

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒

Practitioners associated with Customer Number:

63467

OR

☐

Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒

The address associated with Customer Number:

63467

OR

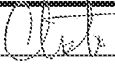
☐	Firm or Individual Name			
	Address			
	City		State	Zip
	Country			
	Telephone	Email		

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

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

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		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. 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 3 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. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	
First Named Inventor	Yifei DAI, et al
Title	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
Art Unit	
Examiner Name	
Attorney Docket Number	20160.0038.NPUS00

SIGNATURE of Applicant or Patent Practitioner

Signature	/Dan Krueger/	Date (Optional)	11/27/2019
Name	Dan Krueger	Registration Number	42771
Title (if Applicant is a juristic entity)	Attorney for Applicant		
Applicant Name (if Applicant is a juristic entity)	Credo Technology Group Limited		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐

*Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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. 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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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Credo Technology Group Limited

Application No./Patent No.: _____ Filed/Issue Date: _____

Titled: ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

Credo Technology Group Limited, a limited company

(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:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
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5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
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6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ 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 J. Krueger

Printed or Typed Name

11/27/2019

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.

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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	
	Filing Date	2019-11-22
	First Named Inventor	Yifei DAI
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20160.0038.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	9322704	B1	2016-04-26	Neveux			
	2	7401985	B2	2008-07-22	Aronson, et al			
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	1	2018161273	WO	A1	2018-09-13	Credo Technology Group Ltd.		
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
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	First Named Inventor	Yifei DAI	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		20160.0038.NPUS00

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	Rumer, B. (2001, February 1). Fighting Jitter in Fibre-Channel Designs. EE Times. Retrieved January 23, 2019, from https://www.eetimes.com/document.asp?doc_id=1277249# .	
	2	Management Data Input/Output. (2018, November 25). Wikipedia. Retrieved January 23, 2019, from https://en.wikipedia.org/wiki/Management_Data_Input/Output .	
	3	QSFP-DD MSA - QSFP-DD Hardware Specification for QSFP Double Density 8X Pluggable Transceiver Rev 4.0 Candidate. August 15, 2018.	
	4	40 Gigabit Ethernet, 40G QSFP+, 40GBASE-LR4, 40G-BASE-SR4, CFP module, CXP Transceiver, MPO MTP Fiber on May 25, 2015 [http://www.cables-solutions.com/guide-to-40-gigabit-ethernet-options.html]	
	5	IEEE P802.3cd/D1.2, 3rd February 2017 (Amendment of IEEE Std 802.3-2015 as amended) IEEE Draft Standard for Ethernet Amendment: Media Access Control Parameters for 50 Gb/s, 100 Gb/s and 200 Gb/s Operation.	

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

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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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.

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		
	Filing Date		2019-11-22
	First Named Inventor	Yifei DAI	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		20160.0038.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)	2019-11-27
Name/Print	Dan Krueger	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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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.



- (51) **International Patent Classification:**
H04L 12/24 (2006.01)
- (21) **International Application Number:**
PCT/CN2017/075961
- (22) **International Filing Date:**
08 March 2017 (08.03.2017)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (71) **Applicant: CREDO TECHNOLOGY GROUP LTD.;**
P.O. Box 309, Ugland House, Grand Cayman 1104 (KY).
- (72) **Inventors: DAI, Yifei;** Room 508, No. 510 Chifeng Road,
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TWOMBLY, Jeff; 13621 Burke Road, Los Altos Hills,
California 94022 (US).
- (74) **Agent: SHANGHAI PATENT & TRADEMARK LAW**
OFFICE, LLC; 435 Guiping Road, Shanghai 200233
(CN).

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- (84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

- (81) Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

- (54) Title:** ETHERNET LINK EXTENSION METHOD AND DEVICE

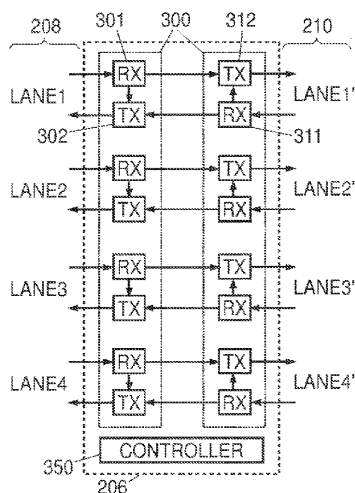


FIG. 3

(57) Abstract: Ethernet link extension methods and devices provide, in one illustrative embodiment, an Ethernet link extender with physical medium attachment (PMA) circuits each having a transmitter and receiver that communicate with a respective node in a sequence of communication phases. The sequence includes at least an auto-negotiation phase and a subsequent training phase, the phases occurring simultaneously for both PMA circuits. In the auto-negotiation phase, the PMA circuits operate in a pass-through mode, rendering the extender transparent to the two nodes. In the training phase, the PMA circuits operate independently, sending training frames to their respective nodes based in part on received back-channel information and locally-determined training status information. The training phases may be prolonged if needed to provide a simultaneous transition to a frame-forwarding phase of the sequence.

ETHERNET LINK EXTENSION METHOD AND DEVICE

BACKGROUND

[0001] The Institute of Electrical and Electronics Engineers (IEEE) Standards Associations 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 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, twisted wire pair cable, fiber optic cable, and electrical backplanes. To support shared access on multisegment networks, the standard provides for the use of repeaters at operational speeds up to 1000 Mb/s. Operation at higher speeds appears contemplated solely for point-to-point communication links of an inconveniently limited length. The length limits are imposed by the existence of channel non-idealities such as dispersion and additive noise.

[0002] This choice to support only point-to-point links enables the protocol to include auto-negotiation and training phases for optimizing high-speed communications. The auto-negotiation phase enables the end nodes to exchange information about their capabilities, and the training phase enables the end nodes to adapt both transmit-side and receive-side equalization filters in a fashion that combats the channel non-idealities. Both phases are governed by strict timing requirements, and they each fail to account for any intermediate devices or filters.

[0003] At least in principle, link extenders, also known as signal reconditioners, retimers, or repeaters, are well known. Ideally such devices operate solely as conduits between the link's end nodes, supporting standard-compliant network operations without appearing as additional nodes in the network. We are not aware of any existing link extension methods or devices that can satisfactorily achieve this ideal for Ethernet links operating at 10 Gb/s or above.

SUMMARY

[0004] Accordingly, there are disclosed herein a Ethernet link extension methods and devices. In one illustrative embodiment, an Ethernet link extender includes physical medium attachment (PMA) circuits each having a transmitter and receiver that communicate with a respective node

in a sequence of communication phases, the sequence including at least an auto-negotiation phase and a subsequent training phase, the phases occurring simultaneously for both PMA circuits. In the auto-negotiation phase, the PMA circuits operate in a pass-through mode, rendering the extender transparent to the two nodes. In the training phase, the PMA circuits operate independently, sending training frames to their respective nodes based in part on received back-channel information and locally-determined training status information.

[0005] An illustrative Ethernet link extension method includes a first communications phase for auto-negotiation and a subsequent communications phase for training for use by a first PMA circuit that communicates with a first node and a second PMA circuit that communicates with a second node. In the first phase, the transmitter of the second PMA circuit is coupled to the receiver of the first PMA circuit to retransmit communications received from the first node, and the transmitter of the first PMA circuit is coupled to the receiver of the second PMA circuit to retransmit communications received from the second node. In the second phase, training controllers in each PMA circuit generate training frames for the respective transmitter to send to the respective node, the frames being based in part on received back-channel information and locally-generated training status information from their respective receivers.

[0006] Each of the foregoing embodiments may be implemented individually or in combination, and may be implemented with any one or more of the following features in any suitable combination: (1) the transmitter of the second PMA circuit is coupled to the receiver of the first PMA circuit during the auto-negotiation phase via an on-chip analog signal line. (2) the transmitter of the second PMA circuit is coupled to the receiver of the first PMA circuit during the auto-negotiation phase via a digital signal bus between an analog-to-digital converter and a digital-to-analog converter. (3) the transmitter of the first PMA circuit and the transmitter of the second PMA circuit each include a transmit filter adapted in accordance with back-channel information received from the first and second nodes, respectively, during the training phase. (4) the receiver of the first PMA circuit and the receiver of the second PMA circuit each include a filter adaptation circuit that generates filter coefficient updates and detects filter convergence. (5) at least one of the transmitter of the first PMA circuit and the transmitter of the second PMA circuit includes a training controller providing back-channel information to at least one of

the first and second nodes. (6) the training controller confirms filter convergence only when filter converge is detected by both the receiver of the first PMA circuit and the receiver of the second PMA circuit. (7) the receiver of the first PMA circuit and the receiver of the second PMA circuit each include detector. (8) the extender initiates a training phase when either of the detectors detects an end of the auto-negotiation phase. (9) the detectors monitor spectra of received signals for high-frequency content indicative of training frames. (10) the detectors decode information from auto-negotiation frames to detect said end. (11) each of the first PMA circuit and the second PMA circuit include multiple transmitter-receiver pairs to support multiple communication lanes between the first and second nodes. (12) coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the auto-negotiation phase includes: (a) digitizing communications received from the first node to obtain received signal samples; (b) conveying the received signal samples on a bus to the transmitter of the second PMA circuit; and (c) converting the received signal samples into an analog electrical transmit signal. (13) adapting a transmit filter in each of the transmitter of the first PMA circuit and the transmitter of the second PMA circuit in accordance with back-channel information received from the first and second nodes, respectively, during the training phase. (14) generating filter coefficient updates and detecting filter convergence with a filter adaptation circuit in each of the receiver of the first PMA circuit and the receiver of the second PMA circuit. (15) providing back-channel information to the first and second nodes with a training controller in each of the transmitter of the first PMA circuit and the transmitter of the second PMA circuit. (16) confirming filter convergence with each of the training controllers only when filter converge is detected by both the receiver of the first PMA circuit and the receiver of the second PMA circuit. (17) initiating the training phase when either, but before both, the receiver of the first PMA circuit and the receiver of the second PMA circuit detects an end of the auto-negotiation phase. (18) monitoring spectra of received signals for high-frequency content to detect said end of the auto-negotiation phase. (19) decoding information from auto-negotiation frames to detect said end.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the drawing:

[0008] Fig. 1 shows an illustrative communications network.

[0009] Fig. 2 is a block diagram of an illustrative extended Ethernet link.

[0010] Fig. 3 is a block diagram of an illustrative Ethernet link extender.

[0011] Fig. 4 is a block diagram of an illustrative PMA circuit receiver.

[0012] Fig. 5 is a block diagram of an illustrative PMA circuit transmitter.

[0013] Fig. 6 is a flowchart of an illustrative Ethernet link extension method.

[0014] It should be understood, however, that the specific embodiments given in the drawings and detailed description 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.

DETAILED DESCRIPTION

[0015] The disclosed apparatus and methods are best understood in the context of the larger environments in which they operate. Accordingly, Fig. 1 shows an illustrative communications network 100 including mobile devices 102 and computer systems 104A-C coupled via a routing network 106. The routing network 106 may be or include, for example, the Internet, a wide area network, or a local area network. In Fig. 1, the routing network 106 includes a network of equipment items 108, such as switches, routers, and the like. The equipment items 108 are connected to one another, and to the computer systems 104A-C, via point-to-point communication links 110 that transport data between the various network components. At least some of the links 110 in network 106 are high-speed Ethernet links operating in compliance with the IEEE Std 802.3-2015 at 10 Gb/s or more .

[0016] Fig. 2 is a block diagram of an illustrative high-speed Ethernet link that may be representative of one or more links 110 in Fig. 1. The illustrated embodiment includes a first node 202 ("Node A") in communication with a second node 204 ("Node B") via an Ethernet link extender 206. Nodes A & B can each be, for example, any one of equipment items 108, computer systems 104A-C, or other sending/receiving devices having high-speed Ethernet ports

and separated by a distance greater than the point-to-point link length limitations imposed by the standard. The nodes can also be integrated circuit (IC) chips in a switch or other telecommunications system. The illustrated link includes four bidirectional communication lanes 208 extending from Node A to the extender 206 and four communication lanes 210 extending from Node B to the extender 206. Each bidirectional lane represents two unidirectional lanes operating in opposite directions. In accordance with the standard, these unidirectional or bidirectional lanes may be transported by different twisted wire pairs, electrical back-plane traces, copper transmission lines, or optical fibers, or they may be multiplexed onto shared electrical/optical conductors.

[0017] The Ethernet standard specifies the node operations in terms of the hierarchical layers of the Open Systems Interconnection (OSI) model, focusing in particular on the lowermost “physical” layer, which provides the electrical and physical specifications of the connections between the nodes and the communications medium (e.g., pin layouts, line impedances, signal voltages & timing), arrangements of the communications medium (e.g., the network topology), and the electrical and physical specifications for the communications medium itself (e.g., conductor arrangements in copper or fiber optic cable, limitations on attenuation, propagation delay, signal skew). The physical layer is responsible for transmission and reception of raw bit streams over the communications medium, employing simplex, half duplex, or full duplex modes.

[0018] Depending on the applicable clauses, the Ethernet standard divides the physical layer into at least three sublayers: the physical medium dependent (PMD) sublayer, the physical medium attachment (PMA) sublayer, and the physical coding sublayer (PCS). The PMD sublayer specifies the transceiver conversions between transmitted/received channel signals and the corresponding bit (or digital symbol) streams. The PMA sublayer operation varies between clauses, but generally specifies (potential) lane remapping, symbol encoding/decoding, framing, and octet/symbol synchronization. In practice, the delineation between PMD and PMA sublayers may be uncertain and the two sublayers more properly regarded as a combined sublayer. The PCS sublayer provides scrambling/descrambling, data encoding/decoding, block and symbol redistribution, alignment marker insertion/removal, and block-level lane

synchronization and deskew. An optional forward error correction (FEC) sublayer may reside between the PMA and PCS sublayers to provide, e.g., Reed-Solomon coding/decoding that distributes data blocks with controlled redundancy across the lanes. If present, the FEC sublayer provides at least some of the functionality otherwise allocated to the PCS sublayer, e.g., encoding/decoding, alignment marker insertion/removal, and block-level lane synchronization and deskew.

[0019] The circuitry associated with each sublayer (and each of the higher layers in the OSI model) adds to the areal and power requirements of the protocol stack for each device's Ethernet connection, and exacerbates the communications link latency. While this situation is largely unavoidable for the nodes, it is singularly undesirable to impose these penalties on every link extender in the system. The following Ethernet link extender devices and methods seek to exclude any circuitry for implementing the PCS sublayer and any higher layers of the OSI model. At least some of the disclosed extender devices and methods limit their circuitry to only that necessary to implement the PMD and PMA sublayers of the Ethernet standard. As described below, this ideal is achievable by enabling the extender to switch between transparent and opaque modes at different phases of the link establishment process. As a result, the Ethernet link's end nodes (Nodes A & B) conduct standard-compliant operations in ignorance of any intermediate extender devices which may be present, thereby overcoming the link length limitations otherwise imposed by the standard.

[0020] Fig. 3 is a high-level block diagram of an illustrative extender 206 having two PMA circuits 300, one for communicating with Node A via communication lanes 208, and one for communicating with Node B via communication lanes 210. The PMA circuits 300 each have a transceiver for each communication lane, yielding four transmitter-receiver pairs within each PMA circuit. For example, receiver 301 and transmitter 302 communicate with Node A via Lane 1, while receiver 311 and transmitter 312 communicate with Node B via Lane 1'. Lanes 2-4 and 2'-4' are similarly supported. An integrated controller 350 provides chip-level support functions (e.g., voltage regulation, clock generation, MDIO/I2C bus interface for programming and testing) and a firmware-programmed microcontroller having registers for coordinating and controlling the operations of the PMA circuits 300.

[0021] In the normal operating phase, i.e., after the link has been established and data is being conveyed between the nodes, extender 300 operates as follows. Receiver 301 receives via Lane 1 a channel signal from Node A, converts the channel signal into digital receive signal, or more precisely, a frame- and symbol-synchronized bit stream representing the data conveyed via Lane 1. Receiver 301 provides this digital receive signal to transmitter 312, which converts it into a channel signal transmitted to Node B via Lane 1'. The signal-to-noise ratio of the transmitted channel signal on Lane 1' is thereby enhanced relative to the signal-to-noise ratio of the received channel signal on Lane 1. Receiver 311 and transmitter 302 perform the same operations for communications from Node B to Node A. The remaining transmitters and receivers operate similarly for the remaining communications lanes. Note that it may advantageously simplify implementation if the communication lanes are enabled to operate independently in the described fashion.

[0022] To get to the normal operating phase, however, the standard requires that the link pass through an auto-negotiation phase and a subsequent training phase. The auto-negotiation phase enables the end nodes to exchange information about their capabilities, and the training phase enables the end nodes to adapt both transmit-side and receive-side equalization filters in a fashion that combats the channel non-idealities. Both phases are governed by strict timing requirements, and the standard fails to account for the possibility of any intermediate devices or filters.

[0023] The standard specifies that the end nodes initiate the setup of each communications lane by transmitting and receiving frames of auto-negotiation information regarding the respective capabilities of both nodes, acknowledgements of received information, and the results of an arbitration process to select an optimal set of communications parameters given the nodes' respective capabilities. To comply with the standard, the extender, being initially ignorant of the respective capabilities of the end nodes, must force multiple rounds of auto-negotiation to assure an optimal set of communications parameters is chosen by the nodes. (The extender would implement PMA and PCS sublayers that enter a first round of auto-negotiation with each end node to determine their respective capabilities, then enter a second round in which the extender masquerades itself to each end node as the other end node. Note

that additional rounds would also be required if more than one extender is present. In the meantime, the timing limitations on the training phase may cause a link failure.)

[0024] Preferably, then, the extender does not participate in the auto-negotiation process, instead operating in a pass through (“transparent”) mode to retransmit the auto-negotiation frames received from each node to the other. In at least some “packet-sniffing” embodiments, the controller 350 monitors the contents of the auto-negotiation frames received on each lane, determining from the embedded control codes for each lane when the selection process is complete and the auto-negotiation phase is concluded. (Rather than treating the communications lanes independently, some alternative embodiments conduct the auto-negotiation process on only the first lane and apply the negotiated communications parameters to all communications lanes. A subsequent failure on any one lane triggers a restart of the auto-negotiation process for all lanes.)

[0025] Notably, however, the auto-negotiation frames are formed from low-rate channel symbols having a large separation (in signal space) even after accounting for channel attenuation and the use of untrained equalization filters. These frames accordingly are not subject to the same link length limitation and can be accurately decoded a significantly greater distances. Accordingly, other “non-decoding” embodiments of extender 206 merely pass along the channel signal waveforms conveying the auto-negotiation frames without timing recovery, demodulation, and/or decoding. Amplification and filtering may be provided, or in some cases, analog-to-digital conversion followed by digital-to-analog conversion at a resolution suitable to pass along the waveform with adequate fidelity. Such embodiments may monitor the spectral content and/or other characteristics of the received channel signals to detect when the auto-negotiation phase is concluded. (For example, the training frames will have high-frequency spectral content that is absent from the auto-negotiation frames.)

[0026] The packet-sniffing embodiments can determine the negotiated operating parameters from the embedded control codes, while the non-decoding extender embodiments can determine the negotiated operating parameters from the spectral characteristics of the training frames. If the negotiated operating parameters are within the extender’s capabilities, the extender configures the receivers and transmitters accordingly and commences the training

phase. For 10GBASE-KR, the training phase details can be found in IEEE Std 802.3 clause 72. For 100GBASE-KP4, the details are in IEEE 802.3 clause 94. If the auto-negotiation phase is successful, the end nodes remain unaware of any intervening link extenders during the auto-negotiation phase. However, if the end nodes negotiate a speed that cannot be supported, at least some link extender embodiments treat this situation as an error condition and temporarily disable the transmitters, thereby aborting the link setup process.

[0027] The auto-negotiation phase is followed by a subsequent training phase, in which each end node transmits and receives frames of training information. The frames include broadband training sequences that the other node can employ to adapt its receive filters, training status information, and back-channel information used by the receiving node to adjust its transmit filters. The standard link length limitations apply to the training sequences, and in any event, the extender's transmit and receive filters should also be trained. Accordingly, the extender participates in the training phase, masquerading itself as an end node on each communication lane. Thus, for example, receiver 301 and transmitter 302 participate in the training phase with Node A, while at the same time receiver 311 and transmitter 312 participate in the training phase with Node B. Other than the simultaneous nature of the training phases, the Node A and Node B training occur independently of each other. If the training occurs more quickly on the Node A link than on the Node B link (or vice versa), the extender may prolong the training process on the sufficiently trained link until the training for both links is completed, so that the Node A and Node B training phases conclude at substantially the same time.

[0028] As previously noted, some extender embodiments coordinate the operations of all lanes, so that the training phase for all lanes begins and ends at the same time. Other embodiments enable the lanes to operate independently, and for each lane provide coordination of the Node A and Node B links. As the training phase for each lane (or for all lanes) concludes, the extender places the lanes in a normal-operations mode, which may alternatively be referred to as the frame-forwarding phase. In the frame-forwarding phase, the extender recovers the symbols or bits from each frame received on a given lane from an end node and retransmits them as a regenerated frame on the corresponding lane to the other end node. The extender can thus convey data between the end nodes with very small latency and low power overhead.

[0029] Fig. 4 shows an illustrative receiver 301 suitable for use in the PMA circuits 300. The channel input (CH_IN) node receives an analog electrical signal from a transducer (e.g., a photodiode) or directly from the channel lane conductor and supplies it to a low noise amplifier (LNA) 402. The LNA 402 provides a high input impedance to minimize channel loading and amplifies the received electrical signal to drive the input of a continuous time linear equalizer (CTLE) filter 404. During normal operations, CTLE 404 provides continuous time filtering to shape the signal spectrum in an adaptive fashion to reduce the length of the channel impulse response while minimizing leading inter-symbol interference (ISI). A decision feedback equalizer (DFE) 406 operates on the filtered signal to correct for trailing ISI and detect each transmitted channel bit or symbol, thereby producing a demodulated digital data stream. Some embodiments employ oversampling. A clock and data recovery (CDR) circuit 408 extracts a clock signal from the filtered signal and/or the digital data stream and supplies it to DFE 406 to control timing of the symbol detection. A serial-to-parallel circuit 410 groups the digital data stream bits or symbols into blocks to enable the use of lower clock rates for subsequent on-chip operations. During normal operations, multiplexer 412 places the blocks on the digital receive bus (RXD) for retransmission to the remote end node by a transmitter (e.g., transmitter 312).

