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Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/257,635	09/29/2020	10788690	PAT266-006US	9814

27543 7590 09/09/2020
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 105 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Kai-Sheng LIN, Sugar Land, TX;
Applied Optoelectronics, Inc., Sugar Land, TX;
Kevin Liu, Houston, TX;
Ziliang Cai, Richmond, TX;

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 USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IR103 (Rev. 10/09)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

27543 7590 07/08/2020
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

April Davis	(Typed or printed name)
/April Davis/	(Signature)
August 25, 2020	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/257,635	01/25/2019	Kai-Sheng LIN	PAT266-006US	9814

TITLE OF INVENTION: OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/08/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
DUONG, HENRY ABRAHAM	2872	359-484030

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Grossman Tucker Perreault
2 & Pfleger, PLLC
3 Norman S. Kinsella

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY AND STATE OR COUNTRY)

Applied Optoelectronics, Inc.

Sugar Land, TX

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-1705

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Kenneth M. Thompson/

Date August 25, 2020

Typed or printed name Kenneth M. Thompson

Registration No. 72,001

Electronic Patent Application Fee Transmittal				
Application Number:		16257635		
Filing Date:		25-Jan-2019		
Title of Invention:		OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		
First Named Inventor/Applicant Name:		Kai-Sheng LIN		
Filer:		Kenneth M. Thompson/April Davis		
Attorney Docket Number:		PAT266-006US		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt

EFS ID:	40379793
Application Number:	16257635
International Application Number:	
Confirmation Number:	9814
Title of Invention:	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE
First Named Inventor/Applicant Name:	Kai-Sheng LIN
Customer Number:	27543
Filer:	Kenneth M. Thompson/April Davis
Filer Authorized By:	Kenneth M. Thompson
Attorney Docket Number:	PAT266-006US
Receipt Date:	25-AUG-2020
Filing Date:	25-JAN-2019
Time Stamp:	17:15:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	E20208OH16004286
Deposit Account	501705
Authorized User	April Davis

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	IssueFee_Transmittal.pdf	199797	no	1
			a0ada25f83a295ce67fea882ef231840db7bde47		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30183	no	2
			b8e2a7a40a32cc7d0eeeedc226571c9a91f908e0		

Warnings:

Information:

Total Files Size (in bytes):	229980
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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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/257,635	01/25/2019	Kai-Sheng LIN	PAT266-006US

CONFIRMATION NO. 9814

PUBLICATION NOTICE



OC000000118845641

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

Title:OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

Publication No.US-2020-0241334-A1

Publication Date:07/30/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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



**Courtesy Reminder for
Application Serial No: 16/257,635**

Attorney Docket No: PAT266-006US

Customer Number: 27543

Date of Electronic Notification: 07/08/2020

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

docketing@gtpp.com

kcarroll@gtpp.com

Youngun_Kim@ao-inc.com

To view your correspondence online or update your email addresses, please visit us anytime at **<https://ppair-my.uspto.gov/pair/PrivatePair>**.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.



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NOTICE OF ALLOWANCE AND FEE(S) DUE

27543 7590 07/08/2020
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

EXAMINER

DUONG, HENRY ABRAHAM

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 07/08/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/257,635	01/25/2019	Kai-Sheng LIN	PAT266-006US	9814

TITLE OF INVENTION: OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/08/2020

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

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27543 7590 07/08/2020
APPLIED OPTOELECTRONICS, INC.
13115 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/257.635	01/25/2019	Kai-Sheng LIN	PAT266-006US	9814

TITLE OF INVENTION: OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/08/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
DUONG, HENRY ABRAHAM	2872	359-484030

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/257,635	01/25/2019	Kai-Sheng LIN	PAT266-006US	9814
27543 7590 07/08/2020 APPLIED OPTOELECTRONICS, INC. 13115 JESS PIRTLE BLVD. SUGAR LAND, TX 77478			EXAMINER DUONG, HENRY ABRAHAM	
			ART UNIT 2872	PAPER NUMBER
DATE MAILED: 07/08/2020				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 minutes 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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) 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 disclosure of these records is required by the Freedom of Information Act.
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 Cooperation Treaty.
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 inspection 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.

Notice of Allowability	Application No. 16/257,635	Applicant(s) LIN et al.	
	Examiner HENRY A DUONG	Art Unit 2872	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 01/25/2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-19. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872	/HENRY A DUONG/ Examiner, Art Unit 2872
--	--

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Kenneth Thompson (Reg. No. 72,001) on June 30, 2020.

The application has been amended as follows:

Claim 8: The optical isolator array of claim 1, wherein the magnetic base includes a substrate mating surface, and whereby the substrate ~~mounting~~mating surface is substantially flat to correspond with a mounting surface of a substrate and to mount thereto.

Claim 17: The optical transceiver of claim 11, wherein the first magnetic base includes a substrate mating surface, and whereby the substrate ~~mounting~~mating surface is substantially flat to correspond with the mounting surface of a substrate to mount thereto.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance:

Regarding claim 1, the prior art of record does not disclose or suggest an optical isolator array for use in an optical subassembly module, an optical isolator array for use in an optical subassembly module comprising a plurality of optical isolators mounted to the at least one mounting surface, each of the plurality of optical isolators disposed substantially in parallel relative to each other; and at least one layer of adhesive disposed on the at least one mounting surface to couple the plurality of optical isolators to the first magnetic base and to hold each optical isolator of the plurality of optical isolators at a predefined position relative to each other, along with other claim limitations.

Claims 2-10 are allowed due to claim dependency.

Yoshie et al US Patent Application Publication 2010/0002988-A1 teaches , the optical isolator (figure 6, optical isolator 600) comprising, a first magnetic base (paragraph [0025], magnetic material B+ for first waveguide portion 602) defining at least one mounting surface.

Yoshie et al does not teach an optical isolator array for use in an optical subassembly module comprising a plurality of optical isolators mounted to the at least one mounting surface, each of the plurality of optical isolators disposed substantially in parallel relative to each other; and at least one layer of adhesive disposed on the at least one mounting surface to couple the plurality of optical isolators to the first magnetic base and to hold each optical isolator of the plurality of optical isolators at a predefined position relative to each other.

YE US Patent Application Publication 2014/0146389-A1 teaches the optical isolator (figure 2, optical isolator 100) comprising, a first magnetic base (magnet 107) defining at least one mounting surface.

YE does not teach an optical isolator array for use in an optical subassembly module, comprises, a plurality of optical isolators mounted to the at least one mounting surface, each of the plurality of optical isolators disposed substantially in parallel relative to each other; and at least one layer of adhesive disposed on the at least one mounting surface to couple the plurality of optical isolators to the first magnetic base and to hold each optical isolator of the plurality of optical isolators at a predefined position relative to each other.

Regarding claim 11, the prior art of record does not disclose or suggest an optical transceiver, the optical transceiver comprising, a transceiver housing; at least one optical transmitter subassembly (TOSA) arrangement disposed in the transceiver housing, the at least one TOSA arrangement comprising, a substrate defined by at least one mounting surface; a plurality of laser diodes mounted to the at least one mounting surface of the substrate, each laser diode of the plurality of laser diodes to emit a different associated channel wavelength along a corresponding light path of a plurality of light paths; and an optical isolator array mounted to the at least one mounting surface adjacent the plurality of laser diodes such that the plurality of light paths intersect with the optical isolator array, the optical isolator array comprising a plurality of optical isolators coupled thereto, and wherein each optical isolator is optically aligned with a corresponding laser diode of the plurality of laser diodes via a corresponding light path; an optical receiver subassembly (ROSA) disposed in the transceiver housing, along with other claim limitations.

Claims 12-19 are allowed due to claim dependency.

Yoshi et al US Patent Application Publication 2010/0002988-A1 teaches an optical transceiver, the optical transceiver (figure 6) comprising, the optical isolator (optical isolator 600) comprising at least a first magnetic base (paragraph [0025], magnetic material B+ for first waveguide portion 602).

Yoshie et al does not teach an optical transceiver, the optical transceiver comprising, a transceiver housing; at least one optical transmitter subassembly (TOSA) arrangement disposed in the transceiver housing, the at least one TOSA arrangement comprising, a substrate defined by at least one mounting surface; a plurality of laser diodes mounted to the at least one mounting surface of the substrate, each laser diode of the plurality of laser diodes to emit a different associated channel wavelength along a corresponding light path of a plurality of light paths; and an optical isolator array mounted to the at least one mounting surface adjacent the plurality of laser diodes such that the plurality of light paths intersect with the optical isolator array, the optical isolator array comprising a plurality of optical isolators coupled thereto, and wherein each optical isolator is optically aligned with a corresponding laser diode of the plurality of laser diodes via a corresponding light path; an optical receiver subassembly (ROSA) disposed in the transceiver housing.

YE US Patent Application Publication 2014/0146389-A1 teaches an optical transceiver, the optical transceiver (figure 2) comprising, the optical isolator (optical isolator 100) comprising at least a first magnetic base (magnet 107).

