electrically connected to the light receiving chip 2. The light receiving chip 2 of this embodiment may be a trans-impedance amplifier (TIA) chip, and the optoelectronic diodes 3 and the trans-impedance amplifier (TIA) chip may be connected by bonding wires. An optical fiber connector 4 may be disposed at another end of the carrier 8, and an arrayed waveguide grating 6 may be further disposed on the top surface of the carrier 8. An input end 61 of the arrayed waveguide grating 6 may be connected to the optical fiber connector 4 for receiving an optical signal from the optical fiber. The optical signals may be divided into multi-channel optical signals in parallel by the arrayed waveguide grating 6 based on their wavelengths. The top surface 63 of an output end 62 of the arrayed waveguide grating 6 may be designed to be at a predetermined angle, allowing for the multi-channel optical signals to be reflected by the top surface 63 to the photosensitive surfaces of the plurality of optoelectronic diodes 3 arranged in array.

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The optical receiving module of this embodiment may further include a bottom shell 1 and top cap 7, defining a space in which the aforementioned structure may be placed so that the aforementioned structure may be protected. Some other shell bodies may be used in the present disclosure to serve the protection purpose. The light receiving chip 2 may be connected to a flexible circuit board 9 by the bonding wires, and the flexible circuit board 9 may be used to connect to other devices of the optical device. The arrayed waveguide grating 6 may include an input end 61 and an output end 62, and the optical signal may be input from the input end. Since a wavelength division multiplexing technology may be used in the optical fiber of the present disclosure, the signals with different wavelengths may be divided into the multi-channel optical signals and output from the output end. The arrayed waveguide grating is a well-known technology, in which the plurality of optical filters capable of filtering the optical signals in different wavelengths is used, so that each of the channels may transmit the optical signal having the specific wavelength range, and the optical signals from the optical fiber may be divided before being outputted. The top surface 63 may be an inclined plane, enabling the reflection of the optical signal upon the top surface 63. The reflected optical signal may be transmitted to the photosensitive surface of the plurality of optoelectronic diodes 3 on the carrier 8 since the top surface 63 may tilt at a predetermined angle. Generally speaking, the optical paths from the output end 62 of the arrayed waveguide grating 6 may correspond to the optoelectronic diodes 3. This embodiment here shows four channels as an example, as the amount of the channels could be based on the actual demand.

With the aforementioned structure, the present disclosure has following features. In the present disclosure, the top surface 63 of the arrayed waveguide grating 6 may be designed to be with a predetermined angle. Therefore, the optical signals emitting from the arrayed waveguide grating 6 may be reflected by the top surface 63 to the photosensitive surfaces of the plurality of optoelectronic diodes. Based on such design, after the position of the optoelectronic diodes is determined, only a placement groove or a guiding structure for the arrayed waveguide grating 6 may be needed on the carrier 8 to guide the arrayed waveguide grating 6 to be in the position aligning with the optoelectronic diodes. Accordingly, the

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arrayed waveguide grating may be installed without much difficulty, and the coupling between the arrayed waveguide grating 6 and the optoelectronic diodes may be no longer necessary. Further, the optoelectronic diodes and the light receiving chip 2 may be disposed on the same surface, reducing length of the bonding wire to improve the integrity and lower the manufacturing cost.

The plurality of optoelectronic diodes may be disposed on the same circuit board. The position of the optoelectronic diodes may become definitive so as to simplify and streamline the manufacturing process. The optoelectronic diodes may be disposed onto the carrier 8 simultaneously, minimizing the iteration of disposing the optoelectronic diodes.

The amount of the optoelectronic diodes may be equal to the amount of the optical paths divided by the arrayed waveguide grating 6.

The predetermined angle of the top surface 63 of an output end 62 of the arrayed waveguide grating 6 may be 41 to 46 degrees.

The predetermined angle of the top surface 63 of the output end 62 of the arrayed waveguide grating 6 may be 42 degrees.

FIG. 4 is an embodiment of the present disclosure in which first lens 5, for coupling the optical fiber, may be disposed between the input end 61 of the arrayed waveguide grating 6 and the optical fiber connector 4. In this embodiment, the first lens 5 disposed on the carrier 8 may be located on the optical path of the optical fiber connector 4 and the arrayed waveguide grating 6, for the optical coupling to be realized.

FIG. 5 to FIG.6 show a second embodiment of the present disclosure in which the input end 61 of the arrayed waveguide grating 6 may be inserted directly into the optical fiber connector 4, and a graded index lens 10 may be disposed on a end where the optical fiber connector 4 and the arrayed waveguide grating 6 may connect. With this structure, the lens does not need to be coupled on the carrier 8, reducing the number of the optical coupling and increasing the integrity of the entire product.

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The foregoing description, for the purpose of explanation, has been described with reference to specific embodiments; however. The embodiments were chosen and described in order to best explain the principles of the disclosure and its practical applications, to thereby enable others skilled in the art to best utilize the disclosure and various embodiments with various modifications as are suited to the particular use contemplated. The embodiments depicted above and the appended drawings are exemplary and are not intended to be exhaustive or to limit the scope of the disclosure to the precise forms disclosed. Modifications and variations are possible in view of the above teachings.