[0030] During the auto-negotiation phase, the illustrated LNA 402 supplies the amplified receive signal to an analog-to-digital converter (ADC) 420. ADC 420 digitizes the receive signal, optionally with a sampling rate and resolution to provide adequate reconstruction without requiring timing recovery. The multiplexer 412 places the digital samples of the receive signal on the RXD bus for retransmission on another link. A detector 422 monitors the receive signal for the end of the auto-negotiation phase and/or the beginning of the training phase frames. Alternatively, the auto-negotiation phase signals may be passed through the normal operations signal path (402-404-406-410) with untrained (default) filters and a packet information extractor 442 employed to monitor the contents of the auto-negotiation frames for detecting the end of the auto-negotiation phase.

[0031] During the training phase, LNA 402 supplies the received signal to CTLE filter 404, DFE 406, and S2P circuit 410. A filter adaptation circuit 440 measures an error between the input and output of a decision element in DFE 406, employing that error in accordance with well-

known techniques from the literature on adaptive filtering to determine adjustments for the coefficients in CTLE filter 404, DFE 406, and a transmit filter 506 (discussed further below), and to determine whether convergence has been achieved. The locally-generated information (LOCAL_INFO) including the transmit filter coefficient adjustments and the convergence status are provided to the local transmitter (e.g., transmitter 302). As discussed below, the local transmitter communicates the transmit filter adjustments and the convergence status via a back-channel to the local end node. In that vein, the received signal includes back-channel information *from* the local end node. A packet information extractor 442 detects the back-channel information (BACK_INFO) and passes it to the local transmitter (e.g., transmitter 302). Once convergence is achieved, receiver 301 is ready to begin normal operations.

[0032] Fig. 5 shows an illustrative transmitter 302 suitable for use in the PMA circuits 300. During normal operations, demultiplexer 502 and multiplexer 503 supply blocks of channel bits or symbols from the remote end node conveyed by the RXD bus to the parallel to serial (P2S) circuit 504. P2S circuit converts the blocks into a digital data stream. A transmit filter 506, also called a pre-emphasis filter, converts the digital data stream into an analog electrical signal with spectral shaping to combat channel degradation. Driver 508 amplifies the analog electrical signal to drive the channel output (CH_OUT) node.

[0033] During the auto-negotiation phase, illustrated demultiplexer 502 directs digital samples of the received auto-negotiation signals received from the remote end node and conveyed via the RXD bus to a digital-to-analog converter (DAC) 520. DAC 520 converts the digital samples into an analog electrical signal that reproduces the received auto-negotiation signals. Driver 508 amplifies the analog electrical signal to drive the channel output (CH_OUT) node. If the ADC path is omitted from receiver (Fig. 4), the DAC path may also be omitted from the transmitter. The normal operations path may be employed with an untrained (default) transmit filter. As another alternative, a switchable on-chip analog signal line may couple LNA 402 for a local end node to the driver 508 for a remote end node.

[0034] During the training phase, multiplexer 503 obstructs information from the RXD bus, instead supplying P2S circuit 504 with training frames from a training controller 540. The training controller 540 generates the training frames based on the convergence status and

transmit filter coefficient adjustments (LOCAL_INFO) received from the local receiver (e.g., receiver 301). Note that even after the local receiver indicates filter convergence has occurred, the training controller 540 may prolong the training phase to coordinate training phase timing with the receiver for the remote end node (e.g., receiver 311). The training frames further include training sequences as specified by the relevant portions of the IEEE Std 802.3.

[0035] The training controller 540 further accepts the back-channel information (BACK_INFO) extracted by the local receiver from received training frames sent by the local end node. The training controller applies the corresponding adjustments to the coefficients of transmit filter 506. Upon conclusion of the training phase, multiplexer 503 begins forwarding RXD blocks to the P2S circuit 504.

[0036] Fig. 6 is a flowchart of an illustrative Ethernet link extension method. It begins in block 602 with a technician or user connecting end nodes of an Ethernet link via an intermediate link extender. When each end node powers up, or periodically thereafter, it initiates an auto-negotiation phase to set up the link. In block 604, the extender conceals itself during the auto-negotiation phase, transparently passing the signals received from each end node to the other end node. The signals may be passed through the extender as analog signals; as analog-to-digital and digital-to-analog converted waveforms, or as demodulated and remodulated data frames. In other words, a transmitter of a second PMA (physical medium attachment) circuit is coupled to a receiver of a first PMA circuit to retransmit communications received from a first node; and a transmitter of the first PMA circuit is coupled to a receiver of the second PMA circuit to retransmit communications received from the second node.

[0037] During the auto-negotiation phase, the extender monitors the received signals until, in block 606, the end of the auto-negotiation phase is detected. As discussed previously, the extender may perform this detection by decoding information from the auto-negotiation frames exchanged between the end nodes and/or by monitoring the spectra for high-frequency content typical of training sequences. Having detected the end of the auto-negotiation phase from either end node on a given lane, the extender initiates the training phase on that lane for both end nodes simultaneously in block 608. Training controllers for each of the first and second PMA circuits generate training frames for transmission by the transmitter of the

respective PMA circuit based in part on back-channel information and training status information from the local receiver of the respective PMA circuit.

[0038] The training phase is performed concurrently for both end nodes, prolonged if necessary until the links are trained for both end nodes in block 610, indicating that the training phase can be concluded for both. The extender then signals the end of the training phase on that lane to both end nodes and enters the frame-forwarding phase in block 612.

[0039] In the frame-forwarding phase of block 612, the extender demodulates the channel data frames to extract the channel bits or symbols from each end node. The channel bits or symbols are then remodulated for transmission to the other end node, obviating any need for a PCS sublayer and thereby minimizing latency and power consumption with minimal impairment to link robustness. In some extender embodiments, the extender monitors the equalization error levels, or performs checksum calculations to detect errors. If a fault is detected, in block 614 the extender temporarily disables the transmitters for that lane to force re-initiation of the link, and the method then repeats beginning with block 604.

[0040] Numerous alternative forms, equivalents, and modifications will become apparent to those skilled in the art once the above disclosure is fully appreciated. For example, the foregoing description focuses on implementations employing only one link extender between end nodes, but the disclosed principles would still apply if multiple extenders are provided in sequence between the end nodes. 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. An Ethernet link extender that comprises:
 - a first PMA (physical medium attachment) circuit having a transmitter and a receiver that communicate in a sequence of phases with a first node, the sequence including at least an auto-negotiation phase and a subsequent training phase; and
 - a second PMA circuit having a transmitter and a receiver that communicate in said sequence of phases with a second, different node, the phases in said sequence being simultaneous for the first and second PMA circuits,the transmitter of the second PMA circuit being coupled to the receiver of the first PMA circuit during the auto-negotiation phase to retransmit communications received from the first node,
- the transmitter of the first PMA circuit being coupled to the receiver of the second PMA circuit during the auto-negotiation phase to retransmit communications received from the second node, and
- the first and second PMA circuits each including a respective training controller that, during the training phase, generates training frames for transmission by the transmitter of the respective PMA circuit based in part on back-channel information and training status information from the receiver of the respective PMA circuit.
2. The extender of claim 1, wherein said coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the auto-negotiation phase is via an on-chip analog signal line.
3. The extender of claim 1, wherein said coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the auto-negotiation phase is via a digital signal bus between an analog-to-digital converter and a digital-to-analog converter.
4. The extender of claim 1, wherein the transmitter of the first PMA circuit and the transmitter of the second PMA circuit each include a transmit filter adapted in accordance with back-channel information received from the first and second nodes, respectively, during the training phase.

5. The extender of claim 1, wherein the receiver of the first PMA circuit and the receiver of the second PMA circuit each include a filter adaptation circuit that generates filter coefficient updates and detects filter convergence.
6. The extender of claim 5, wherein at least one of the transmitter of the first PMA circuit and the transmitter of the second PMA circuit includes a training controller providing back-channel information to at least one of the first and second nodes, and wherein the training controller confirms filter convergence only when filter converge is detected by both the receiver of the first PMA circuit and the receiver of the second PMA circuit.
7. The extender of claim 1, wherein the receiver of the first PMA circuit and the receiver of the second PMA circuit each include detector, and wherein the extender initiates a training phase when either of the detectors detects an end of the auto-negotiation phase.
8. The extender of claim 7, wherein the detectors monitor spectra of received signals for high-frequency content indicative of training frames.
9. The extender of claim 7, wherein the detectors decode information from auto-negotiation frames to detect said end.
10. The extender of claim 1, wherein each of the first PMA circuit and the second PMA circuit include multiple transmitter-receiver pairs to support multiple communication lanes between the first and second nodes.
11. An Ethernet link extension method that comprises,
in a first communications phase for auto-negotiation:
coupling a transmitter of a second PMA (physical medium attachment) circuit to a receiver of a first PMA circuit to retransmit communications received from a first node;
and
coupling a transmitter of the first PMA circuit to a receiver of the second PMA circuit to retransmit communications received from a second node; and
in a subsequent communications phase for training:
generating, with a respective training controller for each of the first and second PMA circuits, training frames for transmission by the transmitter of the respective PMA circuit

based in part on back-channel information and training status information from the receiver of the respective PMA circuit.

12. The method of claim 11, wherein said coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the auto-negotiation phase is via an on-chip analog signal line.

13. The method of claim 11, wherein said coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the auto-negotiation phase includes:

digitizing communications received from the first node to obtain received signal samples;
conveying the received signal samples on a bus to the transmitter of the second PMA circuit;
and
converting the received signal samples into an analog electrical transmit signal.

14. The method of claim 1, further comprising adapting a transmit filter in each of the transmitter of the first PMA circuit and the transmitter of the second PMA circuit in accordance with back-channel information received from the first and second nodes, respectively, during the training phase.

15. The method of claim 11, further comprising generating filter coefficient updates and detecting filter convergence with a filter adaptation circuit in each of the receiver of the first PMA circuit and the receiver of the second PMA circuit.

16. The method of claim 15, further comprising:

providing back-channel information to the first and second nodes with a training controller in each of the transmitter of the first PMA circuit and the transmitter of the second PMA circuit; and

confirming filter convergence with each of the training controllers only when filter converge is detected by both the receiver of the first PMA circuit and the receiver of the second PMA circuit.

17. The method of claim 11, initiating the training phase when either, but before both, the receiver of the first PMA circuit and the receiver of the second PMA circuit detects an end of the auto-negotiation phase.

18. The method of claim 17, further comprising monitoring spectra of received signals for high-frequency content to detect said end of the auto-negotiation phase.
19. The method of claim 17, further comprising decoding information from auto-negotiation frames to detect said end.
20. The method of claim 11, wherein each of the first PMA circuit and the second PMA circuit include multiple transmitter-receiver pairs to support multiple communication lanes between the first and second nodes.
21. An Ethernet link extension method that comprises,
in a first communications phase for auto-negotiation:
coupling a transmitter of a second PMA (physical medium attachment) circuit to a receiver of a first PMA circuit to retransmit channel signal waveforms received from a first node;
coupling a transmitter of the first PMA circuit to a receiver of the second PMA circuit to retransmit channel signal waveforms received from a second node; and
monitoring spectra of the channel signal waveforms received from at least one of the first and second nodes to detect an end of the auto-negotiation phase; and
in a subsequent frame-forwarding phase:
demodulating communications received from the first node by the receiver of the first PMA circuit to obtain a first digital channel symbol or bit stream;
conveying the first digital channel symbol or bit stream to the transmitter of the second PMA circuit for transmission to the second node;
demodulating communications received from the second node by the receiver of the second PMA circuit to obtain a second digital channel symbol or bit stream; and
conveying the second digital channel symbol or bit stream to the transmitter of the first PMA circuit for transmission to the first node.
22. The method of claim 21, wherein said coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the first communications phase is via an on-chip

analog signal line.

23. The method of claim 21, wherein said coupling of the transmitter of the second PMA circuit to the receiver of the first PMA circuit during the first communications phase includes:

- digitizing channel signal waveforms received from the first node to obtain received signal samples;

- conveying the received signal samples on a bus to the transmitter of the second PMA circuit;

- and

- converting the received signal samples into an analog electrical transmit signal.

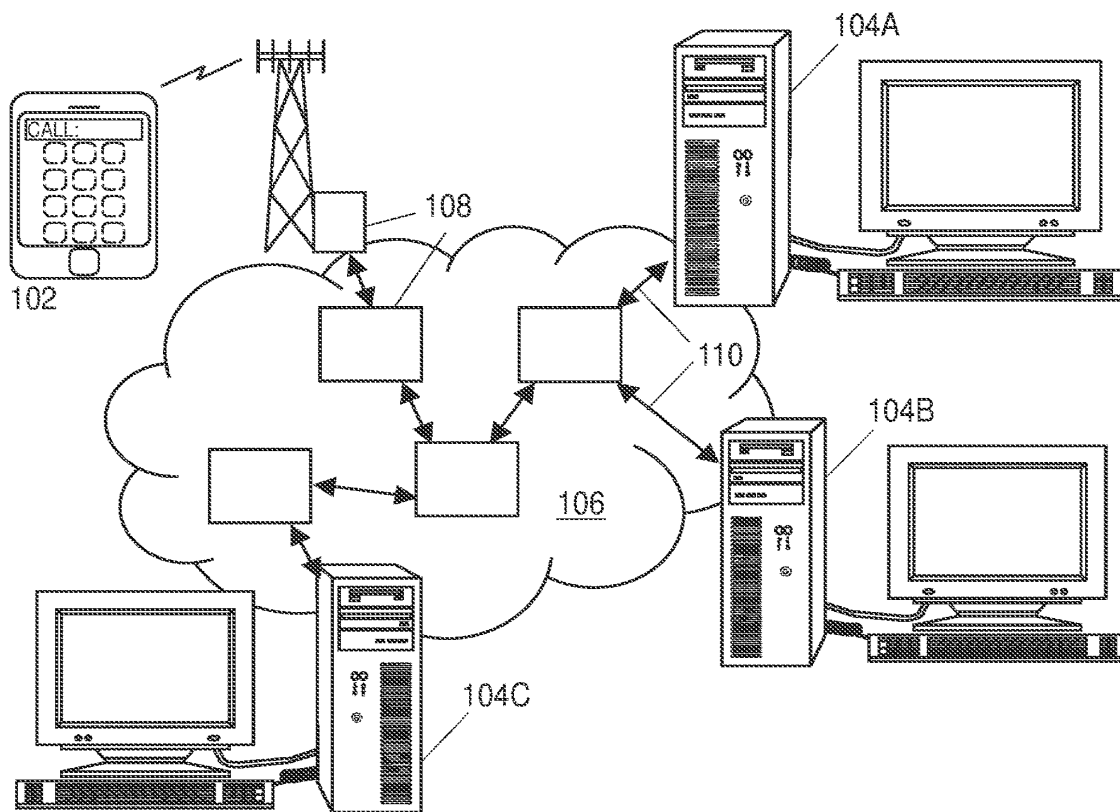


FIG. 1

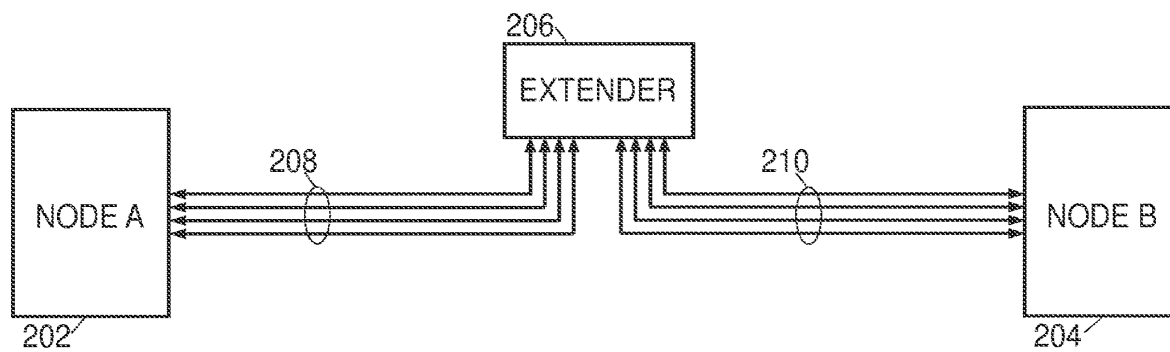


FIG. 2

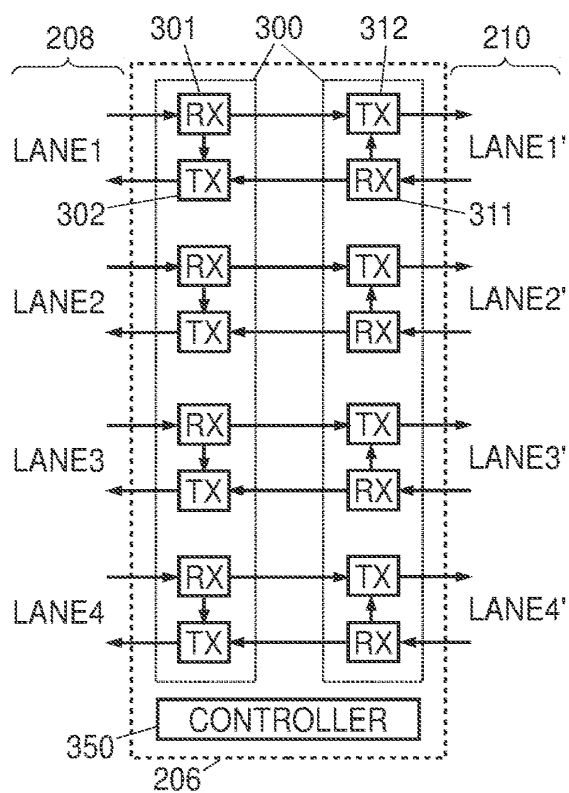


FIG. 3

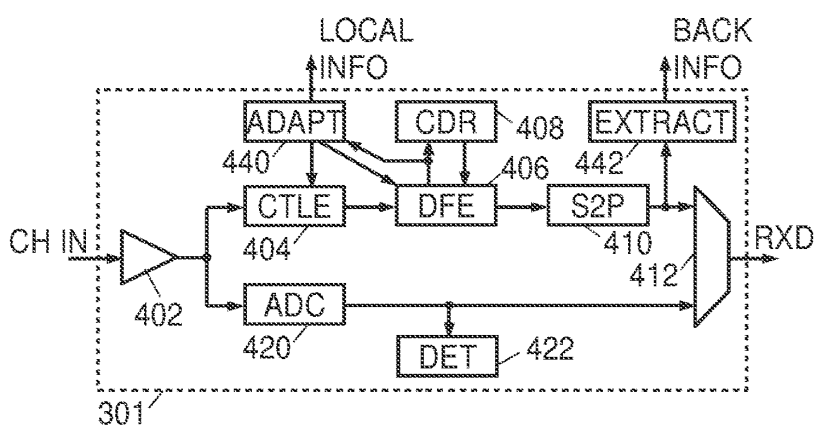


FIG. 4

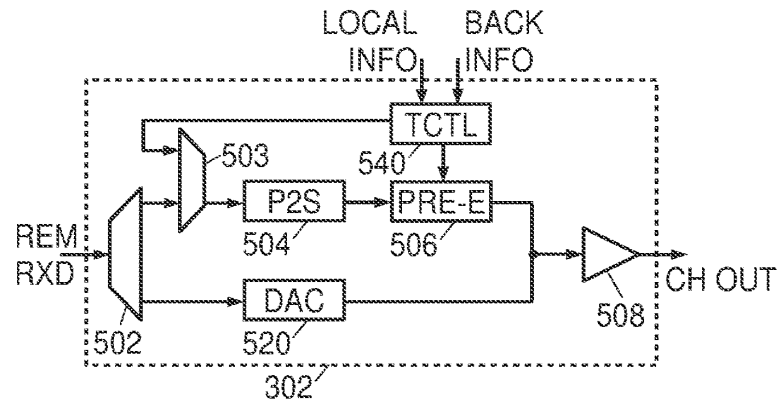


FIG. 5

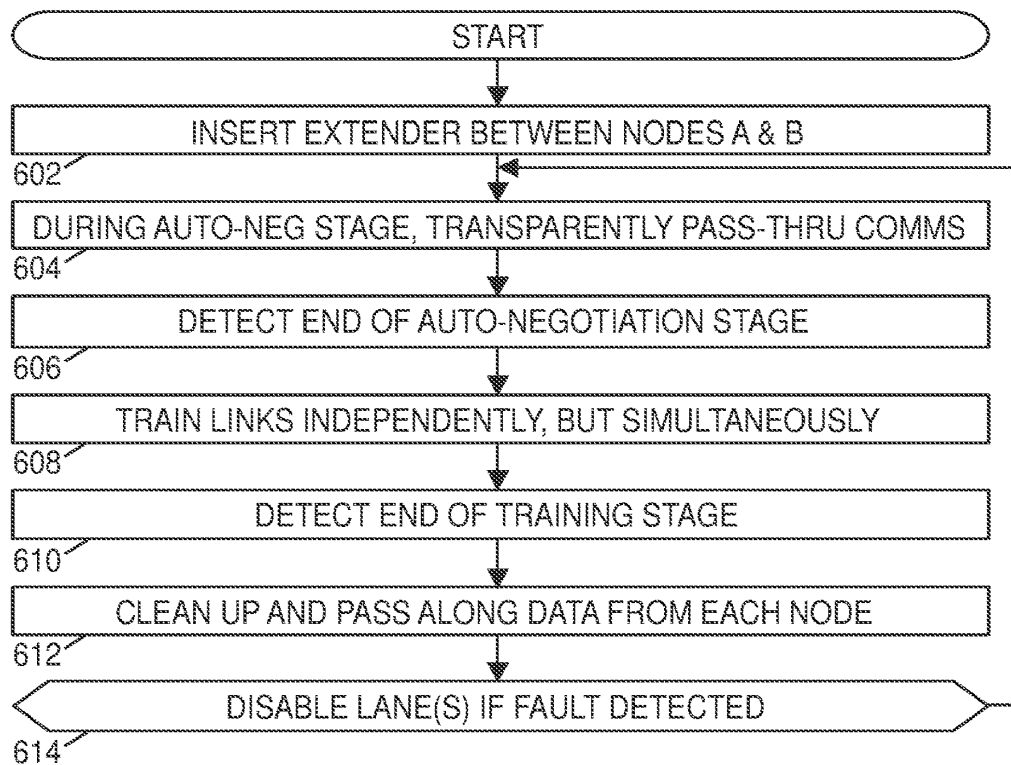


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/075961

A. CLASSIFICATION OF SUBJECT MATTER H04L 12/24(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H04L Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNPAT, CNKI, WPI, EPODOC, IEEE: 802.3, ethernet, extend+, PMA, physical medium attachment, auto w negotiation, training, data, phase, back w channel, modulat+, convey+		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2014146833 A1 (LUSTED, KENT C. ET AL.) 29 May 2014 (2014-05-29) abstract, description, paragraphs [0042]-[0059], [0098]-[0104], [0119]-[0122] and figure 1	1-23
X	US 2014086264 A1 (LUSTED, KENT C. ET AL.) 27 March 2014 (2014-03-27) abstract, description, paragraphs [0041]-[0054], [0099]-[0107], [0119]-[0122] and figure 1	1-23
X	US 2013343400 A1 (LUSTED, KENT C. ET AL.) 26 December 2013 (2013-12-26) abstract, description, paragraphs [0036]-[0049], [0082] and figure 1	1-23
A	CN 1941649 A (BROADCOM CORPORATION) 04 April 2007 (2007-04-04) the whole document	1-23
A	LANMAN Standards Committee of the IEEE Computer Society. "IEEE Standard for Ethernet" IEEE Std 802.3™-2015, 03 September 2015 (2015-09-03), the whole document	1-23
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 08 November 2017		Date of mailing of the international search report 06 December 2017
Name and mailing address of the ISA/CN STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451		Authorized officer CHEN,Xiaowei Telephone No. (86-10)61648277

