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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/146,350	11/08/2022	11495898	20160.0047.NPUS00	6009

63467 7590 10/19/2022
Ramey LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

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 23 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 Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

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

Xike LIU, Shanghai, CHINA;
Zhining LI, Shanghai, CHINA;
Xiangxiang YE, Shanghai, CHINA;
Gaige MEI, Shanghai, CHINA;

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

Credo Technology Group Limited, Grand Cayman, CAYMAN ISLANDS;

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)

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
17146350	11-Jan-2021	Xike LIU	20160.0047.NPUS00	6009

TITLE OF INVENTION :

CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2831	055000	PHUONG CHI NGUYEN
Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
\$1200	\$0	\$1200	23-Dec-2022	\$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
63467 Ramey LLP 5020 Montrose Blvd. Suite 800 Houston TX 77006 UNITED STATES 713 426 3923 tevenbly@rameyfirm.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status**Change in Entity Status**

Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.

Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.



Applicant asserting small entity status. See 37 CFR 1.27.

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.



Applicant changing to regular undiscounted fee status.

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



Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:☒ Issue Fee☐ I authorize USPTO to apply my previously paid issue fee to the current fees due☐ Publication Fee☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____☐ Advance Order - # of copies _____

☐ If in **addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number _____.

☐ The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed**NOTE: If no name is listed, no name will be printed**

For printing on the patent front page, list to be displayed as entered

1. Ramey LLP

2. Daniel J. Krueger

3.

5.Assignee Name(s) and Residence Data To Be Printed

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

Name	City	State	Country	Category
Credo Technology Group Limited	Grand Cayman		CAYMAN ISLANDS	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Dan Krueger/	Date	10-06-2022
Name	Daniel Joseph Krueger	Registration Number	42771

Electronic Patent Application Fee Transmittal				
Application Number:		17146350		
Filing Date:		11-Jan-2021		
Title of Invention:		CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		
First Named Inventor/Applicant Name:		Xike LIU		
Filer:		Daniel Joseph Krueger/Theresa Evenbly		
Attorney Docket Number:		20160.0047.NPUS00		
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 APPL ISSUE FEE	1501	1	1200	1200
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
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 (\$)				1200

Electronic Acknowledgement Receipt	
EFS ID:	46771300
Application Number:	17146350
International Application Number:	
Confirmation Number:	6009
Title of Invention:	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY
First Named Inventor/Applicant Name:	Xike LIU
Customer Number:	63467
Filer:	Daniel Joseph Krueger/Theresa Evenbly
Filer Authorized By:	Daniel Joseph Krueger
Attorney Docket Number:	20160.0047.NPUS00
Receipt Date:	06-OCT-2022
Filing Date:	11-JAN-2021
Time Stamp:	18:54:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1200
RAM confirmation Number	E202206154573360
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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)	Web85b.pdf	62503	no	2
			48ad8f9428f6e2ccb4f5c5ba1b6b30fec1273d05		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	40426	no	2
			98322bdf68214ebd61a3f94d64e03e7cf224a1a9		
Warnings:					
Information:					
Total Files Size (in bytes):			102929		
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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NOTICE OF ALLOWANCE AND FEE(S) DUE

63467 7590 09/23/2022
Ramey LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

EXAMINER

NGUYEN, PHUONG CHI THI

ART UNIT

PAPER NUMBER

2831

DATE MAILED: 09/23/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00	6009

TITLE OF INVENTION: CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	12/23/2022

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. 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.

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)

63467 7590 09/23/2022
Ramey LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

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 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.
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00	6009

TITLE OF INVENTION: CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	12/23/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, PHUONG CHI THI	2831	439-055000

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

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/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,

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

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00	6009
63467	7590	09/23/2022	EXAMINER	
Ramey LLP 5020 Montrose Blvd. Suite 800 Houston, TX 77006			NGUYEN, PHUONG CHI THI	
			ART UNIT	PAPER NUMBER
			2831	
DATE MAILED: 09/23/2022				

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); (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. 17/146,350	Applicant(s) LIU et al.	
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831	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 IDS [RCE 08/15/2022].
☐ 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 1-20 . 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 08/15/22.	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. _____.	

/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831	
--	--

REASONS FOR ALLOWANCE

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 15, 2022 has been entered.
3. Claims 1-20 are allowed.
3. The following is an examiner's statement of reasons for allowance: Kawaguchi et al [US7655869] fails to teach or suggest a printed circuit board that comprises edge connector traces arranged along a first edge; Outer and inner sets of electrodes arranged parallel to a second edge for attaching exposed ends of sheathed wires in outer and inner wires of a cable, respectively; with the electrodes in the inner set being staggered relative to the electrodes in the outer set.
4. 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."
5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuongchi Nguyen whose telephone number is (571) 272-2012. The examiner can normally be reached on 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RIYAMI ABDULLAH A can be reached on 571-270-3119. 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 <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (tollfree).

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.

/PHUONG CHI THI NGUYEN/

Primary Examiner, Art Unit 2831

<i>Notice of References Cited</i>	Application/Control No. 17/146,350		Applicant(s)/Patent Under Reexamination LIU et al.	
	Examiner PHUONG CHI T NGUYEN		Art Unit 2831	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-6143108-A	11-2000	Risen, Jr.; William M.	C09J183/06	385/134
	B					
	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.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20220916

Issue Classification 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

CPC						
Symbol					Type	Version
H01R	/	12	/	53	F	2013-01-01
H05K	/	1	/	117	I	2013-01-01
H01R	/	43	/	02	I	2013-01-01
H05K	/	2201	/	09409	A	2013-01-01
H05K	/	2201	/	09163	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
/		/			

NONE (Assistant Examiner) (Date)		Total Claims Allowed: 20	
/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831 (Primary Examiner) (Date)		16 September 2022 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 6+7

Issue Classification 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H01R		3	00
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
439	491

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

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831 (Primary Examiner) _____ (Date) 16 September 2022		O.G. Print Claim(s) 1	O.G. Print Figure 6+7

Issue Classification 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

☐ 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
1	1	10	10	19	19										
2	2	12	11	20	20										
4	3	13	12												
5	4	14	13												
6	5	15	14												
7	6	11	15												
8	7	16	16												
3	8	17	17												
9	9	18	18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831 (Primary Examiner) _____ (Date) 16 September 2022		O.G. Print Claim(s) 1	O.G. Print Figure 6+7

<i>Search Notes</i> 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

CPC - Searched*		
Symbol	Date	Examiner
h01r12/79, h01r12/78, h01r12/592	06/02/2022	pn

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
see interference search attached	06/02/2022	pn

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
see interference search attached		09/16/2022	pn

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<i>Index of Claims</i> 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS									
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47									
CLAIM		DATE							
Final	Original	06/02/2022	09/16/2022						
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	2	=	=						
	3	=	=						
	4	=	=						
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	19	=	=						
	20	=	=						



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BIB DATA SHEET

CONFIRMATION NO. 6009

SERIAL NUMBER 17/146,350	FILING or 371(c) DATE 01/11/2021 RULE	CLASS 439	GROUP ART UNIT 2831	ATTORNEY DOCKET NO. 20160.0047.NPUS00	
APPLICANTS Credo Technology Group Limited, Grand Cayman, CAYMAN ISLANDS; INVENTORS Xike LIU, Shanghai, CHINA; Zhining LI, Shanghai, CHINA; Xiangxiang YE, Shanghai, CHINA; Gaike MEI, Shanghai, CHINA; ** CONTINUING DATA ***** NONE /PN/ ** FOREIGN APPLICATIONS ***** YES /PN/ CHINA 202010149136.4 03/05/2020 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 01/22/2021					
Foreign Priority claimed ☒ Yes ☐ No 35 USC 119(a-d) conditions met ☒ Yes ☐ No Verified and /PHUONG CHI THI Acknowledged NGUYEN/ Examiner's Signature	☒ Met after Allowance /c/ Initials	STATE OR COUNTRY CHINA	SHEETS DRAWINGS 4	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS Ramey & Schwaller, LLP 5020 Montrose Blvd. Suite 800 Houston, TX 77006 UNITED STATES					
TITLE CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY					
FILING FEE RECEIVED 1820	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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Receipt date 08.15.2022 INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17146350
	Filing Date	2021-01-11
	First Named Inventor	Xike Liu
	Art Unit	2831
	Examiner Name	Phuong Chi Thi Nguyen
	Attorney Docket Number	20160.0047.NPUS00

U.S.PATENTS						Remove
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
/pn/	1	7881064	B2	2011-02-01	Cole, et al	
	2	9049787	B2	2015-06-02	Bugg	
	3	9705273	B2	2017-07-11	Guetig, et al	
	4	9748723	B2	2017-08-29	Sussman	
	5	9751144	B2	2017-09-05	Wu, et al	
	6	10165671	B2	2018-12-25	Bugg	
	7	10193268	B1	2019-01-29	Chow, et al	
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Receipt date 08.15.2022 INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17146350
	Filing Date		2021-01-11
	First Named Inventor	Xike Liu	
	Art Unit	2831	
	Examiner Name	Phuong Chi Thi Nguyen	
	Attorney Docket Number	20160.0047.NPUS00	

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
/pn/	1	20090197459	A1	2009-08-06	Yu, et al	
/pn/	2	20170271834	A1	2017-09-21	Guetig, et al	

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
/pn/	1	MAEDA, K., NORIMATSU, T., KOGO, K., KOHMU, N., NISHIMURA, K., and FUKASAKU, I., "An Active Copper-Cable Supporting 56-Gbit/s PAM4 and 28-Gbit/s NRZ with Continuous Time Linear Equalizer IC for to-Meters Reach Interconnection," 2018 IEEE Symposium on VLSI Circuits, 2018, pp. 49-50, doi: 10.1109/VLSIC.2018.8502352.	

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Examiner Signature	/PCN/	Date Considered	09.15.22
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17146350
	Filing Date	2021-01-11
	First Named Inventor	Xike Liu
	Art Unit	2831
	Examiner Name	Phuong Chi Thi Nguyen
	Attorney Docket Number	20160.0047.NPUS00

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17146350
	Filing Date	2021-01-11
	First Named Inventor	Xike Liu
	Art Unit	2831
	Examiner Name	Phuong Chi Thi Nguyen
	Attorney Docket Number	20160.0047.NPUS00

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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	/Dan Krueger/	Date (YYYY-MM-DD)	2022-08-15
Name/Print	Daniel J. Kruger	Registration Number	42771

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.**

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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.

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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.
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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.
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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.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L13	3904	(H01R12/79, H01R12/78, H01R12/592).CPC.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:04 PM
L14	13	Xike.in. SAME LIU.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:25 PM
L15	14	Zhining.in. SAME LI.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:27 PM
L16	2	Xiangxiang.in. SAME YE.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:58 PM
L17	1	Gaige.in. SAME MEI.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:59 PM
L24	50	"7881064" "9049787" "9705273" "9748723" "9751144" "10165671" "10193268" "20090197459" "20170271834"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/16 05:43 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	1	(exposed SAME sheathed ADJ wires SAME electrodes SAME staggered SAME outer ADJ set).CLM.	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/03 06:07 PM

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (01-22)

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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL **(Submitted Only via EFS-Web)**

Application Number	17146350	Filing Date	2021-01-11	Docket Number (if applicable)	20160.0047.NPUS00	Art Unit	2831
First Named Inventor	Xike Liu			Examiner Name	Phuong Chi Thi Nguyen		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☐ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
 (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to
 Deposit Account No 602539

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (01-22)

Approved for use through 05/31/2024. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Signature of Registered U.S. Patent Practitioner			
Signature	Dan Krueger/	Date (YYYY-MM-DD)	2022-08-15
Name	Daniel J. Krueger	Registration Number	42771

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 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, VA 22313-1450.

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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.