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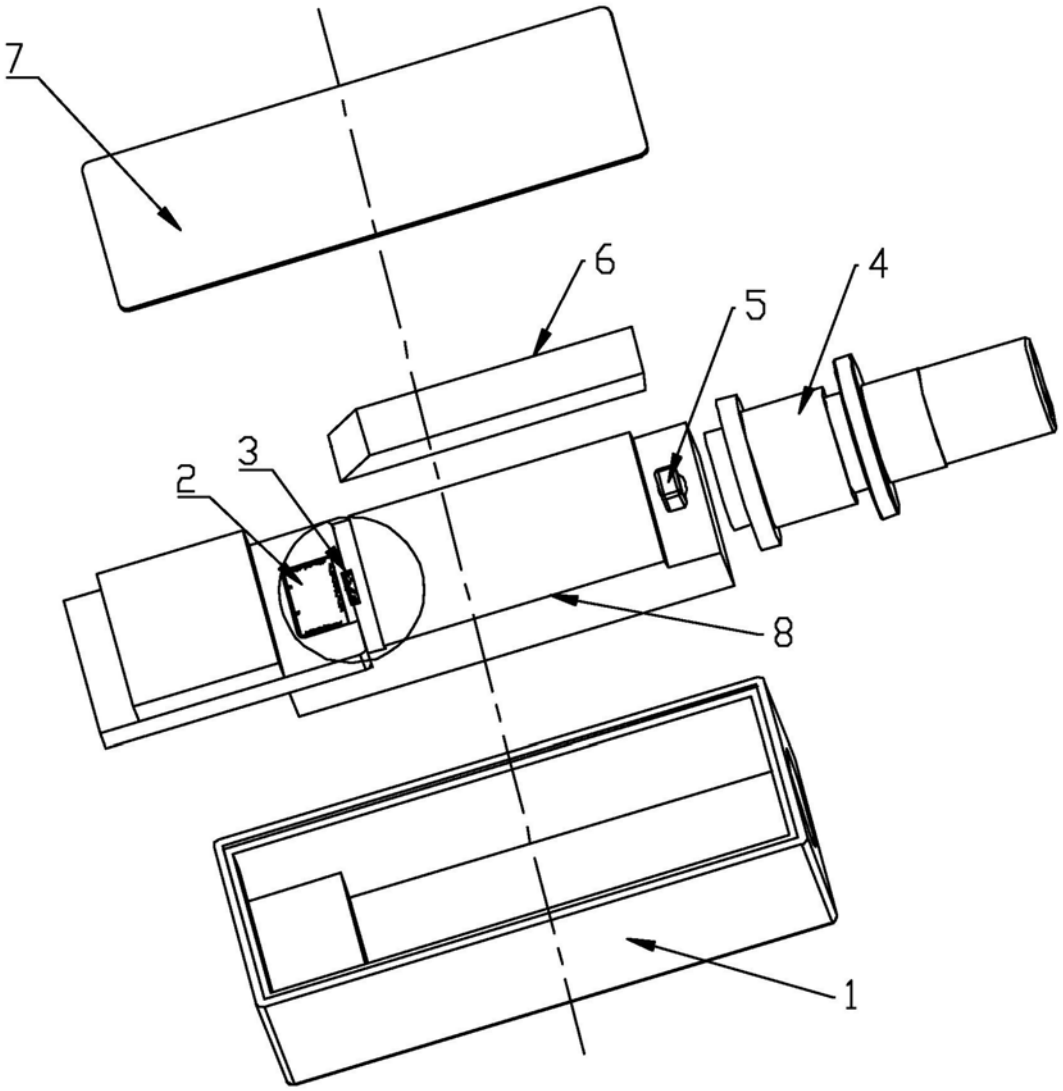


FIG. 1

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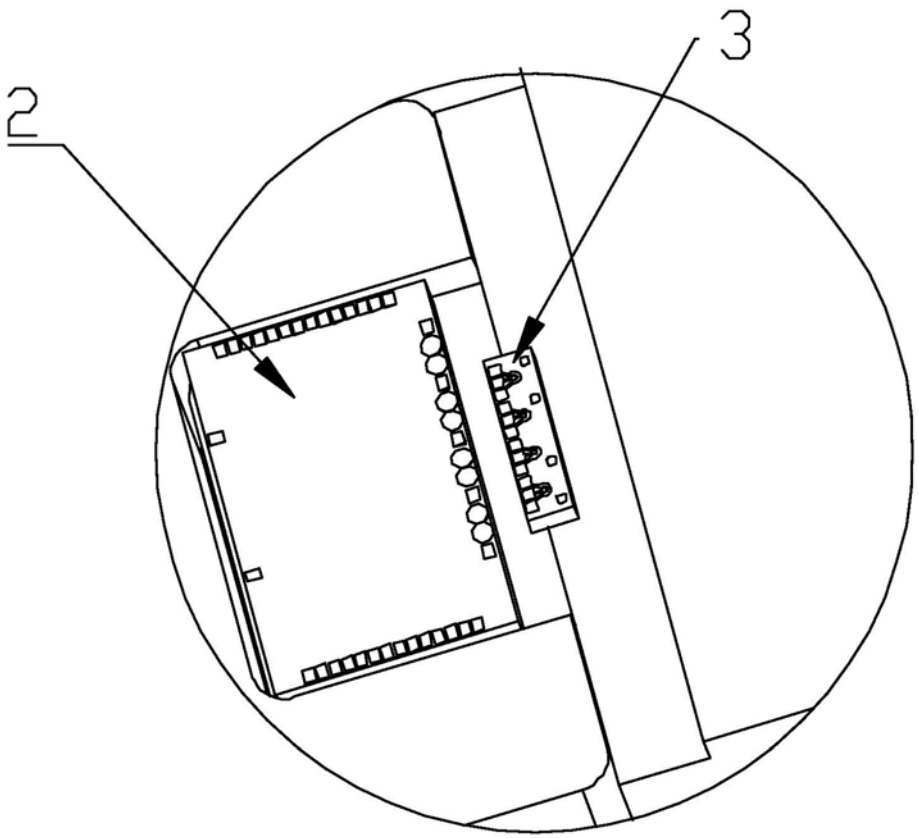