YE does not teach an optical transceiver, the optical transceiver comprising, a transceiver housing; at least one optical transmitter subassembly (TOSA) arrangement disposed in the transceiver housing, the at least one TOSA arrangement comprising, a substrate defined by at least one mounting surface; a plurality of laser diodes mounted to the at least one mounting surface of the substrate, each laser diode of the plurality of laser diodes to emit a different associated channel wavelength along a corresponding light path of a plurality of light paths; and an optical isolator array mounted to the at least one mounting surface adjacent the plurality of laser diodes such that the plurality of light paths intersect with the optical isolator array, the optical isolator array comprising a plurality of optical isolators coupled thereto, and wherein each optical isolator is optically aligned with a corresponding laser diode of the plurality of laser diodes via a corresponding light path; an optical receiver subassembly (ROSA) disposed in the transceiver housing.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY ABRAHAM DUONG whose telephone number is (571)270-0534. The examiner can normally be reached on Monday-Friday from 9:00 AM to 5:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bumsuk Won can be reached on 571-272-2713. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <https://ppair-my.uspto.gov/pair/PrivatePair>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENRY A DUONG/
Examiner, Art Unit 2872

/WILLIAM R ALEXANDER/
Primary Examiner, Art Unit 2872

<i>Examiner-Initiated Interview Summary</i>	Application No. 16/257,635	Applicant(s) LIN et al.		
	Examiner HENRY A DUONG	Art Unit 2872	AIA (First Inventor to File) Status Yes	Page 1 of 2

All participants (applicant, applicants representative, PTO personnel):

1. HENRY A DUONG (Examiner); Telephonic

2. Kenneth Thompson (Attorney of Record: Reg. No. 72,001); Telephonic

Date of Interview: 30 June 2020

Claims Discussed: Applicant's attorney gave permission for Examiner to perform an Examiner's Amendment to correct claims 8 and 17 to "Claim 8: The optical isolator array of claim 1, wherein the magnetic base includes a substrate mating surface, and whereby the substrate mating surface is substantially flat to correspond with a mounting surface of a substrate and to mount thereto.

Claim 17: The optical transceiver of claim 11, wherein the first magnetic base includes a substrate mating surface, and whereby the substrate mating surface is substantially flat to correspond with the mounting surface of a substrate to mount thereto."

Brief Description of the main topic(s) of discussion: Applicant's attorney gave permission for Examiner to perform an Examiner's Amendment to correct claims 8 and 17 to "Claim 8: The optical isolator array of claim 1, wherein the magnetic base includes a substrate mating surface, and whereby the substrate mating surface is substantially flat to correspond with a mounting surface of a substrate and to mount thereto.

Claim 17: The optical transceiver of claim 11, wherein the first magnetic base includes a substrate mating surface, and whereby the substrate mating surface is substantially flat to correspond with the mounting surface of a substrate to mount thereto."

Issues Discussed:

Proposed Amendments:

Applicant's attorney gave permission for Examiner to perform an Examiner's Amendment to correct claims 8 and 17 to "Claim 8: The optical isolator array of claim 1, wherein the magnetic base includes a substrate mating surface, and whereby the substrate mating surface is substantially flat to correspond with a mounting surface of a substrate and to mount thereto.

Claim 17: The optical transceiver of claim 11, wherein the first magnetic base includes a substrate mating surface, and whereby the substrate mating surface is substantially flat to correspond with the mounting surface of a substrate to mount thereto."

/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872	/HENRY A DUONG/ Examiner, Art Unit 2872
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

U.S. Patent and Trademark Office
PTOL-413/413b (Rev. 01/01/2015)

Interview Summary

Paper No. 20200629

Applicant recordation instructions:It is not necessary for applicant to provide a separate record of the substance of interview
.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

<i>Notice of References Cited</i>	Application/Control No. 16/257,635		Applicant(s)/Patent Under Reexamination LIN et al.	
	Examiner HENRY A DUONG		Art Unit 2872	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20100002988-A1	01-2010	YOSHIE; Tomoyuki	G02B6/122	385/14
*	B	US-20140146389-A1	05-2014	YE; Lei	G02F1/093	359/484.03
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Search Notes</i> 	Application/Control No. 16/257,635	Applicant(s)/Patent Under Reexamination LIN et al.
	Examiner HENRY A DUONG	Art Unit 2872

CPC - Searched*		
Symbol	Date	Examiner
G02F1/093,G02B5/3083,G02B6/2746,G02F1/0136,G02B27/283	06/25/2020	HD

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
359	484.03	06/25/2020	HD

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
NPL search (ip.com, google, espacenet)	06/25/2020	HD
Inventor search in EAST, PE2E	06/25/2020	HD
Keyword search in BRS EAST (US PAT, PGPUB, JPO, EPO, DERWENT, FPRS)	06/25/2020	HD
See attached BRS EAST history	06/25/2020	HD
Keyword search in above listed class/subclasses	06/25/2020	HD

/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872	/HENRY A DUONG/ Examiner, Art Unit 2872
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<i>Search Notes</i> 	Application/Control No. 16/257,635	Applicant(s)/Patent Under Reexamination LIN et al.
	Examiner HENRY A DUONG	Art Unit 2872

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
G02F1	093	06/25/2020	HD
G02B5	3083	06/25/2020	HD
G02B6	2746	06/25/2020	HD
G02F1	0136	06/25/2020	HD
G02B27	283	06/25/2020	HD
USPAT and USPGPUB Text Search Only	See attached interference search	06/25/2020	HD

/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872	/HENRY A DUONG/ Examiner, Art Unit 2872
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Issue Classification 	Application/Control No. 16/257,635	Applicant(s)/Patent Under Reexamination LIN et al.
	Examiner HENRY A DUONG	Art Unit 2872

CPC		
Symbol	Type	Version
G02F / 1 / 093	F	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version
/ /				

/HENRY A DUONG/ Examiner, Art Unit 2872 (Assistant Examiner)	30 June 2020 (Date)	Total Claims Allowed: 19	
/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872 (Primary Examiner)	02 July 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 2

Issue Classification 	Application/Control No. 16/257,635	Applicant(s)/Patent Under Reexamination LIN et al.
	Examiner HENRY A DUONG	Art Unit 2872

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G02F	/	1	/ 01
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
359	484.03

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/HENRY A DUONG/ Examiner, Art Unit 2872 (Assistant Examiner)	30 June 2020 (Date)	Total Claims Allowed: 19	
/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872 (Primary Examiner)	02 July 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 2

<i>Issue Classification</i> 	Application/Control No. 16/257,635	Applicant(s)/Patent Under Reexamination LIN et al.
	Examiner HENRY A DUONG	Art Unit 2872

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

/HENRY A DUONG/ Examiner, Art Unit 2872 (Assistant Examiner)	30 June 2020 (Date)	Total Claims Allowed: 19	
/WILLIAM R ALEXANDER/ Primary Examiner, Art Unit 2872 (Primary Examiner)	02 July 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 2

Bibliographic Data

Application No: 16/257,635

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged: /HENRY A DUONG/

Examiner's Signature

Initials

Title:

OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL
SUBASSEMBLY MODULE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/25/2019	359	2872	PAT266-006US
RULE			

APPLICANTS

Applied Optoelectronics, Inc., Sugar Land, TX,

INVENTORS

Kai-Sheng LIN Sugar Land, TX, UNITED STATES

Kevin Liu Houston, TX, UNITED STATES

Ziliang Cai Richmond, TX, UNITED STATES

CONTINUING DATA

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/26/2019

STATE OR COUNTRY

UNITED STATES

ADDRESS

APPLIED OPTOELECTRONICS, INC.

13115 JESS PIRTLE BLVD.

SUGAR LAND, TX 77478

UNITED STATES

FILING FEE RECEIVED

\$1,720

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	418	359/484.03.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/27 23:38
S2	2,883	(G02F1/093).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/27 23:38
S3	39,260	(G02B5/3083 or G02B6/2746 or G02F1/0136 or G02B27/283 or G02F1/093).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/27 23:38
S4	39,335	S1 or S2 or S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/27 23:38
S5	2,277	S4 and (polarization adj insensitive adj Faraday adj Isolator\$1 or optical adj isolator)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/27 23:40
S6	950	S4 and (polarization adj insensitive adj Faraday adj Isolator\$1 or optical adj isolator) same (magnet\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/27 23:40
S8	418	359/484.03.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:28
S9	2,883	(G02F1/093).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:28

S10	39,268	(G02B5/3083 or G02B6/2746 or G02F1/0136 or G02B27/283 or G02F1/093).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:28
S11	39,343	S8 or S9 or S10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:28
S12	2,274	S11 and optical adj isolator	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:28
S13	2,277	S11 and (polarization adj insensitive adj Faraday adj Isolator\$1 or optical adj isolator)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:29
S14	950	S11 and (polarization adj insensitive adj Faraday adj Isolator\$1 or optical adj isolator) same (magnet\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:29
S15	2,277	(S13 or S14)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:29
S16	0	S12 not S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:29
S17	25,279	isolator and (photon\$2 or polariz\$7)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:49
S18	2,051	S17 and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:49
S19	2,277	S13 or S14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/06/30 14:49

			DERWENT; IBM_TDB			
S20	347	S18 not S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 14:49
S21	5	("2006/0013076").URPN.	USPAT	OR	ON	2020/06/30 14:58
S22	0	(10/531284).APP.	USPAT; USOCR	OR	ON	2020/06/30 14:58
S23	9,781	optical adj transceiver	USPAT; USOCR	OR	ON	2020/06/30 14:59
S24	50	S23 and S11	USPAT; USOCR	OR	ON	2020/06/30 14:59
S25	212	((("LIN") near3 ("Kai-Sheng"))) OR ((("LIU") near3 ("Kevin"))) OR ((("CAI") near3 ("Ziliang"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/06/30 15:16
S26	8	S25 and (optical adj isolator).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 15:17
S27	7	"20100003988"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 15:59
S28	9	"20100002988"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/30 15:59
S29	5	"52776742".FMID.	US-PGPUB; USPAT; FPRS; JPO	OR	ON	2020/06/30 17:51