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/075961

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
US	2014146833	A1	29 May 2014	JP	2014107869	A	09 June 2014
				DE	202013105453	U1	06 November 2014
US	2014086264	A1	27 March 2014	JP	2014068345	A	17 April 2014
				DE	202013104344	U1	20 February 2014
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				US	2011205934	A1	25 August 2011
				DE	602006003500	E	18 December 2008

Form PCT/ISA/210 (patent family annex) (July 2009)

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		
First Named Inventor/Applicant Name:		Yifei DAI		
Filer:		Daniel Joseph Krueger/Theresa Evenbly		
Attorney Docket Number:		20160.0038.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	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

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

Electronic Acknowledgement Receipt	
EFS ID:	37886243
Application Number:	16698935
International Application Number:	
Confirmation Number:	1370
Title of Invention:	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
First Named Inventor/Applicant Name:	Yifei DAI
Customer Number:	63467
Filer:	Daniel Joseph Krueger/Theresa Evenbly
Filer Authorized By:	Daniel Joseph Krueger
Attorney Docket Number:	20160.0038.NPUS00
Receipt Date:	27-NOV-2019
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Time Stamp:	23:01:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1720
RAM confirmation Number	E2019AQN01333947
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	Drawings-only black and white line drawings	2019-11-27C0038DRWv5.pdf	240051	no	4
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2		2019-11-27C0038SPECv5-AEC-preeq.pdf	249260	yes	29
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	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	23	
	Claims		24	28	
	Abstract		29	29	
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3	Application Data Sheet	2019-11-27Credo38_ADS-aia0014.pdf	1256248	no	9
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4	Oath or Declaration filed	2019-11-27Declaration_signed0038.pdf	246280	no	3
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5	Power of Attorney	2019-11-27Executed_Gen_POA-signed.pdf	566825	no	1
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7	Assignee showing of ownership per 37 CFR 3.73	2019-11-27Stmt3-73aia0096v2-0038.pdf	658105	no	3
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8	Information Disclosure Statement (IDS) Form (SB08)	2019-11-22updated_IDS.pdf	1034957	no	4
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9	Foreign Reference	WO2018161273-PAMPH-20180913-8077.pdf	1039290	no	24
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10	Non Patent Literature	FightingJitterFibre-ChannelDesignsEETimes.pdf	152928	no	3
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11	Non Patent Literature	MDIO-Wikipedia.pdf	139965	no	3
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Total Files Size (in bytes):			12622576		
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FIG. 1

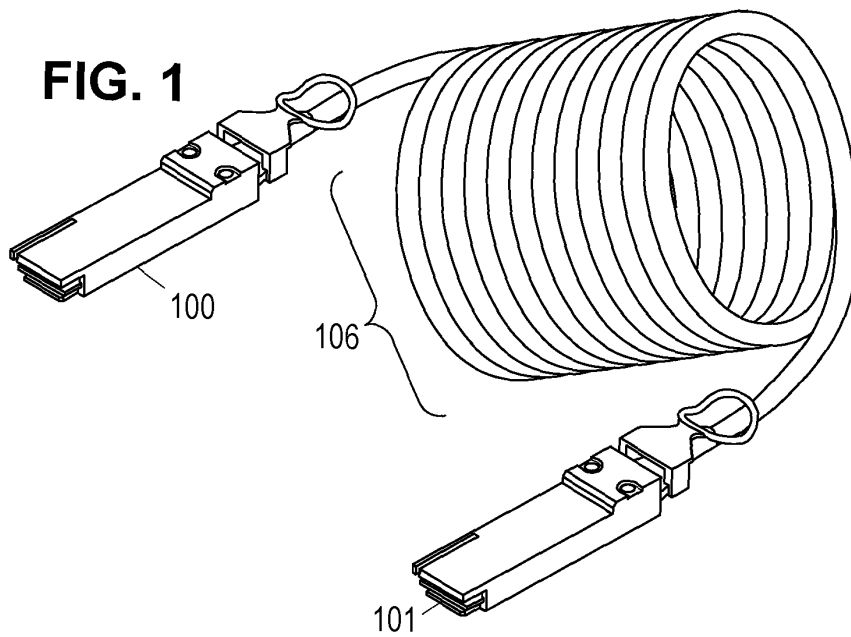


FIG. 2

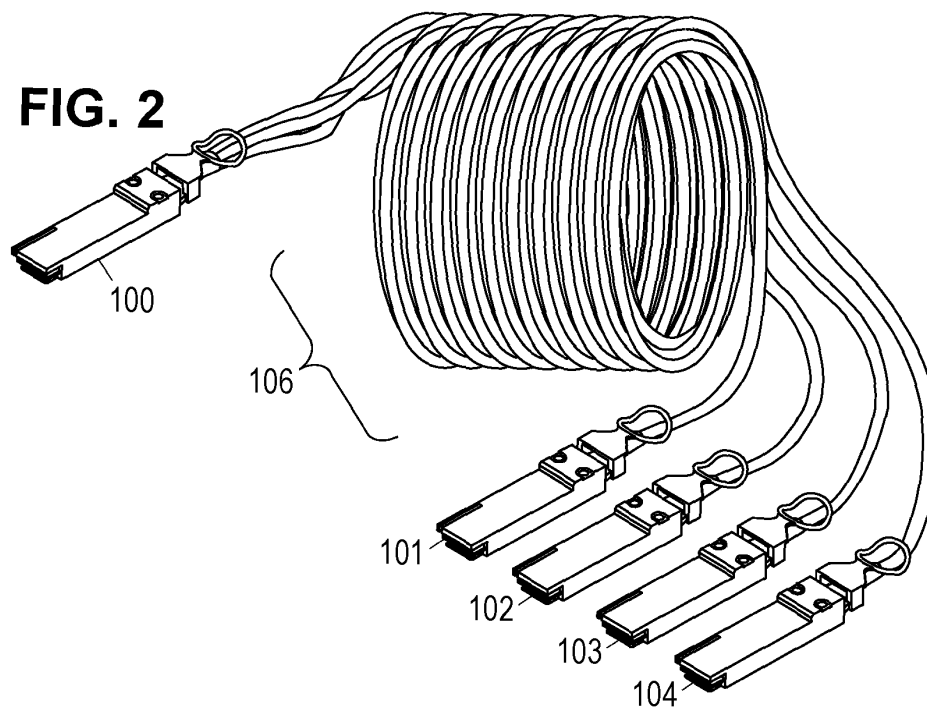
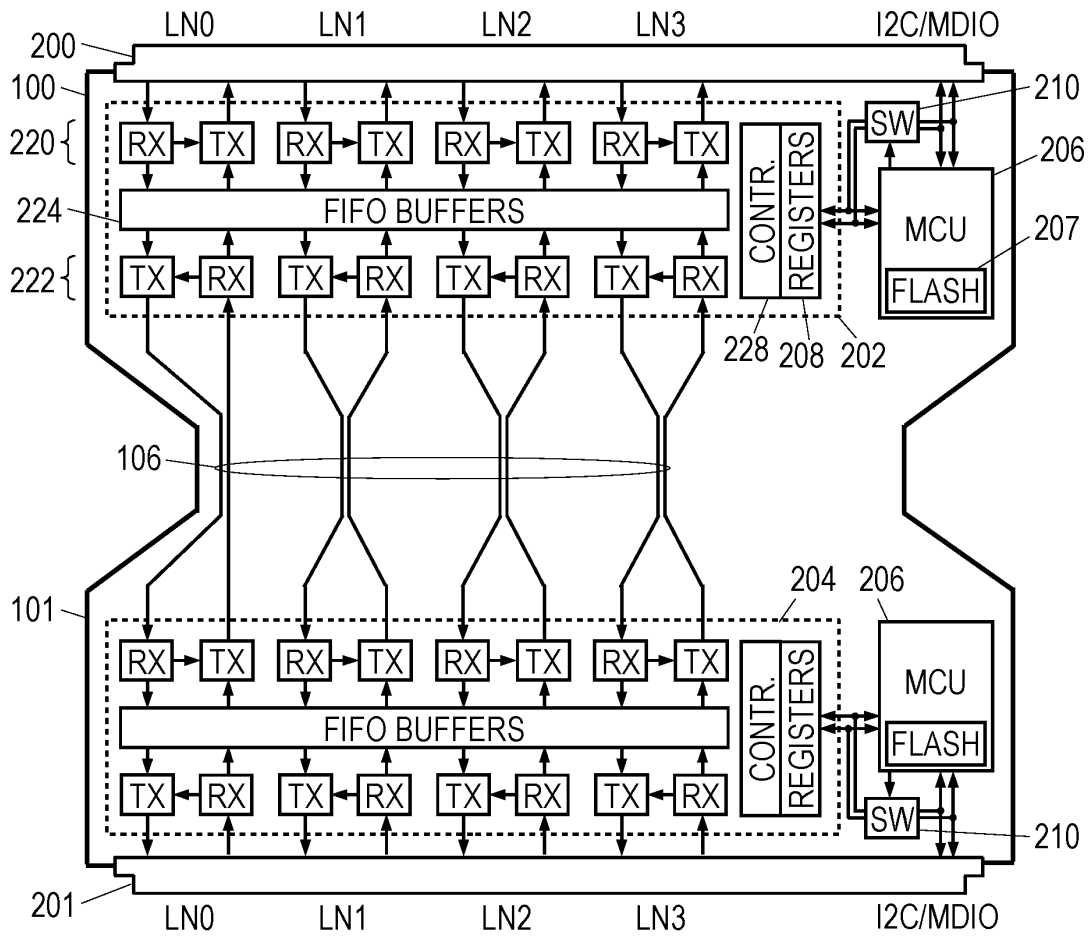


FIG. 3A



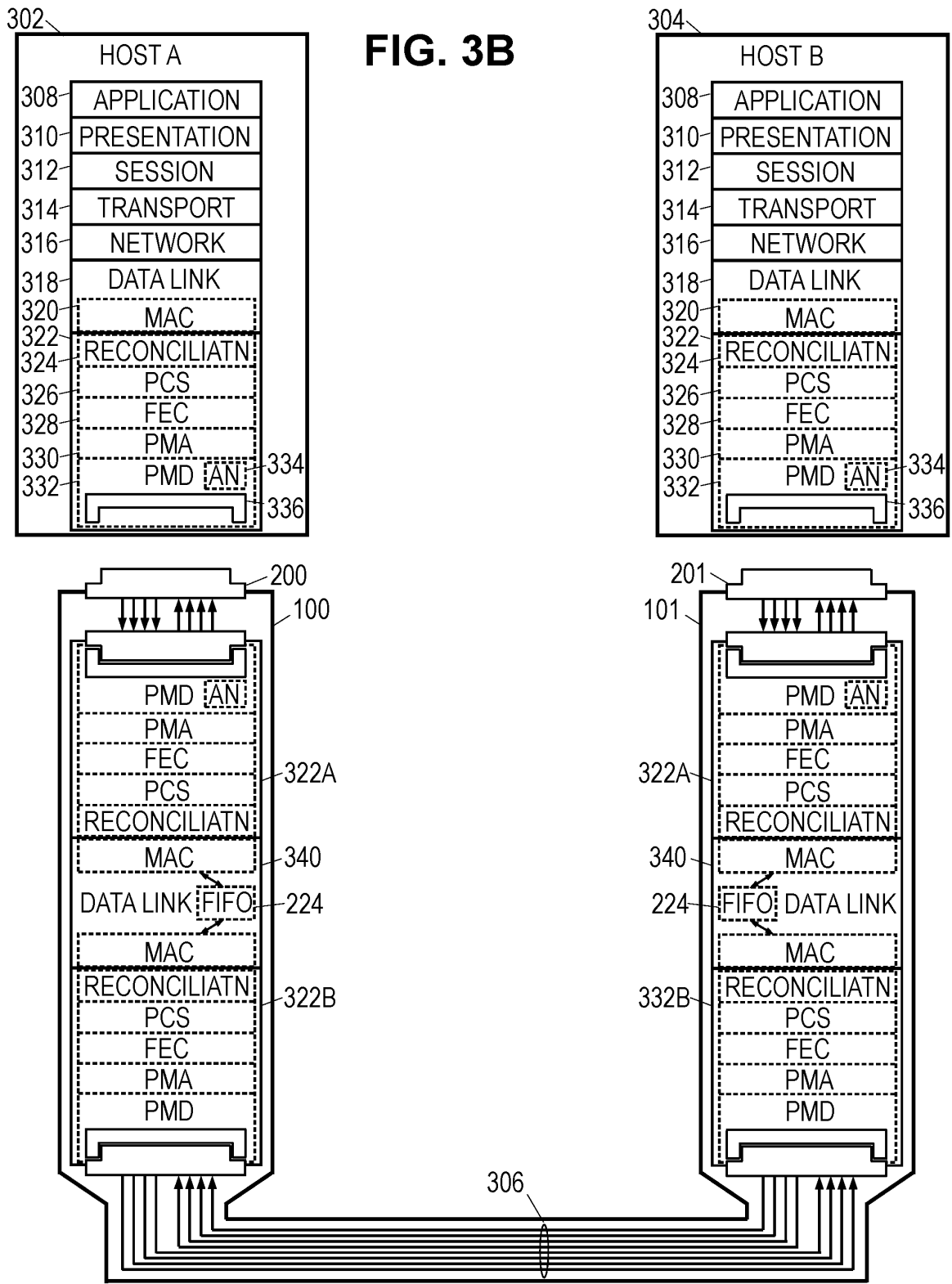
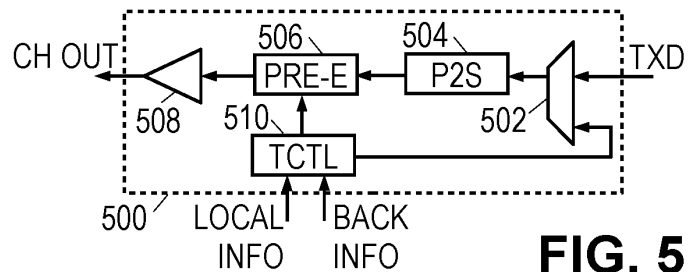
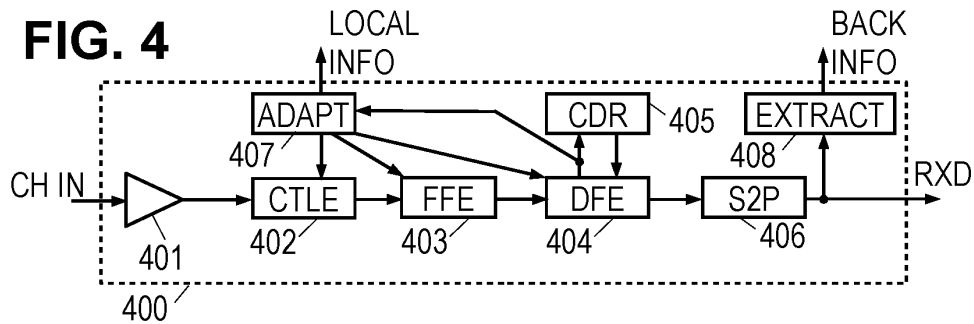
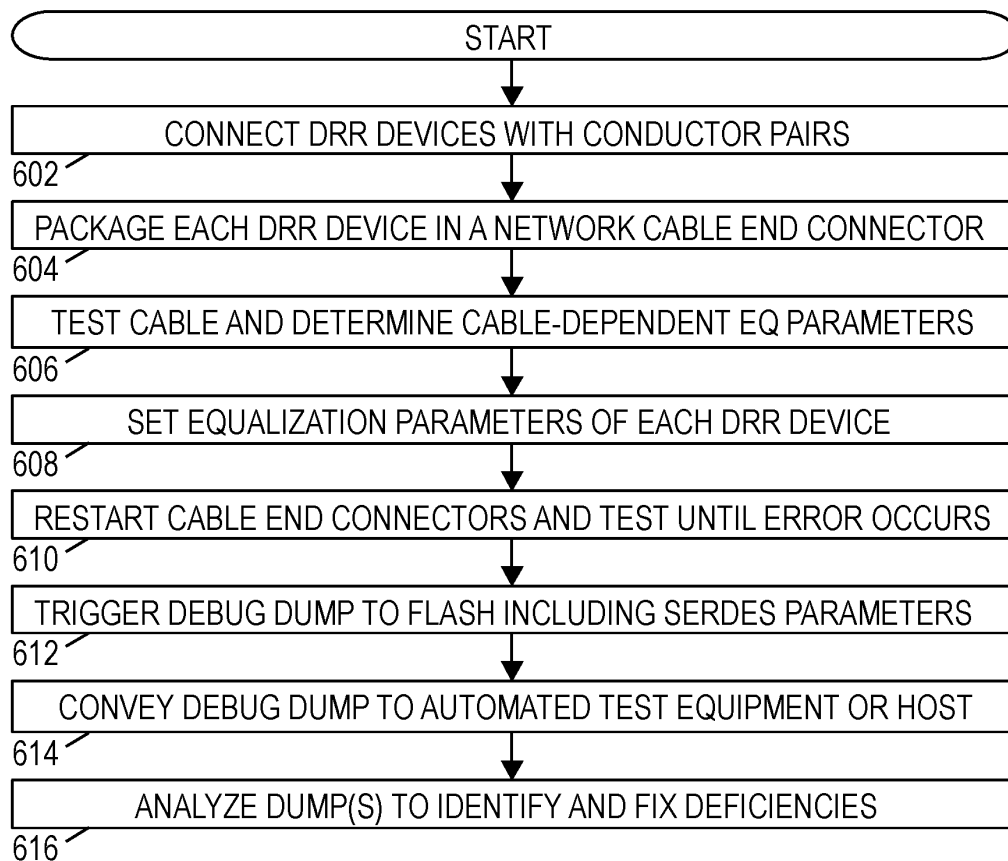


FIG. 4**FIG. 5****FIG. 6**

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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. As demand continues for ever-higher data rates, the standard is being extended. Such extensions to the standard must account for increased channel attenuation and dispersion even as the equalizers are forced to operate at faster symbol rates. It is becoming increasingly difficult to provide affordable, mass-manufactured network hardware that assures consistently robust performance as the proposed per-lane bit rates rise beyond 50 Gbps with PAM4 or larger signal constellations over distance spans more than a couple of meters.

[0002] For distance spans of no more than 2 meters, attenuation is reasonably limited such that passive copper cable, also known as direct-attach cable or "DAC", can be employed. Data centers having larger distance spans are forced to rely on active optical cable (AOC) designs, which convert the electrical interface signals into optical signals transported by optical fiber, even though such cables come with a prohibitively high cost. Active ethernet cable (AEC) is a newly-designed cable that offers affordable high-bandwidth data transport over distance spans up to at least seven meters using hard-wired data recovery and remodulation (DRR) chips in the cable connectors.

[0003] As cable lengths are extended, the increased channel attenuation and dispersion necessitates increasing levels of equalization, to the point that receiver power consumption and dissipation may reach prohibitive levels.