FIG. 2

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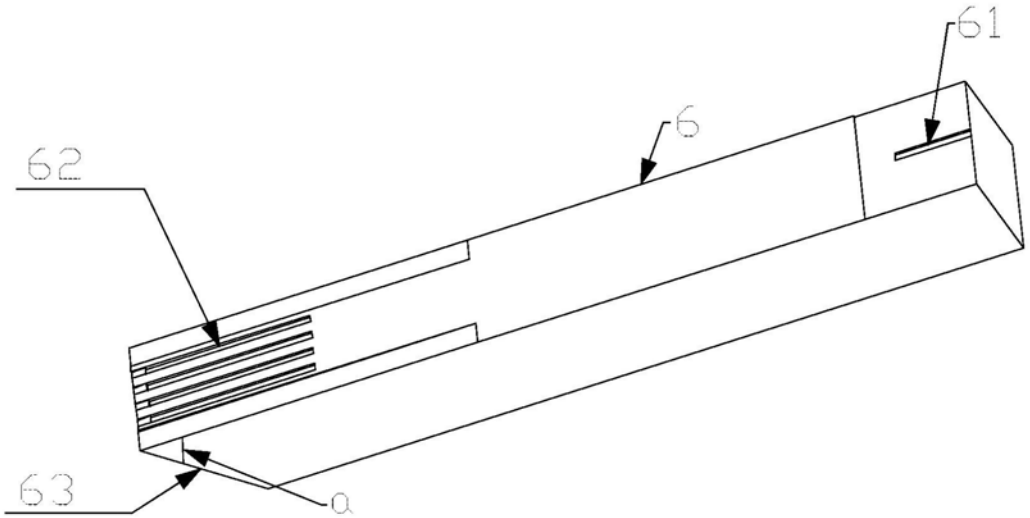


FIG. 3

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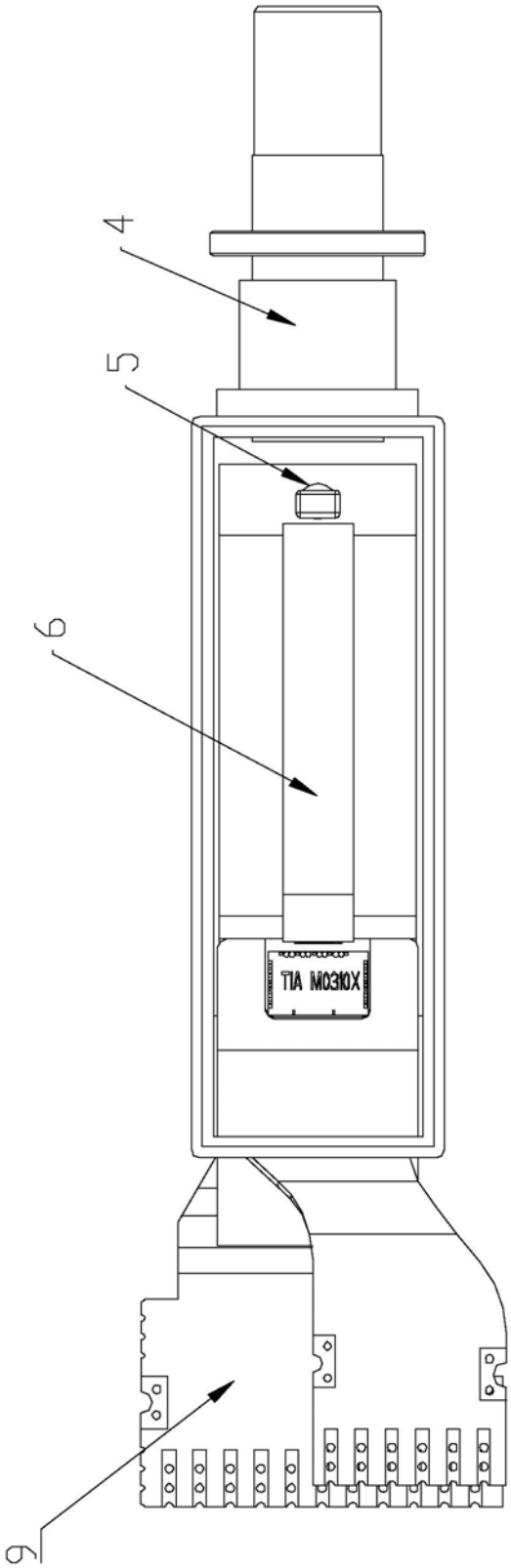