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S30	285	359/484.03.ccls.	US-PGPUB; USPAT	OR	ON	2020/06/30 17:50
S31	751	(G02F1/093).cpc.	US-PGPUB; USPAT	OR	ON	2020/06/30 17:50

S32	10,609	(G02B5/3083 or G02B6/2746 or G02F1/0136 or G02B27/283 or G02F1/093).cpc.	US-PGPUB; OR USPAT	ON	2020/06/30 17:50
S33	10,661	S30 or S31 or S32	US-PGPUB; OR USPAT	ON	2020/06/30 17:50
S34	545	S33 and (optical adj isolator).clm.	US-PGPUB; OR USPAT	ON	2020/06/30 17:50
S35	230	S33 and (optical adj isolator and magnet\$3).clm.	US-PGPUB; OR USPAT	ON	2020/06/30 17:57

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/257,635				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	660			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760			
TOTAL CLAIMS (37 CFR 1.16(j))	19	minus 20 = *			OR	x 100 =	0.00			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *				x 460 =	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			
							0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00			
			TOTAL			TOTAL	1720			
* If the difference in column 1 is less than zero, enter "0" in column 2.										
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	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))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	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))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
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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
16/257,635	01/25/2019	2872	1720	PAT266-006US	19	2

CONFIRMATION NO. 9814

FILING RECEIPT

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



Date Mailed: 02/28/2019

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)

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Ziliang Cai, Richmond, TX;

Applicant(s)

Applied Optoelectronics, Inc., Sugar Land, TX;

Power of Attorney: The patent practitioners associated with Customer Number 27543

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 for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

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Permission to Access Application via Priority Document Exchange: Yes

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If Required, Foreign Filing License Granted: 02/26/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/257,635**

Projected Publication Date: 07/30/2020

Non-Publication Request: No

Early Publication Request: No

Title

OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

Preliminary Class

359

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

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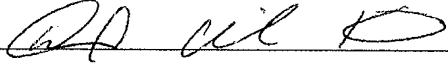
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Applicant Address	
Signature 	Date 9/24/2012
Name and Title (of individual signing on behalf of assignee or obligated assignee)	
David Kuo, Assistant General Counsel	

OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

TECHNICAL FIELD

[0001] The present disclosure relates to optical communications, and more particularly, to an optical isolator array for use in a multi-channel optical subassembly module, the optical isolator array having a magnetic base with a relatively compact and modular profile that supports N number of optical isolators for use in an optical subassembly module.

BACKGROUND INFORMATION

[0002] Optical transceivers are used to transmit and receive optical signals for various applications including, without limitation, internet data center, cable TV broadband, and fiber to the home (FTTH) applications. Optical transceivers provide higher speeds and bandwidth over longer distances, for example, as compared to transmission over copper cables. The desire to provide higher transmit/receive speeds in increasingly space-constrained optical transceiver modules has presented significant challenges. Moreover, optical transceiver modules include a wide-range of package profiles with large variations in channel density and housing dimensions, for instance, that can make reusability of components difficult across multiple types of profiles, if not impossible.

[0003] For example, some approaches to transmitter optical subassemblies (TOSAs) include having a plurality of laser arrangements including, for example, a laser diode driver (LDD), laser diode, focus lens and multiplexer device, and a multiplexing device for combining channel wavelengths from each of the plurality of laser arrangements in a single housing. Each component of the TOSA must be securely attached and optically aligned with other associated optical components, which presents significant challenges for part designs (e.g., sub-mounts, lenses, mirror holders, and so on) that can be reused between package types, particularly as TOSAs continue to scale. In addition, manufacture of such TOSAs routinely require multiple test, correction, and re-test stages, which can ultimately increase per-unit manufacture time, complexity, and reduce yield.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] These and other features and advantages will be better understood by reading the following detailed description, taken together with the drawings wherein:

[0005] FIG. 1 shows a block diagram of a multi-channel optical transceiver in accordance with an embodiment of the present disclosure.

[0006] FIG. 2 shows a perspective view of an optical isolator array for use in the optical transceiver of FIG. 1, in accordance with an embodiment of the present disclosure.

[0007] FIG. 3 shows a front view of the optical isolator array of FIG 2, in accordance with an embodiment of the present disclosure.

[0008] FIG. 4 shows a side view of the optical isolator array of FIG. 2, in accordance with an embodiment of the present disclosure.

[0009] FIG. 5 shows a perspective view of the optical isolator array of FIG. 2 coupled to an optical subassembly substrate, in accordance with an embodiment of the present disclosure.

[0010] FIG. 6 shows a top-down view of the optical isolator array of FIG. 2 and associated optical components, in accordance with an embodiment of the present disclosure.

[0011] FIG. 7 shows another example optical isolator array suitable for use in the optical transceiver of FIG. 1, in accordance with an embodiment of the present disclosure.

[0012] FIG. 8 shows a side view of the example optical isolator array of FIG. 7, in accordance with an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0013] This present disclosure is generally directed to an optical isolator array with a magnetic base (or plate) that allows for mounting and alignment of N number of optical isolator chips, referred to herein as simply optical isolators, within an optical subassembly module. In an embodiment, the magnetic base provides at least one mounting surface for supporting and coupling to N number of optical isolators, with N being equal to an optical channel count for the optical subassembly (e.g., 4-channels, 8-channels, and so on). The magnetic base includes an overall width that allows for a desired number of optical isolators to get mounted thereon. Each optical isolator can be disposed along the same axis on the magnetic base and at a uniform distance from adjacent optical isolators. The optical isolators can extend substantially parallel

relative to each other when coupled to the magnetic base. Further, each optical isolator provides a light-receiving surface at a first end to receive channel wavelengths from a corresponding laser diode, and a light-emitting surface at a second end, opposite the first end, to pass the received channel wavelengths along a direction of propagation. The polarity and orientation of the magnetic base within the optical subassembly module establishes the direction of propagation through each optical isolator. The magnetic base introduces a magnetic field with a magnetic field strength sufficient to ensure nominal power along the desired direction of propagation. Accordingly, each optical isolator coupled to the magnetic base can pass channel wavelengths along the same direction. In an embodiment, this includes optical isolators passing channel wavelengths along a corresponding light path that extends parallel relative to each other. An adhesive such as ultraviolet-curing (UV-curing) optical adhesives may be used to secure each optical isolator at a predefined position on the magnetic base and provide additional structural support. Other types of adhesives and fixation approaches may be utilized and are within the scope of this disclosure.

[0014] In another embodiment of the present disclosure, an optical isolator array is disclosed that includes first and second magnetic bases or plates disposed opposite each other and a plurality of optical isolators sandwiched/disposed therebetween. The optical isolators may be coupled via, for instance, adhesive or other suitable approach to the first and second magnetic bases. The first and second magnetic bases introduce a first and second magnetic field, respectively, and can determine a direction of propagation for the optical isolators based on the same. The magnetic field strength of the first and second magnetic bases may be substantially equal, or different depending on a desired configuration. The addition of a second magnet, and by extension, a second magnetic field, results in greater isolation performance relative to that of a single magnetic field.

[0015] Continuing on, each of the first and second magnetic bases may be configured identically, and thus, either magnetic base can be utilized to couple the optical isolator array to the surface of a substrate, e.g., the sidewall of a transmitter optical subassembly (TOSA). In this embodiment, at least one layer of adhesive may extend between the first and second magnetic bases to securely hold the optical isolators in a predetermined position between the first and second magnetic bases and can increase the overall structural integrity of the optical isolator array.

[0016] Numerous advantages will be apparent over other approaches that utilize discrete/separate optical isolators coupled to a substrate. For example, an optical isolator array consistent with the present disclosure can be easily be shortened or lengthened to accommodate different optical subassembly housing/packaging requirements and/or when less or more optical channels are desired. The total number of optical isolators may vary according to desired channel counts, and such modifications are achievable without substantial redesign of the optical isolator array. Alternatively, or in addition, the distance/pitch between adjacent optical isolator chips may be varied to accommodate a wide-range of package designs.

[0017] In addition, an optical isolator array consistent with the present disclosure may be separately manufactured and optionally tested apart from other optical subassembly components, and then subsequently coupled into an associated housing, e.g., a TOSA housing, as a single unit. This advantageously ensures that each of the optical isolators are optically aligned with associated active and/or passive optical components, e.g., multiplexers, laser diodes, and so on, by virtue of the optical isolator array being coupled to the optical subassembly at a predefined position. The orientation of each optical isolator can be uniformly adjusted in tandem at a fine-grain level (e.g., by less than 10 microns) by simply shifting the physical position of the magnetic base relative to associated optical components, thus minimizing or otherwise reducing the overall number adjustments to achieve nominal power. This can significantly reduce manufacturing complexity, error, and the number of fix-and-repeat testing iterations that normally characterizes optical subassembly manufacturing.

[0018] While the present disclosure includes examples and scenarios directed specifically to optical isolator arrays being used in a transmitter optical subassembly (TOSA) arrangement, this disclosure is not limited in this regard. For example, an optical isolator consistent with the present disclosure may be utilized to align and mount optical isolators in receiver optical subassembly (ROSA) arrangements.

[0019] As used herein, “channel wavelengths” refer to the wavelengths associated with optical channels and may include a specified wavelength band around a center wavelength. In one example, the channel wavelengths may be defined by an International Telecommunication (ITU) standard such as the ITU-T dense wavelength division multiplexing (DWDM) grid. This disclosure is equally applicable to coarse wavelength division multiplexing (CWDM). In one specific example embodiment, the channel wavelengths are implemented in accordance with

local area network (LAN) wavelength division multiplexing (WDM), which may also be referred to as LWDM.