SUMMARY

[0004] Accordingly, there are disclosed herein a cable, a manufacturing method, and a communications method, employing preset transmit-side equalization to provide enhanced performance and/or to reduce receive-side equalization requirements. One illustrative cable embodiment includes: a first data recovery and re-modulation (DRR) device that exchanges inbound and outbound multi-lane data streams with a first host interface port via a first end connector plug; a second DRR device that exchanges inbound and outbound multi-lane data streams with a second host interface port via a second end connector plug; and electrical conductors connecting the first and second DRR devices to convey electrical transit signals therebetween. The first DRR device converts between said electrical transit signals and said inbound and outbound multi-lane data streams for the first host interface port, and the second DRR device converts between said electrical transit signals and said inbound and outbound multi-lane data streams for the second host interface port. The first and second DRR devices provide pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

[0005] An illustrative embodiment of a cable manufacturing method includes: connecting a first connector plug to a first data recovery and re-modulation (DRR) device that exchanges multi-lane data streams with a first host interface port via the first connector plug; connecting a second connector plug to a second DRR

device that exchanges multi-lane data streams with a second host interface port via the second connector plug; connecting electrical conductors to the first and second DRR devices to convey electrical transit signals therebetween. The first DRR device converts between said electrical transit signals and said multi-lane data streams for the first host interface port, and the second DRR device converts between said electrical transit signals and said multi-lane data streams for the second host interface port. The first and second DRR devices provide pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

[0006] An illustrative embodiment of a communications method includes: inserting a first end connector plug of a cable into a first host interface port, the first end connector plug being connected to a first data recovery and re-modulation (DRR) device that converts a multi-lane data stream from the first host interface port into electrical transit signals conveyed by electrical conductors to a second DRR device connected to a second end connector plug of the cable; and inserting the second end connector plug of the cable into a second host interface port, the second DRR device converting a multi-lane data stream from the second host interface port into electrical transit signals conveyed by electrical conductors to the first DRR device. The first and second DRR devices provide pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

[0007] Each of the foregoing embodiments may be implemented individually or in combination, and may be implemented with one or more of the following features in any suitable combination: 1. a first controller that configures the first DRR device in response to a power-on event, the first controller retrieving the transmit filter coefficient values from the nonvolatile memories as part of said configuring. 2. the

first and second DRR devices are programmed to use the transmit coefficient values each time power is supplied to the first and second end connector plugs. 3. the transmit filter coefficient values are determined and stored in the nonvolatile memories after assembly of the cable. 4. the first and second DRR devices employ receiver-based equalization of the electrical transit signals using coefficient values stored in the nonvolatile memories. 5. the electrical conductors comprise twin-axial conductors that carry each of the electrical transit signals in differential form. 6. the first and second DRR devices do not perform pre-equalization of the multi-lane data streams provided to the first and second host interface ports. 7. providing a first controller device that configures the first DRR device in response to a power-on event, the first controller device retrieving the transmit filter coefficient values from an internal nonvolatile memory as part of said configuring. 8. programming the first and second DRR devices to use the transmit coefficient values each time power is supplied to the first and second end connector plugs. 9. after connecting the electrical conductors, characterizing channel characteristics of the electrical conductors to determine the transmit filter coefficient values; and storing the transmit filter coefficient values in the nonvolatile memories. 10. the first and second DRR devices employ receiver-based equalization of the electrical transit signals using coefficient values stored in the nonvolatile memories. 11. supplying power to the first and second end connector plugs, the first and second end connector plugs being connected to first and second controller devices, respectively, each of the first and second controller devices operating to configure the first and second DRR devices in response to a power-on event, the configuring including retrieving the transmit filter coefficient values from internal nonvolatile memory.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Fig. 1 is a perspective view of an illustrative active Ethernet cable (AEC).

[0009] Fig. 2 is a perspective view of an illustrative 1:4 breakout AEC.

[0010] Fig. 3A is a function-block diagram of the illustrative AEC.

[0011] Fig. 3B is an architectural diagram for a communications link including the illustrative cable.

[0012] Fig. 4 is a block diagram of a receiver in an illustrative multi-lane data recovery and remodulation (DRR) device.

[0013] Fig. 5 is a block diagram of a transmitter in an illustrative multi-lane DRR device.

[0014] Fig. 6 is a flow diagram of an illustrative cable manufacturing method.

DETAILED DESCRIPTION

[0015] 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.

[0016] 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. The routing network may be or include, for example, the Internet, a wide area network, a storage 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 electrically connected via electrical

conductors 106 in a cord. The electrical conductors 106 may be electrically conductive wires arranged in a paired form such as with twinaxial conductors. Twinaxial conductors can be likened to coaxial conductors, but with two inner conductors instead of one. The inner conductors may be driven with a differential signal and their shared shield operates to reduce crosstalk with other twinaxial conductors in the cable. Depending on the performance criteria, it may be possible to employ other paired or single-ended conductor implementations.

[0017] Pursuant to the Ethernet standard, each conductor pair may provide unidirectional transport of a differential signal. To enable robust performance over even extended cable lengths, each connector 100, 101 may include 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. The DRR devices process data streams traveling in each direction. Notably, the transceivers perform CDR and re-modulation not only of the inbound data streams to the host interface as they exit the cable, but also of the outbound data streams from the host interface entering the cable. (NB: This inbound/outbound terminology is reversed relative to related applications by the present applicant.)

[0018] It is acknowledged here that the outbound data streams may be expected to be compliant with the relevant standard (e.g., the Ethernet standard for 400 Gbps) and may be expected to have experienced essentially no deterioration from their traversal of the network interface port's receptacle pins and the cable assembly's connector plug pins. Nevertheless, the modulation quality and equalization strategy employed by the electronics manufacturer of the transmitting network interface is generally unknown and the minimum requirements of the standard may be inadequate for transport over an extended cable length, particularly if the

electronics manufacturer of the receiving network interface is different than that of the transmitting network interface. As with the transmitting network interface, the equalization and demodulation strategy employed by the electronics manufacturer of the receiving network interface is generally unknown and may be unable to cope with the attenuation and interference caused by signal transport over an extended cable length, particularly if the connectors aren't fully seated or if the contacts have tarnished. By performing DRR of both inbound and outbound data streams, the illustrative cable ensures that the electrical signals transiting the cable conductors are able to withstand the attenuation and interference encountered between the cable's end connectors, thereby enabling consistently robust data transfer over extended cable lengths to be assured without consideration of these factors.

[0019] Though a 1:1 cable has been used in the foregoing description, the principles disclosed hereinbelow are also applicable to format conversion cables and to breakout cable designs. Fig. 2 is a perspective view of an illustrative 1:4 breakout cable having a unary end connector 100 which may be designed for sending and receiving a 200 Gbps Ethernet data stream, e.g., in the form of 4 lanes of 50 Gbps, each lane using PAM4 at 26.5625 GBd. Electrical conductors 106 are encased as four cords each carrying 1 lane of PAM4 at 26.5625 GBd (50 Gbps) or 2 lanes of non-return to zero (NRZ) signaling at 26.5625 GBd (25 Gbps) to a corresponding one of the split-end connectors 101-104. Each of the split-end connectors 101-104 may be designed for sending and receiving a 50 Gbps Ethernet data stream. Such breakout cables are useful for linking host devices designed to different generations of the Ethernet standard. As another example, the unary end connector may be designed for sending and receiving 400 Gbps (8 lanes of 50 Gbps

PAM4), while each of the split-end connectors may be designed for sending and receiving 100 Gbps (4 lanes of 25 Gbps NRZ). At either the unary end or at the split ends, the DRR devices may provide format conversion by, e.g., converting 1 lane of PAM4 symbols into 2 lanes of NRZ symbols, and vice versa.

[0020] Fig. 3A 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 302 (see Fig. 3B) 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 304. 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 connector plug pins via circuit board traces. The wires of cord 106 may be soldered to corresponding pads on the printed circuit board that electrically connect to the DRR devices.

[0021] In at least some contemplated embodiments, the printed circuit boards each also support a micro-controller unit (MCU) 206 and a bypass switch (SW) 210. 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 as discussed further below. The bypass switch 210 enables the MCU device 206 to electrically connect the first two-wire bus to the second two-wire bus, enabling the host to bypass the MCU device 206 and communicate directly with the DRR device as discussed in greater detail below.

[0022] 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 four bidirectional communication lanes LN0-LN3, each bidirectional lane formed by two unidirectional connections, each unidirectional connection having a differentially-driven twinaxial conductor pair (with a shield conductor not shown here). 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.

[0023] In at least some contemplated embodiments, the host-facing transmitter and receiver set 220 employ fixed equalization parameters that are cable-independent, i.e., they are not customized on a cable-by-cable basis. The center-facing transmitter and receiver set 222 preferably employ cable-dependent

equalization parameters that are customized on a cable-by-cable basis. The cable-dependent equalization parameters may be adaptive or fixed, and initial values for these parameters may be determined during manufacturer tests of the cable. The equalization parameters may include filter coefficient values for pre-equalizer filters in the transmitters, and gain and filter coefficient values for the receivers.

[0024] The illustrative cable of Fig. 3A may be a part of a point-to-point communications link between two host devices 302, 304 as shown in the architectural diagram of Fig. 3B. Fig. 3B shows the architecture using the ISO/IEC Model for Open Systems Interconnection (See ISO/IEC 7498-1:1994.1) for communications over a physical medium such as the twinaxial conductor pairs represented by channels 306. The interconnection reference model employs a hierarchy of layers with defined functions and interfaces to facilitate the design and implementation of compatible systems by different teams or vendors. While it is not a requirement, it is expected that the higher layers in the hierarchy will be implemented primarily by software or firmware operating on programmable processors while the lower layers may be implemented as application-specific hardware.

[0025] The Application Layer 308 is the uppermost layer in the model, and it represents the user applications or other software operating on different systems that need a facility for communicating messages or data. The Presentation Layer 310 provides such applications with a set of application programming interfaces (APIs) that provide formal syntax along with services for data transformations (e.g., compression), establishing communication sessions, connectionless communication mode, and negotiation to enable the application software to identify the available service options and select therefrom. The Session Layer 312

provides services for coordinating data exchange including: session synchronization, token management, full- or half-duplex mode implementation, and establishing, managing, and releasing a session connection. In connectionless mode, the Session Layer may merely map between session addresses and transport addresses.

[0026] The Transport Layer 314 provides services for multiplexing, end-to-end sequence control, error detection, segmenting, blocking, concatenation, flow control on individual connections (including suspend/resume), and implementing end-to-end service quality specifications. The focus of the Transport Layer 314 is end-to-end performance/behavior. The Network Layer 316 provides a routing service, determining the links used to make the end-to-end connection and when necessary acting as a relay service to couple together such links. The Data link layer 318 serves as the interface to physical connections, providing delimiting, synchronization, sequence and flow control across the physical connection. It may also detect and optionally correct errors that occur across the physical connection. The Physical layer 322 provides the mechanical, electrical, functional, and procedural means to activate, maintain, and deactivate channels 306, and to use the channels 306 for transmission of bits across the physical media.

[0027] The Data Link Layer 318 and Physical Layer 322 are subdivided and modified slightly by IEEE Std 802.3-2015, which provides a Media Access Control (MAC) Sublayer 320 in the Data Link Layer 318 to define the interface with the Physical Layer 322, including a frame structure and transfer syntax. Within the Physical Layer 322, the standard provides a variety of possible subdivisions such as the one illustrated in Fig. 3B, which includes an optional Reconciliation Sublayer 324, a Physical Coding Sublayer (PCS) 326, a Forward Error Correction (FEC) Sublayer 328, a Physical Media Attachment (PMA) Sublayer 330, a Physical Medium Dependent

(PMD) Sublayer 332, and an Auto-Negotiation (AN) Sublayer 334.

[0028] The optional Reconciliation Sublayer 324 merely maps between interfaces defined for the MAC Sublayer 320 and the PCS Sublayer 326. The PCS Sublayer 326 provides scrambling/descrambling, data encoding/decoding (with a transmission code that enables clock recovery and bit error detection), block and symbol redistribution, PCS alignment marker insertion/removal, and block-level lane synchronization and deskew. To enable bit error rate estimation by components of the Physical Layer 322, the PCS alignment markers typically include Bit-Interleaved-Parity (BIP) values derived from the preceding bits in the lane up to and including the preceding PCS alignment marker.

[0029] The FEC Sublayer 328 provides, e.g., Reed-Solomon coding/decoding that distributes data blocks with controlled redundancy across the lanes to enable error correction. In some embodiments (e.g., in accordance with Article 91 or proposed Article 134 for the IEEE Std 802.3), the FEC Sublayer 328 modifies the number of lanes (Article 91 provides for a 20-to-4 lane conversion).

[0030] The PMA Sublayer 330 provides lane remapping, symbol encoding/decoding, framing, and octet/symbol synchronization. The PMD Sublayer 332 specifies the transceiver conversions between transmitted/received channel signals and the corresponding bit (or digital symbol) streams. An optional AN Sublayer 334 is shown as an internal element of the PMD Sublayer 332, and it implements an initial start-up of the communications channels, conducting an auto-negotiation phase and a link-training phase before entering a normal operating phase. The auto-negotiation phase enables the end nodes to exchange information about their capabilities, and the training phase enables the end nodes to adapt both transmit-side and receive-side equalization filters in a fashion that combats the channel non-

idealities. A receptacle 336 is also shown as part of the PMD sublayer 332 to represent the physical network interface port.

[0031] The connectors 100, 101, have plugs 200, 201 that mate with the receptacles 336 of the two host devices 302, 304. Within each connector, the DRR devices may implement a host-facing Physical Layer 322A, a center-facing Physical Layer 322B, and a Data Link Layer 340 that bridges together the two Physical Layers. In some embodiments, one or more of the internal sublayers within each connector (e.g., FEC, PCS, Reconciliation, MAC) are bypassed or omitted entirely to reduce areal requirements and/or to reduce power. More information regarding the operation of the sublayers, as well as the electrical and physical specifications of the connections between the nodes and the communications medium (e.g., pin layouts, line impedances, signal voltages & timing), and the electrical and physical specifications for the communications medium itself (e.g., conductor arrangements in copper cable, limitations on attenuation, propagation delay, signal skew), can be found in the current Ethernet standard, and any such details should be considered to be well within the knowledge of those having ordinary skill in the art.

[0032] The MAC, Reconciliation, PCS, FEC, PMA, and PMD Sublayers, may be implemented as application-specific integrated circuitry to enable high-rate processing and data transmission. The receiver and transmitter sets 220, 222, may implement the PMA and PMD sublayers. Figs. 4 and 5 are block diagrams of an illustrative receiver and an illustrative transmitter that may be members of the sets 220, 222.

[0033] In Fig. 4, receiver 400 receives an analog electrical signal (CH_IN) and supplies it to an optional low noise amplifier (LNA) 401. If included, the LNA 401 provides a high input impedance to minimize channel loading and amplifies the

received electrical signal to drive the input of a continuous time linear equalization (CTLE) filter 402. CTLE filter 402 provides continuous time filtering to shape the signal spectrum to reduce the length of the channel impulse response while minimizing leading inter-symbol interference (ISI). A digital feed-forward equalization (FFE) filter 403 may be used to augment the performance of the CTLE filter 402. A decision feedback equalizer (DFE) 404 operates on the filtered signal to correct for trailing ISI and detect each transmitted channel bit or symbol, thereby producing a demodulated digital data stream. Some receiver embodiments employ oversampling in the FFE 403 and DFE 404. A clock and data recovery (CDR) circuit 405 extracts a clock signal from the filtered signal and/or the digital data stream and supplies it to DFE 404 to control sample and symbol detection timing. A serial-to-parallel circuit 406 groups the digital data stream bits or symbols into blocks to enable subsequent on-chip operations to use lower clock rates. The symbols or data blocks are placed on the digital receive bus (RXD) for remodulation and transmission by a transmitter to the remote end of the channel.

[0034] While certain contemplated cable embodiments do not support auto-negotiation, other contemplated embodiments do support auto-negotiation in accordance with the Ethernet standard. When supported, the auto-negotiation may be implemented as described in PCT/CN2017/075961, titled "Ethernet link extension method and device" by inventors Yifei Dai, Haoli Qian, and Jeff Twombly, and filed 2017-03-08. A detector or packet information extractor 408 monitors the receive signal for the end of the auto-negotiation phase and/or the beginning of the training phase frames. Whether or not autonegotiation is supported, a training phase may be performed during the manufacturing process to set initial values of the equalization parameters for the completed cable.

[0035] During the training phase, a filter adaptation circuit 407 measures an error between the input and output of a decision element in DFE 404, employing that error in accordance with well-known techniques from the literature on adaptive filtering to determine adjustments for the coefficients in CTLE filter 402, FFE filter 403, DFE 404, and a transmit filter 506 (discussed further below), and to determine whether convergence has been achieved. The adaptation circuit 407 adjusts the coefficient values of elements 402-404 and outputs locally-generated information (LOCAL_INFO), which includes the transmit filter coefficient adjustments and the convergence status. Where the system supports the use of a backchannel, the LOCAL_INFO is supplied to a local transmitter 500 that communicates in the reverse direction on the data lane. The local transmitter communicates the transmit filter adjustments and the convergence status via the backchannel to the source of the CH_IN signal. In that vein, the received signal includes back-channel information *from* the source of the CH_IN signal. A packet information extractor 408 detects the back-channel information (BACK_INFO) and passes it to the local transmitter 500. In the absence of a back-channel, the LOCAL_INFO may be communicated via the host-interface to the testing apparatus as discussed further below. Once convergence is achieved, receiver 400 is ready to begin normal operations.

[0036] In Fig. 5, transmitter 500 receives blocks of channel bits or symbols for transmission to the source of the CH_IN signal (Fig. 4). During normal operations, multiplexer 502 supplies blocks of channel bits or symbols from the remote source (received on the TXD bus) to the parallel to serial (P2S) circuit 504. P2S circuit converts the blocks into a digital data stream. A transmit filter 506, also called a pre-equalization filter, converts the digital data stream into an analog electrical signal with spectral shaping to combat channel degradation. Driver 508 amplifies

the analog electrical signal to drive the channel output (CH_OUT) node.

[0037] The current IEEE standard provides for up to four taps in the transmit filter, but at least some contemplated cable embodiments employ up to 30 or more taps in the transmit filter. This "long-tap" filter provides sufficient equalization for the receiver to minimize, or even eliminate, the FFE filter and achieve a significant power savings.

[0038] If supported, the auto-negotiation phase may be implemented as set forth in Y.Dai et al. During the training phase, multiplexer 502 obstructs information from the TXD bus, instead supplying P2S circuit 504 with training frames from a training controller 510. The training controller 510 generates the training frames based on the convergence status and transmit filter coefficient adjustments (LOCAL_INFO) received from the local receiver 400. That is, in addition to training patterns, the training frames may include backchannel information to be used by the remote end of the channel. Note that even after the local receiver indicates filter convergence has occurred, the training controller 510 may prolong the training phase to coordinate training phase timing across lanes and along each link of the channel. The training frames include training sequences as specified by the relevant portions of the current Ethernet standard (IEEE Std 802.3).

[0039] The training controller 510 further accepts any back-channel information (BACK_INFO) extracted by the local receiver 400 from received training frames sent by the local end node. The training controller applies the corresponding adjustments to the coefficients of transmit filter 506. Upon conclusion of the training phase, multiplexer 502 begins forwarding TXD blocks to the P2S circuit 504.

[0040] Within the foregoing context of an illustrative implementation, we now return to the block diagram of Fig. 3A. The connector 200, DRR device 202, MCU

device 206, and switch 210, may be mounted to a paddle card, i.e., a printed circuit card encased in the connector body. The connector 200 may be a pluggable module compliant with any one of the pluggable module standards, e.g., SFP, SFP-DD, QSFP, QSFP-DD, OSF. Most of these standards include a two-wire interface (typically an I2C bus) that enables the host to monitor, debug, or control the pluggable module via the host interface. The two-wire interface protocol is a master-slave protocol, with the host expected to be the bus master and the module expected to be the slave. The MCU device 206 operates as an I2C bus slave to communicate with the I2C bus master on the host side.

[0041] The MCU device 206 relies on bootup code and firmware stored in the embedded flash memory 207 to handle the power-on process and coordinate the operations of the other paddle card components, including the DRR device, the switch 210, and power management chip (not shown). The DRR device itself includes an embedded controller 228 that coordinates operation of the other on-chip components, among other things providing lane control and adaptation of filter coefficients in the receivers. The embedded controller 228 accesses the registers 208 via a high speed internal bus, while the MCU device 206 accesses them via a two-wire interface such as the I2C bus or an MDIO interface protocol. The embedded controller 228 and the MCU device 206 can accordingly exchange data by reading and writing the register fields.

[0042] For developing and debugging the operation of the cable electronics, it is desirable for the host to have access to all of the SerDes parameters, including the coefficients of the transmit and receive filters, the noise and error statistics (including equalization error, timing error, symbol error rates, and packet loss rates), link event logs, and buffer contents, for each host-facing and center-facing

interface lane of the DRR device. Yet the time required to convey this information is prohibitive if the DRR device needs to communicate via the registers to the MCU and the MCU needs to then convey the data to the host.

[0043] Accordingly, each connector is provided with a number of features to facilitate debugging, to accelerate host access to the DRR device, and to enhance communications performance of the cable. These features include: transmit filter pre-training, expedited debug data capture, and an MCU bypass switch. These features are each described with reference to the flow diagram of Fig. 6.

[0044] Fig. 6 shows an illustrative cable manufacturing method. It begins in block 602 with electrically connecting the ends of the conductor pairs in the cable cord to the paddle cards, and more specifically, to the center-facing interfaces of the first and second DRR devices. The connecting may be done by automated equipment soldering the wire ends to pads on the paddle cards on which the DRR devices are mounted. In block 604, the equipment packages each paddle card in a respective end connector for the network cable. As previously mentioned, the end connectors may be, e.g., SFP, SFP-DD, QSFP, QSFP-DD, or OSFP pluggable modules. The end connectors are adapted to mate with network interface ports of host devices, and include plugs that electrically connect with matching receptacles in the ports.

[0045] In block 606, the equipment tests the cable to verify compliance with performance specifications and to determine cable-dependent equalization parameters for use by the center-facing transmitter and receiver sets 222. The testing is performed by plugging each cable's end connectors into corresponding ports of automated testing equipment (ATE). As the connectors receive power, the MCU chip retrieves firmware code for itself from nonvolatile memory such as an

internal flash memory, executing it to coordinate the bootup and operation of the other connector components. The internal flash memory may further include firmware for the embedded controller of the DRR device, and if so, the MCU chip conveys the firmware to the embedded controller via a two wire bus such as I2C or MDIO. In some contemplated embodiments, the two wire bus supports both the I2C protocol and the faster MDIO protocol, and the DRR device switch from one protocol to the other on demand. Once the firmware has been loaded, the MCU chip instructs the embedded controller to execute the firmware. Once both the MCU chip and DRR device are both working, the end connector operates as previously described above.

[0046] Channel estimation and equalization are key elements of high bandwidth communication. While the host-facing transmitters and receivers may only need to contend with negligible signal distortion, the center-facing transmitters and receivers will generally have to accommodate severe signal attenuation and distortion. As described with reference to Fig. 4, the equalization may be performed in the receivers using a combination of CTLE, FFE, and DFE elements. While such equalization is very effective, channels with severe signal distortion may require the use of many filter taps (and coefficients) in the FFE filter and DFE feedback filter, leading to prohibitive levels of power consumption and dissipation. The use of a transmitter equalization filter (aka pre-equalization, pre-distortion, or pre-shaping) enables the use of far fewer taps in the receive filters, potentially enabling the FFE filter to be omitted entirely. While additional filter taps are implemented in the transmitter, the net result is that a substantial reduction in the power consumption level is achieved due to a number of factors including avoidance of the noise enhancement often associated with receiver-side

equalization and digital filtering with a reduced bit-width.