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)

Approved for use through 05/31/2024. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17146350
	Filing Date	2021-01-11
	First Named Inventor	Xike Liu
	Art Unit	2831
	Examiner Name	Phuong Chi Thi Nguyen
	Attorney Docket Number	20160.0047.NPUS00

U.S.PATENTS						Remove
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	7881064	B2	2011-02-01	Cole, et al	
	2	9049787	B2	2015-06-02	Bugg	
	3	9705273	B2	2017-07-11	Gueting, et al	
	4	9748723	B2	2017-08-29	Sussman	
	5	9751144	B2	2017-09-05	Wu, et al	
	6	10165671	B2	2018-12-25	Bugg	
	7	10193268	B1	2019-01-29	Chow, et al	
If you wish to add additional U.S. Patent citation information please click the Add button.						Add
U.S.PATENT APPLICATION PUBLICATIONS						Remove

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17146350
	Filing Date		2021-01-11
	First Named Inventor	Xike Liu	
	Art Unit	2831	
	Examiner Name	Phuong Chi Thi Nguyen	
	Attorney Docket Number	20160.0047.NPUS00	

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	20090197459	A1	2009-08-06	Yu, et al	
	2	20170271834	A1	2017-09-21	Guetig, et al	

If you wish to add additional U.S. Published Application citation information please click the Add button.

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FOREIGN PATENT DOCUMENTS

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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
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NON-PATENT LITERATURE DOCUMENTS

Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	MAEDA, K., NORIMATSU, T., KOGO, K., KOHMU, N., NISHIMURA, K., and FUKASAKU, I., "An Active Copper-Cable Supporting 56-Gbit/s PAM4 and 28-Gbit/s NRZ with Continuous Time Linear Equalizer IC for to-Meters Reach Interconnection," 2018 IEEE Symposium on VLSI Circuits, 2018, pp. 49-50, doi: 10.1109/VLSIC.2018.8502352.	

If you wish to add additional non-patent literature document citation information please click the Add button

Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17146350
	Filing Date	2021-01-11
	First Named Inventor	Xike Liu
	Art Unit	2831
	Examiner Name	Phuong Chi Thi Nguyen
	Attorney Docket Number	20160.0047.NPUS00

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17146350
	Filing Date	2021-01-11
	First Named Inventor	Xike Liu
	Art Unit	2831
	Examiner Name	Phuong Chi Thi Nguyen
	Attorney Docket Number	20160.0047.NPUS00

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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	/Dan Krueger/	Date (YYYY-MM-DD)	2022-08-15
Name/Print	Daniel J. Kruger	Registration Number	42771

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.**

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.
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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.



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PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/146,350

RECEIPT DATE / TIME
08/15/2022 07:40:48 PM ET

ATTORNEY DOCKET #
20160.0047.NPUS00

Title of Invention

CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 6009

FILED BY Theresa Evenbly

PATENT CENTER # 60864865

FILING DATE 01/11/2021

CUSTOMER # 63467

FIRST NAMED INVENTOR Xike LIU

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Daniel Krueger

Documents

TOTAL DOCUMENTS: 3

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
An Active Copper-Cable Supporting 56-Gbits PAM4 and 28-Gbits NRZ with Continuous.pdf	2	Non Patent Literature	538 KB
2022-08-10 20160.0047 RCEsb0030efs.pdf	3	Request for Continued Examination (RCE)	1628 KB
2022-08-10 20160.0047 updated_IDS.pdf	5	Information Disclosure Statement (IDS) Form (SB08)	1234 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
An Active Copper-Cable Supporting 56-Gbits PAM4 and 28-Gbits NRZ with Continuous.pdf	BC4121A4076CB34348ED88525A3249FBA694432D652AF97644 0875616195292B7E077AEBC6D35E8C770347F752641E6EECD3 22277AE66B7424D23DB7F9DAD47C
2022-08-10 20160.0047 RCEsb0030efs.pdf	C92227B7F0901E67BD6C40B2821FD2ED6A6DA0DB6FFDCBC5 62DB41EC1B8664C3FFEE4BAE304C1E6B01A513D06E40E0718 E10C0AA9F4F2345C5AFC8AF3C6693FE
2022-08-10 20160.0047 updated_IDS.pdf	231A4A3C3A93A757576A3311A2752F8BEB9505C1132E309557 9D8E5DB2AE647104EA6065D7A5CB3385517960E1A8262C1FD 41FE241E1386619381FBDB0A674C2

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 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.



**UNITED STATES
PATENT AND TRADEMARK OFFICE**

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #
17/146,350

RECEIPT DATE / TIME
08/15/2022 07:40:48 PM ET

ATTORNEY DOCKET #
20160.0047.NPUS00

Title of Invention

CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 6009

FILED BY Theresa Evenbly

PATENT CENTER # 60864865

AUTHORIZED BY Daniel Krueger

CUSTOMER # 63467

FILING DATE 01/11/2021

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Xike LIU

Payment Information

PAYMENT METHOD
CARD / 2005

PAYMENT TRANSACTION ID
E20228EJ42032632

PAYMENT AUTHORIZED BY
Theresa Evenbly

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1801	REQUEST FOR CONTINUED EXAMINATION (RCE) - 1ST REQUEST (SEE 37 CFR 1.114)	1360.00	1	1360.00
TOTAL AMOUNT:				\$1,360.00

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 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

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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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NOTICE OF ALLOWANCE AND FEE(S) DUE

63467 7590 06/09/2022
Ramey LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

EXAMINER

NGUYEN, PHUONG CHI THI

ART UNIT

PAPER NUMBER

2831

DATE MAILED: 06/09/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00	6009

TITLE OF INVENTION: CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/09/2022

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. 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.

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)

63467 7590 06/09/2022
Ramey LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

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 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.
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00	6009

TITLE OF INVENTION: CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/09/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, PHUONG CHI THI	2831	439-055000

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

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/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) ☐ 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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00	6009
63467	7590	06/09/2022	EXAMINER	
Ramey LLP 5020 Montrose Blvd. Suite 800 Houston, TX 77006			NGUYEN, PHUONG CHI THI	
			ART UNIT	PAPER NUMBER
			2831	
DATE MAILED: 06/09/2022				

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.

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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 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. 17/146,350	Applicant(s) LIU et al.	
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831	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 _____.
☐ 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 1-20 . 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. _____.	

/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831	
--	--

REASONS FOR ALLOWANCE

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
2. Claims 1-20 are allowed.
3. The following is an examiner's statement of reasons for allowance: Kawaguchi et al [US7655869] fails to teach or suggest a printed circuit board that comprises edge connector traces arranged along a first edge; Outer and inner sets of electrodes arranged parallel to a second edge for attaching exposed ends of sheathed wires in outer and inner wires of a cable, respectively; with the electrodes in the inner set being staggered relative to the electrodes in the outer set.
4. 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."
5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuongchi Nguyen whose telephone number is (571) 272-2012. The examiner can normally be reached on 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RIYAMI ABDULLAH A can be reached on 571-270--3119. 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 <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (tollfree).

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.

Application/Control Number: 17/146,350
Art Unit: 2831

Page 3

/PHUONG CHI THI NGUYEN/

Primary Examiner, Art Unit 2831

Notice of References Cited	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.	
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831	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-7655869-B2	02-2010	Kawaguchi; Katsuo	H05K3/4691	174/254
*	B	US-6496384-B1	12-2002	Morales; Jorge	H05K3/366	29/830
*	C	US-3490096-A	01-1970	JOHNSON RUSSELL W	E04F13/0862	425/170
*	D	US-5122064-A	06-1992	Zarrei; Mansour	H01R12/58	439/79
*	E	US-5838579-A	11-1998	Olson; Janet	G06F30/33	703/2
*	F	US-6076726-A	06-2000	Hoffmeyer; Mark Kenneth	H05K3/3463	228/56.3
*	G	US-5629839-A	05-1997	Woychik; Gerard A.	H05K3/366	439/55
*	H	US-9549469-B2	01-2017	Beaman; Brian Samuel	H05K3/403	1/1
	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.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20220603

<i>Search Notes</i> 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

CPC - Searched*		
Symbol	Date	Examiner
h01r12/79, h01r12/78, h01r12/592	06/02/2022	pn

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
see interference search attached	06/02/2022	pn

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
see interference search attached		06/02/2022	pn

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Issue Classification 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

CPC						
Symbol					Type	Version
H01R	/	12	/	53	F	2013-01-01
H05K	/	1	/	117	I	2013-01-01
H01R	/	43	/	02	I	2013-01-01
H05K	/	2201	/	09409	A	2013-01-01
H05K	/	2201	/	09163	A	2013-01-01

CPC Combination Sets							
Symbol				Type	Set	Ranking	Version
	/		/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831	02 June 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6+7

U.S. Patent and Trademark Office

Part of Paper No.: 20220603

Issue Classification 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H01R		3	00
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
439	491

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831	02 June 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6+7

Issue Classification 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

☐ 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
1	1	10	10	19	19										
2	2	12	11	20	20										
4	3	13	12												
5	4	14	13												
6	5	15	14												
7	6	11	15												
8	7	16	16												
3	8	17	17												
9	9	18	18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/PHUONG CHI THI NGUYEN/ Primary Examiner, Art Unit 2831 (Primary Examiner) _____ (Date) 02 June 2022		O.G. Print Claim(s) 1	O.G. Print Figure 6+7

U.S. Patent and Trademark Office

Part of Paper No.: 20220603

<i>Index of Claims</i> 	Application/Control No. 17/146,350	Applicant(s)/Patent Under Reexamination LIU et al.
	Examiner PHUONG CHI T NGUYEN	Art Unit 2831

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	06/02/2022								
	1	=								
	2	=								
	3	=								
	4	=								
	5	=								
	6	=								
	7	=								
	8	=								
	9	=								
	10	=								
	11	=								
	12	=								
	13	=								
	14	=								
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	17	=								
	18	=								
	19	=								
	20	=								



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BIB DATA SHEET

CONFIRMATION NO. 6009

SERIAL NUMBER 17/146,350	FILING or 371(c) DATE 01/11/2021 RULE	CLASS 439	GROUP ART UNIT 2831	ATTORNEY DOCKET NO. 20160.0047.NPUS00	
APPLICANTS Credo Technology Group Limited, Grand Cayman, CAYMAN ISLANDS; INVENTORS Xike LIU, Shanghai, CHINA; Zhining LI, Shanghai, CHINA; Xiangxiang YE, Shanghai, CHINA; Gaike MEI, Shanghai, CHINA; ** CONTINUING DATA ***** NONE /PN/ ** FOREIGN APPLICATIONS ***** CHINA 202010149136.4 03/05/2020 YES /PN/ ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 01/22/2021					
Foreign Priority claimed ☒ Yes ☐ No 35 USC 119(a-d) conditions met ☒ Yes ☐ No Verified and /PHUONG CHI THI NGUYEN/ Acknowledged Examiner's Signature	☒ Met after Allowance /c/ Initials	STATE OR COUNTRY CHINA	SHEETS DRAWINGS 4	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS Ramey & Schwaller, LLP 5020 Montrose Blvd. Suite 800 Houston, TX 77006 UNITED STATES					
TITLE CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY					
FILING FEE RECEIVED 1820	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L13	3904	(H01R12/79, H01R12/78, H01R12/592).CPC.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:04 PM
L14	13	Xike.in. SAME LIU.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:25 PM
L15	14	Zhining.in. SAME LI.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:27 PM
L16	2	Xiangxiang.in. SAME YE.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:58 PM
L17	1	Gaige.in. SAME MEI.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/06/03 04:59 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	1	(exposed SAME sheathed ADJ wires SAME electrodes SAME staggered SAME outer ADJ set).CLM.	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/03 06:07 PM



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/146,350	01/11/2021	Xike LIU	20160.0047.NPUS00

CONFIRMATION NO. 6009

63467

Ramey & Schwaller, LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

PUBLICATION NOTICE



OC000000128294164

Title:CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

Publication No.US-2021-0280996-A1

Publication Date:09/09/2021

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

CERTIFICATE OF AVAILABILITY OF A CERTIFIED PATENT DOCUMENT IN A DIGITAL LIBRARY

The International Bureau certifies that a copy of the patent application indicated below has been available to the WIPO Digital Access Service since the date of availability indicated, and that the patent application has been available to the indicated Office(s) as of the date specified following the relevant Office code:

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Application number: 2020101491364

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Date of issue of this certificate: 15 Feb 2021 (15.02.2021)

