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NOTICE OF ALLOWANCE AND FEE(S) DUE

139982 7590 05/16/2024
Wissing Miller LLP
Industrious at Hudson Yards
31 Hudson Yards, 11th Floor
New York, NY 10001

EXAMINER

RODELA, EDUARDO A

ART UNIT

PAPER NUMBER

2893

DATE MAILED: 05/16/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/385,213	10/30/2023	Shih-Yuan WANG	309-0015USCIP	7381

TITLE OF INVENTION: MICROSTRUCTURE ENHANCED ABSORPTION PHOTSENSITIVE DEVICES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	08/16/2024

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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 the USPTO patent electronic filing system.

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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

139982 7590 05/16/2024
Wissing Miller LLP
Industrious at Hudson Yards
31 Hudson Yards, 11th Floor
New York, NY 10001

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.

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 the USPTO patent electronic filing system 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.
18/385,213	10/30/2023	Shih-Yuan WANG	309-0015USCIP	7381

TITLE OF INVENTION: MICROSTRUCTURE ENHANCED ABSORPTION PHOTSENSITIVE DEVICES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	08/16/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
RODELA, EDUARDO A	2893	136-256000

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/ALA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/ALA/47 or PTO/SB/47; Rev 03-02 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 _____

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)

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

☐ Electronic Payment via the USPTO patent electronic filing system ☐ 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. _____



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18/385,213	10/30/2023	Shih-Yuan WANG	309-0015USCIP	7381
139982	7590	05/16/2024	EXAMINER	
Wissing Miller LLP Industrious at Hudson Yards 31 Hudson Yards, 11th Floor New York, NY 10001			RODELA, EDUARDO A	
			ART UNIT	PAPER NUMBER
			2893	
DATE MAILED: 05/16/2024				

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/385,213	Applicant(s) WANG et al.	
	Examiner Eduardo A Rodela	Art Unit 2893	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 4/10/2024.
☐ 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 13-30. 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)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____.	

	/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893
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DETAILED ACTION

This correspondence is in response to the communications received April 10, 2023.
Claims 13-30 are pending. This application has been granted expedited examination status on December 8, 2023.

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.

Priority

It is acknowledged that this application is a continuation of several US applications including 14/947,718 (now US 10,622,498) which has priority benefit of at least Provisional applications 61/905,109 (with date November 15, 2013) and 61/843,021 (with date July 4, 2013). The effective filing date is the earliest of the supported parent applications which appears to be the provisional application 61/843,021, dated **July 4, 2013**.

Information Disclosure Statement

The IDS document dated March 13, 2024 has been annotated by Examiner to include the publication date for the #3 Non-Patent Literature Documents (on page 8) as June 2019.

Applicant's Representative provided the following two citations for the Jonghoon Park et al. "Pixel Technology for improving IR Quantum Efficiency of Backside-illuminated CMOS Image Sensor" document. The citation dates were found via Google Search in the citation section.

First citation:

Park, Jonghoon, Yunki Lee, Bumsuk Kim, Bomi Kim, Junsung Park, Eunju Yeom, Yunji Jung et al. "Pixel technology for improving IR quantum efficiency of backside-illuminated CMOS image sensor." In Proc. Int. Image Sensor Workshop, vol. 4, pp. 1-4. 2019.

Second citation:

Park, J., Lee, Y., Kim, B., Kim, B., Park, J., Yeom, E., ... & Park, Y. (2019, June). Pixel technology for improving IR quantum efficiency of backside-illuminated CMOS image sensor. In Proc. Int. Image Sensor Workshop (Vol. 4, pp. 1-4).

Claim Objections

The claim objections have been withdrawn in light of Applicant's newly presented amendment, which does not contain the language that previously warranted the objection.

Relevant Prior Art

Kuriyama et al. (US 2004/0157354) Figs. 2A, 2B, shown below. This reference shows plural light sensitive pillars, but are lacking the holes formed in the pillars with dielectric filling.

FIG. 2A

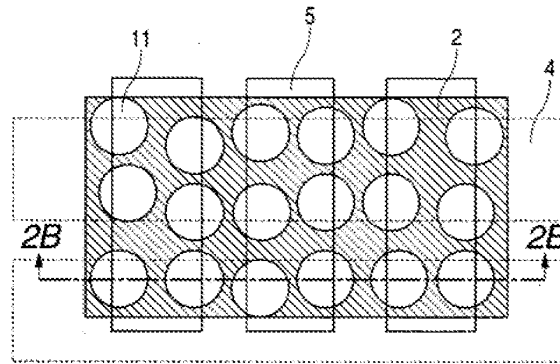
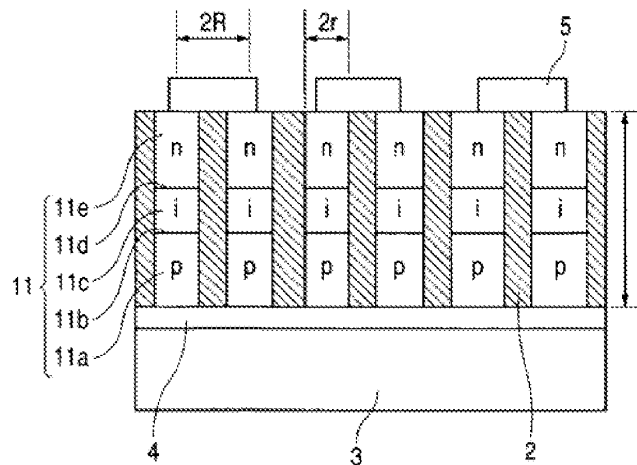