[0047] In block 606, the DRR devices set their transmit and receive filter coefficients to initial default values. As the communications link is established, the center-facing transmitters and receivers may optionally engage in a training phase to adapt the filter coefficient values. Alternatively, or in addition, the automated testing equipment may begin sending and receiving a training pattern such as, e.g., a pseudo-random binary sequence (PRBS), enabling optional adaptation of the filter coefficients. As yet another alternative or addition, the filter coefficient values may be maintained while the automated test equipment correlates collected error measurements to the training patterns to estimate residual intersymbol interference (ISI). Such residual ISI estimates can be combined with knowledge of the filter coefficient settings to determine, directly or iteratively, the optimum transmit and receive filter coefficient values.

[0048] In block 608, the automated tester equipment "burns" the flash memory or otherwise programs the initial default values of the filter coefficients to be the optimum values identified in block 606. The communication between the DRR devices and the ATE to, e.g., collect channel estimation information and refine the default coefficient values, occurs via a two wire interface built in to the pins of the connector plug. Preferably the two wire interface supports the well known I2C protocol for maximum acceptance. However, the I2C protocol may be limited to a maximum clock rate of 1 MHz, limiting the bandwidth of the information collection process and prolonging the time required for the ATE to determine and program the optimum filter coefficient values. Accordingly, at least some contemplated embodiments also support the use of the MDIO interface protocol which can employ clock rates up to at least 10 MHz, significantly reducing the time required

by the ATE. The ATE may establish initial communication with the MCU chip using the I2C protocol, then the ATE and the MCU chip may coordinate a dynamic switch to the faster MDIO protocol for the duration of the channel characterization and firmware programming.

[0049] The two-wire interface enables the ATE to communication with the MCU chip, and optionally relies on the MCU chip to access the DRR device registers. This two-step process may prolong the duration of the testing and debugging operations. To enable the ATE to obtain direct access to the DRR device, at least some contemplated embodiments include a bypass switch 210. The ATE initially establishes communication with the MCU chip 206 and instructs the MCU chip 206 to close the bypass switch 210, shorting the two wire bus from the connector plug to the two wire bus from the DRR device. The MCU device 206 may continue to monitor the bus to detect when the ATE wishes to terminate the bypass operations. The bypass switch is preferably an analog switch, though other switch implementations would also be suitable.

[0050] In some embodiments, the ATE communicates with the MCU during the initial link-up using the I2C protocol. The ATE writes to a particular address in the MCU to enable Debug mode, causing the MCU to close the bypass switch and enable direct communications between the ATE and the DRR devices. At this time, the ATE may switch to the MDIO protocol for communicating with the DRR device to take advantage of the speed enhancement. In other situations such as on-site debugging, the host may not support the use of the MDIO protocol and may continue to employ I2C for direct communication with the DRR device.

[0051] Once the filter coefficient values have been programmed, the cable manufacturing process is nominally complete. In practice, however, it is desired to

verify the proper operation of the cable and, in the event any failures are detected, it is desirable to debug the potential causes of the failure. Accordingly, the illustrated method includes block 610, in which the cable is manually or electrically "unplugged" and "re-plugged" into the same or different receptacles to reboot the cable hardware. As part of the reboot, the filter coefficients are set to their default values from the flash memory. The ATE applies a test data sequence to the cable to verify proper operation. If no errors are detected, such as e.g., inadequate signal margins, excessive symbol error rates, lost packets, or link failures, the cable operation is verified and the process completes. The cable may then be packaged and sold to customers expecting robust performance.

[0052] On the other hand, if errors are detected at this point, or optionally if they are later detected in the field, the ATE or host may trigger a debug dump in block 612. The ATE or host uses the two-wire bus to write a register in the MCU chip to initiate the debug dump. After receiving the dump command, the MCU chip may trigger an interrupt of the embedded controller by writing the associated register in the DRR device. The interrupt causes the embedded controller to capture all the serdes parameters in memory. The serdes parameters may include, e.g., link status, frequency offset, signal margin (aka eye height).

[0053] As the memory in the DRR device is primarily volatile memory (SRAM), the DRR device in block 614 writes the captured information word by word to the registers, enabling ATE or host to retrieve the captured information via the two wire bus and/or enabling the MCU chip to read and store the information in nonvolatile memory (flash). If the latter option is used, perhaps in the field by a host lacking the facilities for parsing and analyzing the debug dump, the cable can later be plugged into automated test equipment that retrieves the captured

information from the nonvolatile memory.

[0054] In block 616, the ATE provides the captured information to a computer that enables engineers to analyze the debug dump to identify the cause(s) of the failures. With knowledge of the causes, engineers can correct the vulnerabilities by re-training the filters, by updating the firmware, and/or by adjusting the hardware design.

[0055] These techniques can drastically reduce the testing time in the manufacturing facilities where the ATE acts as a host. They can also speed up the debug process either on the ATE or also on the customer switch.

[0056] 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 cable that comprises:

a first data recovery and re-modulation (DRR) device that exchanges inbound and outbound multi-lane data streams with a first host interface port via a first end connector plug;

a second DRR device that exchanges inbound and outbound multi-lane data streams with a second host interface port via a second end connector plug; and

electrical conductors connecting the first and second DRR devices to convey electrical transit signals therebetween,

the first DRR device converting between said electrical transit signals and said inbound and outbound multi-lane data streams for the first host interface port, and

the second DRR device converting between said electrical transit signals and said inbound and outbound multi-lane data streams for the second host interface port,

the first and second DRR devices providing pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

2. The cable of claim 1, further comprising a first controller that configures the first DRR device in response to a power-on event, the first controller retrieving the transmit filter coefficient values from the nonvolatile memories as part of said configuring.

3. The cable of claim 1, wherein the first and second DRR devices are programmed

to use the transmit coefficient values each time power is supplied to the first and second end connector plugs.

4. The cable of claim 3, wherein the transmit filter coefficient values are determined and stored in the nonvolatile memories after assembly of the cable.

5. The cable of claim 4, wherein the first and second DRR devices employ receiver-based equalization of the electrical transit signals using coefficient values stored in the nonvolatile memories.

6. The cable of claim 4, wherein the electrical conductors comprise twin-axial conductors that carry each of the electrical transit signals in differential form.

7. The cable of claim 1, wherein the first and second DRR devices do not perform pre-equalization of the multi-lane data streams provided to the first and second host interface ports.

8. A cable manufacturing method that comprises:

connecting a first connector plug to a first data recovery and re-modulation (DRR) device that exchanges multi-lane data streams with a first host interface port via the first connector plug;

connecting a second connector plug to a second DRR device that exchanges multi-lane data streams with a second host interface port via the second connector plug;

connecting electrical conductors to the first and second DRR devices to convey electrical transit signals therebetween,

the first DRR device converting between said electrical transit signals and said multi-lane data streams for the first host interface port, and

the second DRR device converting between said electrical transit signals and

said multi-lane data streams for the second host interface port, the first and second DRR devices providing pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

9. The method of claim 8, further comprising: providing a first controller device that configures the first DRR device in response to a power-on event, the first controller device retrieving the transmit filter coefficient values from an internal nonvolatile memory as part of said configuring.

10. The method of claim 8, further comprising: programming the first and second DRR devices to use the transmit coefficient values each time power is supplied to the first and second end connector plugs.

11. The method of claim 10, further comprising: after connecting the electrical conductors, characterizing channel characteristics of the electrical conductors to determine the transmit filter coefficient values; and storing the transmit filter coefficient values in the nonvolatile memories.

12. The method of claim 11, wherein the first and second DRR devices employ receiver-based equalization of the electrical transit signals using coefficient values stored in the nonvolatile memories.

13. The method of claim 11, wherein the electrical conductors comprise twin-axial conductors that carry each of the electrical transit signals in differential form.

14. The method of claim 8, wherein the first and second DRR devices do not perform pre-equalization of the multi-lane data streams provided to the first and second host interface ports.

15. A communications method that comprises:

inserting a first end connector plug of a cable into a first host interface port, the first end connector plug being connected to a first data recovery and re-modulation (DRR) device that converts a multi-lane data stream from the first host interface port into electrical transit signals conveyed by electrical conductors to a second DRR device connected to a second end connector plug of the cable; and

inserting the second end connector plug of the cable into a second host interface port, the second DRR device converting a multi-lane data stream from the second host interface port into electrical transit signals conveyed by electrical conductors to the first DRR device, the first and second DRR devices providing pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

16. The method of claim 15, further comprising: supplying power to the first and second end connector plugs, the first and second end connector plugs being connected to first and second controller devices, respectively, each of the first and second controller devices operating to configure the first and second DRR devices in response to a power-on event, the configuring including retrieving the transmit filter coefficient values from internal nonvolatile memory.

17. The method of claim 15, wherein the first and second DRR devices are programmed to use the transmit coefficient values each time power is supplied to the first and second end connector plugs.

18. The method of claim 17, wherein the transmit filter coefficient values are determined and stored in the nonvolatile memories after assembly of the cable.

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19. The method of claim 18, wherein the first and second DRR devices employ receiver-based equalization of the electrical transit signals using coefficient values stored in the nonvolatile memories.
20. The method of claim 15, wherein the first and second DRR devices do not perform pre-equalization of the multi-lane data streams provided to the first and second host interface ports.

ABSTRACT

A cable, a manufacturing method, and a communications method, employing preset transmit-side equalization to provide enhanced performance and/or to reduce receive-side equalization requirements. One illustrative cable embodiment includes: a first data recovery and re-modulation (DRR) device that exchanges inbound and outbound multi-lane data streams with a first host interface port via a first end connector plug; a second DRR device that exchanges inbound and outbound multi-lane data streams with a second host interface port via a second end connector plug; and electrical conductors connecting the first and second DRR devices to convey electrical transit signals therebetween. The first DRR device converts between said electrical transit signals and said inbound and outbound multi-lane data streams for the first host interface port, and the second DRR device converts between said electrical transit signals and said inbound and outbound multi-lane data streams for the second host interface port. The first and second DRR devices provide pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
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Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		
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Attorney Docket Number	20160.0038.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)	3A

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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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Publication Information:

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Customer Number	63467										

Domestic Benefit/National Stage Information:

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

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

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

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ 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).

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)	Remove
201910542576.3	CN	2019-07-01		
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				Add

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

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

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	20160.0038.NPUS00
		Application Number	
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant	1	Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
		Clear	
☐ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	CREDO TECHNOLOGY GROUP LIMITED		
Mailing Address Information For Applicant:			
Address 1	Ugland House		
Address 2			
City	Grand Cayman	State/Province	
Country	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. Add			

Assignee Information including Non-Applicant Assignee Information:

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Assignee 1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.			
			Remove
If the Assignee or Non-Applicant Assignee is an Organization check here. ☒			
Organization Name	CREDO TECHNOLOGY GROUP LIMITED		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	Jugland House		
Address 2			
City	Grand Cayman	State/Province	
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.			Add

Signature:

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

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

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

Signature	/Dan Krueger/		Date (YYYY-MM-DD)	2019-11-27	
First Name	Daniel	Last Name	Krueger	Registration Number	42771
Additional Signature may be generated within this form by selecting the Add button.				Add	

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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.

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

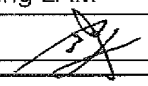
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____. The above-identified application 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>Yifei Dai</u> Date (Optional) : _____ Signature: <u>Yifei Dai</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.	

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

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

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.

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

Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
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>Yattung LAM</u> Date (Optional) : _____ Signature: <u></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.	

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

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

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

Title of
Invention

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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: Rajan PAI

Date (Optional): _____

Signature: _____

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.

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

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/698,935				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	660			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760			
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *			OR	x 100 =	0.00			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *			OR	x 460 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL	1720			
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
TOTAL ADD'L FEE								OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY		
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
TOTAL ADD'L FEE								OR	TOTAL ADD'L FEE	
* 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.										



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/698,935	11/27/2019	1737	1720	20160.0038.NPUS00	20	3

CONFIRMATION NO. 1370

FILING RECEIPT



0000000113423692

63467

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

Date Mailed: 12/20/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Yifei DAI, Shanghai, CHINA;
Yattung LAM, Palo Alto, CA;
Rajan PAI, San Jose, CA;

Applicant(s)

CREDO TECHNOLOGY GROUP LIMITED, Grand Cayman, CAYMAN ISLANDS;

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 201910542576.3 07/01/2019 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 12/18/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/698,935**

Projected Publication Date: 01/07/2021

Non-Publication Request: No

Early Publication Request: No
Title

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

Preliminary Class

430

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

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

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

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

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

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

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

Request to Retrieve Electronic Priority Application(s)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

COMPLETE IF KNOWN

Application Number	16/698,935
Filing Date	November 27, 2019
First Named Inventor	Yifei DAI
Art Unit	2883
Examiner Name	Hollweg, Thomas A
Attorney Docket Number	20160.0038.NPUS00

Pursuant to 37 CFR 1.55(i), the undersigned hereby requests that the USPTO retrieve an electronic copy of each of the following foreign applications for which priority has been claimed under 35 U.S.C. 119(a)-(d) from a foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement. This Request must be submitted:

- within the later of sixteen months from the filing date of the prior foreign application or four months from the actual filing date of an application under 35 U.S.C. 111(a),
- within four months from the later of the date of commencement (37 CFR 1.491(a)) or the date of the initial submission under 35 U.S.C. 371 of an application entering the national stage under 35 U.S.C. 371, or
- with a petition under 37 CFR 1.55(e) or (f).



OPTION A

Please retrieve the priority application identified in Column C, a certified copy of which is contained in the EP or JP application identified in Columns A and B:

A Code for Participating Office (EP or JP only)	B Application containing the non-participating priority application			C Non-participating priority application to be retrieved	
	App. No.	Filing Date	Access Code (for JP only)	Country Code	App. No.
1					



OPTION B

This Request may be used for the infrequent circumstance when a claim for priority to an application filed in a participating foreign intellectual property office was made prior to that foreign intellectual property office becoming a participating foreign intellectual property office.

Please retrieve the priority application identified in Columns A and B:

A		B		
Code for Participating Office (e.g., EP) or WIPO DAS Depositing Office (e.g., AU, BR, CN, DK, EA, EE, ES, FI, GB, IB, IN, JP, KR, MA, NL, NZ, SE)	Application to be retrieved			
	App. No.	Filing Date	Access Code (for WIPO DAS Depositing Office)	
1	CN	201910542576.3	07/01/2019	F937
2				

The USPTO will not attempt to retrieve the identified priority application(s) unless an identical claim for foreign priority to the application identified above is made pursuant to 37 CFR 1.55(d) or a petition is granted under 37 CFR 1.55(e) or (f). Applicants are advised to consult Private PAIR (accessed through www.uspto.gov) to assure that the retrieval has been successful. The 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 set forth in 37 CFR 1.55(g)(1).

I hereby declare that I have the authority to grant access to the above-identified foreign application(s).

/Dan Krueger/

Signature

Daniel J. Krueger

Printed or Typed Name

Attorney of Record

Title

April 24, 2020

Date

713-426-3923

Telephone Number

42771

Registration Number, if applicable

This collection of information is required by 37 CFR 1.55(d). 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 8 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. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Yifei		DAI		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Shanghai		Country of Residenceⁱ	CN	
Mailing Address of Inventor:					
Address 1	Hongkou District				
Address 2					
City	Shanghai		State/Province		
Postal Code			Countryⁱ	CN	
Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Yattung		LAM		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Palo Alto	State/Province	CA	Country of Residenceⁱ	US
Mailing Address of Inventor:					
Address 1	C/o Credo, Inc.				
Address 2	1600 Technology Drive, Fifth Floor				
City	San Jose		State/Province	CA	
Postal Code	95110		Countryⁱ	US	
Inventor	3				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Rajan		PAI		

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service			
City	San Jose	State/Province	CA
		Country of Residence	US
Mailing Address of Inventor:			
Address 1	c/o Credo, Inc.		
Address 2	c/o 1600 Technology Drive, Fifth Floor		
City	San Jose	State/Province	CA
Postal Code	95110	Country	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	docketing@rameyfirm.com Add Email Remove Email

Application Information:

Title of the Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		
Attorney Docket Number	20160.0038.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)	3A

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

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	53467		

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)¹ 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).

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
201910542576.3	CN	2019-07-01	F937
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

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

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

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	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant	1		Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
		Clear	
☐ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	CREDO TECHNOLOGY GROUP LIMITED		
Mailing Address Information For Applicant:			
Address 1	Ugland House		
Address 2			
City	Grand Cayman	State/Province	
Country	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. Add			

Assignee Information including Non-Applicant Assignee Information:

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

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698,935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

Assignee 1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.			
Remove			
If the Assignee or Non-Applicant Assignee is an Organization check here. ☒			
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	
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. Add			

Signature: [Remove](#)

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

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

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

Signature	/Dan Krueger/		Date (YYYY-MM-DD)	2020-04-24
First Name	Daniel	Last Name	Krueger	Registration Number 42771
Additional Signature may be generated within this form by selecting the Add button. Add				

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	20160.0038.NPUS00
		Application Number	16/698 935
Title of Invention	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		

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

Privacy Act Statement

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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.

Electronic Acknowledgement Receipt	
EFS ID:	39265074
Application Number:	16698935
International Application Number:	
Confirmation Number:	1370
Title of Invention:	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
First Named Inventor/Applicant Name:	Yifei DAI
Customer Number:	63467
Filer:	Daniel Joseph Krueger/Shanay Hines
Filer Authorized By:	Daniel Joseph Krueger
Attorney Docket Number:	20160.0038.NPUS00
Receipt Date:	24-APR-2020
Filing Date:	27-NOV-2019
Time Stamp:	22:57:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for USPTO to retrieve priority docs	2020-04-24_Req_to_Retrieve_Electronic_Priority.pdf	274028 dadcecd83a21fb477a8afb28d1cc31d009d434a4	no	2

Warnings:

Information:					
2	Application Data Sheet	2020-04-24_ADS_.pdf	3643578	no	9
			e5937ca38bbbf7dae92c6ae5c3de5a269fdf e15c		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
Total Files Size (in bytes):			3917606		
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.					



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/698,935	11/27/2019	2883	1720	20160.0038.NPUS00	20	3

CONFIRMATION NO. 1370

REPLACEMENT FILING RECEIPT



0000000118358029

63467

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

Date Mailed: 04/28/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Yifei DAI, Shanghai, CHINA;
Yattung LAM, Palo Alto, CA;
Rajan PAI, San Jose, CA;

Applicant(s)

CREDO TECHNOLOGY GROUP LIMITED, Grand Cayman, CAYMAN ISLANDS;

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 201910542576.3 07/01/2019 Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

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

If Required, Foreign Filing License Granted: 04/27/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/698,935**

Projected Publication Date: 01/07/2021

Non-Publication Request: No

Early Publication Request: No

Title

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

Preliminary Class

385

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

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

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor

community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



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

NOTICE OF ALLOWANCE AND FEE(S) DUE

63467 7590 10/15/2020
Ramey & Schwaller, LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

EXAMINER

JORDAN, ANDREW

ART UNIT

PAPER NUMBER

2883

DATE MAILED: 10/15/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00	1370

TITLE OF INVENTION: ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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	01/15/2021

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

PART B - FEE(S) TRANSMITTAL

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

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 10/15/2020
Ramey & Schwaller, 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.
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00	1370

TITLE OF INVENTION: ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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	01/15/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
JORDAN, ANDREW	2883	385-076000

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

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

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

2. For printing on the patent front page, list

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

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

1 _____

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.
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00	1370
63467	7590	10/15/2020	EXAMINER	
Ramey & Schwaller, LLP			JORDAN, ANDREW	
5020 Montrose Blvd.			ART UNIT	
Suite 800			PAPER NUMBER	
Houston, TX 77006			2883	

DATE MAILED: 10/15/2020

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

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

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

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

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

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

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/698,935	Applicant(s) DAI et al.	
	Examiner ANDREW JORDAN	Art Unit 2883	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 the filing of 4/24/20.
☐ 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. _____.	

/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	
--	--

Notice of Pre-AIA or AIA Status

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

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

DETAILED ACTION

This is an AIA application.

The effective filing date of this AIA application is seen as July 1, 2019, the date of the earliest priority application (CHINA 201910542576.3).

The claims originally filed **November 27, 2019** are entered, currently outstanding, and subject to examination.

This action is in response to the original filing of the same date.

Claims 1-20 are currently pending.

No claims have been withdrawn.

No claims have been cancelled.

Claims 1-20 are currently outstanding and subject to examination.

This is a notice of allowability and is the first action on the merits.

Allowable subject matter is indicated below.

Often, in the substance of the action below, formal matters are addressed first,

claim rejections second, and any response to arguments third.

Special Definitions for Claim Language - MPEP § 2111.01(IV)

No special definitions are seen as present in the specification regarding the language used in the claims. Consequently, the words and phrases of the claims are given their plain meaning.

If special definitions are present, Applicant should bring those to the attention of the examiner and the prosecution history with its next response.

Claims Allowed

Claims 1-20 are allowed.

Allowable Subject Matter

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

The prior art does not teach or suggest

first and second DRR devices providing pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories as set forth in the claimed combination of independent claim(s) 1, 8, and 15.

Applicant's other applications are seen as providing the closest prior art. However, while limited by the enabling disclosure of the specification as originally filed and the confines of teachings and substance therein, Applicant's active Ethernet cable appears to have elements new to the art.

Any comments considered necessary by applicant must be submitted no later than

the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Applicant's publication is not yet published and so is not cited.

The projected publication date is January 7, 2021.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited references have elements related to Applicant's disclosure and/or claims or are otherwise associated with the other cited references, particularly with respect to active Ethernet cables and related equalization systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW JORDAN whose telephone number is (571) 270-1571. The examiner can normally be reached on most days 1000-1800 PACIFIC TIME ZONE (messages are returned).