FIG. 4

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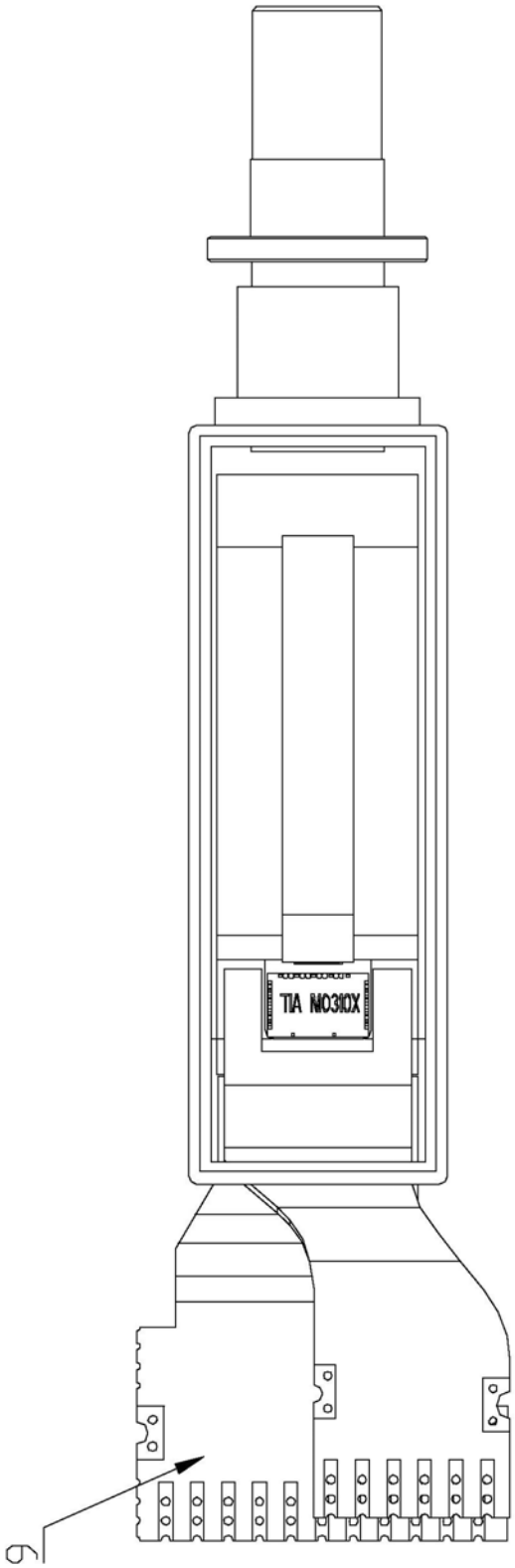


FIG. 5

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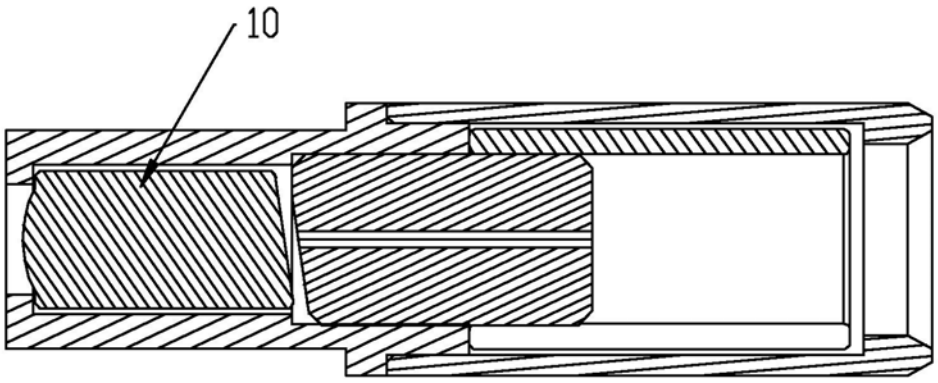


FIG. 6

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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE
First Named Inventor/Applicant Name:	Jian-Hong LUO
Filer:	Kevin J. Carroll/April Davis
Attorney Docket Number:	AOIC006

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

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Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1600**

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Electronic Acknowledgement Receipt

EFS ID:	28351815
Application Number:	15432242
International Application Number:	
Confirmation Number:	2079
Title of Invention:	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE
First Named Inventor/Applicant Name:	Jian-Hong LUO
Customer Number:	27543
Filer:	Kevin J. Carroll/April Davis
Filer Authorized By:	Kevin J. Carroll
Attorney Docket Number:	AOIC006
Receipt Date:	14-FEB-2017
Filing Date:	
Time Stamp:	14:56:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1600
RAM confirmation Number	021517INTEFSW14565800
Deposit Account	501705
Authorized User	April Davis