国家知识产权局

NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION, PRC



证 明

本证明之附件是向本局提交的下列专利申请文件副本。

申 请 号：202010149136.4

申 请 类 型：发明专利

发 明 创 造 名 称：具有改进的接线连接几何结构的连接器桨片卡

申 请 日：2020 年 03 月 05 日

申 请 人：默升科技集团有限公司

发明人或设计人：刘西柯、李志宁、叶翔翔、梅改革

局长

申长雨

2020 年 03 月 09 日

1. 一种印刷电路板，包括至少一个表面，其具有：

沿第一边缘布置的边缘连接器印制线，用于接触插座连接器中的导体；

平行于第二边缘布置的外电极组，用于附接电缆（“外导线”）中的铠装线的暴露端；以及

平行于所述第二边缘布置的内电极组，用于附接电缆（“内导线”）中的铠装线的暴露端，

内组中的电极相对于外组中的电极错开排列。

2. 根据权利要求 1 所述的印刷电路板，内组和外组的每一个中的电极被隔开，使内导线能够在外导线之间通过，同时保持与所述至少一个表面的接触。

3. 根据权利要求 1 所述的印刷电路板，其中所述外导线各具有与所述暴露端毗连的具有给定厚度的外皮，以及其中所述印刷电路板还包括沿所述第二边缘和所述外电极组之间的每一个外导线外皮的路径在所述至少一个表面中的一个或多个凹部。

4. 根据权利要求 3 所述的印刷电路板，其中所述一个或多个凹部各容纳多个外导线的外皮。

5. 根据权利要求 3 所述的印刷电路板，其中每个外导线具有一个或多个凹部中的对应的一个。

6. 根据权利要求 3 所述的印刷电路板，其中所述一个或多个凹部中的每一个足够深以容纳所述外皮的给定厚度，使得所述外导线的每一个暴露端能够接触所述外组中的电极，同时保持与所述至少一个表面平行。

7. 根据权利要求 6 所述的印刷电路板，还包括第二表面，其具有：

平行于所述第二边缘布置的第二外电极组，用于附接铠装的外导线的暴露端；以及

第二表面中的一个或多个凹部，沿着所述第二边缘和所述第二外

电极组之间的每一个铠装的外导线的外皮的路径延伸。

8. 根据权利要求 1 所述的印刷电路板，还包括集成电路，该集成电路恢复并再调制通过所述边缘连接器印制线与内组和外组的电极之间的信号。

9. 一种电缆，其包括：

在第一连接器和第二连接器之间延伸的铠装线，

所述第一连接器和所述第二连接器中的每一个包括具有至少一个表面的印刷电路板，其具有：

沿第一边缘布置的边缘连接器印制线，用于在所述连接器插入插座时接触导电体；

平行于第二边缘布置的外电极组，用于附接一些铠装线的未覆盖端；以及

平行于第二边缘布置的内电极组，用于附接其他铠装线的未覆盖端，

内组中的电极相对于外组中的电极错开排列。

10. 根据权利要求 9 所述的电缆，其中内组和外组的每一个中的电极被隔开，使得附接到所述内组的铠装线能够在通过附接到所述外组的铠装线之间时保持与所述至少一个表面的接触。

11. 根据权利要求 9 所述的电缆，其中每个印刷电路板还包括在所述第二边缘和所述外电极组之间的至少一个表面中的一个或多个凹部，以容纳附接到所述外电极组的铠装线的外皮。

12. 根据权利要求 11 所述的电缆，其中所述一个或多个凹部各容纳多个铠装线的外皮。

13. 根据权利要求 11 所述的电缆，其中附接到所述外电极组的每个铠装线都有一个或多个凹部中的对应的一个。

14. 根据权利要求 11 所述的电缆，其中所述一个或多个凹部中的每一个足够深以容纳所述未覆盖端附近的外皮的全厚度，使得附接到所述外电极组的导线的每个未覆盖端能够接触那些电极，同时保持与

所述至少一个表面平行。

15. 根据权利要求 9 所述的电缆，还包括集成电路，该集成电路恢复并再调制通过所述边缘连接器印制线与所述内组和所述外组的电极之间的信号。

16. 一种电缆制造方法，包括：

提供第一和第二印刷电路板，各具有：

沿第一边缘布置的边缘连接器印制线，用于在所述印刷电路板插入匹配的插座时接触导电体；

平行于第二边缘布置的外电极组，用于附接电缆中某些铠装线的未覆盖端；以及

平行于第二边缘布置的内电极组，用于附接电缆中其他铠装线的未覆盖端，其中内组中的电极相对于外组中的电极交错排列；

将所述铠装线的未覆盖端焊接到所述内组和所述外组中的电极上；以及

将所述第一和第二印刷电路板封装成适于装入插座的连接器。

17. 根据权利要求 16 所述的方法，还包括为所述第一和第二印刷电路板中的每一个配备集成电路，该集成电路恢复并再调制通过所述边缘连接器印制线与所述内组和所述外组的电极之间的信号。

18. 根据权利要求 16 所述的方法，其中所述内组和所述外组的每一个中的电极被隔开，使得附接到所述内组的铠装线能够在通过附接到所述外组的铠装线之间时与所述至少一个表面保持接触。

19. 根据权利要求 18 所述的方法，其中每个印刷电路板还包括在所述第二边缘与所述外电极组之间的至少一个表面中的一个或多个凹部，以容纳附接到所述外电极组的铠装线的外皮，每一个凹部都足够深以容纳所述未覆盖端附近的所述外皮的全厚度。

20. 据权利要求 19 所述的方法，其中附接到所述外电极组的每个铠装线都具有所述一个或多个凹部中的对应的一个。

具有改进的接线连接几何结构的连接器桨片卡

背景技术

电气和电子工程师学会（IEEE）标准协会公布了以太网的 IEEE 标准，即 IEEE Std 802.3-2015，对于本应用所属领域的普通技术人员来说，该标准是熟悉的。该以太网标准提供了一种通用的媒体访问控制规范，用于具有各种信道信号星座的，在同轴电缆、双轴电缆、双绞线电缆、光缆和电气背板上以 1Mb/s 到 100 Gb/s 的选定速度的局域网（LAN）运行。提供了各种标准电缆连接器和连接端口，包括例如 QSFP-DD（“四倍小形状因子可插拔双密度”）连接器，其被设计成用于安放带有集成的收发器电子设备的小型印刷电路板。在这种情况下，印刷电路板通常被称为“桨片卡（paddle card）”。

“桨片卡”是行话短语。“卡”提示该板是较小的板（例如，子卡），意在插入较大的板（例如，主板）中，通常带有可装入较大板上的相应插槽的边缘连接器。“桨片卡”是一种专用类型的子卡，起到适配器的作用，通常具有将来自边缘连接器的信号耦合到外部系统元件的最少数量的电子元件。更具体地，桨片卡可以接收并再驱动信号通过主板和外部元件之间，通常提供作为过程的一部分的协议转换。

当用作电缆连接器的一部分时，桨片卡与光纤、导体或其他信号通信信道接口。例如，电缆中的信号线可以沿着卡的一个边缘焊接到端子上。然而，现有的卡采用信号线连接，其在考虑到最新版本的 IEEE 标准（50 Gbaud 及以上）的波特率下具有不良的大阻抗失配。

发明内容

因此，本文公开了具有改进的接线连接几何结构的连接器桨片卡，其可减少阻抗失配。还公开了使用这种桨片卡的电缆和制造这种桨片卡的方法。一个说明性实施例是印刷电路板，在至少一个表面上具有：沿第一边缘布置的边缘连接器印制线，用于接触插座连接器中的导体；平行于第二边缘布置的外电极组，用于附接电缆（“外导

线”)中的铠装线的暴露端;以及平行于第二边缘布置的内电极组,用于附接电缆(“内导线”)中铠装线的暴露端,内组中的电极相对于外组中的电极交错排列。

说明性电缆实施例包括在第一连接器和第二连接器之间延伸的铠装线,第一和第二连接器中的每一个包括如上所述的印刷电路板。

一种说明性电缆制造方法包括:提供第一和第二印刷电路板,各具有:沿第一边缘布置的边缘连接器印制线,用于在印刷电路板插入匹配插座时接触导电体;平行于第二边缘布置的外电极组,用于附接电缆中某些铠装线的未覆盖端;以及平行于第二边缘布置的内电极组,用于附接电缆中其他铠装线的未覆盖端,其中内组中的电极相对于外组中的电极交错排列。该方法还包括:将铠装线的未覆盖端焊接到内组和外组中的电极上;以及将第一和第二印刷电路板封装成适合于装入匹配插座的连接器。

前述实施例中的每一个可以单独地或结合地实现,并且可以以一个或多个下述特征的任何合适的组合来实现:1. 内组和外组的每一个中的电极被隔开,使内导线通过外导线之间,同时保持与至少一个表面的接触。2. 外导线各具有与暴露端毗连的具有给定厚度的外皮。3. 所述印刷电路板包括沿着第二边缘和外电极组之间的每一个外导线外皮的路径的至少一个表面中的一个或多个凹部。4. 一个或多个凹部各容纳多个外导线的外皮。5. 每个外导线具有一个或多个凹部中的对应的一个。6. 一个或多个凹部中的每一个都足够深,以容纳外皮的给定厚度,使得外导线的每一个暴露端接触外组中的电极,同时保持与至少一个表面平行。7. 第二表面具有:平行于第二边缘布置的第二外电极组,用于附接铠装的外导线的暴露端;以及沿第二边缘和第二外电极组之间的每个铠装的外导线的外皮的路径延伸的第二表面中的一个或多个凹部。8. 一种集成电路,其恢复和再调制通

过边缘连接器印制线与内组和外组的电极之间的信号。

附图说明

图 1 是说明性有源以太网电缆（AEC）的透视图。

图 2 是说明性 AEC 的功能框图。

图 3 是具有不合需要的连接几何结构的第一桨片卡实施例的俯视图。

图 4 是示出第一实施例的尺寸参数的近摄侧视图。

图 5 是第一实施例的导线连接部的俯视图。

图 6 是第一实施例的导线连接部的剖面图。

图 7 是具有增强连接几何结构的导线连接部的俯视图。

图 8 是具有增强连接几何结构的导线连接部的剖面图。

图 9 是具有增强连接几何结构的导线连接部的等距视图。

图 10 是具有宽凹部的导线连接部的等距视图。

图 11 是阻抗对距集成电路的距离（延迟）的曲线图。

具体实施方式

尽管在附图和以下描述中给出了具体实施例，但请记住，它们并不限制本公开。相反，它们为普通技术人员提供了辨别包括在所附权利要求范围内的替代形式、等价物和修改的基础。

图 1 是说明性电缆的透视图，可用于在路由网络（例如用于数据中心、服务器场和互连交换的路由网络）中的设备之间提供高带宽通信链路。路由网络可以是例如因特网、广域网或局域网的一部分，或者可以包括例如因特网、广域网或局域网。连接的设备可以是计算机、交换机、路由器等。该电缆包括第一连接器 100 和第二连接器 101，其通过一起封装在 106 缆绳中的导电体连接。导电体可以单独地和（可选地）共同地被屏蔽，具有接地导电外皮，比如同轴电缆或双轴电缆，以减少信号串扰。优选地以 50GBaud 或以上单端或差分信号驱动导电体。每个连接器 100、101 包括执行时钟和数据恢复（CDR）以及数据流的再调制的电动收发器，以下称为数据恢复和再调制（DRR）设

备。

图 2 是图 1 的说明性电缆的功能框图。连接器 100 包括插头 200，其适于装入第一主机设备中的符合标准的以太网端口，以接收来自主机设备的携带出站数据流的电输入信号，并向主机设备提供携带入站数据流的电输出信号。类似地，连接器 101 包括适合装入第二主机设备的以太网端口的插头 201。连接器 100 包括第一 DRR 设备 202，以执行在连接器 100 处进入和离开电缆的数据流的 CDR 和再调制，并且连接器 101 包括第二 DRR 设备 204，以执行在连接器 101 处进入和离开电缆的数据流的 CDR 和再调制。DRR 设备 202、204 可以是安装在印刷电路板上的集成电路，并且通过电路板印制线连接到边缘连接器印制线（用于与主机设备接口）和焊盘（用于附接到电缆线）。导电体 106 和屏蔽物可以被焊接到与 DRR 设备电连接的印刷电路板上的相应焊盘上。