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas (Tom) Hollweg can be reached on 571-270-1739. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Andrew Jordan/
Primary Examiner, Art Unit 2883
V: (571) 270-1571 (Pacific time)
F: (571) 270-2571
October 10, 2020

Notice of References Cited	Application/Control No. 16/698,935		Applicant(s)/Patent Under Reexamination DAI et al.	
	Examiner ANDREW JORDAN		Art Unit 2883	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-20200280329-A1	09-2020	LAM; Yattung	H04B1/38	1/1
*	B	US-20200280458-A1	09-2020	LAM; Yattung	H04L25/4917	1/1
*	C	US-20150334186-A1	11-2015	Chen; Shidong	H04N7/183	348/143
*	D	US-20140086264-A1	03-2014	Lusted; Kent C.	H04L69/14	370/470
*	E	US-20140146833-A1	05-2014	Lusted; Kent C.	H04L12/413	370/437
*	F	US-20130343400-A1	12-2013	Lusted; Kent C.	H04L12/413	370/419
*	G	US-20070237464-A1	10-2007	Aronson; Lewis B.	G02B6/4416	385/89
	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. 20201010

Issue Classification 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

CPC						
Symbol					Type	Version
G02B		6		4284	F	2013-01-01
G02B		6		3846	I	2013-01-01
G02B		6		387	I	2013-01-01

CPC Combination Sets					
Symbol				Type	Set

NONE (Assistant Examiner)		Total Claims Allowed: 20	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883 (Primary Examiner)		10 October 2020 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 2

Issue Classification 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G02B6/42		6	42

NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	10 October 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

Issue Classification 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

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

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883 (Primary Examiner) _____ (Date) 10 October 2020		O.G. Print Claim(s) 1	O.G. Print Figure 2

<i>Index of Claims</i> 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

✓	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	10/10/2020							
	1	=							
	2	=							
	3	=							
	4	=							
	5	=							
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	19	=							
	20	=							

<i>Search Notes</i> 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

CPC - Searched*		
Symbol	Date	Examiner
G02B6/4284, /3846, and /387	10/10/2020	aj

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
G02B6/4284, /3846, and /387 (See search history printout)	10/10/2020	aj
EAST search history attached	10/10/2020	aj
Inventor name search	10/10/2020	aj
Assignee and/or Applicant name search	10/10/2020	aj

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see attached EAST history	10/10/2020	aj

/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	
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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. 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	
	Filing Date	2019-11-22
	First Named Inventor	Yifei DAI
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20160.0038.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		
/AJ/	1	9322704	B1	2016-04-26	Neveux			
	2	7401985	B2	2008-07-22	Aronson, 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	
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							
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add	
FOREIGN PATENT DOCUMENTS							Remove	
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
/AJ/	1	2018161273	WO	A1	2018-09-13	Credo Technology Group Ltd.		
If you wish to add additional Foreign Patent Document citation information please click the Add button.							Add	
NON-PATENT LITERATURE DOCUMENTS							Remove	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2019-11-22
First Named Inventor	Yifei DAI	
Art Unit		
Examiner Name		
Attorney Docket Number		20160.0038.NPUS00

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
/AJ/	1	Rumer, B. (2001, February 1). Fighting Jitter in Fibre-Channel Designs. EE Times. Retrieved January 23, 2019, from https://www.eetimes.com/document.asp?doc_id=1277249# .	
	2	Management Data Input/Output. (2018, November 25). Wikipedia. Retrieved January 23, 2019, from https://en.wikipedia.org/wiki/Management_Data_Input/Output .	
	3	QSFP-DD MSA - QSFP-DD Hardware Specification for QSFP Double Density 8X Pluggable Transceiver Rev 4.0 Candidate. August 15, 2018.	
	4	40 Gigabit Ethernet, 40G QSFP+, 40GBASE-LR4, 40G-BASE-SR4, CFP module, CXP Transceiver, MPO MTP Fiber on May 25, 2015 [http://www.cables-solutions.com/guide-to-40-gigabit-ethernet-options.html]	
	5	IEEE P802.3cd/D1.2, 3rd February 2017 (Amendment of IEEE Std 802.3-2015 as amended) IEEE Draft Standard for Ethernet Amendment: Media Access Control Parameters for 50 Gb/s, 100 Gb/s and 200 Gb/s Operation.	

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

EXAMINER SIGNATURE

Examiner Signature	/ANDREW JORDAN/ (10/03/2020)	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.

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		
Filing Date		2019-11-22
First Named Inventor	Yifei DAI	
Art Unit		
Examiner Name		
Attorney Docket Number		20160.0038.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)	2019-11-27
Name/Print	Dan Krueger	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.
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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	0	("1000004519290").fmid.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:00
S2	130	((Yifei near2 DAI) or (Yattung near2 LAM) or (Rajan near2 PAI)).inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:00
S3	0	((Yifei near2 DAI) and (Yattung near2 LAM) and (Rajan near2 PAI)).inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:00
S4	1,377	CREDO.as,aanm,asn. or (CREDO near2 TECHNOLOGY).as,aanm,asn. or (CREDO near2 TECHNOLOGY near2 GROUP).as,aanm,asn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:00
S5	643	(CREDO near2 TECHNOLOGY).as,aanm,asn. or (CREDO near2 TECHNOLOGY near2 GROUP).as,aanm,asn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:00
S6	11,524	(G02B6/4284 or G02B6/3846 or G02B6/387).cpc. G02B6/4284.cpc. G02B6/3846.cpc. G02B6/387.cpc. (385/76).ccls. (385/76).ccls. (385/76).fs. (385/76).fs. (385/76).ccls,fs. (385/76).ccls,fs. (G02B6/4284 or G02B6/3846 or G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:01

S7	0	(G02B6/4284 and G02B6/3846 and G02B6/387).cpc. (G02B6/4284 and G02B6/3846 and G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:01
S8	0	(G02B6/4284 and G02B6/3846 and G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:01
S9	0	(G02B6/4284 and G02B6/3846 and G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:01
S10	0	ACTIVE near2 ETHERNET near2 CABLE near2 PRESET near2 PRE-EQUALIZATION	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:02
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S12	34	ETHERNET near2 EQUALIZATION	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:02
S13	0	ETHERNET with PRE\$1EQUALIZATION	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:03

S14	0	S2 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:03
S15	332	ETHERNET with EQUALIZATION	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:04
S16	6	(ETHERNET near2 cabl\$4) with EQUALIZATION	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:04
S17	1	S2 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 16:04
S18	2	("7401985" "9322704").PN.	US-PGPUB; USPAT	OR	ON	2020/10/02 20:36
S19	3	("55754620" "38575371").fmid.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 20:37
S20	3	US-2014146833-\$.did. or US- 2014086264-\$.did. or US-2013343400- \$.did. Cn-1941649-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 20:43
S21	9	US-20140146833-\$.did. or US- 20140086264-\$.did. or US- 20130343400-\$.did. Cn-1941649-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/02 20:43

			DERWENT; IBM_TDB			
S22	50	ACTIV\$4 near2 ETHER\$1NET\$4 near2 CABL\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:23
S23	656,531	PRE\$1EQUALIZATION\$4 or EQUALIZATION\$4 PRE\$1EQUALIZAT\$4 or EQUALIZAT\$4 PRE\$1EQUALIZ\$4 or EQUALIZ\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:24
S24	2	S22 and S23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:24
S25	11,524	(G02B6/4284 or G02B6/3846 or G02B6/387).cpc. G02B6/4284.cpc. G02B6/3846.cpc. G02B6/387.cpc. (385/76).ccls. (385/76).ccls. (385/76).fs. (385/76).fs. (385/76).ccls,fs. (385/76).ccls,fs. (G02B6/4284 or G02B6/3846 or G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:53
S26	50	ACTIV\$4 near2 ETHER\$1NET\$4 near2 CABL\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:53
S27	0	S26 and S25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:53
S28	130	((Yifei near2 DAI) or (Yattung near2 LAM) or (Rajan near2 PAI)).inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/02 21:54

			DERWENT; IBM_TDB			
S29	1	S26 and S28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:54
S30	1,377	CREDO.as,aanm,asn. or (CREDO near2 TECHNOLOGY).as,aanm,asn. or (CREDO near2 TECHNOLOGY near2 GROUP).as,aanm,asn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:54
S31	2	S26 and S30	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/02 21:54
S32	5,176	(data\$4 near2 recover\$4 near2 re\$1modulat\$4) or DRR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:11
S33	11,528	(G02B6/4284 or G02B6/3846 or G02B6/387).cpc. G02B6/4284.cpc. G02B6/3846.cpc. G02B6/387.cpc. (385/76).ccls. (385/76).ccls. (385/76).fs. (385/76).fs. (385/76).ccls,fs. (385/76).ccls,fs. (G02B6/4284 or G02B6/3846 or G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:12
S34	0	S32 and S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:12
S35	1,377	CREDO.as,aanm,asn. or (CREDO near2 TECHNOLOGY).as,aanm,asn. or (CREDO near2 TECHNOLOGY near2 GROUP).as,aanm,asn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/09 21:12

			DERWENT; IBM_TDB			
S36	2	S32 and S35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:12
S37	51	activ\$4 near2 (ether\$1net\$4 or ethre\$1net\$4) near2 cabl\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:47
S38	83,727	(transmi\$4 or transmit\$4 or transmiss\$4) near2 (equal\$4 or equaliz\$4 or equilis\$4 or equalizat\$4 or equilisat\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:49
S39	1	S37 and S38	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 21:49
S40	11,528	(G02B6/4284 or G02B6/3846 or G02B6/387).cpc. G02B6/4284.cpc. G02B6/3846.cpc. G02B6/387.cpc. (385/76).ccls. (385/76).ccls. (385/76).fs. (385/76).fs. (385/76).ccls,fs. (385/76).ccls,fs. (G02B6/4284 or G02B6/3846 or G02B6/387).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 22:14
S41	0	S37 and S40	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 22:14
S42	51	ACTIV\$4 near2 ETHER\$1NET\$4 near2 CABL\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/09 22:19

			DERWENT; IBM_TDB			
S43	657,046	PRE\$1EQUALIZATION\$4 or EQUALIZATION\$4 PRE\$1EQUALIZAT\$4 or EQUALIZAT\$4 PRE\$1EQUALIZ\$4 or EQUALIZ\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 22:20
S44	51	S37 or S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 22:20
S45	2	S44 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/09 22:21

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S46	62,890	(PRE\$1EQUALIZATION\$4 or EQUALIZATION\$4 PRE\$1EQUALIZAT\$4 or EQUALIZAT\$4 PRE\$1EQUALIZ\$4 or EQUALIZ\$4).clm.	US- PGPUB; USPAT	OR	ON	2020/10/09 22:28
S47	400	((data\$4 near2 recover\$4 near2 re\$1modulat\$4) or DRR).clm.	US- PGPUB; USPAT	OR	ON	2020/10/09 22:28
S48	6	S46 and S47	US- PGPUB; USPAT	OR	ON	2020/10/09 22:29

10/10/2020 12:26:09 AM

C:\Users\ajordan1\Documents\EAST\Workspaces\16_698_935 Dai ACTIVE ETHERNET CABLE.wsp

Bibliographic Data

Application No: 16/698,935

Foreign Priority claimed: ☐ Yes ☒ No

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

Verified and Acknowledged: /ANDREW JORDAN/

Examiner's Signature

Initials

Title:

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/27/2019	385	2883	20160.0038.NPUS00
RULE			

APPLICANTS

CREDO TECHNOLOGY GROUP LIMITED, Grand Cayman, CAYMAN ISLANDS

INVENTORS

Yifei DAI, Shanghai, CHINA

Yattung LAM, Palo Alto, CA, UNITED STATES

Rajan PAI, San Jose, CA, UNITED STATES

CONTINUING DATA

FOREIGN APPLICATIONS

CHINA CN201910542576.3 07/01/2019

IF REQUIRED, FOREIGN LICENSE GRANTED**

04/27/2020

STATE OR COUNTRY

CHINA

ADDRESS

Ramey & Schwaller, LLP

5020 Montrose Blvd.

Suite 800

Houston, TX 77006

UNITED STATES

FILING FEE RECEIVED

\$1,720

Doc code: RCEX

PTO/SB/30EFS (07-09)

Doc description: Request for Continued Examination (RCE)

Approved for use through 07/31/2012. 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.

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

Application Number	16/698,935	Filing Date	2019-11-27	Docket Number (if applicable)	20160.00038.NPUS00	Art Unit	2883
First Named Inventor	Yifei Dai			Examiner Name	Andrew Jordan		

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 (07-09)

Approved for use through 07/31/2012. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	Dan Krueger/	Date (YYYY-MM-DD)	2020-10-21
Name	Daniel 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.

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16698935
	Filing Date	2019-11-27
	First Named Inventor	Yifei DAI
	Art Unit	2883
	Examiner Name	Jordan, Andrew
	Attorney Docket Number	20160.0038.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		
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If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² i	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
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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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16698935
	Filing Date		2019-11-27
	First Named Inventor	Yifei DAI	
	Art Unit	2883	
	Examiner Name	Jordan, Andrew	
	Attorney Docket Number	20160.0038.NPUS00	

1	Ex Parte Quayle Action received March 11, 2020 for U.S. Application no. 16/539,910
2	Notice of Allowance received June 4, 2020 for U.S. Application no. 16/539,910
3	Restriction Requirement received May 1, 2020 for U.S. Application no. 16/541,094
4	Non Final Office Action received September 9, 2020 for U.S. Application no. 16/541,094
5	Notification of Reopening of Prosecution Due to Consideration of Information Disclosure Statement Filed After Mailing of a Notice of Allowance received October 5, 2020 for U.S. Application no. 16/539,910

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

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.

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	16698935
	Filing Date	2019-11-27
	First Named Inventor	Yifei DAI
	Art Unit	2883
	Examiner Name	Jordan, Andrew
	Attorney Docket Number	20160.0038.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	/Daniel Krueger/	Date (YYYY-MM-DD)	2020-10-21
Name/Print	Daniel Krueger	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.
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.

Electronic Patent Application Fee Transmittal				
Application Number:		16698935		
Filing Date:		27-Nov-2019		
Title of Invention:		ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		
First Named Inventor/Applicant Name:		Yifei DAI		
Filer:		Daniel Joseph Krueger/Shanay Hines		
Attorney Docket Number:		20160.0038.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:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
Total in USD (\$)				1360

Electronic Acknowledgement Receipt	
EFS ID:	40905581
Application Number:	16698935
International Application Number:	
Confirmation Number:	1370
Title of Invention:	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
First Named Inventor/Applicant Name:	Yifei DAI
Customer Number:	63467
Filer:	Daniel Joseph Krueger/Shanay Hines
Filer Authorized By:	Daniel Joseph Krueger
Attorney Docket Number:	20160.0038.NPUS00
Receipt Date:	21-OCT-2020
Filing Date:	27-NOV-2019
Time Stamp:	14:40:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1360
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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	Request for Continued Examination (RCE)	RCE_form.pdf	697605	no	3
			fbaebf5d3e02b528835301e78e4ee8eeb5a3bade		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	2020-10-21_SB08.pdf	612205	no	4
			45cb1c7cb10dbfdff86b8a848b0e0386473022501		
Warnings:					
Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
3	Other Reference-Patent/App/Search documents	2020-03-11_16539910_20160-0039-NPUS00_ExPQ.pdf	378412	no	9
			e8fda0dfc0c899f77edfffc306fc9cf1ab092c53		
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	2020-06-04_16539910_20160-0039_NPUS00_NOA.pdf	427146	no	8
			a95349b0e7be937345a2e8aa6fbff0a72831b033		
Warnings:					
Information:					
5	Other Reference-Patent/App/Search documents	2020-05-01-16541094_20160-0036_NPUS00_RR.pdf	238634	no	7
			da47ea08eba7e98593010a2859618567372d3aa		
Warnings:					
Information:					

6	Other Reference-Patent/App/Search documents	2020-09-09_16541094_NFOA.pdf	1024671	no	26				
			9cb6818d41e7c60bb03414e0fc0c548babe86c6						
Warnings:									
Information:									
7	Other Reference-Patent/App/Search documents	2020-10-05_16539910_20160-0039-NPUS00_OA_QPIDS.pdf	507706	no	10				
			acd0618f1d7e032926559bb9ccea7e35e066						
Warnings:									
Information:									
8	Fee Worksheet (SB06)	fee-info.pdf	30667	no	2				
			7d91d3d9d364af364510eaffd0d2056d4246fc63						
Warnings:									
Information:									
Total Files Size (in bytes):			3917046						
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.									



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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NOTICE OF ALLOWANCE AND FEE(S) DUE

63467 7590 11/06/2020
Ramey & Schwaller, LLP
5020 Montrose Blvd.
Suite 800
Houston, TX 77006

EXAMINER

JORDAN, ANDREW

ART UNIT

PAPER NUMBER

2883

DATE MAILED: 11/06/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00	1370

TITLE OF INVENTION: ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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	02/08/2021

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

PART B - FEE(S) TRANSMITTAL

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

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 11/06/2020
Ramey & Schwaller, 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.
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00	1370

TITLE OF INVENTION: ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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	02/08/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
JORDAN, ANDREW	2883	385-076000

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

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

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

2. For printing on the patent front page, list

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

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

1 _____
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. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00	1370
63467	7590	11/06/2020	EXAMINER	
Ramey & Schwaller, LLP			JORDAN, ANDREW	
5020 Montrose Blvd.			ART UNIT	
Suite 800			PAPER NUMBER	
Houston, TX 77006			2883	

DATE MAILED: 11/06/2020

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

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

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

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

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

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

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/698,935	Applicant(s) DAI et al.	
	Examiner ANDREW JORDAN	Art Unit 2883	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 the filing of 10/21/20.
☐ 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: CN 2019 1054 2576.3 .

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. _____.	

/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	
--	--

Notice of Pre-AIA or AIA Status

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

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

DETAILED ACTION

This is an AIA application.

The effective filing date of this AIA application is seen as July 1, 2019, the date of the earliest priority application (CHINA 201910542576.3).

The claims originally filed **November 27, 2019** are entered, currently outstanding, and subject to examination.

This action is in response to the RCE filing of October 21, 2020.

Claims 1-20 are currently pending.

No claims have been amended.

No claims have been withdrawn.

No claims have been cancelled.

Claims 1-20 are currently outstanding and subject to examination.

This is a notice of allowability and is the second action on the merits.

Allowable subject matter is indicated below.

Often, in the substance of the action below, formal matters are addressed first, claim rejections second, and any response to arguments third.

Continued Examination Under 37 CFR 1.114

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 after allowance or after an Office action under Ex Parte Quayle, 25 USPQ 74, 453 OG 213 (Comm'r Pat. 1935). 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, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on October 21, 2020 has been entered.

***MPEP § 2001.06(b)
Information Relating to or From
Copinging United States Patent Applications [R-08.2017]***

The individuals covered by 37 CFR 1.56 have a duty to bring to the attention of the examiner, or other Office official involved with the examination of a particular application, information within their knowledge as to other copinging United States applications which are "material to patentability" of the application in question. This may include providing the identification of pending or abandoned applications filed by at least one of the inventors or assigned to the same assignee as the current application that disclose similar subject matter that are not otherwise identified in the current application. As set forth by the court in *Armour & Co. v. Swift & Co.*, 466 F.2d 767, 779, 175 USPQ 70, 79 (7th Cir. 1972):

[W]e think that it is unfair to the busy examiner, no matter how diligent and well informed he may be, to assume that he retains details of every pending file in his mind when he is reviewing a particular application . . . [T]he applicant has the burden of presenting the examiner with a complete and accurate record to support the allowance of letters patent.

See also MPEP § 2004, paragraph 9.

Accordingly, the individuals covered by 37 CFR 1.56 cannot assume that the examiner of a particular application is necessarily aware of other applications which are "material to patentability" of the application in question, but must instead bring such other applications to the attention of the examiner. See *Regeneron Pharm., Inc. v. Merus B.V.*, 144 F. Supp. 3d 530, 560 (S.D.N.Y. 2015), and *Dayco Prod., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1365-69, 66 USPQ2d 1801, 1806-08 (Fed. Cir. 2003). For example, if a particular inventor has different applications pending which disclose similar subject matter but claim patentably indistinct inventions, the existence of other applications must be disclosed to the examiner of each of the involved applications. Similarly, the prior art references from one application must be made of record in another subsequent application if such prior art references are "material to patentability" of the subsequent application. See *Dayco Prod.*, 329 F.3d at 1369, 66 USPQ2d at 1808.

If the application under examination is identified as a continuation, divisional, or continuation-in-part of an earlier application, the examiner will consider the prior art properly cited in the earlier application. See MPEP § 609 and MPEP § 719.05, subsection (II)(A), example J. The examiner must indicate in the first Office action whether the prior art in a related earlier application has been reviewed. Accordingly, no separate citation of

the same prior art need be made in the later application, unless applicant wants a listing of the prior art printed on the face of the patent.

Special Definitions for Claim Language - MPEP § 2111.01(IV)

No special definitions are seen as present in the specification regarding the language used in the claims. Consequently, the words and phrases of the claims are given their plain meaning. MPEP §§ 2173.01, 2173.05(a), and 2111.01.

If special definitions are present, Applicant should bring those to the attention of the examiner and the prosecution history with its next response.

To date, Applicant has provided no indication of special definitions.

Claims Allowed

Claims 1-20 are allowed.

Allowable Subject Matter

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

The prior art does not teach or suggest

first and second DRR devices providing pre-equalization of the electrical transit signals using transmit filter coefficient values stored in nonvolatile memories as set forth in the claimed combination of independent claim(s) 1, 8, and 15.

No change is seen from the notice of allowance issued October 15, 2020.

Applicant's other applications are seen as providing the closest prior art. However, while limited by the enabling disclosure of the specification as originally filed and the

confines of substance therein, Applicant's active Ethernet cable appears to have elements new to the art.

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

Conclusion

Applicant's publication is not yet published and so is not cited.

The projected publication date is January 7, 2021.

No new art is cited.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW JORDAN whose telephone number is (571) 270-1571. The examiner can normally be reached on most days 1000-1800 PACIFIC TIME ZONE (messages are returned).