[0020] The term “coupled” as used herein refers to any connection, coupling, link or the like and “optically coupled” refers to coupling such that light from one element is imparted to another element. Such “coupled” devices are not necessarily directly connected to one another and may be separated by intermediate components or devices that may manipulate or modify such signals. On the other hand, the term “direct optical coupling” refers to an optical coupling via an optical path between two elements that does not include such intermediate components or devices, e.g., a mirror, waveguide, and so on, or bends/turns along the optical path between two elements.

[0021] The term substantially, as generally referred to herein, refers to a degree of precision within acceptable tolerance that accounts for and reflects minor real-world variation due to material composition, material defects, and/or limitations/peculiarities in manufacturing processes. Such variation may therefore be said to achieve largely, but not necessarily wholly, the stated/nominal characteristic. To provide one non-limiting numerical example to quantify “substantially,” such a modifier is intended to include minor variation that can cause a deviation of up to and including $\pm 5\%$ from a particular stated quality/characteristic unless otherwise provided by the present disclosure.

[0022] Referring to the Figures, FIG. 1, an optical transceiver 100, consistent with embodiments of the present disclosure, is shown and described. In this embodiment, the optical transceiver 100 includes a multi-channel transmitter optical subassembly (TOSA) arrangement 104 and a multi-channel receiver optical subassembly (ROSA) arrangement 106 coupled to a substrate 102, which may also be referred to as an optical module substrate. The substrate 102 may comprise, for example, a printed circuit board (PCB) or PCB assembly (PCBA). The substrate 102 may be configured to be “pluggable” for insertion into an optical transceiver cage 109.

[0023] In the embodiment shown, the optical transceiver 100 transmits and receives four (4) channels using four different channel wavelengths (λ_1 , λ_2 , λ_3 , λ_4) via the multi-channel TOSA arrangement 104 and the multi-channel ROSA arrangement 106, respectively, and may be capable of transmission rates of at least about 25 Gbps per channel. In one example, the channel wavelengths λ_1 , λ_2 , λ_3 , λ_4 may be 1270 nm, 1290 nm, 1310 nm, and 1330 nm, respectively.

Other channel wavelengths are within the scope of this disclosure including those associated with local area network (LAN) wavelength division multiplexing (WDM). The optical transceiver 100 may also be capable of transmission distances of 2 km to at least about 10 km. The optical transceiver 100 may be used, for example, in internet data center applications or fiber to the home (FTTH) applications. Although the following examples and embodiments show and describe a 4-channel optical transceiver, this disclosure is not limited in this regard. For example, the present disclosure is equally applicable to 2, 6, or 8-channel configurations.

[0024] In more detail, the multi-channel TOSA arrangement 104 includes a TOSA housing 114 with a plurality of sidewalls that define a cavity (not shown). The cavity includes a plurality of laser arrangements 110, an optical isolator array 127, and a multiplexing device 124 disposed therein. The optical isolator array 127 may be implemented as the optical isolator array 200 of FIGs. 2-6 or the optical isolator array 200' of FIGs. 7-8, which will be discussed in greater detail below. In any event, each laser arrangement of the plurality of laser arrangements 110 can be configured to transmit optical signals having different associated channel wavelengths. Each laser arrangement may include passive and/or active optical components such as a laser diode (LD), monitor photodiode (MPD), laser diode driver (LDD), and so on. Additional components comprising each laser arrangement include filters, optical isolators, filtering capacitors, and so on.

[0025] To drive the plurality of laser arrangements 110, the optical transceiver 100 includes a transmit connecting circuit 112 to provide electrical connections to the plurality of laser arrangements 110 within the housing 114. The transmit connecting circuit 112 may be configured to receive driving signals (e.g., TX_D1 to TX_D4) from, for example, circuitry within the optical transceiver cage 109. The housing 114 may be optionally hermetically sealed to prevent ingress of foreign material, e.g., dust and debris. Therefore, a plurality of transmit (TX) traces 117 (or electrically conductive paths) may be patterned on at least one surface of the substrate 102 and are electrically coupled with a feedthrough device 116 of the TOSA housing 114 to bring the transmit connecting circuit 112 into electrical communication with the plurality of laser arrangements 110, and thus, electrically interconnect the transmit connecting circuit 112 with the multi-channel TOSA arrangement 104. The feedthrough device 116 may comprise, for instance, ceramic, metal, or any other suitable material.

[0026] In operation, the multi-channel TOSA arrangement 104 may then receive driving signals (e.g., TX_D1 to TX_D4), and in response thereto, generates and launches multiplexed channel wavelengths on to an output waveguide 120 such as a transmit optical fiber. The generated multiplexed channel wavelengths may be combined based on a demultiplexing device 124 such as an arrayed waveguide grating (AWG) that is configured to receive emitted channel wavelengths 126 from the plurality of laser assemblies 110 and output a signal carrying the multiplexed channel wavelengths on to the output waveguide 120 by way of optical fiber receptacle 122.

[0027] Continuing on, the multi-channel ROSA arrangement 106 includes a demultiplexing device 124, e.g., an arrayed waveguide grating (AWG), a photodiode (PD) array 128, and an amplification circuitry 130, e.g., a transimpedance amplifier (TIA). An input port of the demultiplexing device 124 may be optically coupled with a receive waveguide 134, e.g., an optical fiber, by way of an optical fiber receptacle 136. An output port of the demultiplexing device 124 may be configured to output separated channel wavelengths on to the PD array 128. The PD array 128 may then output proportional electrical signals to the TIA 130, which then may be amplified and otherwise conditioned. The PD array 128 and the transimpedance amplifier 130 detect and convert optical signals received from the fiber array 133 into electrical data signals (RX_D1 to RX_D4) that are output via the receive connecting circuit 132. In operation, the PD array 128 may then output electrical signals carrying a representation of the received channel wavelengths to a receive connecting circuit 132 by way of conductive traces 119 (which may be referred to as conductive paths).

[0028] Referring to FIGs. 2-6, an example optical isolator array 200 is shown consistent with an embodiment of the present disclosure. As shown, the optical isolator array 200 includes a magnetic base 202 (or magnetic plate) and a plurality of optical isolators shown collectively as 204 and individually as 204-1 to 204-4. The magnetic base 202 may be formed from a metal or metal alloy such as iron, nickel, cobalt, or any combination thereof. In an embodiment the magnetic base 202 may be configured as a permanent magnet device, although other types of magnets are within the scope of this disclosure as such electromagnet devices.

[0029] A plurality of sidewalls define the magnetic base 202 and provide at least a first mounting surface 207. The first mounting surface 207 can be substantially planar, as shown, although in other embodiments the first mounting surface 207 may not necessarily be flat. The

first mounting surface 207 supports the plurality of optical isolators 204. The overall width W1 (See FIG. 3) of the magnetic base 202 may be a function of the desired number of optical isolators. For instance, in the embodiment shown in FIG. 3 the overall width W1 may measure about 100 microns with each of the plurality of optical isolators 204 having a corresponding width of about 20 microns. In this example, 100 microns may be chosen for the overall width W1 to allow for a portion of the overall width W1, namely widths W2 and W3, to provide adhesive overflow regions, with W2 and W3 each measuring equally at about 10 microns. This advantageously provides sufficient mounting space for the four optical isolators as well as surface area to allow each end of the at least one layer of adhesive 206 to flow and cure without overflowing beyond the sides of the magnetic base 202. Thus, the following equation may be used to determine the overall width W1 of the magnetic base 202:

$$W1 = N * Wn + Wn \quad \text{Equation (1)}$$

with W1 being the overall length, N being the desired number of optical isolators, and Wn being the width of an optical isolator.

[0030] On the other hand, the overall height H1 of the magnetic base 202 may be chosen to ensure, for instance, that each optical isolator of the plurality of optical isolators 204 is aligned vertically with an associated laser arrangement along a Z axis, which will be discussed in greater detail below with regard to FIG. 7.

[0031] Each of the plurality of optical isolators 204 can comprise polarization-insensitive Faraday Isolators that include multiple segments/portions including a rotator portion sandwiched/disposed between first and second polarization sections. The first and second polarization sections polarizers can comprise birefringent wedges, e.g. made of rutile (TiO₂). This configuration is particularly well suited for space constrained housing. Each of the plurality of optical isolators 204 may include segments formed from different materials to target desired channel wavelengths.

[0032] The plurality of optical isolators may be secured at a predefined position on the first mounting surface 207 via at least one layer of adhesive 206. As shown, the at least one layer of adhesive 206 may be disposed in a manner that at least partially surrounds each optical isolator of the plurality of optical isolators 204. The at least one layer of adhesive 206 may flow during a depositing process along a direction that is substantially transverse relative to the first mounting surface 207 based on capillary action caused by proximity of each of the plurality of optical

isolators 204, or may simply cure as shown based on being disposed between each optical isolator of the plurality of optical isolators 204. In either case, the at least one layer of adhesive 206 can be used as, in a general sense, a submount to hold and/or support each of the plurality of optical isolators at a predefined position relative to the magnetic base 202.

[0033] To this end, a method for forming the optical isolator array 200 may include first disposing the at least one layer of adhesive 206 on to the mounting surface 207 of the base followed by disposing each of the plurality of optical isolators 204 at their predefined positions. Notably, the use of adhesives to hold each optical isolator 204-1 to 204-4 in place advantageously allows for relatively simple, fine-grain adjustments to the pitch/distance between optical isolators. As further shown in FIG. 3, each of the plurality of optical isolators 204 may be disposed at predefined positions that include a uniform distance of D1 between adjacent optical isolators. The at least one layer of adhesive 206 may vertically displace each of the plurality of optical isolators 204 by a distance D2. Distance D2 may be uniform across the plurality of optical isolators 204, although variations may be introduced by design and/or by function of how the at least one layer of adhesive 206 cures. Each of the optical isolators may be further disposed parallel with each other in a linear array.