在至少一些考虑的实施例中，每个印刷电路板还支持微控制器单元（MCU）206。每个 DRR 设备 202、204 耦合到各自的 MCU 设备 206，其通过第一双线总线配置 DRR 设备的运行。接通电源时，MCU 设备 206 将均衡参数从闪存 207 加载到 DRR 设备的配置寄存器 208 中。主机设备可以经由根据 I2C 总线协议和/或更快的 MDIO 协议运行的第二双线总线来访问 MCU 设备 206。通过对 MCU 设备 206 的这种访问，主机设备可以调整电缆的运行参数并监视电缆的性能。

每个 DRR 设备 202、204 包括用于与主机设备通信的发射器和接收器的组 220，以及用于经由延续电缆的长度的导体对进行发送和接收的发射器和接收器的组 222。所说明的电缆支持八个双向通信信道 LN0-LN7，每个双向信道由成对的单向连接形成。单向连接可以提供单端信令或差分对信令，并且 DRR 设备可以在两者之间转换。在一些实施例中，DRR 设备进一步在 PAM4 和 NRZ 信令之间转换。收发器可选地包括存储器 224，以在发射器和接收器组 220、222 之间提供先进先出（FIFO）缓冲。嵌入式控制器 228 通过例如设置初始均衡参

数和确保在使发射器和接收器进入数据传输阶段之前在所有信道和链路上完成训练阶段，来协调发射器和接收器的运行。嵌入式控制器 228 使用一组寄存器 208 来接收命令和参数值，并提供可能包括状态信息和性能数据的响应。

图 3 是桨片卡 300 的第一实施例的俯视图。桨片卡 300 是具有通过中间部 302 耦合在一起的边缘连接部 301 和接线附接部 303 的印刷电路板，中间部具有可选的电子元件（例如集成电路 DRR 设备 310），用于接收和再驱动每个方向中的信号，同时可选地提供协议和信号格式转换。

边缘连接部 301 具有沿着卡的左边缘的印刷电路印制线，当左边缘位于边缘连接器插座内时，这些印刷电路印制线被暴露，用于电接触导体。通常，印制线的暴露表面镀有铜或金的硬质合金，以抵抗磨损和腐蚀，从而使印制线能够提供与插座连接器中的相应导电体的可靠的耦合。边缘连接器印制线通常有金色，有时使得边缘连接部被称为“金手指”。

与传统印刷电路板一样，中间部 302 包括用于将集成电路（例如 DRR 设备 310）的引线或球栅阵列和其他支持电子元件附接到板上的图案化印制线的焊盘。印刷电路板可以具有多层，具有通过导电通孔提供的不同层的印制线之间的连接。软件可供用于自动放置元件和路由印制线，以将它们连接在一起，并连接到边缘连接器印制线和接线连接电极。

接线连接部 303 具有用于固定附接到电缆主体中的导电体的电极布置。如所示，导电体被封装为双轴导线，每根导线都有一对铠装导体由导电屏蔽物（通常伴随有屏蔽导体以减少屏蔽阻抗）和外皮包裹。当给定的双轴导线的端部被剥离以露出铠装的导体的端部时，每个导体（包括屏蔽导体）的暴露端与相应的电极对准并被焊接到位。

所示的电极以形成内电极组 306 和外电极组 308 的两列，平行于桨片卡 300 的右边缘布置。（术语“内”和“外”仅用于指示电极相

对于桨片卡边缘的位置。在引用附接到内电极或外电极的导线时，也使用这些术语，指示它们的附接点，除本文明确说明外，没有任何其他关于导线位置的意义。）修剪内导线的其中之一，使其中一根外导线的附接配置可见。

图 4 示出了用焊料或另一种形式的导电粘合剂附接到电极 406 的内导线 412 的暴露端 401 的近景，以及类似地附接到电极 408 的外导体 420 的暴露端 403。虽然连接几何结构可以是复杂的，但影响连接阻抗的两个几何参数是暴露端长度 L （如弯曲前测量的）和“回路高度” H （暴露端离开 PCB 表面上方的外皮的高度）。因此，图 4 示出了 L_i 和 H_i ，即内导线连接的几何参数，以及 L_o 和 H_o ，即外导线连接的几何参数。

请注意，在图 3 中，内和外电极组相互对齐，迫使内导线通过外导线之上，如图 4 所示。考虑到连接器空间限制和其他考虑因素（例如易于制造和导线长度的均匀性），这种布置增加了内导线连接的回路高度，并且可能需要增加暴露端的长度。即使外导线连接（由于外皮厚度）具有非零回路高度，并且可能具有比需要的暴露端长度长的长度。这些因素导致导线连接具有不合需要的阻抗间断性，从而导致接收信号中的信号衰减（并可能产生信号回波）。

图 5 是第一实施例的导线连接部 303 的俯视图，示出了对齐的内电极组 306 和外电极组 308。两个内导线 410、412 示出为具有附接到相应的内电极的信号导体，以及两根外导线 420、422 示出为具有附接到相应的外电极的信号导体。（为清楚起见，省略了屏蔽导体。）

图 6 是第一实施例的导线连接部 303 的剖面图，示出附接到顶面上的电极的内导线 412 和外导线 420。任选地，导线连接部提供在底面上的电极，用于附接到另一组内和外导线，包括内导线 612 和外导线 620。桨片卡优选地包括接地平面 600，其在所述导线连接部 303 的相对表面上的附接电极之间延伸。

与前面所示和所描述的接线连接部相比，图 7-9 示出了接线连接

部 703，其提供具有增强的连接几何结构的桨片卡，以减小回路高度并使暴露端长度能够减小。

图 7 是具有相互错开的内电极组 706 和外电极组 708 的导线连接部 703 的俯视图。外导线 718、720 被间隔得足够开，使得通过交错定位，内导线 710、712 能够在外导线之间通过，并且保持与 PCB 表面平行，而不是被迫通过外导线上方。还显示了可选的凹部 730，以容纳外部导体的外皮。

图 8 是导线连接部 703 的剖面图，示出了其暴露端 801 附接到内电极的内导线 712 以及其暴露端 803 附接到外电极的外导线 720。值得注意地，内导线 712 在外导线 730 之后通过而不是如图 6 所示的之上。理想地，内导线保持与 PCB 表面接触，尽管可能需要一些小的间距来容纳外导线接地导体的连接（见图 3）。图 8 还示出用于导线连接部的底面的可选附接物。

导线连接部 303 具有可选的表面凹部 730，其沿着外导线的路径从桨片卡的边缘向外部电极延伸，以容纳外导线的外皮，使暴露端 803 附接到外电极，同时保持与导线连接部 303 的上表面平行。虽然表面凹部 730 优选地具有至少等于外皮厚度的深度，但相对于图 6 的几何结构即使减小的深度也将减小环路高度 H。在一些考虑到的实施例中，接线外皮厚度可以使得在给定的 PCB 制造过程中可以实现的凹部深度不能完全容纳外皮厚度。即使这种容纳是可能的，也可能有其他考虑因素（例如阻抗的导数，或总反射能量）要求部分容纳外皮厚度。因此，通过仿真和实验可以确定和优化首选的凹部深度。

图 9 是示出每根外导线的凹部 730 的导线连接部 703 的等距视图。凹部 730 显示为矩形，但也考虑了适合容纳外导线外皮的圆柱形凹面或其他形状。在一些实施例中，凹部 730 如图 10 所示被加宽，使得每个凹部可以容纳来自多个外导线的外皮。如果需要，凹部可以延伸横穿桨片卡的整个宽度，以提供紧接外电极组的阶梯形轮廓。

图 11 是从外导线的电缆侧测量的阻抗量值对距离（以传播延迟为

单位)的曲线图。阻抗开始恒定,但在信号离开外皮并沿着导线的暴露端向焊料连接处传播的地方增加。然后,阻抗在信号穿过焊料连接处微降,在信号穿过通孔处呈现较小的峰值,并在信号沿印刷电路印制线传播处返回到恒定值。在原始几何结构(例如图 6)中,阻抗从 102 欧姆上升到 118 欧姆(16 欧姆峰值),而在增强几何结构中,阻抗仅上升到正好 110 欧姆(<8 欧姆峰值)之下,峰值大小减小 50%。峰宽也从约 35ps 缩小到约 28ps,减小了 20%。

因此,为了制造具有改进性能的电缆,制造系统可以获得第一和第二印刷电路板,各板具有:沿第一边缘布置的边缘连接器印制线,用于在印刷电路板插入匹配的插座时接触导电体;平行于第二边缘布置的外电极组,用于附接电缆中某些铠装线的未覆盖端;以及平行于第二边缘布置的内电极组,用于附接电缆中其他铠装线的未覆盖端,其中内组中的电极相对于外组中的电极交错排列。在将第一和第二印刷电路板封装成适合于装入符合标准的插座之前,系统将电缆导线的端部拔出,并将暴露端焊接到内组和外组中的电极上。在处理的早期阶段,系统可以为第一和第二印刷电路板配备集成电路,该集成电路恢复并再调制通过边缘连接器印制线与内组和外组的电极之间的信号。

一旦充分领会上述公开,许多替代形式、等效物和修改对本领域技术人员将是显而易见的。所以,意图是将权利要求解释为包括在所附权利要求的范围内包含的所有此类替代形式、等效物和修改。