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37 CFR 1.17 (Patent application and reexamination processing fees)

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37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	AOIC006_ADS.pdf	1823214 63d4b59bfa39ef813dfefbace3a37c23a5786e07	no	9
Warnings:					
Information:					
2	Power of Attorney	POA_Global_Technology_Inc.pdf	718854 277a9aabcf7ff75583e05b76c8976fd4ac1fec40	no	1
Warnings:					
Information:					
3	Oath or Declaration filed	AOIC006_Declaration.pdf	529585 0cdda05fe87c640accf88c4dc70a45d55ddc3570	no	2
Warnings:					
Information:					
4	Oath or Declaration filed	AOIC006_Substitute_Statement.pdf	1697669 0f2477be3b70b7175c92bfcb18cfbe85604b20b5	no	2
Warnings:					
Information:					
5		AOIC006_Application_asfiled_021417.pdf	45521 a23103e6e697c0d5032f29154e9e5e7d05e8b712	yes	10

Multipart Description/PDF files in .zip description

Document Description	Start	End
Abstract	10	10
Claims	8	9
Specification	1	7

Warnings:					
Information:					
6	Drawings-only black and white line drawings	AOIC006_Drawings_asfiled_021417.pdf	44759 6cb45c2b82b7855311131da851fe1c5ae20d3b49	no	6
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	34747 c89a6c5e6ee866298b7194429af59614bea0f63d	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	4894349	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jian-Hong		LUO	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Ningbo	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	No. 88, Qiushi Rd., Wangchun Industrial Park		
Address 2			
City	Ningbo	State/Province	
Postal Code	315176	Country [i]	CN

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Dong-Biao		JIANG	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Ningbo	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	No. 88, Qiushi Rd., Wangchun Industrial Park		
Address 2			
City	Ningbo	State/Province	
Postal Code	315176	Country [i]	CN

Inventor 3 Remove

Legal Name

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Peng		NIE	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Ningbo	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	No. 88, Qiushi Rd., Wangchun Industrial Park		
Address 2			
City	Ningbo	State/Province	
Postal Code	315176	Country [i]	CN

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiao-Liang		DING	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Ningbo	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	No. 88, Qiushi Rd., Wangchun Industrial Park		
Address 2			
City	Ningbo	State/Province	
Postal Code	315176	Country [i]	CN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	27543		
Email Address	kcarroll@gtpp.com	Add Email	Remove Email

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

Application Information:

Title of the Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE		
Attorney Docket Number	AOIC006	**Small Entity Status Claimed** ☐	
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	27543		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
2016103460078	CN	2016-05-23	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Global Technology Inc.		
Mailing Address Information For Applicant:			
Address 1	No. 88, Qiushi Rd., Wangchun Industrial Park		
Address 2			
City	Ningbo	**State/Province**	
Country	CN	Postal Code	315176
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Kevin J. Carroll/			Date (YYYY-MM-DD)	2017-02-14
First Name	Kevin	Last Name	Carroll	Registration Number	36384

Additional Signature may be generated within this form by selecting the Add button. Add

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	AOIC006
	Application Number	
Title of Invention	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/432,242	02/14/2017	2883	1600	AOIC006	7	1

CONFIRMATION NO. 2079

27543
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

FILING RECEIPT

OC000000089403286

Date Mailed: 02/24/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Jian-Hong LUO, Ningbo, CHINA;
Dong-Biao JIANG, Ningbo, CHINA;
Peng NIE, Ningbo, CHINA;
Xiao-Liang DING, Ningbo, CHINA;

Applicant(s)

Global Technology Inc., Ningbo, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 32047

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
CHINA 2016103460078 05/23/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 02/22/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/432,242**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No

Title

MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE

Preliminary Class

385

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

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SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

AOI_NDCal 4-24cv09041_ 00001984

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/432,242

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	7 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

AOI_NDCal 4-24cv09041_ 00001985

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/432,242	02/14/2017	Jian-Hong LUO	AOIC006

CONFIRMATION NO. 2079

27543
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

FORMALITIES LETTER

OC000000089403287

Date Mailed: 02/24/2017

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
  - The drawings are not in compliance with 37 CFR 1.84 because figures 5 contain figure or view numbers that have incorrect orientation. Reference characters, sheet numbers, and view numbers must be oriented in the same direction as the view. See 37 CFR 1.84(p)(1).

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/zretta/

AOI_NDCal 4-24cv09041_ 00001987

To: kinsella@ao-inc.com,docketing@gtpp.com,kcarroll@gtpp.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 27543

Feb 24, 2017 04:16:19 AM

Dear PAIR Customer:

APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 27543 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

Disclaimer:
The list of documents shown below is provided as a courtesy and is not part of the official file wrapper. The content of the images shown in PAIR is the official record.