[0034] With specific reference to FIG. 4, the magnetic base 202 introduces a first magnetic field 212-1. As shown, the flux lines of the first magnetic field 212-1 intersect with each of the optical isolators in the plurality of optical isolators 204 mounted to the magnetic base 202. In operation, the polarity of the first magnetic field 212-2 therefore determines the direction of propagation for light which is incident to the plurality of optical isolators 204.

[0035] Turning to FIG. 5, the optical isolator array 200 is shown mounted to a substrate 220. In particular, the magnetic base 202 of the optical isolator array 200 is coupled to the mounting surface 221 provided by the substrate 220 by way of a substrate mating surface 230. The substrate mating surface 230 may be substantially planar and correspond with the mounting surface 221 of a substrate 220.

[0036] The substrate 220 may comprise, for example, a printed circuit board (PCB), a sidewall of a housing (e.g., made of metal or other suitably rigid material) or any other suitable material. The optical isolator array 200 may be at least partially assembled separately from other components in an optical subassembly and later coupled during manufacturing processes as effectively, a single piece. Accordingly, each of the plurality of optical isolators 204 may be

disposed at a predetermined orientation and position on the magnetic base 202 to ensure that each will be aligned within nominal tolerances along and X and Y axis. Optical alignment of the optical isolator array 200, and more particularly each of the optical isolators mounted thereon, with associated passive and/or active optical components, e.g., a laser diode, may therefore be achieved by simply coupling the optical isolator 200 at a predefined location on the mounting surface 221 of the substrate 220. The overall height H1 (See FIG. 3) may then displace the plurality of optical isolators 200 along the Z axis such that each optical isolator is optically aligned within nominal tolerances of associated active and/or passive components.

[0037] For example, and as shown in the highly simplified embodiment of FIG. 6, each of the optical isolators 204-1 to 204-4 may be optically aligned with a corresponding collimating lens of a plurality of collimating lenses 205 and corresponding laser diode 208-1 to 208-4 of the plurality of laser diodes 208 based at least in part on the dimensions of the magnetic base 202. This advantageously allows for the mounting surface 221 of the substrate 220 to act as a stop for the substrate mating surface 230 and provide a positive indication that each of the optical isolators is at a desired position along the Z axis simply by having the substrate mating surface 230 of the magnetic base 202 flush with the mounting surface 221 of the substrate 220. Likewise, alignment for each of the plurality of optical isolators 204 along the X and Y axis requires simply ensuring the magnetic base 202 is positioned at a predetermined X and Y position relative to the associated optical components.

[0038] Each of the laser diodes 208-1 to 208-4 may be configured to emit a different channel wavelength. Following the laser diodes 208, each of the optical isolators 204-1 to 204-4 include a light-receiving surface (e.g., light-receiving surface 209-1) for receiving channel wavelengths from a corresponding laser diode of the laser diodes 208-1 to 208-4, and a light-emitting surface (e.g., light-emitting surface 211-1) disposed opposite the light-receiving surface for passing the received channel wavelengths to the multiplexing device, e.g., the multiplexing device 124 (FIG. 1). Each light-receiving and light-emitting surface may be angled, e.g., at about 8 degrees, relative to a corresponding light path, such as shown.

[0039] Thus, after coupling of the optical isolator array 200 on the substrate 220, an optical path may then extend from each an emission surface of each of the laser diodes 208-1 to 208-4, through an associated collimating lens of the plurality of collimating lenses 205 and then through the an associated optical isolator of the plurality of optical isolators 204. Each of the light paths

may extend substantially parallel to each other, although other embodiments are within the scope of this disclosure.

[0040] FIG. 7 shows another example optical isolator array 200' in accordance with an embodiment of the present disclosure. As shown, the optical isolator array 200' is substantially similar to the optical isolator array 200 discussed above with regard to FIGs. 2-6, the description of which is equally applicable to the embodiment of FIG. 7 but will not be repeated for brevity. However, the example optical isolator array 200' includes a second magnetic base 203. The second magnetic base 203 may be disposed on an upper surface of the optical isolators 204-1 to 204-4, or alternatively supported by the at least one layer of adhesive 206' disposed between the optical isolators 204 and the second magnetic base 203.

[0041] Therefore, the plurality optical isolators 204 and the at least one layer of adhesive 206' can be sandwiched/disposed between the first and second magnetic bases 202, 203. The first and second magnetic bases may extend substantially parallel relative to each other and may have identical dimensions, although other embodiments are within the scope of this disclosure. As shown, the at least one layer of adhesive 206' may extend a distance D2 from the mounting surface 207 of the first magnetic base 202 up to a mounting surface 213 of the second magnetic base 203. To this end, the at least one layer of adhesive 206' securely attaches the first and second magnetic bases 202, 203 to each other, and more importantly, securely fixes the optical isolators 204-1 to 204-4 therebetween.

[0042] As shown in FIG. 8, the first and second magnetic base 202, 203 introduce first and second magnetic fields 212-1, 212-2, respectively. The first and second magnetic fields 212-1, 212-2 may at least partially overlap, or not, depending on a desired configuration. In either case, the polarity of the first and second magnetic fields 212-1, 212-2 may be utilized to establish a direction of propagation for wavelengths incident to the plurality of optical isolators 204.

[0043] In accordance with an aspect of the present disclosure an optical isolator array for use in an optical subassembly module is disclosed. The optical isolator array comprising a first magnetic base defining at least one mounting surface, a plurality of optical isolators mounted to the at least one mounting surface, each of the plurality of optical isolators disposed substantially in parallel relative to each other, and at least one layer of adhesive disposed on the at least one mounting surface to couple the plurality of optical isolators to the first magnetic base and to hold

each optical isolator of the plurality of optical isolators at a predefined position relative to each other.

[0044] In accordance with another aspect of the present disclosure an optical transceiver is disclosed. The optical transceiver comprising a transceiver housing, at least one optical transmitter subassembly (TOSA) arrangement disposed in the transceiver housing, the at least one TOSA arrangement comprising a substrate defined by at least one mounting surface, a plurality of laser diodes mounted to the at least one mounting surface of the substrate, each laser diode of the plurality of laser diodes to emit a different associated channel wavelength along a corresponding light path of a plurality of light paths, and an optical isolator array mounted to the at least one mounting surface adjacent the plurality of laser diodes such that the plurality of light paths intersect with the optical isolator array, the optical isolator array comprising a at least a first magnetic base and a plurality of optical isolators coupled thereto, and wherein each optical isolator is optically aligned with a corresponding laser diode of the plurality of laser diodes via a corresponding light path, an optical receiver subassembly (ROSA) disposed in the transceiver housing.

[0045] While the principles of the disclosure have been described herein, it is to be understood by those skilled in the art that this description is made only by way of example and not as a limitation as to the scope of the disclosure. Other embodiments are contemplated within the scope of the present disclosure in addition to the exemplary embodiments shown and described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present disclosure, which is not to be limited except by the following claims.

CLAIMS

What is claimed is:

1. An optical isolator array for use in an optical subassembly module, the optical isolator array comprising:
 - a first magnetic base defining at least one mounting surface;
 - a plurality of optical isolators mounted to the at least one mounting surface, each of the plurality of optical isolators disposed substantially in parallel relative to each other; and
 - at least one layer of adhesive disposed on the at least one mounting surface to couple the plurality of optical isolators to the first magnetic base and to hold each optical isolator of the plurality of optical isolators at a predefined position relative to each other.
2. The optical isolator array of claim 1, wherein the magnetic base is formed from a permanent magnet.
3. The optical isolator array of claim 1, wherein the magnetic base introduces a first magnetic field that intersects with the plurality of optical isolators to establish a direction of propagation.
4. The optical isolator array of claim 1, wherein each optical isolator of the plurality of optical isolators comprises a Faraday Isolator.
5. The optical isolator array of claim 1, wherein each optical isolator of the plurality of optical isolators includes an angled light-receiving surface to receive channel wavelengths from an associated laser diode.
6. The optical isolator array of claim 1, wherein the plurality of optical isolators is disposed uniformly across the at least one mounting surface.

7. The optical isolator array of claim 1, wherein the at least one layer of adhesive is disposed between adjacent optical isolators of the plurality of optical isolators.

8. The optical isolator array of claim 1, wherein the magnetic base includes a substrate mating surface, and whereby the substrate mounting surface is substantially flat to correspond with a mounting surface of a substrate and to mount thereto.

9. The optical isolator array of claim 1, further comprising a second magnetic base, the second magnetic base being coupled to the plurality of optical isolators via the at least one layer of adhesive.

10. The optical isolator array of claim 9, wherein the second magnetic base introduces a second magnetic field, the second magnetic field intersecting with the plurality of optical isolators.

11. An optical transceiver, the optical transceiver comprising:
a transceiver housing;
at least one optical transmitter subassembly (TOSA) arrangement disposed in the transceiver housing, the at least one TOSA arrangement comprising:
a substrate defined by at least one mounting surface;
a plurality of laser diodes mounted to the at least one mounting surface of the substrate, each laser diode of the plurality of laser diodes to emit a different associated channel wavelength along a corresponding light path of a plurality of light paths; and
an optical isolator array mounted to the at least one mounting surface adjacent the plurality of laser diodes such that the plurality of light paths intersect with the optical isolator array, the optical isolator array comprising a at least a first magnetic base and a plurality of optical isolators coupled thereto, and wherein each optical isolator is optically aligned with a corresponding laser diode of the plurality of laser diodes via a corresponding light path;
an optical receiver subassembly (ROSA) disposed in the transceiver housing.