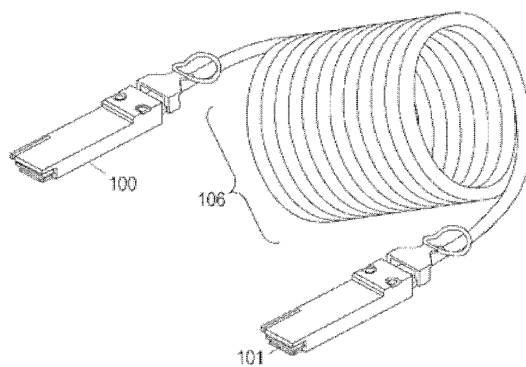


图 1

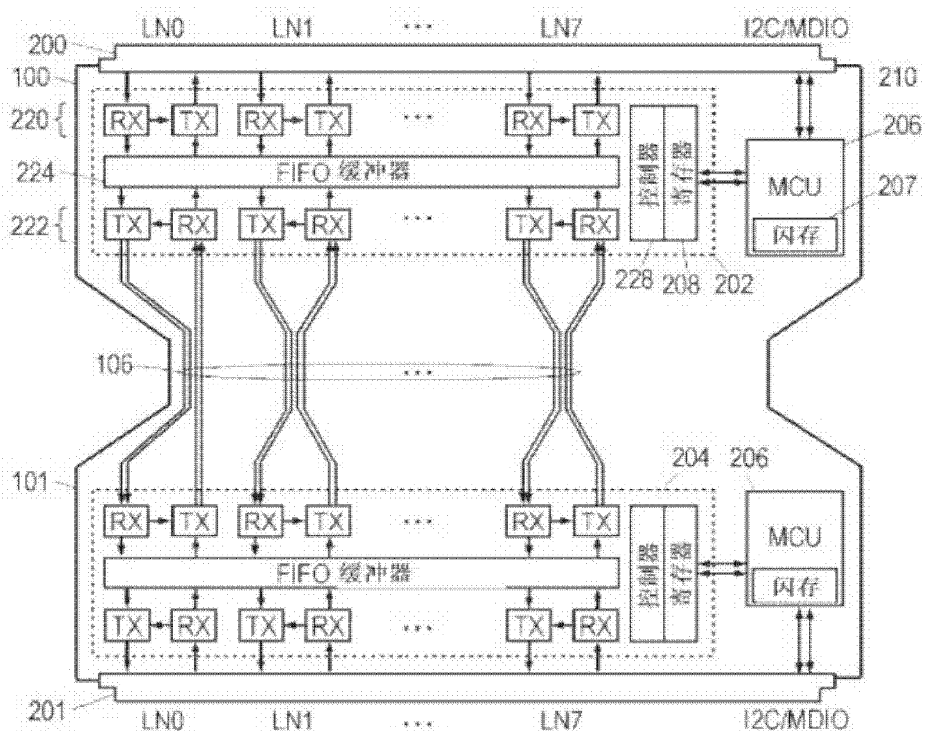


图 2

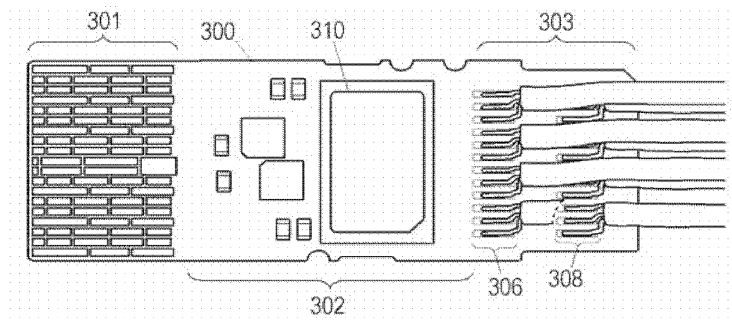


图 3

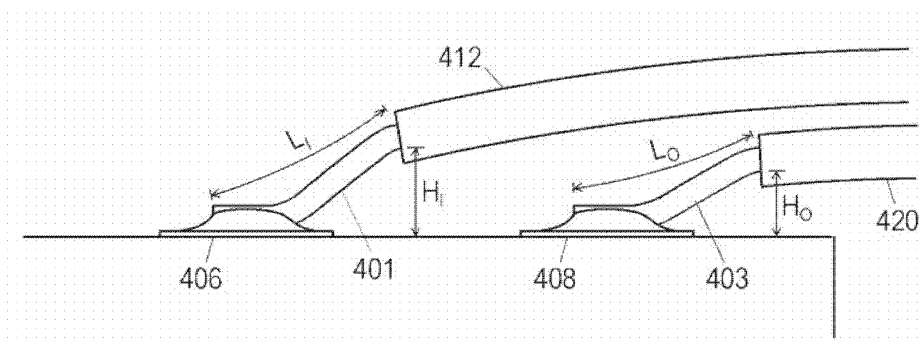


图 4

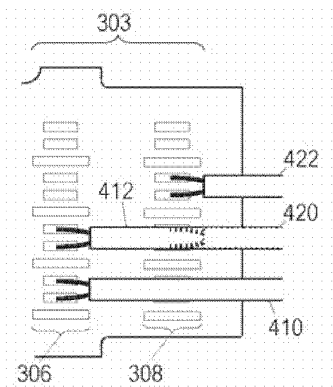


图 5

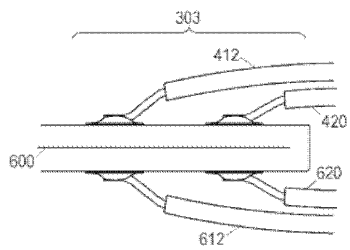


图 6

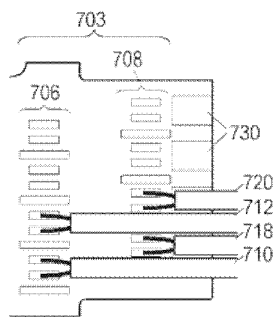


图 7

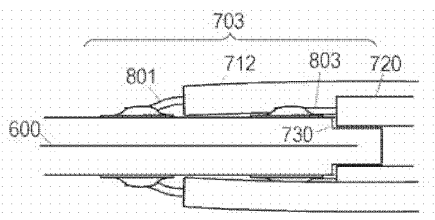


图 8

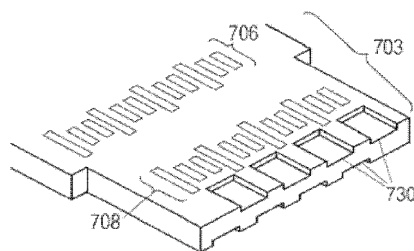


图 9

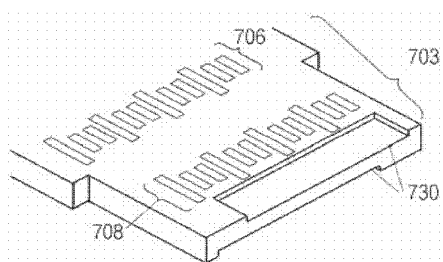


图 10

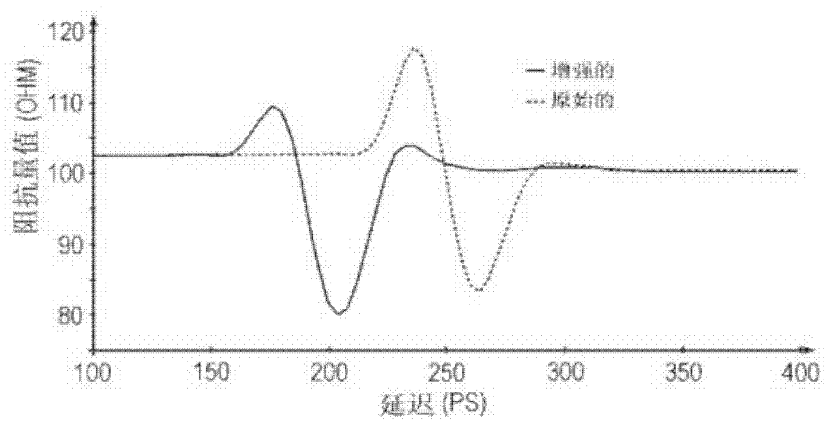


图 11



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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
17/146,350	01/11/2021	2834	1820	20160.0047.NPUS00	20	3

CONFIRMATION NO. 6009

FILING RECEIPT



63467
Ramey & Schwaller, LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

Date Mailed: 01/26/2021

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Inventor(s)

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Applicant(s)

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Assignment For Published Patent Application

Credo Technology Group Limited, Grand Cayman, CAYMAN ISLANDS

Power of Attorney: The patent practitioners associated with Customer Number 63467

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
CHINA 202010149136.4 03/05/2020 Access Code Provided

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/146,350**

Projected Publication Date: 09/09/2021

Non-Publication Request: No

Early Publication Request: No

Title

CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

Preliminary Class

310

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

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 17/146,350	
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	320
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *			OR	x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
				TOTAL		TOTAL	1820
* 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	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OTHER THAN SMALL ENTITY	
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	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		TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
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	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
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* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							

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63467

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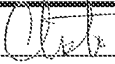
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Assignee Name and Address: **Credo Technology Group Limited, Ugland House, Grand Cayman Ky1-1104, Cayman Islands**

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SIGNATURE of Assignee of Record

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

Signature		Date 2-9-2018
Name	Adam Thorngate-Gottlund	Telephone 408-664-9329 x127
Title	General Counsel	

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Title of Invention:		CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		
First Named Inventor/Applicant Name:		Xike LIU		
Filer:		Daniel Joseph Krueger/Shanay Hines		
Attorney Docket Number:		20160.0047.NPUS00		
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	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
Claims:				
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Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1820

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EFS ID:	41611767
Application Number:	17146350
International Application Number:	
Confirmation Number:	6009
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First Named Inventor/Applicant Name:	Xike LIU
Customer Number:	63467
Filer:	Daniel Joseph Krueger/Shanay Hines
Filer Authorized By:	Daniel Joseph Krueger
Attorney Docket Number:	20160.0047.NPUS00
Receipt Date:	11-JAN-2021
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Application Type:	Utility under 35 USC 111(a)

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			3b6e1a4a216e280061495cf879aae84cac7b e9f2		
Warnings:					
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2	Application Data Sheet	WebADS.pdf	146405	no	8
			8b110b0d67a95bdf721d195eadd4e35758 5cb0a4		
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Information:					
3		SPEC_2.pdf	6760570	yes	18
			5ccad0da192020734b80c1a568597719339 3e201		
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	Document Description		Start	End	
	Specification		1	12	
	Claims		13	17	
	Abstract		18	18	
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6	Power of Attorney	2018-02-09_Executed_US-Gen_POA.pdf	566825	no	1
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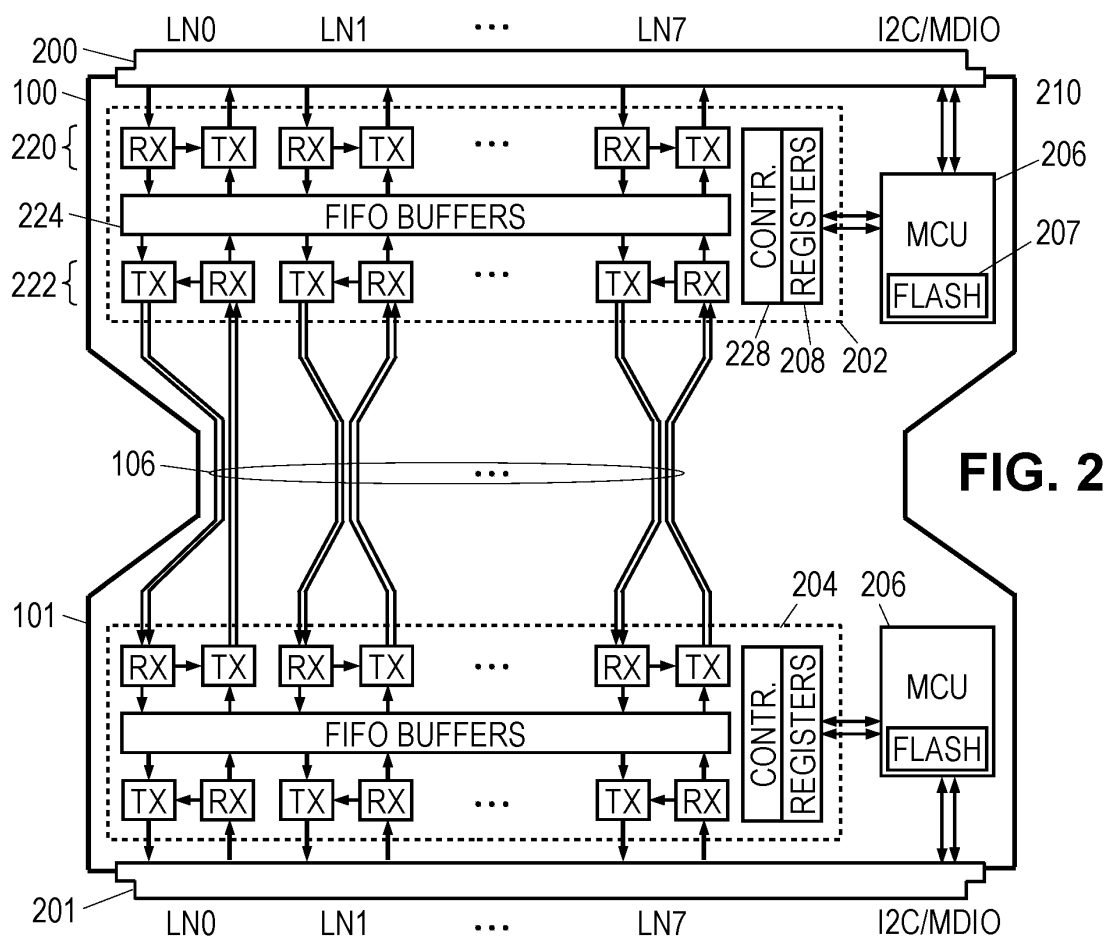
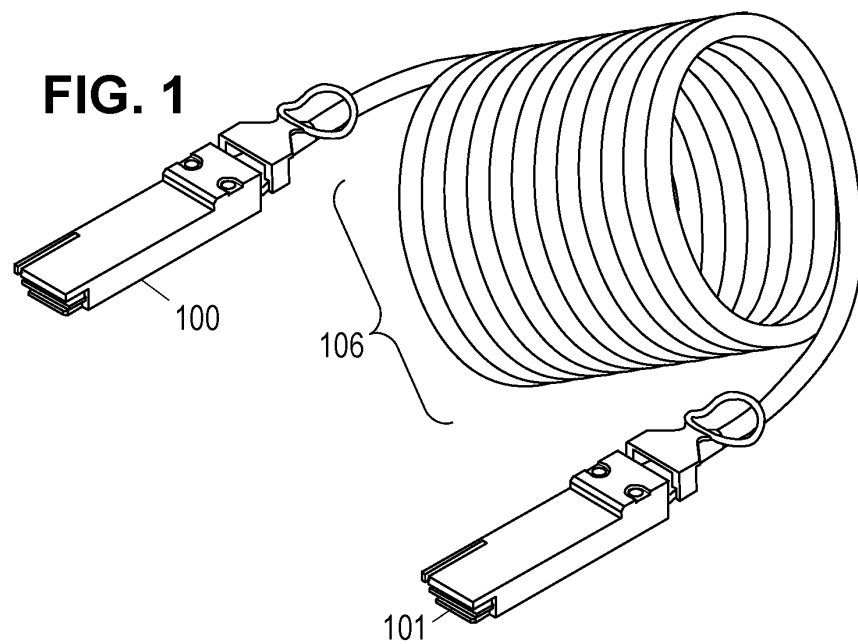