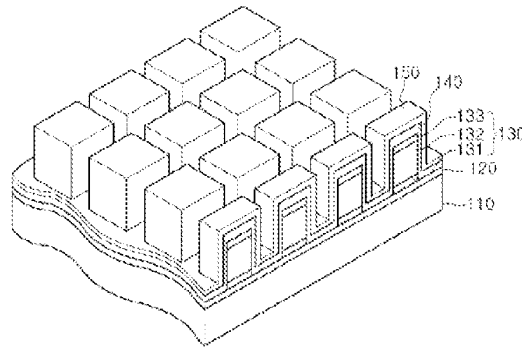
FIG. 2B



Hong et al. (US 2010/0193022) Fig. 12, shown below. “The light-converting layer 130 is formed in plurality spaced apart from each other. Each of the light-converting layers 130 includes a plurality of semiconductor layers. For example, each of the light-converting layers

130 includes a stack of a p-type amorphous silicon layer 131, an i-type amorphous silicon layer 132, and an n-type amorphous silicon layer 133. Herein, the p-type amorphous silicon layer 131 is a layer that is doped with p-type impurities, the i-type amorphous silicon layer 132 is a layer that is not doped with impurities, and the n-type amorphous silicon layer 133 is a layer that is doped with n-type impurities.”, ¶ 0039. This reference shows plural light sensitive pillars, but are lacking the holes formed in the pillars with dielectric filling.

[Fig. 12]



Hsu et al. (US 2008/0083963) Fig. 3G shown below. This reference shows plural light sensitive pillars, but are lacking the holes formed in the pillars with dielectric filling.

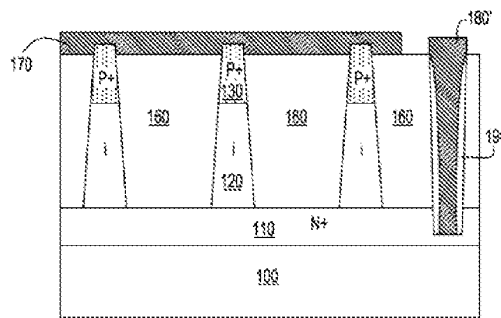


FIG. 3G

Han et al. (US 2013/0014814) Fig. 8, shown below, which depicts lattice constant on efficiency and Absorption, shown below.

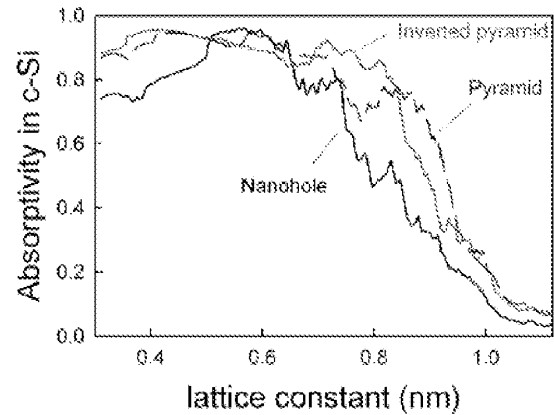


FIG. 9

Bandyopahyay et al. (US 8,207,064) Fig. 10G, shown below. This reference shows plural light sensitive pillars, but are lacking the holes formed in the pillars with dielectric filling.

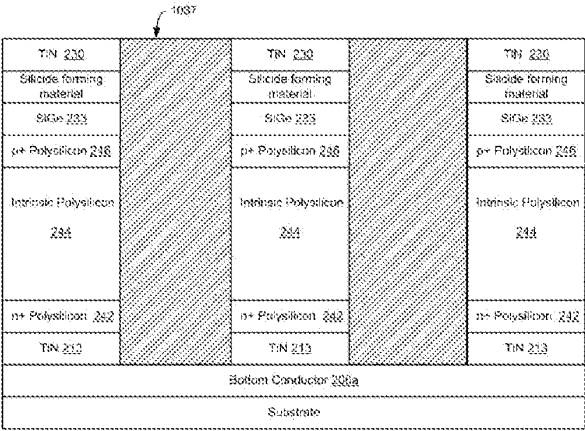


Fig. 10G

Applicant's Claim to Figure Comparison

It is noted that this comparison is merely for the benefit of reviewers of this office action during prosecution, to allow for an understanding of the examiner's interpretation of the Applicant's independent claims as compared to disclosed embodiments in Applicant's Figures. No response or comments are necessary from Applicant.