12. The optical transceiver of claim 11, wherein the first magnetic base of the optical isolator array is formed from a permanent magnet.

13. The optical transceiver of claim 11, wherein the first magnetic base introduces a first magnetic field that intersects with the plurality of optical isolators to establish a direction of propagation.

14. The optical transceiver of claim 11, wherein each optical isolator of the plurality of optical isolators includes an angled light-receiving surface to receive channel wavelengths from a corresponding laser diode of the plurality of laser diodes.

15. The optical transceiver of claim 11, wherein the plurality of optical isolators is disposed uniformly across the at least one mounting surface.

16. The optical transceiver of claim 11, wherein at least one layer of adhesive is disposed between adjacent optical isolators of the plurality of optical isolators.

17. The optical transceiver of claim 11, wherein the first magnetic base includes a substrate mating surface, and whereby the substrate mounting surface is substantially flat to correspond with the mounting surface of a substrate to mount thereto.

18. The optical transceiver of claim 11, further comprising a second magnetic base, the second magnetic base being coupled to the plurality of optical isolators and the first magnetic base via at least one layer of adhesive.

19. The optical transceiver of claim 18, wherein the second magnetic base introduces a second magnetic field, the second magnetic field intersecting with the plurality of optical isolators.

OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

ABSTRACT

This present disclosure is generally directed to an optical isolator array with a magnetic base that allows for mounting and alignment of N number of optical isolators modules within an optical subassembly module. In an embodiment, the magnetic base provides at least one mounting surface for coupling to N number of optical isolators, with N being equal to an optical channel count for the optical subassembly (e.g., 4-channels, 8-channels, and so on). The magnetic base includes an overall width that allows for a desired number of optical isolators to get mounted thereon. Each optical isolator can be uniformly disposed along the same axis on the magnetic base and at a distance D from adjacent optical isolators. An adhesive such as ultraviolet-curing (UV-curing) optical adhesives may be used to secure each optical isolator at a predefined position and increase overall structural integrity.