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas (Tom) Hollweg can be reached on 571-270-1739. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Andrew Jordan/
Primary Examiner, Art Unit 2883
V: (571) 270-1571 (Pacific time)
F: (571) 270-2571
November 3, 2020

<i>Index of Claims</i> 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

✓	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	10/10/2020	11/03/2020						
	1	=	=						
	2	=	=						
	3	=	=						
	4	=	=						
	5	=	=						
	6	=	=						
	7	=	=						
	8	=	=						
	9	=	=						
	10	=	=						
	11	=	=						
	12	=	=						
	13	=	=						
	14	=	=						
	15	=	=						
	16	=	=						
	17	=	=						
	18	=	=						
	19	=	=						
	20	=	=						

Issue Classification 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

CPC						
Symbol					Type	Version
G02B		6		4284	F	2013-01-01
G02B		6		3846	I	2013-01-01
G02B		6		387	I	2013-01-01

CPC Combination Sets					
Symbol				Type	Version

NONE (Assistant Examiner)		Total Claims Allowed: 20	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883 (Primary Examiner)		03 November 2020 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 2

Issue Classification 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G02B6/42		6	42

NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	03 November 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

Issue Classification 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

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

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883 (Primary Examiner) _____ (Date) 03 November 2020		O.G. Print Claim(s) 1	O.G. Print Figure 2

U.S. Patent and Trademark Office

Part of Paper No.: 20201103

<i>Search Notes</i> 	Application/Control No. 16/698,935	Applicant(s)/Patent Under Reexamination DAI et al.
	Examiner ANDREW JORDAN	Art Unit 2883

CPC - Searched*		
Symbol	Date	Examiner
G02B6/4284, /3846, and /387	10/10/2020	aj

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
G02B6/4284, /3846, and /387 (See search history printout)	10/10/2020	aj
EAST search history attached (updated 11/3/20)	10/10/2020	aj
Inventor name search	10/10/2020	aj
Assignee and/or Applicant name search	10/10/2020	aj

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see attached EAST history (updated 11/3/20)	10/10/2020	aj

/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S53	2	S52 and S51	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/03 00:06
S52	51	S49 or S50	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/03 00:06
S51	659,581	PRE\$1EQUALIZATION\$4 or EQUALIZATION\$4 PRE\$1EQUALIZAT\$4 or EQUALIZAT\$4 PRE\$1EQUALIZ\$4 or EQUALIZ\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/03 00:06
S50	51	ACTIV\$4 near2 ETHER\$1NET\$4 near2 CABL\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/03 00:06
S49	51	activ\$4 near2 (ether\$1net\$4 or ethre\$1net\$4) near2 cabl\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/03 00:06

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S58	0	S56 not S57	US- PGPUB; USPAT	OR	ON	2020/11/03 00:07
S57	6	"Term Removed" or "Term Removed"	US- PGPUB; USPAT	OR	ON	2020/11/03 00:07
S56	6	S54 and S55	US- PGPUB; USPAT	OR	ON	2020/11/03 00:06
S55	404	((data\$4 near2 recover\$4 near2 re\$1modulat\$4) or DRR).clm.	US- PGPUB; USPAT	OR	ON	2020/11/03 00:06

S54	63,078	(PRE\$1EQUALIZATION\$4 or EQUALIZATION\$4 PRE\$1EQUALIZAT\$4 or EQUALIZAT\$4 PRE\$1EQUALIZ\$4 or EQUALIZ\$4).clm.	US- PGPUB; USPAT	OR	ON	2020/11/03 00:06
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11/3/2020 12:09:12 AM

C:\Users\ajordan1\Documents\EAST\Workspaces\16_698_935 Dai ACTIVE ETHERNET CABLE.wsp

Bibliographic Data

Application No: 16/698,935

Foreign Priority claimed: ☐ Yes ☒ No

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

Verified and Acknowledged: /ANDREW JORDAN/

Examiner's Signature

Initials

Title:

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/27/2019	385	2883	20160.0038.NPUS00
RULE			

APPLICANTS

CREDO TECHNOLOGY GROUP LIMITED, Grand Cayman, CAYMAN ISLANDS

INVENTORS

Yifei DAI, Shanghai, CHINA

Yattung LAM, Palo Alto, CA, UNITED STATES

Rajan PAI, San Jose, CA, UNITED STATES

CONTINUING DATA

FOREIGN APPLICATIONS

CHINA CN201910542576.3 07/01/2019

IF REQUIRED, FOREIGN LICENSE GRANTED**

04/27/2020

STATE OR COUNTRY

CHINA

ADDRESS

Ramey & Schwaller, LLP

5020 Montrose Blvd.

Suite 800

Houston, TX 77006

UNITED STATES

FILING FEE RECEIVED

\$1,720

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0651-0031

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

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16698935
	Filing Date	2019-11-27
	First Named Inventor	Yifei DAI
	Art Unit	2883
	Examiner Name	Jordan, Andrew
	Attorney Docket Number	20160.0038.NPUS00

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
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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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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16698935
Filing Date	2019-11-27
First Named Inventor	Yifei DAI
Art Unit	2883
Examiner Name	Jordan, Andrew
Attorney Docket Number	20160.0038.NPUS00

/AJ/	1	Ex Parte Quayle Action received March 11, 2020 for U.S. Application no. 16/539,910
/AJ/	2	Notice of Allowance received June 4, 2020 for U.S. Application no. 16/539,910
/AJ/	3	Restriction Requirement received May 1, 2020 for U.S. Application no. 16/541,094
/AJ/	4	Non Final Office Action received September 9, 2020 for U.S. Application no. 16/541,094
/AJ/	5	Notification of Reopening of Prosecution Due to Consideration of Information Disclosure Statement Filed After Mailing of a Notice of Allowance received October 5, 2020 for U.S. Application no. 16/539,910

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

EXAMINER SIGNATURE

Examiner Signature	/ANDREW JORDAN/ (11/02/2020)	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.

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	16698935
	Filing Date	2019-11-27
	First Named Inventor	Yifei DAI
	Art Unit	2883
	Examiner Name	Jordan, Andrew
	Attorney Docket Number	20160.0038.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	/Daniel Krueger/	Date (YYYY-MM-DD)	2020-10-21
Name/Print	Daniel Krueger	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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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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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.

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

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
16698935	27-Nov-2019	Yifei DAI	20160.0038.NPUS00	1370

TITLE OF INVENTION :

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2883	076000	ANDREW JORDAN
Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
\$1200	\$0	\$1200	08-Feb-2021	\$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 & Schwaller, 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.

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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 _____

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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 & SCHWALLER LLP

2. DANIEL 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	/Daniel J. Krueger/	Date	11-20-2020
Name	Daniel Joseph Krueger	Registration Number	42771

Electronic Patent Application Fee Transmittal				
Application Number:		16698935		
Filing Date:		27-Nov-2019		
Title of Invention:		ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION		
First Named Inventor/Applicant Name:		Yifei DAI		
Filer:		Daniel Joseph Krueger/Shanay Hines		
Attorney Docket Number:		20160.0038.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:	41182842
Application Number:	16698935
International Application Number:	
Confirmation Number:	1370
Title of Invention:	ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION
First Named Inventor/Applicant Name:	Yifei DAI
Customer Number:	63467
Filer:	Daniel Joseph Krueger/Shanay Hines
Filer Authorized By:	Daniel Joseph Krueger
Attorney Docket Number:	20160.0038.NPU500
Receipt Date:	20-NOV-2020
Filing Date:	27-NOV-2019
Time Stamp:	16:59:07
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	E2020AJG59048583
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	46513	no	2
			4a307c7186169d85d10ba86a403fd11c86d3198f		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32334	no	2
			f5f3b1888ccbaee57489995f656c30e9e4f2074		
Warnings:					
Information:					
Total Files Size (in bytes):			78847		
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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UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/698,935	12/29/2020	10877233	20160.0038.NPUS00	1370

63467 7590 12/09/2020
Ramey & Schwaller, 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 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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

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

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

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

Yifei DAI, Shanghai, CHINA;
CREDO TECHNOLOGY GROUP LIMITED, Grand Cayman, CAYMAN ISLANDS;
Yattung LAM, Palo Alto, CA;
Rajan PAI, San Jose, CA;

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/698,935	11/27/2019	Yifei DAI	20160.0038.NPUS00

CONFIRMATION NO. 1370

63467

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

PUBLICATION NOTICE



OC000000122502773

Title:ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

Publication No.US-2021-0003794-A1

Publication Date:01/07/2021

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/>.

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UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 10,877,233

APPLICATION NO.: 16/698,935

ISSUE DATE : 2020-12-29

INVENTOR(S) : Yifei Dai, Yattung Lam, Rajan Pai

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

After "(22) Filed: Nov. 27, 2019" in column 1 of page 1, please insert:

-- (30) Foreign Application Priority Data
Jul. 1, 2019 (CN) 201910542576.3 --

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

Daniel J. Krueger (#42,771), Ramey LLP
5020 Montrose Blvd., Suite 800
Houston, TX 77006

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Routine uses of the information in this record may include disclosure to: 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law; 2) a Federal, state, local, or international agency, in response to its request; 3) a contractor of the USPTO having need for the information in order to perform a contract; 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record; 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record; 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations; 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals; 8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)); 9) the Office of Personnel Management (OPM) for personnel research purposes; and 9) the Office of Management and Budget (OMB) for legislative coordination and clearance.

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Additional USPTO uses of the information in this record may include disclosure to: 1) the International Bureau of the World Intellectual Property Organization, if the record is related to an international application filed under the Patent Cooperation Treaty; 2) the public i) after publication of the application pursuant to 35 U.S.C. 122(b), ii) after issuance of a patent pursuant to 35 U.S.C. 151, iii) 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, or iv) without publication of the application or patent under the specific circumstances provided for by 37 CFR 1.14(a)(1)(v)-(vii); and/or 3) the National Archives and Records Administration, for inspection of records.

Serial No.: 16/698,935
Filing Date: 2019-11-27
Confirmation: 1370
Atty Docket: 20160.0038.npUS00
1st Inventor: Yifei Dai
Title: Active Ethernet Cable with Preset Pre-Equalization
Examiner: Andrew Jordan
Art Unit: 2883

PETITION TO ACCEPT BELATED CERTIFIED COPY OF FOREIGN APPLICATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 23313-1450

Dear Commissioner:

To perfect priority claims that were timely-submitted, Patentee submits this petition and a certified copy of the foreign application pursuant to 37 CFR 1.55(f). A concurrently filed document requests a Certificate of Correction to insert the priority claim on the face of the patent.

In the original Application Data Sheet submitted on the application's filing date, 2019-11-27, patentee claimed priority to China Application 201910542576.3 and this claim is reflected in the Filing Receipt that the Office mailed 2019-12-20, albeit with a notation "No Access Code Provided". Patentee subsequently submitted a revised ADS and a Request to Retrieve Electronic Priority Application on 2020-04-24, and the Office mailed a Replacement Filing Receipt on 2020-04-28 showing the priority claim with "Access Code Provided". The Request to Retrieve was submitted within 16 months of the priority application's filing date, 2019-06-21, and is thus timely under 37 CFR 1.55(f).

The Notices of Allowability mailed 2020-10-15 and 2020-11-06 each acknowledged the priority claim with an indication that no certified copy had been received, but a certified copy was not believed necessary in view of the Office's ability to obtain an electronic copy at any time pursuant to the Request to Retrieve. It was the undersigned

practitioner's understanding that the Office would obtain the electronic copy before issuance, and that if they could not, the undersigned would receive a notification from the examiner pursuant to MPEP §215 (VI) ("No Certified Copy").

To reiterate, the Office could easily have obtained an electronic copy of the priority application in a timely fashion or at any time thereafter. In the experience of the undersigned practitioner, the Office has been supremely reliable in using the Electronic Priority Document Exchange. There is no evidence that the Office even tried to obtain the electronic copy in this case, a circumstance perhaps attributable to the timing of the Request relative to the recent pandemic. In any event, Patentee received no notice that the Office had failed to obtain an electronic copy of the priority application and thus failed to submit a certified copy directly. To make matters more confusing, the Office's systems and Filing Receipts consistently reflect the Patentee's priority claim as part of the bibliographic information for the patent.

When the patent issued the undersigned practitioner failed to notice the omission of Foreign Priority Data from the face. The patentee did not discover the omission until recently and acted immediately to order the certified copy. This petition and associated fees are being submitted as soon as the certified copy can be obtained. The delay in submitting this certified copy and petition is entirely unintentional.

Patentee respectfully requests that this petition be granted, and the priority claim to the foreign application be perfected. The reader is encouraged to contact the undersigned practitioner if a discussion might prove helpful.

Respectfully submitted,

/Dan Krueger/

2024-05-14

 **RAMEY**
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5020 Montrose Blvd # 800
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713-426-3923 x304

Dr. Daniel J. Krueger
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Attorney for Patentee
dan@rameyfirm.com
713-449-9669 (direct)

Date

UNITED STATES
PATENT AND TRADEMARK OFFICEP.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/698,935RECEIPT DATE / TIME
05/14/2024 03:02:31 PM Z ETATTORNEY DOCKET #
20160.0038.NPUS00**Title of Invention**

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

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

PATENT # 10877233

CONFIRMATION # 1370

FILED BY BASAK GUZEL

PATENT CENTER # 65520966

FILING DATE 11/27/2019

CUSTOMER # 63467

FIRST NAMED INVENTOR Yifei DAI

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Daniel Krueger

Documents**TOTAL DOCUMENTS: 4**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
C038ReqCertCorr.pdf	2	Request for Certificate of Correction	83 KB
sb0044.pdf	2	Request for Certificate of Correction	586 KB
C038Petition Belated Certified Copy.pdf	2	Petition for review by the Office of Petitions	83 KB
Certified Copy of CN 201910542576.3.pdf	24	Interim Copy of the Foreign Priority Document	3085 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
C038ReqCertCorr.pdf	0355F21C7571FB8C1CBDA0E16A7637FC2045257946B4DDF70 86859B1901E791C0A772E939E79177ACA1C1244E8765E435EB A13ED7E05EA10C31616BF05749601
sb0044.pdf	ED7BD1A4C8634840E1DA8FC25A9C0C75D14F09BB7BEBC8B5 11610D2BFC8FB298BC795AFEBD584567BB5661FDED3448946 A59B5CF7D56E0EB2CE5BA3A2A72110F
C038Petition Belated Certified Copy.pdf	014E1D5B7E16E28FD83175C412CA5402FB3AA9A31796B9F53 45BD130CF5EF29B834161F6A339EE50630954D95F4CFFF71B4 5AF91175E7A21C5232AA6FDFDA1AB
Certified Copy of CN 201910542576.3.pdf	4E9BEAAF2F2EF6694570EC954AE2BCD596604A43A8E24A7EF 74247B36C5160612725120975FE1B9962966D72DD7853023D5B C57FA7EAF22C545062E2EB6B1C2C

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.

Serial No.: 16/698,935

Filing Date: 2019-11-27

Confirmation: 1370

Atty Docket: 20160.0038.npUS00

1st Inventor: Yifei Dai

Title: Active Ethernet Cable with Preset Pre-Equalization

Examiner: Andrew Jordan

Art Unit: 2883

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 35 USC § 255 (Applicant Mistake)

Commissioner for Patents

Office of Data Management Attention: Certificates of Correction Branch

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Commissioner:

This paper is filed in connection with an attached Certificate of Correction Form. This form is submitted to correct the erroneous omission of Foreign Application Priority Data from the front page of the patent. This omission seems due to the Office's failure to fulfill Patentee's Request to Retrieve Electronic Priority Application submitted 2020-04-24, and due to the Patentee's apparent error in not recognizing the need to directly submit a certified copy of the priority document.

Patentee now submits:

- * A certified copy of the priority document
- * A Petition to Accept a Belated Certified Copy Under 37 CFR 1.55(f)
- * A \$220 undiscounted petition fee under 37 CFR 1.17(g)
- * This Request for Certificate of Correction for Applicant Mistake, and
- * A \$160 certificate of correction fee under 37 CFR 1.20(a)

Patentee requests that the attached Certificate of Correction be entered into the record. The reader is encouraged to contact the undersigned attorney if a discussion might prove helpful.

Respectfully submitted,

/Dan Krueger/

2024-05-14

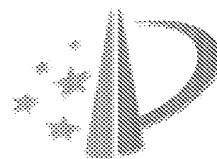

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Attorney for Patentee
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Date

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：2019105425763

申请类型：发明专利

发明创造名称：具有预设预均衡的有源以太网电缆

申请日：2019年06月21日

申请人：默升科技集团有限公司

发明人或设计人：戴逸飞、Y·拉姆、R·帕伊

局长

申长雨

申长雨

2024年04月28日

权 利 要 求 书

1. 一种电缆，包括：

5 第一数据恢复和重新调制 DRR 设备，经由第一端部连接器插头而与第一主机接口端口交换入站多通道数据流和出站多通道数据流；

第二 DRR 设备，经由第二端部连接器插头而与第二主机接口端口交换入站多通道数据流和出站多通道数据流；以及

电导体，连接所述第一 DRR 设备和所述第二 DRR 设备，以在所述第一 DRR 设备与所述第二 DRR 设备之间传送电传输信号，

10 所述第一 DRR 设备在所述电传输信号与针对所述第一主机接口端口的所述入站多通道数据流和出站多通道数据流之间转换，并且

所述第二 DRR 设备在所述电传输信号与针对所述第二主机接口端口的所述入站多通道数据流和出站多通道数据流之间转换，

15 所述第一 DRR 设备和所述第二 DRR 设备使用非易失性存储器中所存储的发射滤波器系数值来提供所述电传输信号的预均衡。

2. 如权利要求 1 所述的电缆，进一步包括响应于通电事件而配置所述第一 DRR 设备的第一控制器，作为所述配置的部分，所述第一控制器从所述非易失性存储器检取所述发射滤波器系数值。

20

3. 如权利要求 1 所述的电缆，其中，所述第一 DRR 设备和所述第二 DRR 设备被编程为用于在每次功率被供应给所述第一端部连接器插头和所述第二端部连接器插头时使用所述发射系数值。

25

4. 如权利要求 3 所述的电缆，其中，在对所述电缆进行装配之后，所述发射滤波器系数值被确定并被存储在所述非易失性存储器中。

5. 如权利要求 4 所述的电缆，其中，所述第一 DRR 设备和所述第二 DRR 设备使用所述非易失性存储器中所存储的系数值来采用所述电传输信号的基

于接收器的均衡。

6. 如权利要求 4 所述的电缆，其中，所述电导体包括以差分形式承载所述电传输信号中的每个电传输信号的双轴导体。

5

7. 如权利要求 1 所述的电缆，其中，所述第一 DRR 设备和所述第二 DRR 设备不执行被提供给所述第一主机接口端口和所述第二主机接口端口的所述多通道数据流的预均衡。

10 8. 一种电缆制造方法，所述方法包括：

将第一连接器插头连接至第一数据恢复和重新调制 DRR 设备，所述第一 DRR 设备经由所述第一连接器插头而与第一主机接口端口交换多通道数据流；

将第二连接器插头连接至第二 DRR 设备，所述第二 DRR 设备经由所述第二连接器插头而与第二主机接口端口交换多通道数据流；

15 将电导体连接至所述第一 DRR 设备和所述第二 DRR 设备，以在所述第一 DRR 设备与所述第二 DRR 设备之间传送电传输信号，

所述第一 DRR 设备在所述电传输信号与针对所述第一主机接口端口的所述多通道数据流之间转换，并且

20 所述第二 DRR 设备在所述电传输信号与针对所述第二主机接口端口的所述多通道数据流之间转换，

所述第一 DRR 设备和所述第二 DRR 设备使用非易失性存储器中所存储的发射滤波器系数值来提供所述电传输信号的预均衡。

25 9. 如权利要求 8 所述的方法，进一步包括：提供响应于通电事件而配置所述第一 DRR 设备的第一控制器，作为所述配置的部分，所述第一控制器从内部非易失性存储器检取所述发射滤波器系数值。

10. 如权利要求 8 所述的方法，进一步包括：将所述第一 DRR 设备和所述第二 DRR 设备编程为用于在每次功率被供应给所述第一端部连接器插头和



所述第二端部连接器插头时使用所述发射系数值。

11. 如权利要求 10 所述的方法, 进一步包括: 在连接所述电导体之后, 表征所述电导体的信道特性以确定所述发射滤波器系数值; 以及将所述发射滤波器系数值存储在所述非易失性存储器中。

12. 如权利要求 11 所述的方法, 其中, 所述第一 DRR 设备和所述第二 DRR 设备使用所述非易失性存储器中所存储的系数值来采用所述电传输信号的基于接收器的均衡。

10

13. 如权利要求 11 所述的方法, 其中, 所述电导体包括以差分形式承载所述电传输信号中的每个电传输信号的双轴导体。

14. 如权利要求 8 所述的方法, 其中, 所述第一 DRR 设备和所述第二 DRR 设备不执行被提供给所述第一主机接口端口和所述第二主机接口端口的所述多通道数据流的预均衡。

15. 一种通信方法, 包括:

将电缆的第一端部连接器插头插入到第一主机接口端口中, 所述第一端部连接器插头连接至第一数据恢复和重新调制 DRR 设备, 所述第一 DRR 设备将来自所述第一主机接口端口的多通道数据流转换为由电导体传送给第二 DRR 设备的电传输信号, 所述第二 DRR 设备连接至所述电缆的第二端部连接器插头; 以及

将所述电缆的第二端部连接器插头插入到第二主机接口端口中, 所述第二 DRR 设备将来自所述第二主机接口端口的多通道数据流转换为由电导体传送给所述第一 DRR 设备的电传输信号,

所述第一 DRR 设备和所述第二 DRR 设备使用非易失性存储器中所存储的发射滤波器系数值来提供所述电传输信号的预均衡。

16. 如权利要求 15 所述的方法，进一步包括：向所述第一端部连接器插头和所述第二端部连接器插头供应功率，所述第一端部连接器插头和所述第二端部连接器插头分别连接至第一控制器设备和第二控制器设备，所述第一控制器设备和所述第二控制器设备中的每一者进行操作以响应于通电事件而配置
5 所述第一 DRR 设备和所述第二 DRR 设备，所述配置包括从内部非易失性存储器检取所述发射滤波器系数值。