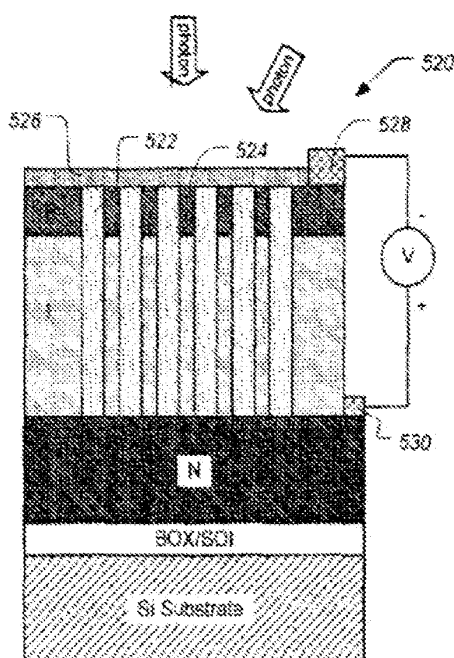


FIG. 5B

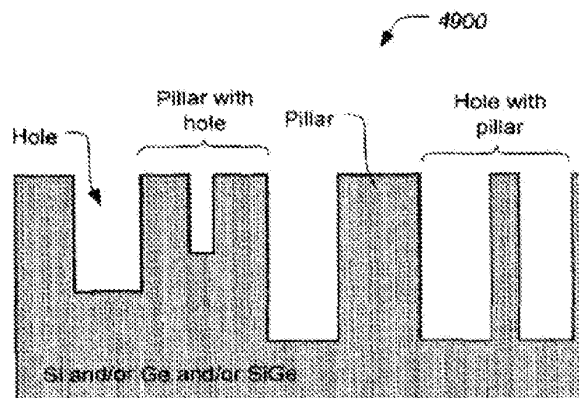


FIG. 49

Regarding claim 13, the Applicant discloses in Figs. 5B and 49, provided above, an integrated structure comprising:

an array of pillars comprising Si, Ge, and/or SiGe alloy semiconductor material wherein at least some of the pillars are configured as photodetectors that have respective light-receiving surfaces and have sides (from ¶ 0132, “Fig. 5B shows a microstructured pillar and or hole PD 520 in silicon with the starting material 500 consisting of a P-I-N Si layer grown on an Si substrate 502...”);

wherein at least some of the photodetectors comprise P-doped and N- doped regions and regions therebetween (P-I-N structure shown in Fig. 5B) and are configured to respond to illumination with light in selected visible and infrared wavelength ranges by generating electrical charge carriers (from ¶ 0132, “the optical signal wavelengths range from 750-1100 nm”);

one or more holes that are deliberately formed into the light-receiving surfaces (noted “holes” are understood to be further holes that are within surfaces of the pillars, and are in

addition to the “holes” or discontinuities in material that allow for the creation of the pillars), have elongated and/or other shapes at said light- receiving surfaces (see Fig. 49), extend into the photodetectors to a depth of 100 to 10000 nm (§ 0154), and are filled at least partly with solid dielectric material (§ 0095, “when structures such as ... holes (which can be filled with low index material ...”):

side-isolation comprising solid material at said sides of at least some of the photodetectors (passivation 522 in Fig. 5B, which isolates each pillar from a neighboring pillar);

a solid dielectric material forming a base dielectric region for said array (‘BOX/SOI’ layer shown in Fig. 5B); and

electrical contacts (528 and 530 as shown in Fig. 5B) configured to provide electrical pathways to at least some of the photodetectors, including for selected reverse-biasing thereof (discussed in at least § 0023);

wherein the presence of said one or more holes increases by a factor of at least 1.1 the absorption of the light by at least some of the photodetectors relative to an otherwise like photodetectors lacking said holes (discussed in § 0114).

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 Ivan S. Kavrukov on May 8, 2024.

The application has been amended as follows:

In the Claims:

Please amend claim 13 as follows. On the second to last line of the recitation of “photodetectors relative to ~~an~~ otherwise like photodetectors lacking said holes”, please delete the term “an”.

REASONS FOR ALLOWANCE

Claims 13-30 are allowed.

The following is an Examiner's statement of reasons for allowance: The integrated structure as recited in the claims of the instant invention fail to be taught by the prior art cited of interest.