Application	Document	Mailroom Date	Attorney Docket No.
15432242	APP.FILE.REC	02/24/2017	AOIC006
	NT.CR.APP.PA	02/24/2017	AOIC006

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor:	LUO et al		
Serial No.:	15/432,242		
Filed:	February 14, 2017	Docket No.:	AOIC006
Customer No.:	27543	Confirmation No.	2079

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

This is in response to the Notice To File Corrected Application Papers mailed February 24, 2017. Applicants believe that no extension of time is required. However, Applicants conditionally petition for an extension of time to provide for the possibility that the need for such a petition has been inadvertently overlooked. As provided below, please charge Deposit Account No. 50-1705 for any additional required fees.

As set forth in the Notice, replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required, specifically Figure 5. Applicants submit herewith 2 sheets of replacement drawings including Figures 4 and 5. Applicant respectfully requests that the foregoing be entered before the examination of the present application.

In the event the Examiner deems personal contact is necessary, please contact the undersigned attorney at (603) 668-6560.

Respectfully submitted,

/ Kevin J. Carroll /
Kevin J. Carroll
Attorney for Applicants
Reg. No. 36,384

AOI_NDCal 4-24cv09041_ 00001989

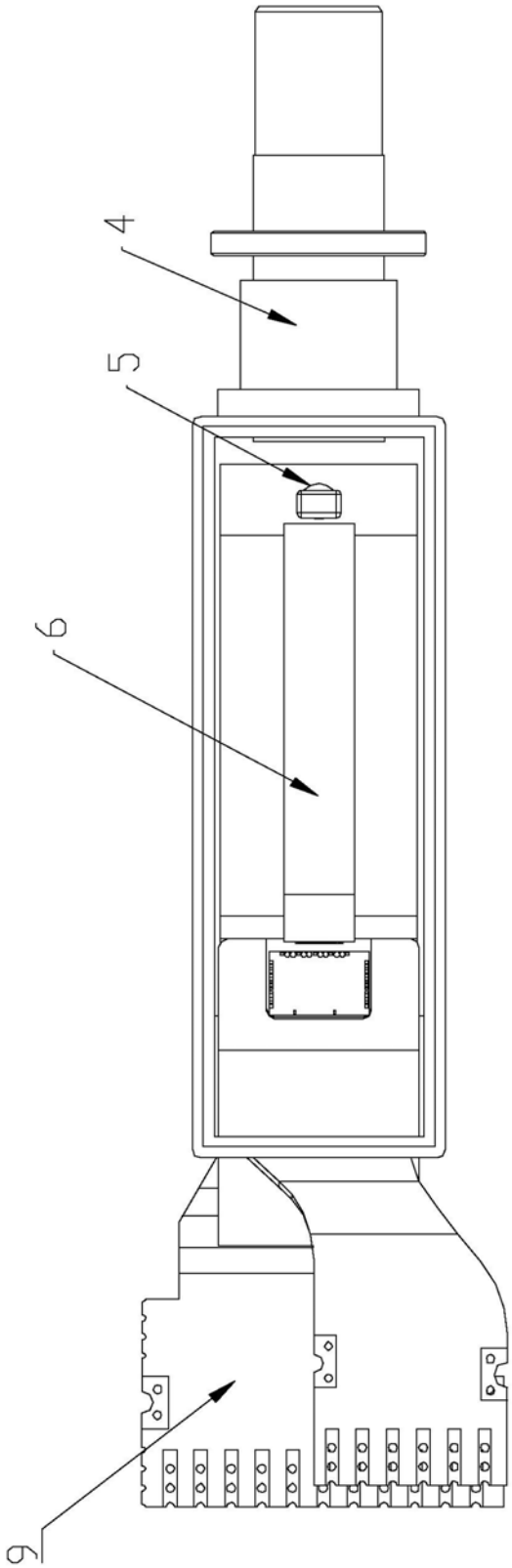


FIG. 4

AOI_NDCal 4-24cv09041_ 00001990

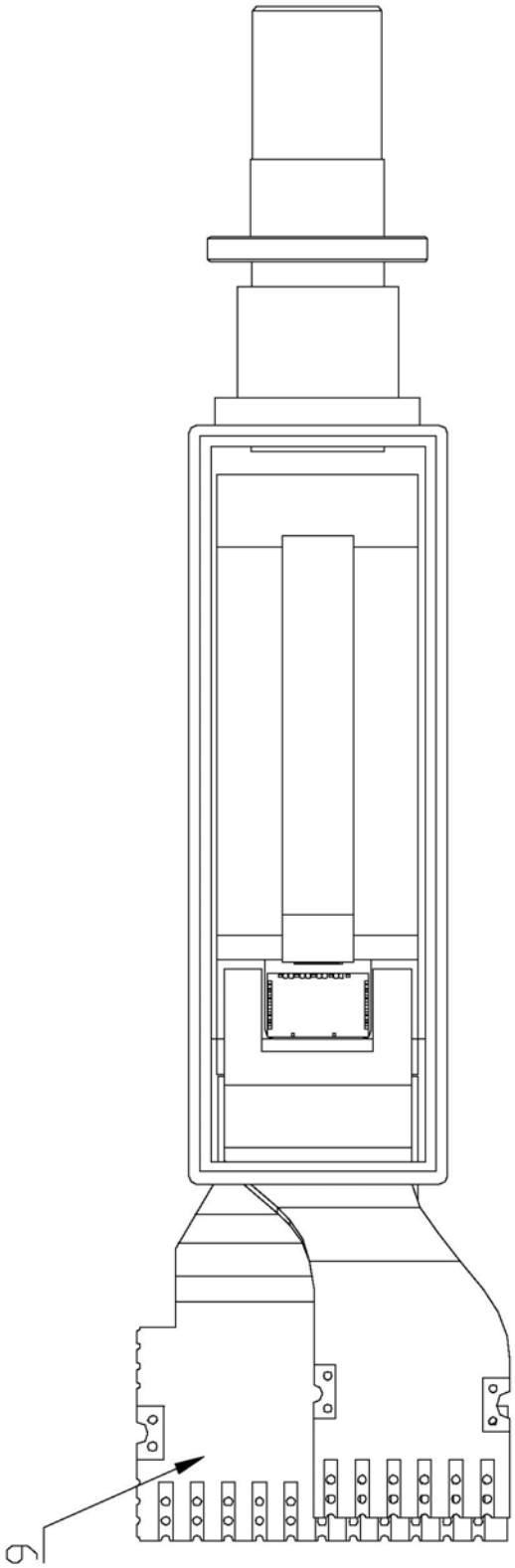


FIG. 5

Electronic Acknowledgement Receipt

EFS ID:	29007180
Application Number:	15432242
International Application Number:	
Confirmation Number:	2079
Title of Invention:	MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE
First Named Inventor/Applicant Name:	Jian-Hong LUO
Customer Number:	27543
Filer:	Kevin J. Carroll/April Davis
Filer Authorized By:	Kevin J. Carroll
Attorney Docket Number:	AOIC006
Receipt Date:	24-APR-2017
Filing Date:	14-FEB-2017
Time Stamp:	14:46:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	AOIC006_Response_asfiled_042417.pdf	14548 21c067c87aa9cedbd745e2e5f244a2d7ab9ec89f	no	1

Warnings:

AOI_NDCal 4-24cv09041_ 00001992

Information:					
2	Drawings-only black and white line drawings	AOIC006_Replacement_Drawings.pdf	23156 6e51e856167f34dfa28b0b533cd140144fb5ad36	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	37704	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/432,242	02/14/2017	2883	1600	AOIC006	7	1