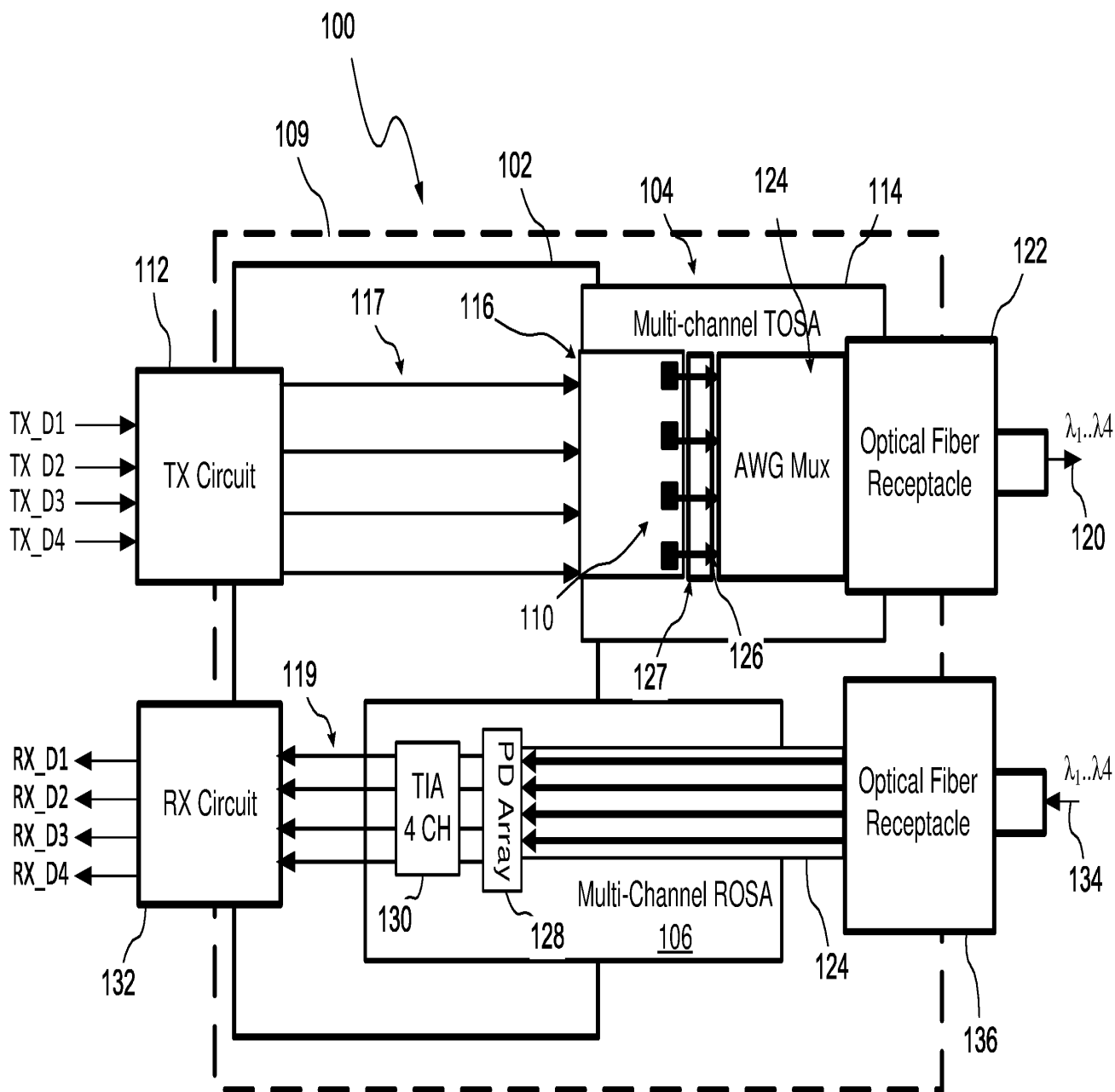


FIG. 1

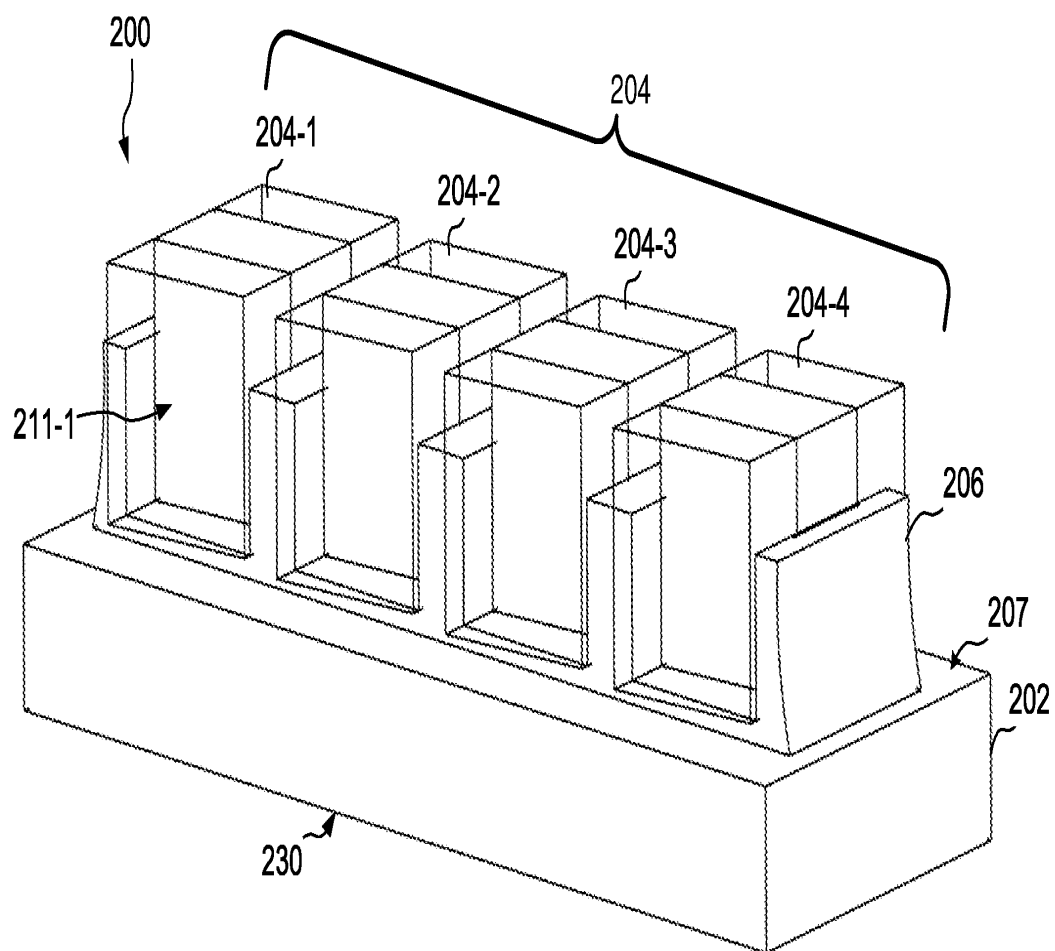


FIG. 2

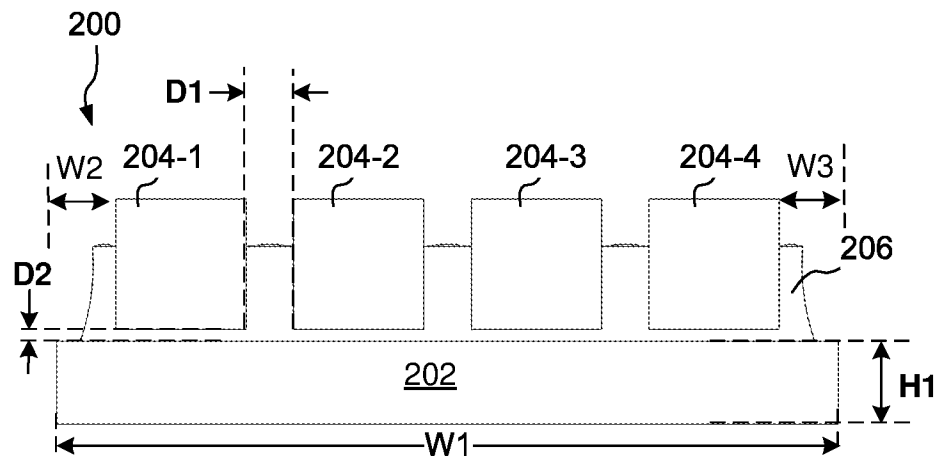


FIG. 3

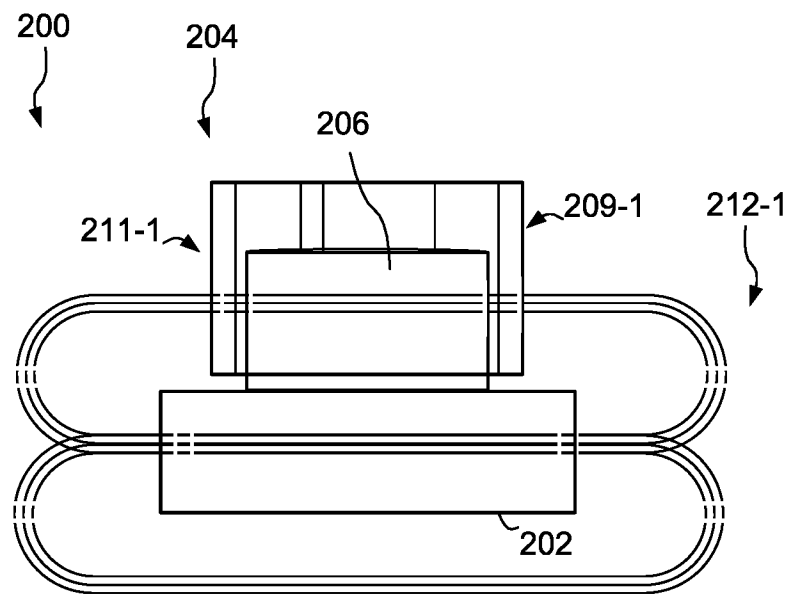


FIG. 4

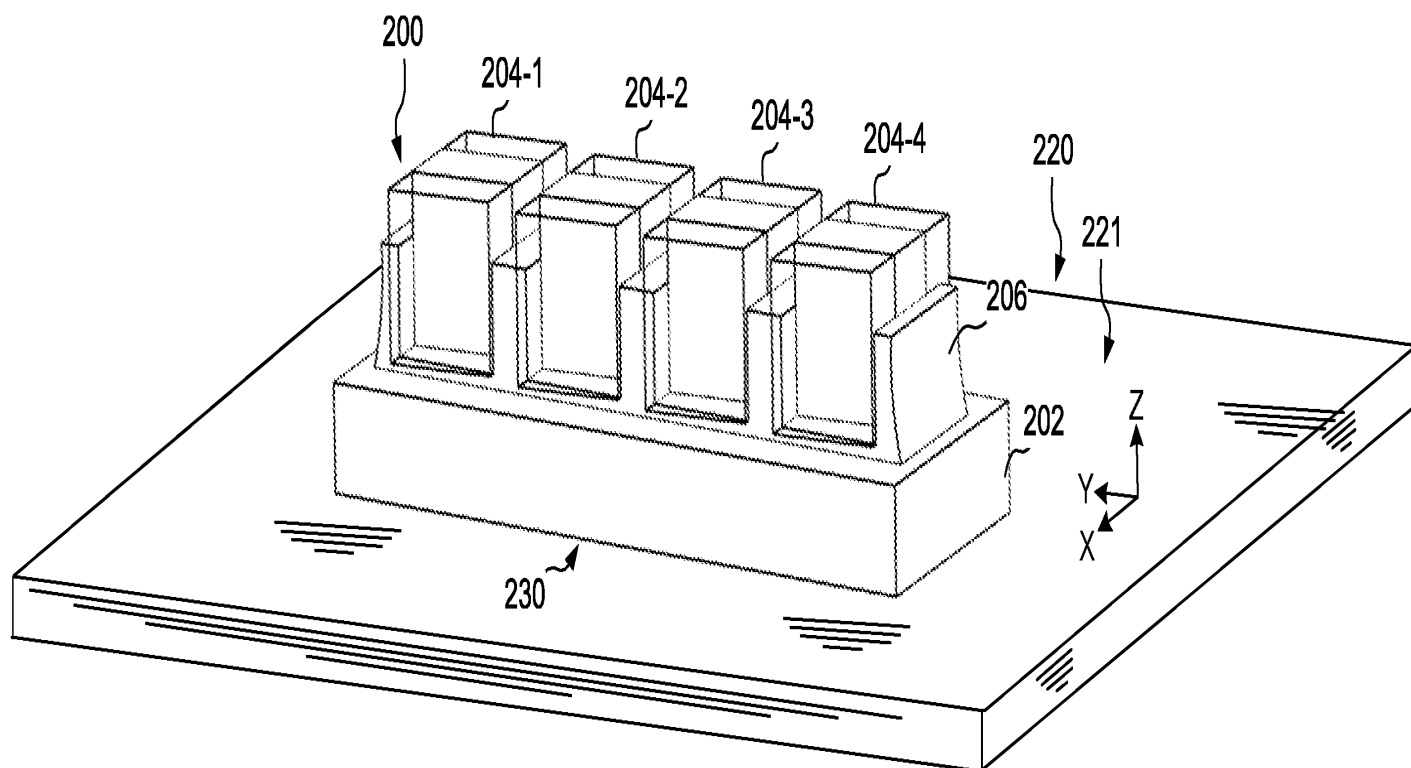


FIG. 5

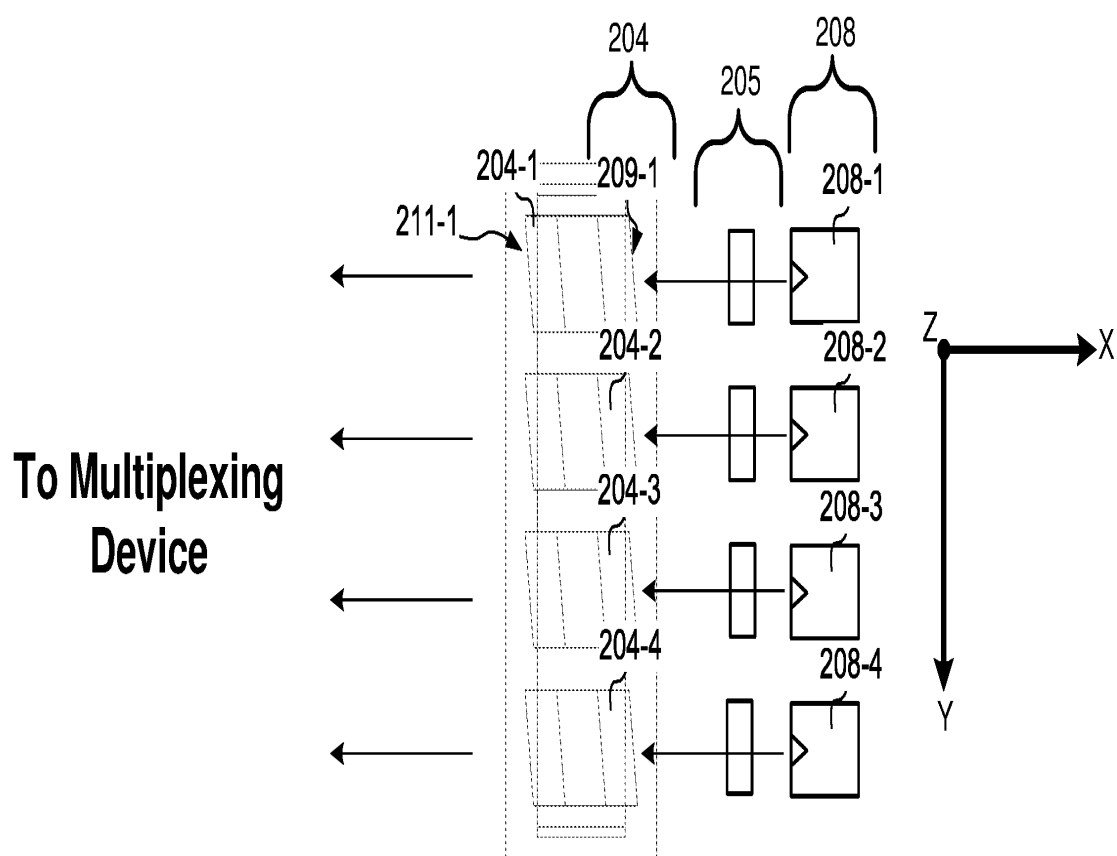


FIG. 6

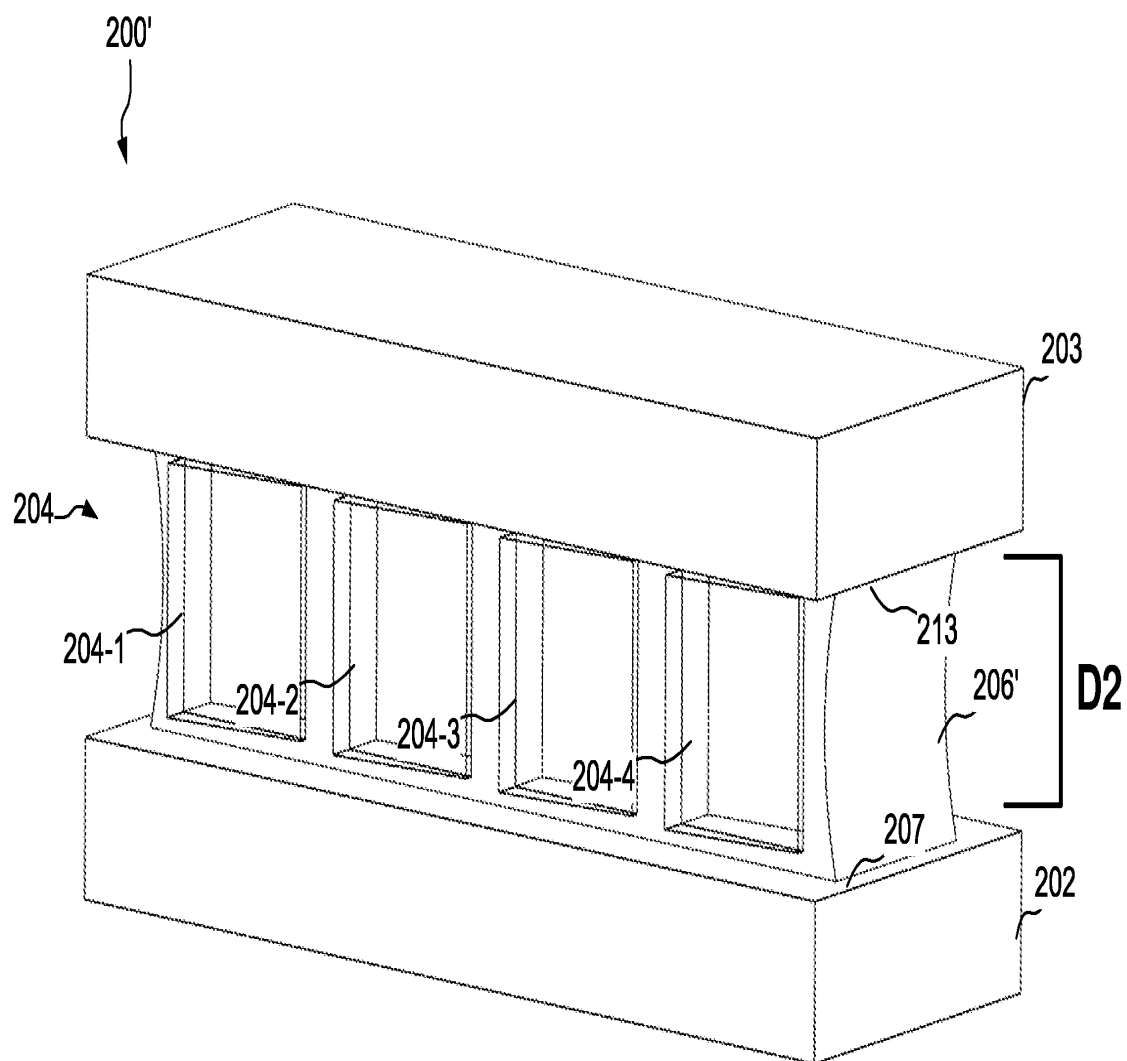


FIG. 7

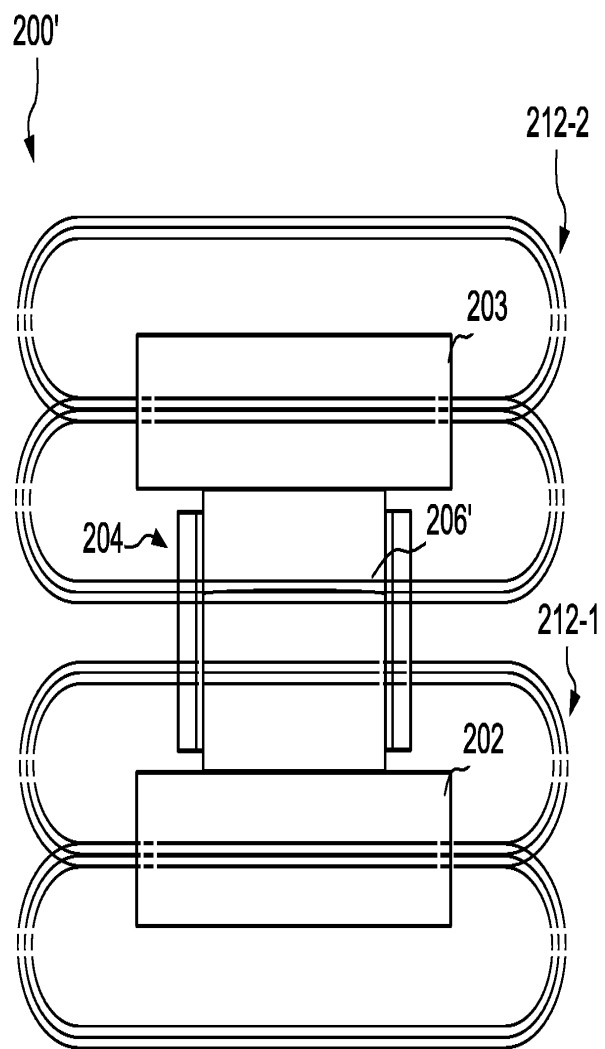


FIG. 8

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		
First Named Inventor/Applicant Name:		Kai-Sheng LIN		
Filer:		Kenneth M. Thompson/April Davis		
Attorney Docket Number:		PAT266-006US		
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	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1720

Electronic Acknowledgement Receipt

EFS ID:	34963408
Application Number:	16257635
International Application Number:	
Confirmation Number:	9814
Title of Invention:	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE
First Named Inventor/Applicant Name:	Kai-Sheng LIN
Customer Number:	27543
Filer:	Kenneth M. Thompson/April Davis
Filer Authorized By:	Kenneth M. Thompson
Attorney Docket Number:	PAT266-006US
Receipt Date:	25-JAN-2019
Filing Date:	
Time Stamp:	14:34:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 1720
RAM confirmation Number	012819INTEFSW00000945501705
Deposit Account	501705
Authorized User	April Davis

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	PAT266_006US_ADS.pdf	1822766	no	9
			3817ab9e5f250a6460c0429a09b55499a5dd3843		
Warnings:					
Information:					
2	Oath or Declaration filed	PAT266_006US_DECLARATION.pdf	678472	no	2
			cce81660477eb01fc14245ee73fe5a15a1fb eddf		
Warnings:					
Information:					
3	Power of Attorney	AOI_GENERAL_POA.pdf	37470	no	1
			3080c133b72c5782a34e68c344de8d065cdfb7d4		
Warnings:					
Information:					
4		PAT266_006US_Application_as filed.pdf	98127	yes	16
			5253c4b31f114d0eb59a0a9e36818a4c1efdc4388		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	12	
	Claims		13	15	
	Abstract		16	16	
Warnings:					
Information:					
5	Drawings-only black and white line drawings	PAT266_006US_Drawings_asfiled.pdf	371118	no	6
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Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	34787	no	2
			09bee74bc7ac722073c6207b461bfd8c65364667		
Warnings:					
Information:					
Total Files Size (in bytes):			3042740		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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 Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		
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						
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	Kai-Sheng		LIN			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
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Inventor	2				Remove	
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Prefix	Given Name	Middle Name	Family Name	Suffix		
	Kevin		LIU			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