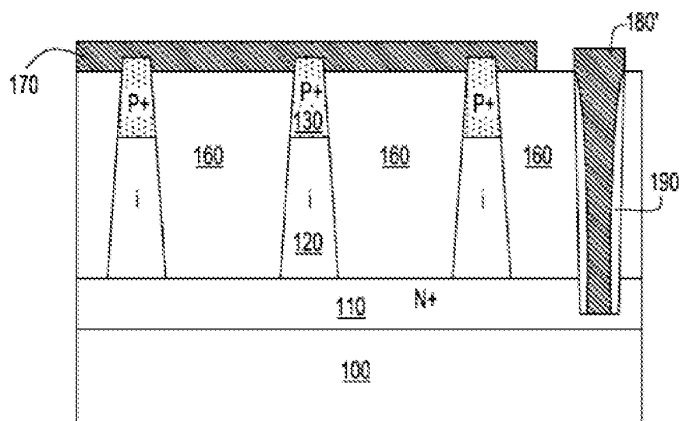


FIG. 3G

Regarding claim 13, the prior art of Hsu et al. (US 2008/0083963) discloses in Fig. 3G, a light converting pillar diode array, but fails to disclose the specific characteristic recited in the claims of the instant invention e.g. the combination of claimed limitations of an array of pillars and their particular semiconductor material that are configured as photodetectors, the photodetectors comprise P-I-N doping arrangement, holes are formed in the light receiving surfaces of the pillars, the holes are of a dimension as claimed, side-isolation, solid dielectric material, electrical contacts, the holes improve absorption by a particular amount. The prior art fails to disclose the particulars of the holes formed in the light receiving surfaces of the pillars. The Hsu reference (above) shows plural light sensitive pillars, but are lacking the particulars of the holes formed in the pillars, which are then filled with dielectric filling.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo A Rodela whose telephone number is (571)272-8797. The examiner can normally be reached M-F, 8:30-5:00pm ET.

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, Yara B Green can be reached on (571) 270-3035. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/EDUARDO A RODELA/
Primary Examiner, Art Unit 2893

<i>Examiner-Initiated Interview Summary</i>	Application No. 18/385,213	Applicant(s) WANG et al.		
	Examiner Eduardo A Rodela	Art Unit 2893	AIA (First Inventor to File) Status Yes	Page 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
Eduardo A Rodela	Primary Examiner	Telephonic
Ivan S. Kavrukov	Attorney of Record	

Date of Interview: 08 May 2024

Issues Discussed:

Other

Examiner sought to have Applicant, resubmit the document #3 on page 8 of the IDS (dated March 13, 2024), to include the date of publication, which is not currently present in the document. Applicant's Representative then supplied the date as June 2019 for said citation of the IDS document. Next, Examiner sought clarification on the support for claim 13 limitation of "side isolation". Applicant's Representative then supplied an explanation that the features were captured in para 0144 and in Fig. 9D as "filler 916". This is analogous to Fig. 5B's fillers identified as elements 522.

		/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893
<p>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</p> <p>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</p>		

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. 18/385,213		Applicant(s)/Patent Under Reexamination WANG et al.	
	Examiner Eduardo A Rodela		Art Unit 2893	Page 1 of 1

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*	B	US-20120255603-A1	2012-10-11	Yu; Young-June	H01L31/02363	257/E31.127
*	C	US-8207064-B2	2012-06-26	Bandyopadhyay; Abhijit	H01L29/456	438/682
*	D	US-20150096613-A1	2015-04-09	TJAHJONO; BUDI	H01L31/02363	136/256
*	E	US-20080083963-A1	2008-04-10	Hsu; Louis Lu-Chen	H01L27/1446	257/431
*	F	US-20100193022-A1	2010-08-05	Hong; Jin	H01L31/035281	257/E31.127
*	G	US-20040157354-A1	2004-08-12	Kuriyama, Akira	H01L31/105	438/45
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	I					
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	K					
	L					
	M					

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

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

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

Issue Classification 	Application/Control No. 18/385,213	Applicant(s)/Patent Under Reexamination WANG et al.
	Examiner Eduardo A Rodela	Art Unit 2893

CPC						
Symbol					Type	Version
H01L	/	31	/	035272	F	2013-01-01
H01L	/	31	/	035281	I	2013-01-01
H01L	/	31	/	075	I	2013-01-01
H01L	/	31	/	105	I	2013-01-01
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H01L	/	31	/	022475	I	2013-01-01
H01L	/	31	/	035209	I	2013-01-01
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893	07 May 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	13	5B, 49

U.S. Patent and Trademark Office

Part of Paper No.: 20240408

Issue Classification 	Application/Control No. 18/385,213	Applicant(s)/Patent Under Reexamination WANG et al.
	Examiner Eduardo A Rodela	Art Unit 2893

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Symbol					Type	Version
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H01L	/	31	/	1844	I	2013-01-01
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G02B	/	2006	/	12176	A	2013-01-01
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CPC Combination Sets						
Symbol			Type	Set	Ranking	Version
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893 (Primary Examiner)	07 May 2024 (Date)	O.G. Print Claim(s) 13	O.G. Print Figure 5B, 49

U.S. Patent and Trademark Office

Part of Paper No.: 20240408

Issue Classification 	Application/Control No. 18/385,213	Applicant(s)/Patent Under Reexamination WANG et al.	
	Examiner Eduardo A Rodela	Art Unit 2893	

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H01L	/	31	/ 0236
H01L	/	31	/ 0232

NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893	07 May 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	13	5B, 49