CONFIRMATION NO. 2079

UPDATED FILING RECEIPT

27543
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

OC000000090898299

Date Mailed: 04/27/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Jian-Hong LUO, Ningbo, CHINA;
Dong-Biao JIANG, Ningbo, CHINA;
Peng NIE, Ningbo, CHINA;
Xiao-Liang DING, Ningbo, CHINA;

Applicant(s)

Global Technology Inc., Ningbo, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 32047

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
CHINA 2016103460078 05/23/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 02/22/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/432,242**

Projected Publication Date: 11/23/2017

Non-Publication Request: No

Early Publication Request: No

Title

MULTI-CHANNEL PARALLEL OPTICAL RECEIVING DEVICE

Preliminary Class

385

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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NOT GRANTED

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/432,242

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	7 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

AOI_NDCal 4-24cv09041_ 00001998

To: kinsella@ao-inc.com,docketing@gtpp.com,kcarroll@gtpp.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 27543

Apr 27, 2017 03:34:21 AM

Dear PAIR Customer:

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13115 JESS PIRTLE BLVD.
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证　　明

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申　　请　　号：201610346007.8

申　请　类　型：发明专利

发明 创造 名称：多通道并行的光接收器件

申　　请　　日：2016 年 05 月 23 日

申　　请　　人：宁波环球广电科技有限公司

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2017 年 06 月 26 日

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权 利 要 求 书

1、一种多通道并行的光接收器件，其特征在于：它包括一载板，载板的一端的正面上设有阵列设置的多个光电二极管，以及一光接收芯片，多个光电二极管与光接收芯片电连接，载板的另一端设有光纤连接器，载板的正面上方还设有阵列波导光纤，阵列波导光纤的入射端与光纤连接器连接，用于接收光纤上的光信号，并在阵列波导光纤中将光信号按波长分成并列设置的多路光信号，阵列波导光纤的出射端的端面设有角度使得多路光信号通过端面反射到阵列设置的多个光电二极管的感光面上。

2、根据权利要求 1 所述的多通道并行的光接收器件，其特征在于：所述多个光电二极管设置在同一线路板上。

3、根据权利要求 1 所述的多通道并行的光接收器件，其特征在于：所述光电二极管的数量与阵列波导光纤中分出的光路的数量相同。

4、根据权利要求 1 所述的多通道并行的光接收器件，其特征在于：所述阵列波导光纤的出射端的端面的研磨角度为 41~46 度。

5、根据权利要求 4 所述的多通道并行的光接收器件，其特征在于：所述阵列波导光纤的出射端的端面的研磨角度为 42 度。

6、根据权利要求 1 所述的多通道并行的光接收器件，其特征在于：所述阵列波导光纤的入射端与光纤连接器之间设有用于耦合光纤的第一透镜。

7、根据权利要求 1 所述的多通道并行的光接收器件，其特征在于：所述阵列波导光纤的入射端直接插接在光纤连接器上，所述光纤连接器与阵列波导光纤连接的一端内置了一渐变折射率透镜。