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Mailing Address of Inventor:

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Postal Code	77063	Country i	US			

Inventor	3				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Ziliang		CAI			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		PAT266-006US	
		Application Number			
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE				
City	Richmond	State/Province	TX	Country of Residence	US
Mailing Address of Inventor:					
Address 1	16919 Mulben CT.				
Address 2					
City	Richmond	State/Province	TX		
Postal Code	77407	Country i	US		
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

Application Information:

Title of the Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		
Attorney Docket Number	PAT266-006US	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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		

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		

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
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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		

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.	
--	--

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		

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	Applied Optoelectronics, Inc.	
Mailing Address Information For Applicant:		
Address 1	13139 Jess Pirtle Blvd.	
Address 2		
City	Sugar Land	State/Province TX
Country	US	Postal Code 77478
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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		

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:

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	/Kenneth M. Thompson/		Date (YYYY-MM-DD)	2019-01-25
First Name	Kenneth M.	Last Name	Thompson	Registration Number
				72001
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	PAT266-006US
		Application Number	
Title of Invention	OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE		

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 Cooperation Treaty.
- 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.

Declaration for United States Patent Application

TITLE OF APPLICATION: OPTICAL ISOLATOR ARRAY FOR USE IN AN OPTICAL SUBASSEMBLY MODULE

As a below named inventor, I hereby declare that:

This declaration is directed to:

☒ the attached application, or

☐ United States Application No. or PCT Application No. _____ filed on _____, 20__.

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.

Kai-Sheng LIN

Full name of sole or first inventor

Sole or first inventor's signature

Date

1/23/2019

Kevin LIU

Full name of additional inventor, if any

Additional inventor's signature

Date

1/23/2019

Ziliang CAI

Full name of additional inventor, if any

Additional inventor's signature

Date

1/22/2019

§ 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.