U.S. Patent and Trademark Office

Part of Paper No.: 20240408

Issue Classification 	Application/Control No. 18/385,213	Applicant(s)/Patent Under Reexamination WANG et al.
	Examiner Eduardo A Rodela	Art Unit 2893

☐ 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
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	2		11	8	20	17	29								
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	5	2	14	11	23										
	6	3	15	12	24										
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	8	5	17	14	26										
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NONE	Total Claims Allowed:	
(Assistant Examiner)	(Date)	18
/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893	07 May 2024	O.G. Print Claim(s)
(Primary Examiner)	(Date)	13
		O.G. Print Figure
		5B, 49

<i>Search Notes</i> 	Application/Control No. 18/385,213	Applicant(s)/Patent Under Reexamination WANG et al.
	Examiner Eduardo A Rodela	Art Unit 2893

CPC - Searched*		
Symbol	Date	Examiner
H01L31/02019; H01L31/022408; H01L31/02327; H01L31/02363; H01L31/028; H01L31/035281; H01L31/105; H01L31/107; H01L27/1446,146,14607,14625,14643,14649; H01L31/02027,02327,02363,035281,09,107,105	05/07/2024	EAR

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
PE2E search - see history for complete details	05/07/2024	EAR
Inventor & Applicant search	05/07/2024	EAR
IEEE Xplore	12/29/2023	EAR

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
noted CPC search area	in conjunction with a text limited search	05/07/2024	EAR

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<i>Search Notes</i> 	Application/Control No. 18/385,213	Applicant(s)/Patent Under Reexamination WANG et al.
	Examiner Eduardo A Rodela	Art Unit 2893

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Bibliographic Data

Application No: 18/385,213

Foreign Priority claimed: ☐ Yes ☒ No

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

Verified and Acknowledged: /EDUARDO A RODELA/

Examiner's Signature

Initials

Title:

MICROSTRUCTURE ENHANCED ABSORPTION
PHOTOSENSITIVE DEVICES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/30/2023	136	2893	309-0015USCIP
RULE			

APPLICANTS

W&W Sens Devices, Inc., Los Altos, CA, UNITED STATES

INVENTORS

Shih-Yuan WANG, Palo Alto, CA, UNITED STATES

Shih-Ping WANG, Los Altos, CA, UNITED STATES

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FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

11/14/2023

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Wissing Miller LLP
Industrious at Hudson Yards
31 Hudson Yards, 11th Floor

New York, NY 10001

UNITED STATES

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L72	70	((US-10622498-B2 OR US-11621360-B2 OR US-7525170-B2 OR US-9257583-B2 OR US-9841510-B2 OR US-6538299-B1 OR US-6177289-B1 OR US-6111305-A OR US-9496435-B2 OR US-11536914-B2 OR US-11757072-B2 OR US-8357960-B1 OR US-11855239-B2 OR US-11728457-B2 OR US-10854656-B2 OR US-9184202-B2 OR US-7183127-B2 OR US-7396696-B2 OR US-11502219-B2 OR US-9362448-B2 OR US-8946675-B2 OR US-8664636-B2 OR US-8659037-B2 OR US-8476637-B2 OR US-8431817-B2 OR US-7132677-B2 OR US-8129710-B2 OR US-9559231-B2 OR US-8330173-B2 OR US-7161220-B2 OR US-7022544-B2 OR US-6879014-B2 OR US-11550099-B2 OR US-11101304-B2 OR US-6027956-A OR US-5757057-A OR US-5625636-A OR US-4571559-A OR US-8829460-B2 OR US-11764248-B2 OR US-10651225-B2 OR US-11211419-B2 OR US-11152408-B2 OR US-11088189-B2).did. AND USPT.dbnm.) OR ((US-20230215962-A1 OR US-20180182806-A1 OR US-20180012918-A1 OR US-20120153127-A1 OR US-20120012741-A1 OR US-20160225631-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/06 09:24 AM

L73	14	A1 OR US- 20150054997-A1 OR US-20140263975-A1 OR US-20140001528- A1 OR US- 20040144985-A1 OR US-20040048092-A1 OR US-20110000545- A1 OR US- 20100313941-A1 OR US-20100288341-A1 OR US-20100221866- A1 OR US- 20100193768-A1 OR US-20090225804-A1 OR US-20090008735- A1 OR US- 20080218740-A1 OR US-20070134840-A1 OR US-20050184354- A1).did. AND PGPB.dbnm.) OR ((CN- 103348486-A).did. AND FTDB.dbnm.) OR ((WO-2012160662-A1 OR US-20120168613- A1 OR US-11094846- B1 OR US- 20150008554-A1).did. AND DWPI.dbnm.) "20180182806"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/06 11:29 AM
L74	13	("4827114" "5055894" "6111305" "6177289" "6300648" "6451702" "6538299" "6707126").pn. OR ("7525170").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/06 04:12 PM
L75	35	(@rlpd<="20130704" OR @rlad<="20130704"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY,	OR	ON	ON	2024/05/06 04:12 PM