FIG. 3

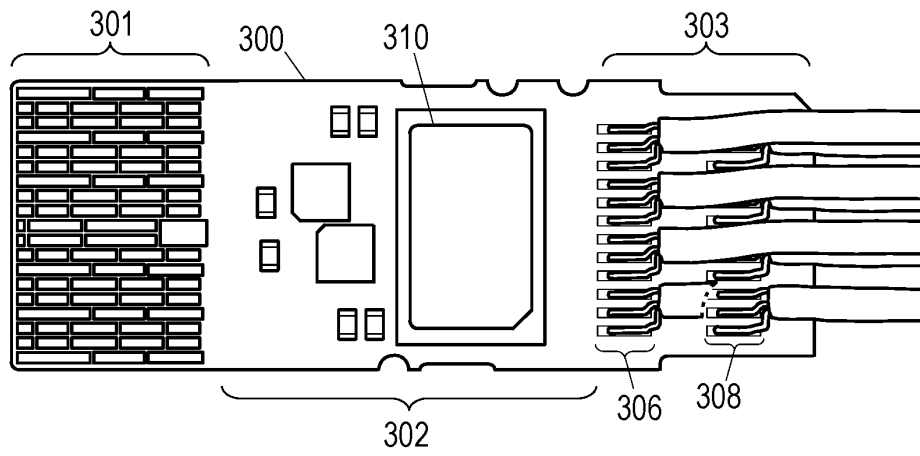
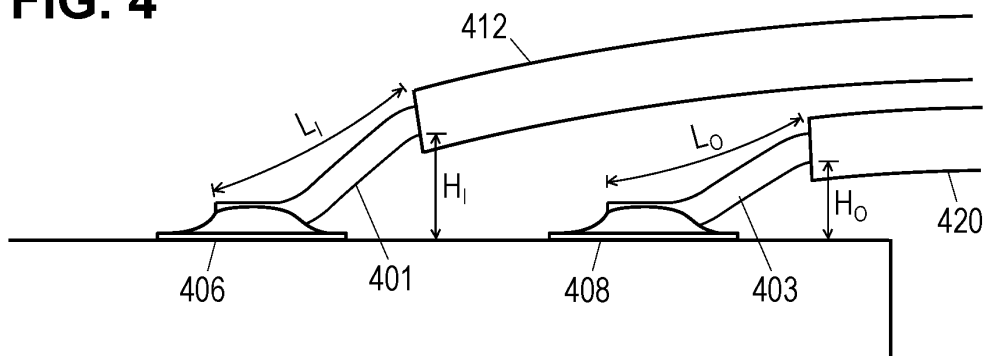


FIG. 4



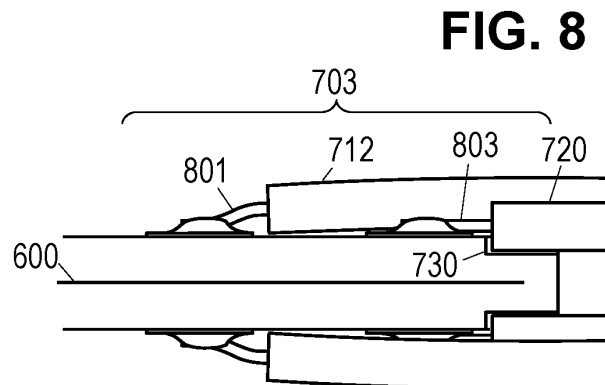
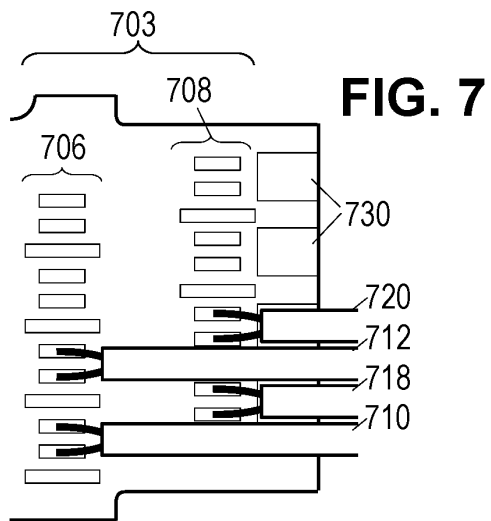
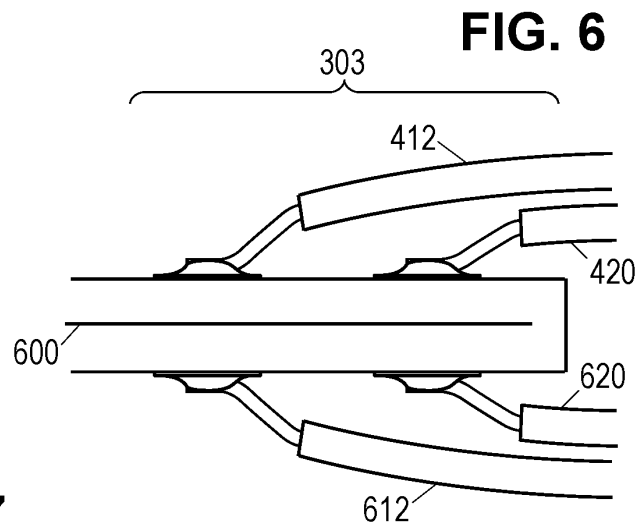
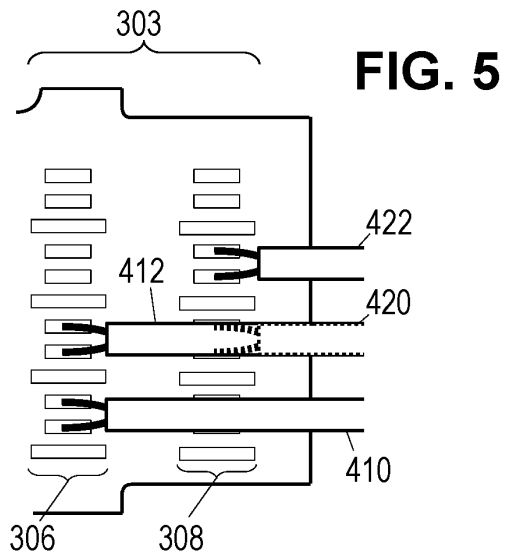


FIG. 9

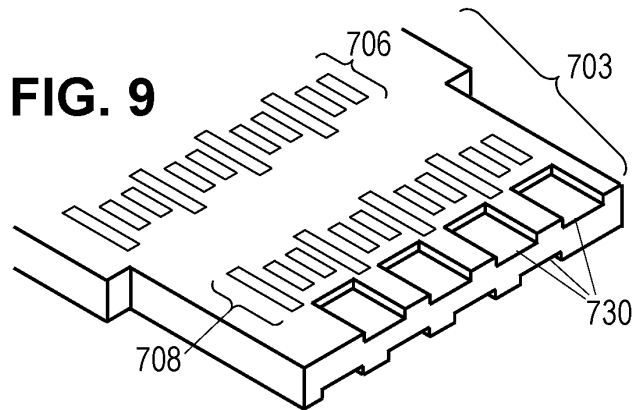


FIG. 10

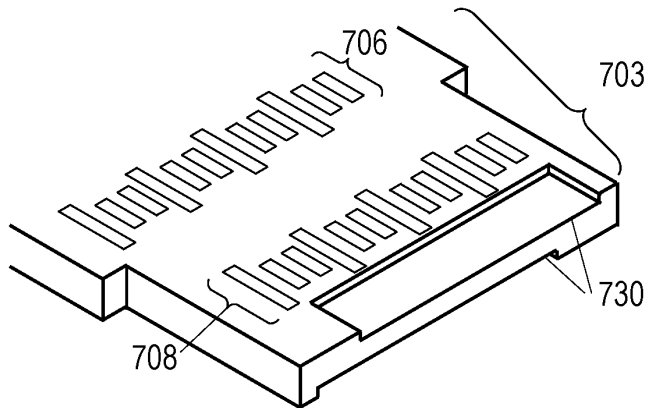
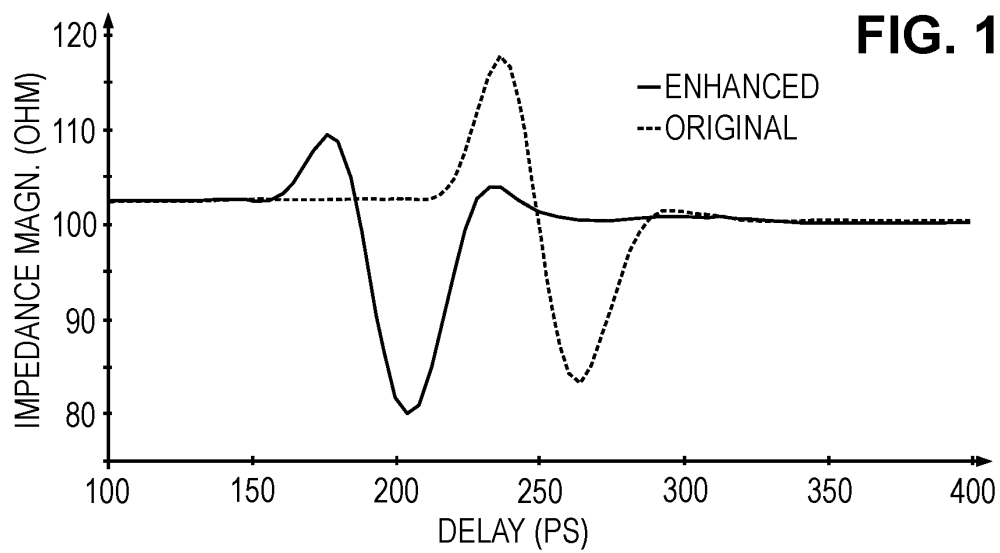


FIG. 11



Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		
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				
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
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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	95110	Country ⁱ	US	
Inventor 3				
Legal Name				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiangxiang		YE	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
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City	San Jose	State/Province	CA	
Postal Code	95110	Country ⁱ	US	

Inventor 4

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Gaige		MEI	
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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City	San Jose	State/Province	CA	
Postal Code	95110	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	63467		
Email Address	uspto@rameyfirm.com	Add Email	Remove Email
Email Address	dkrueger@rameyfirm.com	Add Email	Remove Email
Email Address	shines@rameyfirm.com		Remove Email

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

Application Information:

Title of the Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		
Attorney Docket Number	20160.0047.NPUS00	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	8

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

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

Please Select One:					
☒	Customer Number	☐	US Patent Practitioner	☐	Limited Recognition (37 CFR 11.9)
Customer Number		63467			
Prefix	Given Name	Middle Name	Family Name	Suffix	Remove
Registration Number					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

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Registration Number					
Additional Representative Information blocks may be generated within this form by selecting the Add button.					

Domestic Benefit/National Stage Information:

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

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

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) 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 ^l (if applicable)
202010149136.4	CN	2020-03-05	F6E3
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

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	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

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	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

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

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 Credo Technology Group Limited

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Address 2			
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Country ¹	KY	Postal Code	KY1-1104
Phone Number		Fax Number	
Email Address			

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

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.