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说　　明　　书

多通道并行的光接收器件

技术领域

本发明涉及光纤通信技术领域，具体讲是一种多通道并行的光接收器件。

背景技术

光接收器件是指用于光通信中的接收光纤中的光信号并将光信号转换为电信号的器件，随着现在市场的需求增加，对产品的成本和性能要求也越来越高。目前在光通信，数据中心的光模块中，由于受限于产品的应用空间，因此，为了提供产品的密度，和容量，就必须提高产品的单通道的速率，以及增加产品的通道数目，因此，很多情况下，需要在光模块中做多路并行的设计方案。那么光模块之间需要通过光纤来传输，而且光模块之间是采用跳线来对接的，这样成本会比较高。

发明内容

本发明要解决的技术问题是，克服现有技术的缺陷，提供一种能够实现多路接收并传输，而且可靠性高，成本较低的多通道并行的光接收器件。

为解决上述技术问题，本发明提供一种多通道并行的光接收器件，它包括一载板，载板的一端的正面上设有阵列设置的多个光电二极管，以及一光接收芯片，多个光电二极管与光接收芯片电连接，载板的另一端设有光纤连接器，载板的正面上方还设有阵列波导光栅，阵列波导光栅的入射端与光纤连接器连接，用于接收光纤上的光信号，并在阵列波导光栅中将光信号按波长分成并列设置的多路光信号，阵列波导光栅的出射端的端面设有角度使得多路光信号通过端面反射到阵列设置的多个光电二极管的感光面上。

采用上述结构后，本发明具有以下优点：本发明通过将阵列波导光栅的端面研磨出一个角度，使得阵列波导光栅中出射的光信号通过端面的反射可以反射到光电二极管的感光面上，这样在设计时在光电二极管的位置已经确定好之后，只需要在载板上做出阵列波导光栅的放置槽或导向结构来确定阵列波导光栅的位置即可，安装简单方便，省去了阵列波导光栅和光电二极管之间的耦合，而且光电二极管可以和光接收芯片设在同一平面上，节省了连接线的结构以及长度，稳定非常高，制造成本也较低。

所述多个光电二极管设置在同一线路板上。采用这种结构，可以确定不同光电二极管之间的位置，以及在制造时简单方便。

所述光电二极管的数量与阵列波导光栅中分出的光路的数量相同。

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所述阵列波导光栅的出射端的端面的研磨角度为 41~46 度。

所述阵列波导光栅的出射端的端面的研磨角度为 42 度。

所述阵列波导光栅的入射端与光纤连接器之间设有用于耦合光纤的第一透镜。采用这种结构在光纤连接器和阵列波导光栅中设置第一透镜来进行耦合。

所述阵列波导光栅的入射端直接插接在光纤连接器上，所述光纤连接器与阵列波导光栅连接的一端内置了一渐变折射率透镜。采用这种结构，减少了一次耦合次数，能够提高产品的稳定性。

附图说明

图 1 为本发明的结构爆炸示意图；

图 2 为图 1 的放大结构示意图；

图 3 为阵列波导光栅的结构示意图；

图 4 为实施例之一的结构示意图；

图 5 为实施例之二的结构示意图；

图 6 为实施例之二的光纤连接器的剖视示意图。

如图所示：1、下壳，2、光接收芯片，3、光电二极管，4、光纤连接器，5、第一透镜，6、阵列波导光栅，61、入射端，62、出射端，63、端面，7、上盖，8、载板，9、柔性线路板，10、渐变折射率透镜，a、研磨角度。

具体实施方式

下面结合附图和具体实施方式对本发明做进一步详细的说明：

如图 1-图 6 所示，本发明提供一种多通道并行的光接收器件，它包括一载板 8，载板 8 的一端的正面上设有阵列设置的多个光电二极管 3，以及一光接收芯片 2，多个光电二极管 3 与光接收芯片 2 电连接，本实施例中所述光接收芯片 2 为跨阻放大器 TIA 芯片，光电二极管与跨阻放大器 TIA 芯片通过金线连接，载板 8 的另一端设有光纤连接器 4，载板 8 的正面上方还设有阵列波导光栅 6，阵列波导光栅 6 的入射端 61 与光纤连接器 4 连接，用于接收光纤上的光信号，并在阵列波导光栅 6 中将光信号按波长分成并列设置的多路光信号，阵列波导光栅 6 的出射端 62 的端面 63 设有角度使得多路光信号通过端面 63 反射到阵列设置的多个光电二极管 3 的感光面上。

当然本实施例中光接收器件还包括下壳 1 和上盖 7，将上述结构装在壳体内用于保护上述结构，但这种壳体结构并非是本发明的保护点，并且设置其它类型的壳体均可以。光接收

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