L76	15	OR @pd<="20130704" OR @ad<="20130704") AND L74	CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
		("6515315" "6841807" "6897471" "7233051" "7259444" "7525170" "20040108516" "20040157354" "20050173712" "20060060933" "20060076589" "20080265357" "20110180894" "20110309240").pn. OR ("9166091").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/06 04:13 PM
L77	38	(Artificial Intelligence) More like doc: US-20040157354-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/06 04:47 PM
		Text: (US-7183127-B2 OR JP-2004193527-A OR JP-4235440-B2 OR JP- 2005353828-A OR WO- 2011156266-A2 OR EP-2580791-A2 OR KR-101786765-B1 OR KR-20140010921-A OR CN-103069585-B OR CN-103069585-A OR EP-2580791-B1 OR EP-3116036-A1 OR WO-2017005792-A1 OR EP-3320567-A1 OR US-20180199409-A1 OR WO-2011156266- A3 OR US-10201054- B2 OR EP-3320567-B1 OR JP-2020181937-A OR WO-2023064157- A1).did.					
L78	26099	(P-I-N OR "P-I-N") WITH (apd OR (avalanche NEAR photo NEAR diode) OR junction OR diode)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2024/05/06 05:37 PM

L79	507	(P-I-N OR "P-I-N") WITH (apd OR (avalanche NEAR photo NEAR diode) OR junction OR diode) WITH (column OR pillar)	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/06 05:37 PM
L80	444	(@rtpd<="20130704" OR @rlad<="20130704" OR @pd<="20130704" OR @ad<="20130704") AND L79	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/06 05:37 PM
L81	9	("7435996" "7453097" "20060207647" "20080083963" "20090165844" "20090194160" "20100078055" "20100193022" "20110240099").pn. OR ("9966486").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/07 09:11 AM
L82	41	(Artificial Intelligence) More like doc:	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2024/05/07 09:21 AM

L83	3581639	US-20080083963-A1 Text: (US-7525170-B2 OR CN-101159277-A OR CN-100568516-C OR CN-115295660-A OR EP-2747154-B1 OR WO-2012054436-A1 OR CN-103415929-B OR KR-20100138391-A OR CN-103415929-A OR KR-101033028-B1 OR EP-2717322-A1 OR US-20140166100-A1 OR WO-2013009615- A1 OR US- 20130009265-A1 OR US-8368159-B2 OR WO-2012160662-A1 OR JP- WO2012160662-A1 OR WO-2022138050-A1 OR US-9257583-B2 OR TW-I466307-B).did. (face OR surface) NEAR (textur\$2 OR pattern OR shapes OR pyramids OR divots OR dimples OR holes)	AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 09:29 AM
L84	21358	H01L31/0236,02363.cp c.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 10:03 AM
L85	11	(@r!pd<="20130704"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07

		OR @rlad<="20130704" OR @pd<="20130704" OR @ad<="20130704") AND L79 AND L84	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				10:04 AM
L86	4780	(@rlpd<="20130704" OR @rlad<="20130704" OR @pd<="20130704" OR @ad<="20130704") AND L83 AND L84	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 10:27 AM
L87	26100	(P-I-N OR "P-I-N") WITH (apd OR (avalanche NEAR photo NEAR diode) OR junction OR diode)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 10:27 AM
L88	194	(@rlpd<="20130704" OR @rlad<="20130704" OR @pd<="20130704" OR @ad<="20130704") AND L83 AND L84 AND L87	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2024/05/07 10:28 AM

L89	4	("20080006319" "20080185036" "20090194160" "20100001359").pn. OR ("9331220").urpn. AND (PGPB USPT USOC).dbnm.	PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/07 12:48 PM
L90	35	(Artificial Intelligence) More like doc: US-20120255603-A1 Text: (WO-2023221714-A1 OR US-10658529-B2 OR US-10230010-B2 OR US-20160204286- A1 OR DE- 102012210875-A1 OR US-20150255641-A1 OR US-20130000704- A1 OR US-9741880-B2 OR US-20170288071- A1 OR DE- 102012210875-B4 OR US-10347779-B2 OR US-11011655-B2 OR US-20190237597-A1 OR WO-2013186945- A1 OR KR- 20150104431-A OR WO-2013125036-A1 OR JP- WO2013125036-A1 OR CN-115117198-A OR KR-20120086593-A OR AT-411409-B).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 01:08 PM
L91	38	(Artificial Intelligence) More like doc: US-20130014814-A1 Text: (WO-2011085297-A1 OR WO-2013028510- A2 OR US- 20140209154-A1 OR US-20230231066-A1 OR CH-633631-A5 OR US-20120060913-A1 OR US-8314327-B2 OR KR-101575854-B1 OR WO-2019194911-A1 OR US-10935702-B2 OR US-20070204901-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 02:15 PM