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.			
If the Assignee or Non-Applicant Assignee is an Organization check here. ☒			
Organization Name	Credo Technology Group Limited		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	Ugland House		
Address 2			
City	Grand Cayman	State/Province	OT
Country i	KY	Postal Code	KY1-1104
Phone Number		Fax Number	
Email Address			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0047.NPUS00
		Application Number	
Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY		

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	/Dan Krueger/			Date (YYYY-MM-DD)	
First Name	Daniel	Last Name	Krueger	Registration Number	42771
Additional Signature may be generated within this form by selecting the Add button.					

CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

BACKGROUND

[0001] The Institute of Electrical and Electronics Engineers (IEEE) Standards Association publishes an IEEE Standard for Ethernet, IEEE Std 802.3-2015, which will be familiar to those of ordinary skill in the art to which this application pertains. This Ethernet standard provides a common media access control specification for local area network (LAN) operations at selected speeds from 1 Mb/s to 100 Gb/s over coaxial cable, twinaxial cable, twisted wire pair cable, fiber optic cable, and electrical backplanes, with various channel signal constellations. Various standard cable connectors and connection ports are provided including, e.g., QSFP-DD ("quad small form-factor pluggable double density") connectors, which are designed to house small printed circuit boards with integrated transceiver electronics. In this context, the printed circuit boards are often called "paddle cards".

[0002] "Paddle card" is a jargon phrase. "Card" suggests that the board is smaller board (e.g., a daughter card) intended to plug into a larger board (e.g., a motherboard), usually with an edge connector that fits into a corresponding slot on the larger board. A "paddle card" is a specialized type of daughter card that functions as an adapter, typically having a minimal number of electronic components that couple signals from the edge connector to external system components. More specifically, the paddle card may receive and re-drive signals passing between the motherboard and the external component, often providing protocol translation as part of the process.

[0003] When used as part of a cable connector, the paddle card interfaces with the optical fibers, electrical conductors, or other signal communication channels. For

example, the signal wires in a cable may be soldered to terminals along one edge of the card. However, existing cards employ signal wire connections having undesirably large impedance mismatches at the baud rates being contemplated for the latest versions of the IEEE standard (50 GBaud and above).

SUMMARY

[0004] Accordingly, there are disclosed herein connector paddle cards having improved wiring connection geometry that reduces impedance mismatch. Also disclosed are cables using such paddle cards and methods for manufacturing such paddle cards. One illustrative embodiment is a printed circuit board having, on at least one surface: edge connector traces arranged along a first edge for contacting electrical conductors in a socket connector; an outer set of electrodes arranged parallel to a second edge for attaching exposed ends of sheathed wires in a cable ("outer wires"); and an inner set of electrodes arranged parallel to the second edge for attaching exposed ends of sheathed wires in a cable ("inner wires"), with the electrodes in the inner set being staggered relative to the electrodes in the outer set.

[0005] An illustrative cable embodiment includes sheathed wires extending between a first connector and a second connector, with each of the first and second connectors including a printed circuit board as described above.

[0006] An illustrative cable manufacturing method includes: providing first and second printed circuit boards each having: edge connector traces arranged along a first edge for contacting electrical conductors when the printed circuit board is inserted in a matching socket; an outer set of electrodes arranged parallel to a second edge for attaching unsheathed ends of certain sheathed wires in a cable;

and an inner set of electrodes arranged parallel to the second edge for attaching unsheathed ends of other sheathed wires in the cable, with the electrodes in the inner set being staggered relative to the electrodes in the outer set. The method further includes: soldering unsheathed ends of the sheathed wires to the electrodes in the inner and outer set; and packaging the first and second printed circuit boards into connectors adapted to fit the matching socket.

[0007] Each of the foregoing embodiments may be implemented individually or conjointly, and may be implemented with one or more of the following features in any suitable combination: 1. the electrodes in each of the inner and outer sets being spaced to enable the inner wires to pass between the outer wires while maintaining contact with the at least one surface. 2. the outer wires each have a sheath with a given thickness adjacent to the exposed end. 3. the printed circuit board includes one or more recesses in the at least one surface along each outer wire sheath's path between the second edge and the outer set of electrodes. 4. the one or more recesses each accommodates sheathes of multiple outer wires. 5. each outer wire has a corresponding one of the one or more recesses. 6. each of the one or more recesses is deep enough to accommodate the given thickness of the sheath, enabling each of the exposed ends of the outer wires to contact the electrodes in the outer set while remaining parallel to the at least one surface. 7. a second surface having: a second outer set of electrodes arranged parallel to the second edge for attaching exposed ends of sheathed outer wires; and one or more recesses in the second surface extending along a path of each sheathed outer wire's sheath between the second edge and the second outer set of electrodes. 8. an integrated circuit that recovers and remodulates signals passing between the edge connector traces and the electrodes of the inner and outer sets.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0008] Fig. 1 is a perspective view of an illustrative active Ethernet cable (AEC).
- [0009] Fig. 2 is a function-block diagram of the illustrative AEC.
- [0010] Fig. 3 is a top view of a first paddle card embodiment having an undesirable connection geometry.
- [0011] Fig. 4 is a close-up side view showing dimension parameters of the first embodiment.
- [0012] Fig. 5 is a top view of the first embodiment's wire connection portion.
- [0013] Fig. 6 is a cross-section of the first embodiment's wire connection portion.
- [0014] Fig. 7 is a top view of a wire connection portion with enhanced connection geometry.
- [0015] Fig. 8 is a cross-section of the wire connection portion with enhanced connection geometry.
- [0016] Fig. 9 is an isometric view of the wire connection portion with enhanced connection geometry.
- [0017] Fig. 10 is an isometric view of the wire connection portion with broad recesses.
- [0018] Fig. 11 is a graph of impedance vs distance (delay) from the integrated circuit.

DETAILED DESCRIPTION

[0019] While specific embodiments are given in the drawings and the following description, keep in mind that they do not limit the disclosure. On the contrary, they provide the foundation for one of ordinary skill to discern the alternative forms, equivalents, and modifications that are encompassed in the scope of the

appended claims.

[0020] Fig. 1 is a perspective view of an illustrative cable that may be used to provide a high-bandwidth communications link between devices in a routing network such as that used for data centers, server farms, and interconnection exchanges. The routing network may be part of, or may include, for example, the Internet, a wide area network, or a local area network. The linked devices may be computers, switches, routers, and the like. The cable includes a first connector 100 and a second connector 101 that are connected via electrical conductors packaged together in a 106 cord. The electrical conductors may be individually and (optionally) collectively shielded, having grounded conductive sheaths like coaxial or twinaxial cables to reduce signal crosstalk. The electrical conductors are preferably driven with single-ended or differential signals at 50 GBaud or more. Each connector 100, 101 includes a powered transceiver that performs clock and data recovery (CDR) and re-modulation of data streams, hereafter called a data recovery and re-modulation (DRR) device.

[0021] Fig. 2 is a function-block diagram of the illustrative cable of Fig. 1. Connector 100 includes a plug 200 adapted to fit a standard-compliant Ethernet port in a first host device to receive an electrical input signal carrying an outbound data stream from the host device and to provide an electrical output signal carrying an inbound data stream to the host device. Similarly, connector 101 includes a plug 201 that fits an Ethernet port of a second host device. Connector 100 includes a first DRR device 202 to perform CDR and re-modulation of the data streams entering and exiting the cable at connector 100, and connector 101 includes a second DRR device 204 to perform CDR and re-modulation of the data streams entering and exiting the cable at connector 101. The DRR devices 202, 204 may be integrated circuits

mounted on a printed circuit board and connected to edge connector traces (for interfacing with the host devices) and to solder pads (for attachment to cable wires) via circuit board traces. The electrical conductors 106 and shields may be soldered to corresponding pads on the printed circuit board that electrically connect to the DRR devices.

[0022] In at least some contemplated embodiments, the printed circuit boards each also support a micro-controller unit (MCU) 206. Each DRR device 202, 204 is coupled to a respective MCU device 206 which configures the operation of the DRR device via a first two-wire bus. At power-on, the MCU device 206 loads equalization parameters from Flash memory 207 into the DRR device's configuration registers 208. The host device can access the MCU device 206 via a second two-wire bus that operates in accordance with the I2C bus protocol and/or the faster MDIO protocol. With this access to the MCU device 206, the host device can adjust the cable's operating parameters and monitor the cable's performance.

[0023] Each DRR device 202, 204, includes a set 220 of transmitters and receivers for communicating with the host device and a set 222 of transmitters and receivers for sending and receiving via conductor pairs running the length of the cable. The illustrated cable supports eight bidirectional communication lanes LN0-LN7, each bidirectional lane formed by pairs of unidirectional connections. The unidirectional connections may be provided with single-ended signaling or differential pair signaling, and the DRR devices may convert between the two. In some embodiments, the DRR devices further convert between PAM4 and NRZ signaling. The transceivers optionally include a memory 224 to provide first-in first-out (FIFO) buffering between the transmitter & receiver sets 220, 222. An embedded controller 228 coordinates the operation of the transmitters and receivers by, e.g.,

setting initial equalization parameters and ensuring the training phase is complete across all lanes and links before enabling the transmitters and receiver to enter the data transfer phase. The embedded controller 228 employs a set of registers 208 to receive commands and parameter values, and to provide responses potentially including status information and performance data.

[0024] Fig. 3 is a top view of a first embodiment of a paddle card 300. The paddle card 300 is a printed circuit board having an edge connection portion 301 and a wiring attachment portion 303 coupled together by an intermediate portion 302 having optional electronic components (such as an integrated circuit DRR device 310) for receiving and redriving signals in each direction while optionally providing protocol and signal format conversion.

[0025] Edge connection portion 301 has printed circuit traces along the left edge of the card, which are exposed for electrically contacting conductors when the left edge is seated within an edge connector socket. Typically, the exposed surface of the traces is plated with a hard alloy of copper or gold to resist wear and corrosion, enabling the traces to provide reliable coupling with the corresponding electrical conductors in the socket connector. The edge connector traces often have a gold coloration, sometimes causing the edge connection portion to be called "the golden finger".

[0026] As with conventional printed circuit boards, intermediate portion 302 includes solder pads for attaching leads or ball grid arrays of integrated circuits (such as DRR device 310) and other supporting electronic components to patterned traces on the board. The printed circuit board may have multiple layers with connections between traces of different layers being provided by conductive vias. Software is available for automatically placing components and routing traces to

connect them together and to the edge connector traces and the wiring connection electrodes.

[0027] Wiring connection portion 303 has an arrangement of electrodes for permanent attachment to the electrical conductors in the body of the cable. As shown the electrical conductors are packaged as twinaxial wires each having a pair of sheathed conductors wrapped by a conductive shield (often accompanied by a shield conductor to reduce the shield impedance) and an outer sheath. When the end of a given twinaxial wire is stripped to expose the ends of the sheathed conductors, the exposed end of each conductor (including the shield conductor) is aligned with a corresponding electrode and soldered into place.

[0028] The electrodes are shown arranged parallel to the right edge of the paddle card 300 in two columns forming an inner set of electrodes 306 and an outer set of electrodes 308. (The terms "inner" and "outer" are used solely to indicate the electrode position relative to the edge of the paddle card. The terms are also used when referencing wires that are attached to the inner or outer electrodes, indicating their attachment point without any other import as to the wire position except as expressly described herein.) One of the inner wires is cropped to make visible the attachment configuration of one of the outer wires.

[0029] Fig. 4 shows a close-up of an exposed end 401 of inner wire 412 attached to electrode 406 with solder or another form of conductive adhesive, and the exposed end 403 of outer conductor 420 similarly attached to electrode 408. Though the connection geometry can be complex, two geometric parameters that influence the connection impedance are the exposed end length L (as measured before bending) and the "loop height" H (the height at which the exposed end exits the sheath above the PCB surface). Thus Fig. 4 shows L_i and H_i , the geometric

parameters for the inner wire connections and L_o and H_o , the geometric parameters for the outer wire connections.