L92	25	A1 OR WO- 2013171286-A1 OR US-20090293931-A1 OR JP-2023123575-A OR JP-7381486-B2 OR US-20190302325-A1 OR TW-201001729-A OR EP-3776666-A1 OR US-8829337-B1 OR CN-103237745-B).did. ("4514748" "5604136" "5714772" "6452218" "7008813").pn. OR ("7186611").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/07 03:14 PM
L93	2	((("W&W") near3 ("Sens") near3 ("Devices") near3 ("Inc"))).AS,AANM.	(US-PGPUB; USPAT)	OR	ON	ON	2024/05/07 04:45 PM
L94	859	((("WANG") near3 ("Shih-Yuan")) OR (("WANG") near3 ("Shih-Ping"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2024/05/07 04:45 PM
L95	0	(L93 OR L94) AND ((array)(pillar\$1)("Si" OR "Ge" OR "SiGe" OR silicon OR germanium OR (silicon NEAR germainum))(photo NEAR detect\$3)(light NEAR recciving NEAR surface\$1)((p-dop\$1 OR p-type OR "P") NEAR region)((n-dop\$1 OR n-type OR "N") NEAR region)((undop\$3 OR intrinsic) NEAR (region))(holes OR divots OR textur\$2 OR (inverted NEAR pyramid OR cylinder)))(contacts)(ab sorption OR abosorb\$3))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	AND	ON	ON	2024/05/07 05:05 PM
L96	1	single WITH micro-hole WITH per WITH pixel	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO,	OR	ON	ON	2024/05/07 06:04 PM

L97	15	(single WITH (micro NEAR hole) WITH pixel) AND cmos	RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:05 PM
L98	11	(@rlpd<="20130704" OR @rlad<="20130704" OR @pd<="20130704" OR @ad<="20130704") AND L97	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:05 PM
L99	36	(Artificial Intelligence) More like doc: WO-2005072370-A2 Text: (EP-1712087-A2 OR US-20050225654-A1 OR EP-2315448-A1 OR JP-2007520166-A OR KR-20070019979-A OR EP-2315448-B1 OR US-7773143-B2 OR JP-4797151-B2 OR KR-101227544-B1 OR JP-2011072039-A OR EP-1712087-B1 OR JP-5646445-B2 OR JP-2012070431-A OR CN-1934872-A OR CN-1934872-B OR CN-105141933-A OR CN-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:06 PM

L100	44	105141933-B OR WO-2005072370-A3 OR US-20050073603-A1 OR US-7405761-B2).did. ("4479143" "4804249" "5355222" "5568197" "5671073" "5748371" "5757423" "5760832" "6069738" "6108036" "6137535" "6346969" "6366319" "6414296" "6417950" "6541284" "6611289" "6632701" "6882364" "7003177" "7009652" "7034866" "20020089596" "20020122124" "20020163582" "20020181123" "20020181126" "20050073603" "20050104991" "20050128335" "20050242410" "20050248680" "20050258350" "20060044450").pn. OR ("7773143").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/07 06:06 PM
L101	2	(single WITH (micro NEAR hole) WITH (pillar OR column)) AND pixel AND cmos	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:08 PM
L102	7	(single WITH (micro NEAR hole) WITH (pillar OR column)) AND pixel	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2024/05/07 06:08 PM

L103	8	"20160307939"	PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:09 PM
L104	31	("11211419" "11728457 "20180182806" "6879 014" "7396696" "75251 70" "8129710" "835796 0" "8946675" "9184202").PN.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:18 PM
L105	61	(US-10411053-\$ US- 10522582-\$ US- 11309444-\$ US- 6879014-\$ US- 7396696-\$ US- 7525170-\$ US- 8558336-\$ US- 9000492-\$).DID. OR (US-11211419-\$ US- 11728457-\$ US- 20100320444-\$ US- 20110309331-\$ US- 20180182806-\$ US- 8129710-\$ US- 8357960-\$ US- 8946675-\$ US- 9184202-\$).DID. OR (US-20110156195-\$ US-20120012741-\$	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/05/07 06:27 PM

L106	8	US-20120153127-\$ US-20160240579-\$ US-20170141153-\$ US-20180012918-\$ US-20180102442-\$ US-20190166317-\$ US-20200006407-\$).DID. OR (US-20200006407-\$ US-20200006416-\$).DID. OR (US-20050145779-\$ US-20120153416-\$).DID. OR (US-0103255-\$ US-09040854-\$ US-20080101301-\$).DID. ("6147732" "8711263" "20050040440" "20110222145" "20120153416" "20130075849" "20140184810" "20150268394").pn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/05/07 06:36 PM
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PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	0	((H01L31/02019 OR H01L31/022408 OR H01L31/02327 OR H01L31/02363 OR H01L31/028 OR H01L31/035281 OR H01L31/105 OR H01L31/107).cpc.) OR L84) AND ((array)(pillar\$1)("Si" OR "Ge" OR "SiGe" OR silicon OR germanium OR (silicon NEAR germanium))(photo NEAR detect\$3)(light NEAR receiving NEAR surface\$1)((p-dop\$1 OR p-type OR "P") NEAR region)((n-dop\$1 OR n-type OR "N") NEAR region)((undop\$3 OR intrinsic) NEAR (region))(holes OR divots OR textur\$2 OR (inverted NEAR (pyramid OR cylinder)))(contacts)(ab	(US-PGPUB; USPAT)	AND	ON	ON	2024/05/07 05:15 PM

		sorption OR abosorb\$3)).clm.					
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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		18385213
	Filing Date		2023-10-20
	First Named Inventor	Shih-Yuan WANG	
	Art Unit	2893	
	Examiner Name	EDUARDO A RODELA	
	Attorney Docket Number	309-0015USCIP	

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	11309444		2022-04-19	Wang et al.	
	2	8558336		2013-10-15	Su	
	3	10411053		2019-09-10	Yokogawa	
	4	10522582		2019-12-31	Maruyama et al.	
	5	9000492		2015-04-07	Suzuki et al.	
	6	6879014		2005-04-12	Wagner	
	7	7396696		2008-07-08	Kim	
	8	7525170		2009-04-28	Hsu	

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	9	8129710		2012-03-06	Cho	
	10	8357960		2013-01-22	Dutta	
	11	8946675		2015-02-03	Yu	
	12	9184202		2015-11-10	Dutta	
	13	11211419		2021-12-28	Wu	
	14	11728457		2023-08-15	Sung	

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20100320444		2010-12-23	Dutta	
	2	20110309331		2011-12-22	Yu et al.	
	3	20180182806		2018-06-28	Jin et al.	

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	4	20110156195		2011-06-30	Tivarus et al.	
	5	20120153127		2012-06-21	Hirigoyen et al.	
	6	20180012918		2018-01-11	Na et al.	
	7	20190166317		2019-05-30	Tanaka et al.	
	8	20120012741		2012-01-19	Vasylyev	
	9	20180102442		2018-04-12	Wang	
	10	20160240579		2016-08-18	Sun et al.	
	11	20170141153		2017-05-18	Lee et al.	
	12	20180102442		2018-04-12	Wang et al.	
	13	20200006407		2020-01-02	Yokogawa	
	14	20200006416		2020-01-02	Baba et al.	

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² i	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	20080101301	KR		2008-11-21	Dongbu Hitek Co. Ltd.		☐
	2	2002314116	JP		2002-10-25	Seiko Epson Corp.		☐
	3	0103255	WO		2001-01-11	Scott		☐
	4	2019018846	WO		2019-01-24	W&W Sens Devices Inc.		☐
	5	09040854	EP		1999-09-08	IBM United Kingdom Limited		☐
	6	2007013065	JP		2007-01-18	Matsushita Electric Works Ltd.		☐
	7	103956403	CN		2017-02-15	Suzhou Beipeng Photoelectric Technology Co. Ltd.		☐

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	1	Copy of International Search Report and Written Opinion for PCT/US2020/051733 mailed December 17, 2020.	☐
	2	Copy of Written Opinion of International Search Report for PCT/US2020/051733 dated December 17, 2020.	☐
	3	BEAUSOLEIL, Nanoelectronic and Nanophotonic Interconnect, The emerging integrated circuit interconnection bottleneck may be overcome if tiny, efficient photon-transport waveguides and small transceivers for photon-electron information exchange can be developed, 18 pages, January 29, 2007; revised September 25, 2007.	☐
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If you wish to add additional non-patent literature document citation information please click the Add button			
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Examiner Signature	/EDUARDO A RODELA/		Date Considered 05/07/2024
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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	2	8680591		2014-03-25	Haddad et al.	
	3	9299865		2016-03-29	Marty et al.	
	4	9871147		2018-01-16	Kotani et al.	
	5	10600930		2020-03-24	Suzuki et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20120313204		2012-12-13	Haddad et al.	

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	2	20130167915		2013-07-14	Moslehi et al.	
	3	20170141243		2017-05-18	Kotani et al.	
	4	20170263798		2017-09-14	Suzuki et al.	
	5	20200075656		2020-03-05	Lee et al.	
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	13	20180012918		2018-01-11	Na et al.	
	14	20180102442		2018-04-12	Wang et al.	
	15	20190166317		2019-05-30	Tanaka et al.	

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NON-PATENT LITERATURE DOCUMENTS

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	1	E. PONIZOVSKAYA DEVINE et al., Single Microhole per Pixel in CMOS Image Sensors with Enhanced Optical Sensitivity in Near-Infrared, IEEE Sensors Journal, 2021, pages 1-7.	☐
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	Attorney Docket Number	309-0015USCIP	

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6	Copy of International Search Report for PCT Application No. PCT/US20/51733, mailed December 17, 2020.	☐

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EXAMINER SIGNATURE

Examiner Signature	/EDUARDO A RODELA/	Date Considered	05/07/2024
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	Art Unit	2893
	Examiner Name	EDUARDO A RODELA
	Attorney Docket Number	309-0015USCIP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ivan S. Kavrukov/	Date (YYYY-MM-DD)	2024-03-13
Name/Print	Ivan S. Kavrukov	Registration Number	25,161

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**