[0030] Note in Fig. 3 that the inner and outer sets of electrodes are aligned with each other, forcing the inner wires to pass over the outer wires as shown in Fig. 4. Given the connector space constraints and other considerations (such as ease of manufacture and uniformity of wire length), this arrangement increases the loop height for the inner wire connections and may necessitate increase length of the exposed end. Even the outer wire connections have a nonzero loop height (due to the sheath thickness) and may have a longer than necessary exposed end length. These factors cause the wire connections to have an undesirable impedance discontinuity, causing signal attenuation (and potentially producing signal echoes) in the receive signal.

[0031] Fig. 5 is a top view of the first embodiment's wire connection portion 303, showing aligned sets of inner electrodes 306 and outer electrodes 308. Two inner wires 410, 412 are shown with the signal conductors attached to corresponding inner electrodes, and two outer wires 420, 422 are shown with signal conductors attached to corresponding outer electrodes. (For clarity, the shield conductors are omitted.)

[0032] Fig. 6 is a cross-section of the first embodiment's wire connection portion 303, showing inner wire 412 and outer wire 420 attached to the electrodes on the top surface. Optionally, the wire connection portion provides electrodes on the bottom surface for attachment to another set of inner and outer wires, including inner wire 612 and outer wire 620. The paddle card preferably includes a ground plane 600 that extends between attachment electrodes on opposite surfaces of the wire connection portion 303.

[0033] In contrast with the wiring connection portions shown and described previously, Figs. 7-9 show a wiring connection portion 703 that provides a paddle card with an enhanced connection geometry to reduce the loop heights and enable reduction of the exposed end lengths.

[0034] Fig. 7 is a top view of a wire connection portion 703 having an inner set of electrodes 706 and an outer set of electrodes 708 that are staggered relative to each other. The outer wires 718, 720 are spaced far enough apart that with the staggered positioning, the inner wires 710, 712 are able to pass between the outer wires and remain parallel to the PCB surface, rather than being forced to pass over the outer wires. Also shown are optional recesses 730 to accommodate the sheathes of the outer conductors.

[0035] Fig. 8 is a cross-section of the wire connection portion 703, showing an inner wire 712 with its exposed end 801 attached to an inner electrode and an outer wire 720 with its exposed end 803 attached to an outer electrode. Notably, inner wire 712 passes behind outer wire 730 rather than over as shown in Fig. 6. Ideally, the inner wire maintains contact with the PCB surface, though some small separation may be needed to accommodate the connection of the outer wire ground conductors (see Fig. 3). Fig. 8 also shows optional attachments for the bottom surface of the wire connection portion.

[0036] Wire connection portion 303 has an optional surface recess 730 that extends along the path of the outer wire from the edge of the paddle card toward the outer electrode to accommodate the outer wire's sheath, enabling exposed end 803 to be attached to the outer electrode while remaining parallel to the upper surface of the wire connection portion 303. While the surface recess 730 preferably has a depth at least equal to the sheath thickness, even reduced depths will reduce the

loop height H relative to the geometry of Fig. 6. In some contemplated embodiments, the wiring sheath thickness may be such that the recess depth achievable with the given PCB manufacturing process cannot fully accommodate the sheath thickness. Even where such accommodation is possible, there may be other considerations (e.g., derivative of the impedance, or total reflection energy) that call for partial accommodation of the sheath thickness. Accordingly the preferred recess depth may be determined and optimized through simulation and experiment.

[0037] Fig. 9 is an isometric view of wire connection portion 703 showing a recess 730 for each outer wire. The recesses 730 are shown as rectangular, but cylindrical concavities or other shapes suitable for accommodating the outer wire sheathes are also contemplated. In some embodiments, the recesses 730 are broadened as shown in Fig. 10 so that each recess can accommodate sheathes from multiple outer wires. If desired, the recess may extend across the full width of the paddle card to provide a stepped profile next to the outer set of electrodes.

[0038] Fig. 11 is a graph of impedance magnitude vs distance (in terms of propagation delay) as measured from the cable side of an outer wire. The impedance starts off constant, but increases where the signal exits the sheath and propagates along the exposed end of the wire to the solder connection. The impedance then dips where the signal traverses the solder connection, exhibits a smaller peak where the signal traverses a via, and returns to a constant value where the signal propagates along a printed circuit trace. In the original geometry (e.g., Fig. 6), the impedance rises from 102 to 118 ohms (16 ohm peak), whereas in the enhanced geometry the impedance rises only to just under 110 ohms (<8 ohm peak), a 50% reduction in the size of the peak. The peak width also shrinks from

about 35ps to about 28ps, a 20% reduction.

[0039] Thus, to manufacture cables having an improved performance, a manufacturing system may obtain first and second printed circuit boards each having: edge connector traces arranged along a first edge for contacting electrical conductors when the printed circuit board is inserted in a matching socket; an outer set of electrodes arranged parallel to a second edge for attaching unsheathed ends of certain sheathed wires in a cable; and an inner set of electrodes arranged parallel to the second edge for attaching unsheathed ends of other sheathed wires in the cable, with the electrodes in the inner set being staggered relative to the electrodes in the outer set. The system unsheathes the ends of the cable wires and solders the exposed ends to the electrodes in the inner and outer set, before packaging the first and second printed circuit boards into connectors adapted to fit standard-compliant socket. At an earlier stage of the process, the system may equip the first and second printed circuit boards with an integrated circuit that recovers and remodulates signals passing between the edge connector traces and the electrodes of the inner and outer sets.

[0040] Numerous alternative forms, equivalents, and modifications will become apparent to those skilled in the art once the above disclosure is fully appreciated. It is intended that the claims be interpreted to embrace all such alternative forms, equivalents, and modifications that are encompassed in the scope of the appended claims.

CLAIMS

What is claimed is:

1. A printed circuit board that comprises at least one surface having:
 - edge connector traces arranged along a first edge for contacting electrical conductors in a socket connector;
 - an outer set of electrodes arranged parallel to a second edge for attaching exposed ends of sheathed wires in a cable ("outer wires"); and
 - an inner set of electrodes arranged parallel to the second edge for attaching exposed ends of sheathed wires in a cable ("inner wires"),with the electrodes in the inner set being staggered relative to the electrodes in the outer set.
2. The printed circuit board of claim 1, with the electrodes in each of the inner and outer sets being spaced to enable the inner wires to pass between the outer wires while maintaining contact with the at least one surface.
3. The printed circuit board of claim 1, wherein the outer wires each have a sheath with a given thickness adjacent to the exposed end, and wherein the printed circuit board further comprises one or more recesses in the at least one surface along each outer wire sheath's path between the second edge and the outer set of electrodes.
4. The printed circuit board of claim 3, wherein the one or more recesses each accommodates sheathes of multiple outer wires.
5. The printed circuit board of claim 3, wherein each outer wire has a corresponding one of the one or more recesses.
6. The printed circuit board of claim 3, wherein each of the one or more recesses is deep enough to accommodate the given thickness of the sheath, enabling each

of the exposed ends of the outer wires to contact the electrodes in the outer set while remaining parallel to the at least one surface.

7. The printed circuit board of claim 6, further comprising a second surface having:

- a second outer set of electrodes arranged parallel to the second edge for attaching exposed ends of sheathed outer wires; and
- one or more recesses in the second surface extending along a path of each sheathed outer wire's sheath between the second edge and the second outer set of electrodes.

8. The printed circuit board of claim 1, further comprising an integrated circuit that recovers and remodulates signals passing between the edge connector traces and the electrodes of the inner and outer sets.

9. A cable that comprises:

- sheathed wires extending between a first connector and a second connector, each of the first and second connectors including a printed circuit board with at least one surface having:

- edge connector traces arranged along a first edge for contacting electrical conductors when the connector is inserted in a socket;
- an outer set of electrodes arranged parallel to a second edge for attaching unsheathed ends of some of the sheathed wires; and
- an inner set of electrodes arranged parallel to the second edge for attaching unsheathed ends of others of the sheathed wires, with the electrodes in the inner set being staggered relative to the electrodes in the outer set.

10. The cable of claim 9, wherein the electrodes in each of the inner and outer sets are spaced to enable the sheathed wires attached to the inner set to maintain contact with the at least one surface while passing between the sheathed wires attached to the outer set.
11. The cable of claim 9, wherein each printed circuit board further comprises one or more recesses in the at least one surface between the second edge and the outer set of electrodes to accommodate sheathes of the sheathed wires attached to the outer set of electrodes.
12. The cable of claim 11, wherein the one or more recesses each accommodates sheathes of multiple sheathed wires.
13. The cable of claim 11, wherein each sheathed wire attached to the outer set of electrodes has a corresponding one of the one or more recesses.
14. The cable of claim 11, wherein each of the one or more recesses is deep enough to accommodate a full thickness of the sheath near the unsheathed end, enabling each of the unsheathed ends of the wires attached to the outer set of electrodes to contact those electrodes while remaining parallel to the at least one surface.
15. The cable of claim 9, further comprising an integrated circuit that recovers and remodulates signals passing between the edge connector traces and the electrodes of the inner and outer sets.
16. A cable manufacturing method that comprises:
 providing first and second printed circuit boards each having:
 edge connector traces arranged along a first edge for contacting electrical
 conductors when the printed circuit board is inserted in a matching

- socket;
 - an outer set of electrodes arranged parallel to a second edge for attaching unsheathed ends of certain sheathed wires in a cable; and
 - an inner set of electrodes arranged parallel to the second edge for attaching unsheathed ends of other sheathed wires in the cable, with the electrodes in the inner set being staggered relative to the electrodes in the outer set;
 - soldering unsheathed ends of the sheathed wires to the electrodes in the inner and outer set; and
 - packaging the first and second printed circuit boards into connectors adapted to fit into a socket.
17. The method of claim 16, further comprising equipping each of the first and second printed circuit boards with an integrated circuit that recovers and remodulates signals passing between the edge connector traces and the electrodes of the inner and outer sets.
18. The method of claim 16, wherein the electrodes in each of the inner and outer sets are spaced to enable the sheathed wires attached to the inner set to maintain contact with the at least one surface while passing between the sheathed wires attached to the outer set.
19. The method of claim 18, wherein each printed circuit board further comprises one or more recesses in the at least one surface between the second edge and the outer set of electrodes to accommodate sheathes of the sheathed wires attached to the outer set of electrodes, each of the recesses being deep enough to accommodate a full thickness of the sheath near the unsheathed end.
20. The method of claim 19, wherein each sheathed wire attached to the outer

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set of electrodes has a corresponding one of the one or more recesses.

ABSTRACT

Connector paddle cards are provided with an improved wiring connection geometry that reduces impedance mismatch. One illustrative embodiment is a printed circuit board having, on at least one surface: edge connector traces arranged along a first edge for contacting electrical conductors in a socket connector; an outer set of electrodes arranged parallel to a second edge for attaching exposed ends of sheathed wires in a cable ("outer wires"); and an inner set of electrodes arranged parallel to the second edge for attaching exposed ends of sheathed wires in a cable ("inner wires"), with the electrodes in the inner set being staggered relative to the electrodes in the outer set.

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I 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. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Xike LIU</u> Date (Optional): <u>2020-02-19</u> Signature: <u>Xike Lin</u> Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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As the below named inventor, I hereby declare that:

This declaration is directed to: ☒ The attached application, or
☐ United States application or PCT international application number _____
filed on _____.

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

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

I 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.

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LEGAL NAME OF INVENTOR

Inventor: Gaige MEI Date (Optional): 2020.2.19
Signature: 梅改军

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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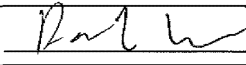
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LEGAL NAME OF INVENTOR Inventor: <u>Xiangxiang YE</u> Date (Optional): <u>2020.02.21</u> Signature: <u>叶翔翔</u>	
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LEGAL NAME OF INVENTOR Inventor: <u>Zhining Li</u> Date (Optional): <u>2020/2/24</u> Signature: <u></u>	
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Credo Technology Group Limited

Application No./Patent No.: _____ Filed/Issue Date: January 11, 2021

Titled: CONNECTOR PADDLE CARD WITH IMPROVED WIRING CONNECTION GEOMETRY

Credo Technology Group Limited, a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

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[Page 1 of 2]

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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Dan Krueger/

Signature

Daniel Krueger

Printed or Typed Name

January 11, 2021

Date

42,771

Title or Registration 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); (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.

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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.
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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.
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