17. 如权利要求 15 所述的方法，其中，所述第一 DRR 设备和所述第二 DRR 设备被编程为用于在每次功率被供应给所述第一端部连接器插头和所述
10 第二端部连接器插头时使用所述发射系数值。

18. 如权利要求 17 所述的方法，其中，在对所述电缆进行装配之后，所述发射滤波器系数值被确定并被存储在所述非易失性存储器中。

15 19. 如权利要求 18 所述的方法，其中，所述第一 DRR 设备和所述第二 DRR 设备使用所述非易失性存储器中所存储的系数值来采用所述电传输信号的基于接收器的均衡。

20. 如权利要求 15 所述的方法，其中，所述第一 DRR 设备和所述第二 DRR 设备不执行被提供给所述第一主机接口端口和所述第二主机接口端口的所述多通道数据流的预均衡。

说明书

具有预设均衡的有源以太网电缆

5 背景技术

- [0001] 电气和电子工程师协会 (IEEE) 标准协会出版了以太网 IEEE 标准 IEEE 标准 802.3-2015, 这对于本申请所属领域的普通技术人员而言将是熟悉的。该以太网标准为通过同轴电缆、双轴电缆、双绞线电缆、光纤电缆和电子背板以各种信道信号星座在 1Mb/s 至 100Gb/s 的选定速度下的局域网 (LAN) 操作提供通用介质访问控制规范。随着对更高数据速率的持续需求, 正在扩展该标准。即使均衡器被迫以更快的码元速率操作, 这种对标准的扩展也必须考虑增加的信道衰减和色散。随着所提出的每通道比特率随着超过几米的距离跨度上的 PAM4 或更大的信号星座而上升超过 50Gbps, 提供确保始终如一的稳健性能的可负担且大规模制造的网络硬件变得越来越困难。
- 15 [0002] 对于不超过 2 米的距离跨度, 衰减被合理地限制, 以使得可以采用无源铜电缆, 该无源铜电缆也被称为直接附连电缆或“DAC”。具有更大距离跨度的数据中心被迫使依赖于有源光缆 (AOC) 设计, 该 AOC 设计将电接口信号转换为由光纤传输的光信号, 即便此类电缆伴随有极高的成本。有源以太网电缆 (AEC) 是一种新设计的电缆, 其使用电缆连接器中的硬连线的数据恢复和重新调制 (DRR) 芯片来提供高达至少七米的距离跨度上的负担得起的高带宽数据传输。

[0003] 随着电缆长度的扩展, 增加的信道衰减和色散需要增加的均衡水平, 到接收器功耗和耗散可能达到禁止水平的程度。

25 发明内容

[0004] 相应地, 本文中公开了采用预设发射侧均衡来提供增强的性能和/或降低接收侧均衡要求的一种电缆、一种制造方法和一种通信方法。一个说明性电缆实施例包括: 第一数据恢复和重新调制 DRR 设备, 经由第一端部连接器插头而与第一主机接口端口交换入站多通道数据流和出站多通道数据流;

第二 DRR 设备, 经由第二端部连接器插头而与第二主机接口端口交换入站多通道数据流和出站多通道数据流; 以及电导体, 连接第一 DRR 设备和第二 DRR 设备, 以在该第一 DRR 设备与第二 DRR 设备之间传送电传输信号。第一 DRR 设备在所述电传输信号与针对第一主机接口端口的所述入站多通道数据流和
5 出站多通道数据流之间转换, 并且第二 DRR 设备在所述电传输信号与针对第二主机接口端口的所述入站多通道数据流和出站多通道数据流之间转换。第一 DRR 设备和第二 DRR 设备使用非易失性存储器中所存储的发射滤波器系数值来提供电传输信号的预均衡。

[0005] 一种电缆制造方法的说明性实施例包括: 将第一连接器插头连
10 接至第一数据恢复和重新调制 (DRR) 设备, 该第一 DRR 设备经由第一连接器插头而与第一主机接口端口交换多通道数据流; 将第二连接器插头连接至第二 DRR 设备, 该第二 DRR 设备经由第二连接器插头而与第二主机接口端口交换多通道数据流; 将电导体连接至第一 DRR 设备和第二 DRR 设备, 以在该第一 DRR 设备与第二 DRR 设备之间传送电传输信号。第一 DRR 设备在所述电
15 传输信号与针对第一主机接口端口的所述多通道数据流之间转换, 并且第二 DRR 设备在所述电传输信号与针对第二主机接口端口的所述多通道数据流之间转换。第一 DRR 设备和第二 DRR 设备使用非易失性存储器中所存储的发射滤波器系数值来提供电传输信号的预均衡。

[0006] 一种通信方法的说明性实施例包括: 将电缆的第一端部连接器
20 插头插入到第一主机接口端口中, 该第一端部连接器插头连接至第一数据恢复和重新调制 (DRR) 设备, 该第一 DRR 设备将来自第一主机接口端口的多通道数据流转换为由电导体传送给第二 DRR 设备的电传输信号, 该第二 DRR 设备连接至电缆的第二端部连接器插头; 以及将电缆的第二端部连接器插头插入到第二主机接口端口中, 该第二 DRR 设备将来自第二主机接口端口的多通道
25 数据流转换为由电导体传送给第一 DRR 设备的电传输信号。第一 DRR 设备和第二 DRR 设备使用非易失性存储器中所存储的发射滤波器系数值来提供电传输信号的预均衡。

[0007] 前述实施例中的每一个可以单独或组合地实现, 并且能以任何合适的组合来利用以下特征中的一个或多个来实现: 1. 第一控制器, 响应于通

- 电事件而配置所述第一 DRR 设备，作为所述配置的部分，该第一控制器从非易失性存储器检取发射滤波器系数值。2. 第一 DRR 设备和第二 DRR 设备被编程为用于在每次功率被供应给第一端部连接器插头和第二端部连接器插头时使用发射系数值。3. 在对电缆进行装配之后，发射滤波器系数值被确定并被
- 5 存储在非易失性存储器中。4. 第一 DRR 设备和第二 DRR 设备使用非易失性存储器中所存储的系数值来采用电传输信号的基于接收器的均衡。5. 电导体包括以差分形式承载电传输信号中的每个电传输信号的双轴导体。6. 第一 DRR 设备和第二 DRR 设备不执行被提供给第一主机接口端口和第二主机接口端口的多通道数据流的预均衡。7. 提供响应于通电事件而配置所述第一 DRR 设备
- 10 的第一控制器，作为所述配置的部分，该第一控制器从非易失性存储器检取发射滤波器系数值。8. 将第一 DRR 设备和第二 DRR 设备编程为用于在每次功率被供应给第一端部连接器插头和第二端部连接器插头时使用发射系数值。9. 在连接电导体之后，表征该电导体的信道特性以确定发射滤波器系数值；以及将该发射滤波器系数值存储在非易失性存储器中。10. 第一 DRR 设备和第二
- 15 DRR 设备使用非易失性存储器中所存储的系数值来采用电传输信号的基于接收器的均衡。11. 向第一端部连接器插头和第二端部连接器插头供应功率，该第一端部连接器插头和第二端部连接器插头分别连接至第一控制器设备和第二控制器设备，该第一控制器设备和第二控制器设备中的每一者进行操作以响应于通电事件而配置第一 DRR 设备和第二 DRR 设备，该配置包括从内部非易
- 20 失性存储器检取发射滤波器系数值。

附图说明

- [0008] 图 1 是说明性有源以太网电缆（AEC）的透视图。
- [0009] 图 2 是说明性 1：4 分支 AEC 的透视图。
- 25 [0010] 图 3A 是说明性 AEC 的功能框图。
- [0011] 图 3B 是包括说明性电缆的通信链路的架构图。
- [0012] 图 4 是说明性多通道数据恢复和重新调制（DRR）设备中的接收器的框图。
- [0013] 图 5 是说明性多通道 DRR 设备中的发射器的框图。

[0014] 图 6 是说明性电缆制造方法的流程图。

具体实施方式

[0015] 尽管在附图和以下描述中给出了特定实施例，但是请记住它们
5 不限制本公开。相反，它们为普通技术人员提供用于辨别包含在所附权利要求书的范围内的替代形式、等效物和修改的基础。

[0016] 图 1 是说明性电缆的透视图，该电缆可用于在路由网络中的设备之间提供高带宽通信链路。路由网络可以是或者包括例如互联网、广域网、存储区域网络或局域网。所链接的设备可以是计算机、交换机、路由器等等。
10 电缆包括经由电导体 106 电连接的第一连接器 100 和第二连接器 101。电导体 106 可以是以成对的形式（诸如，利用双轴导体）布置的电导线。双轴导体可以比作同轴导体，但其具有两个内导体而不是一个内导体。内导体可以用差分信号来驱动，并且它们共享的屏蔽件进行操作以减少与电缆中其他双轴导体的串扰。取决于性能标准，可能可以采用其他成对或单端的导体实现方式。

[0017] 根据以太网标准，每个导体对可提供对差分信号的单向传输。
15 为了在甚至扩展的电缆长度上实现稳健的性能，每个连接器 100、101 可包括执行对时钟和数据恢复（CDR）以及对数据流的重新调制的被供电的收发器，下文被称为数据恢复和重新调制（DRR）设备。DRR 设备处理在每个方向上行进的数据流。值得注意的是，收发器不仅会在去往主机接口的入站数据流离开电缆时对这些入站数据流执行 CDR 和重新调制，而且会在来自主机接口的
20 出站数据流进入电缆时对这些出站数据流进行 CDR 和重新调制。（注意：相对于本申请人的相关申请，该入站/出站术语是颠倒的。）

[0018] 此处认识到，可预期出站数据流符合相关标准（例如，400 Gbps 的以太网标准），并且可预期出站数据流基本上没有从它们在网络接口端口的
25 插座引脚和电缆组件的连接器插头引脚的遍历中经历劣化。然而，由发送网络接口的电子制造商采用的调制质量和均衡策略一般是未知的，并且标准的最低要求可能不足以在延长的电缆长度上传输，特别是如果接收网络接口的电子制造商与发送网络接口的制造商不同。与发送网络接口一样，由接收网络接口的电子制造商采用的均衡和解调策略通常是未知的，并且可能无法应对由延长的

电缆长度上的信号传输引起的衰减和干扰，特别是如果连接器没有被完全安置或者如果接触件已经受损。通过对入站和出站数据流两者执行 DRR，说明性电缆确保经过电缆导体的电信号能够耐受在电缆的终端连接器之间遇到的衰减和干扰，由此使得能够在不考虑这些因素的情况下确保延长的电缆长度上始终稳健的数据传输。

[0019] 虽然在前述描述中已经使用了 1:1 电缆，但是下文中所公开的原理也可适用于格式转换电缆并且可适用于分支电缆设计。图 2 是具有二元端连接器 100 的说明性 1:4 分支电缆的透视图，该 1:4 分支电缆可被设计成用于发送和接收 200Gbps 以太网数据流，例如，以 50Gbps 的 4 个 50 Gbps 的通道 10 的形式，每个通道使用 26.5625 GBd 下的 PAM4。电导体 106 被包封为四根电绳，每根电绳承载一个 26.5625 GBd (50 Gbps) 下的 PAM4 的通道或 2 个到分割端连接器 101-104 中对应的一个分割端连接器的 26.5625 GBd (25 Gbps) 下的不归零信令的通道。这些分割端连接器 101-104 中的每一个可被设计成用于发送和接收 50 Gbps 以太网数据流。此类分支电缆可用于链接被设计成用于不同代的以太网标准的主机设备。作为另一示例，一元端连接器可被设计成用于发送和接收 400 Gbps (8 个 50 Gbps PAM4 的通道)，而分割端连接器中的每一个可被设计成用于发送和接收 100 Gbps (4 个 25 Gbps NRZ 的通道)。在一元端处或在分割端处，DRR 设备可通过例如将 1 个 PAM4 码元通道转换成 2 个 NRZ 码元通道并且反之亦然来提供格式转换。

[0020] 图 3A 是图 1 的说明性电缆的功能框图。连接器 100 包括插头 200，其适于适配第一主机设备 302 (参见图 3B) 中的符合标准的以太网端口，以接收承载来自主机设备的出站数据流的输入电信号并提供承载去往主机设备的入站数据的输出电信号。类似地，连接器 101 包括适配第二主机设备 304 的以太网端口的插头 201。连接器 100 包括第一 DRR 设备 202，用于对在连接器 100 处进入和离开电缆的数据流执行 CDR 和重新调制，并且连接器 101 包括第二 DRR 设备 204，用于对在连接器 101 处进入和离开电缆的数据流执行 CDR 和重新调制。DRR 设备 202、204 可以是安装在印刷电路板上并经由电路板迹线连接到连接器插头引脚的集成电路。电绳 106 的线可被焊接到印刷电路板上电连接至 DRR 设备的对应焊盘。

[0021] 在至少一些预期的实施例中，印刷电路板还各自支撑微控制器单元（MCU）206 和旁路开关（SW）210。每个 DRR 设备 202、204 经由第一双线总线耦合至配置该 DRR 设备的操作的相应的 MCU 设备 206。在通电时，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。

5 主机设备可以经由第二双线总线访问 MCU 设备 206，该第二双线总线根据 I2C 总线协议和/或更快速的 MDIO 协议来进行操作。如下文进一步讨论，利用对 MCU 设备 206 的此种访问，主机设备可以调节电缆的操作参数并监视电缆的性能。如下文更详细地讨论，旁路开关 210 使得 MCU 设备 206 能够将第一双线总线电连接至第二双线总线，使得主机能够绕过 MCU 设备 206 并且直接与

10 DRR 设备进行通信。

[0022] 每个 DRR 设备 202、204 包括用于与主机设备进行通信的发射器和接收器集合 220 以及用于经由沿电缆长度的导体对进行发送和接收的发射器和接收器集合 222。所图示的电缆支持四个双向通信通道 LN0-LN3，每个双向通道由两个单向连接形成，每个单向连接具有差动驱动的双轴导体对（此处

15 未示出屏蔽导体）。收发器任选地包括存储器 224，用于在发射器和接收器集合 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并确保在使所述发射器和接收器能够进入数据传输阶段之前跨所有通道和链路完成训练阶段来协调发射器和接收器的操作。嵌入式控制器 228 采用寄存器集合 208 来接收命令和参数值并提供潜在地包括状态信息和性能数据的响应。

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[0023] 在至少一些预期的实施例中，面向主机的发射器和接收器集合 220 采用与电缆无关的（即，它们不是在逐个电缆的基础上定制的）固定均衡参数。面向中心的发射器和接收器集合 222 优选采用在逐个电缆的基础上定制的依赖于电缆的均衡参数。依赖于电缆的均衡参数可以是自适应或固定的，并

25 且可以在电缆的制造商测试期间确定这些参数的初始值。均衡参数可包括用于发射器中的预均衡器滤波器的滤波器系数值、以及用于接收器的增益和滤波器系数值。

[0024] 图 3A 的说明性电缆可以是如图 3B 的架构图中所示的两个主机设备 302、304 之间的点对点通信链路的部分。图 3B 示出了使用用于开放式系

统互连的 ISO/IEC 模型（参见 ISO/IEC 7498-1: 1994.1）的架构，以用于通过诸如由信道 306 表示的双轴导体对的物理介质上的通信。互连参考模型采用具有定义的功能和接口的层的层级结构，以促进由不同团队或供应商对兼容系统的设计和实现。虽然这不是要求，但预期层级结构中的较高层主要由在可编程
5 处理器上操作的软件或固件来实现，而较低层可被实现为专用硬件。

[0025] 应用层 308 是模型中的最上层，并且它表示在需要用于传递消息或数据的设施的不同系统上操作的用户应用或其他软件。表示层 310 向此类应用提供一组应用编程接口（API）（其提供形式语法以及用于数据变换（例如，压缩）的服务），从而建立通信会话、无连接通信模式以及协商以使应用
10 软件能够标识可用的服务选项并从中选择。会话层 312 提供用于协调数据交换的服务，这些服务包括：会话同步、令牌管理、全双工或半双工模式实现、以及建立、管理和释放会话连接。在无连接模式下，会话层可仅仅在会话地址和传输地址之间进行映射。

[0026] 传输层 314 为多路复用、端到端序列控制、错误检测、分段、
15 阻塞、级联、各个连接上的流量控制（包括挂起/恢复），以及实现端到端服务质量规范提供服务。传输层 314 的重点是端到端性能/行为。网络层 316 提供路由服务，确定用于进行端到端连接的链路，并在必要时充当中继服务以将此类链路耦合在一起。数据链路层 318 充当到物理连接的接口，提供跨物理连接的定界、同步、序列和流量控制。它也可以检测并任选地校正跨物理连接发生的
20 错误。物理层 322 提供机械、电、功能和程序手段来激活、维持和去激活信道 306，并使用信道 306 以用于跨物理介质的比特传送。

[0027] 数据链路层 318 和物理层 322 通过 IEEE 标准 802.3-2015 被稍微细分和修改，IEEE 标准 802.3-2015 在数据链路层 318 中提供媒体访问控制（MAC）子层 320 以定义与物理层 322 的接口，包括帧结构和传输语法。在物
25 理层 322 内，该标准提供了诸如图 3B 中所示的细分之类的各种可能的细分，其包括任选的调解子层 324、物理编码子层（PCS）326、前向纠错（FEC）子层 328、物理介质附件（PMA）子层 330、物理介质从属（PMD）子层 332 和自动协商（AN）子层 334。

[0028] 任选的调解子层 324 仅仅在为 MAC 子层 320 和 PCS 子层 326

定义的接口之间映射。PCS 子层 326 提供加扰/解扰、数据编码/解码（具有能够实现时钟恢复和位错误检测的传送码）、块和码元重新分配、PCS 对准标记插入/移除以及块级别通道同步和抗扭斜（deskew）。为了利用物理层 322 的部件实现误码率估计，PCS 对准标记典型地包括从通道中的直到并包括先前 PCS 对准标记的先前位导出的位交叉奇偶校验（BIP）值。

[0029] FEC 子层 328 提供例如 Reed-Solomon 编码/解码，其分配具有跨通道的受控冗余性的数据块以实现纠错。在一些实施例中（例如，根据 IEEE 标准 802.3 的第 91 条或提出的第 134 条），FEC 子层 328 修改通道的数量（第 91 条提供 20 到 4 通道转换）。

10 [0030] PMA 子层 330 提供通道重新映射、码元编码/解码、成帧（framing）和八位位组/码元同步。PMD 子层 332 指定发射/接收的信道信号与对应的位（或数字码元）流之间的收发器转换。任选的 AN 子层 334 被示为 PMD 子层 332 的内部元件，并且其实现通信信道的初始启动，从而在进入正常操作阶段之前进行自动协商阶段和链路训练阶段。自动协商阶段使端节点能够交换关于其能力

15 的信息，并且训练阶段使得端节点能够以对抗信道非理想性的方式适配发射侧和接收侧均衡滤波器两者。插座 336 还被示为 PMD 子层 332 中表示物理网络接口端口的部分。

[0031] 连接器 100、101 具有插头 200、201，插头 200、201 与两个主机设备 302、304 的插座 336 配合。在每个连接器内，DRR 设备可实现面向主机的物理层 322A、面向中心的物理层 322B、以及将两个物理层桥接在一起的数据链路层 340。在一些实施例中，每个连接器内的内部子层中的一个或多个（例如，FEC、PCS、调解、MAC）被整体绕过或省略，以降低面积要求和/或降低功率。关于子层的操作的更多信息以及节点与通信介质之间的连接的电气和物理规范（例如，引脚布局、线路阻抗、信号电压和时序）、以及通信介

25 质本身的电气和物理规范（例如，铜电缆中的导体布置、衰减限制、传播延迟、信号偏斜）可以在当前的以太网标准中找到，并且任何这样的细节都应该被认为是本领域普通技术人员的知识范围内。

[0032] MAC、调解、PCS、FEC、PMA 和 PMD 子层可被实现为专用集成电路，以实现高速率处理和数据传送。接收器和发射器集合 220、222 可

实现 PMA 和 PMD 子层。图 4 和图 5 是说明性接收器和说明性发射器的框图，该说明性接收器和说明性发射器可以是集合 220、222 的成员。

[0033] 在图 4 中，接收器 400 接收模拟电信号 (CH_IN) 并将其提供给任选的低噪声放大器 (LNA) 401。如果被包括，则 LNA 401 提供高输入阻抗以使信道负载最小化并放大接收到的电信号以驱动连续时间线性均衡器 (CTLE) 滤波器 402 的输入。CTLE 滤波器 402 提供连续时间滤波以对信号频谱进行整形，从而减小信道脉冲响应的长度，同时使前导码间干扰 (ISI) 最小化。可以使用数字前馈均衡 (FFE) 滤波器 403 来增强 CTLE 滤波器 402 的性能。决策反馈均衡器 (DFE) 404 对经滤波的信号进行操作以校正尾随 ISI 并检测每个发射的信道位或码元，由此产生经解调的数字数据流。一些接收器实施例在 FFE 403 和 DFE 404 中采用过采样。时钟和数据恢复 (CDR) 电路 405 从经滤波的信号和/或数字数据流中提取时钟信号，并将其提供给 DFE 404 以控制样本和码元检测定时。串并转换电路 406 将数字数据流位或码元分组为块，以使得随后的片上操作能够使用较低的时钟速率。码元或数据块被放置在数字接收总线 (RXD) 上，以便重新调制并由发射器传送到信道的远端。

[0034] 虽然某些预期的电缆实施例不支持自动协商，但是其他预期的实施例确实支持根据以太网标准的自动协商。当得到支持时，可以如发明人 Yifei Dai, Haoli Qian 和 Jeff Twombly 在于 2017 年 3 月 8 日提交的题为“Ethernet link extension method and device (以太网链路扩展方法和设备)”的 PCT/CN2017/075961 中所描述的那样实现自动协商。检测器或分组信息提取器 408 针对自动协商阶段的结束和/或训练阶段帧的开始来监视接收信号。不论自动协商是否得到支持，训练阶段可在制造过程期间被执行，以设置用于完成的电缆的均衡参数的初始值。

[0035] 在训练阶段期间，滤波器适配电路 407 测量 DFE 404 中的决策元件的输入和输出之间的误差，从而根据来自关于自适应滤波的文献中的公知技术采用该误差来确定对 CTLE 滤波器 402、FFE 滤波器 403、DFE 404 和发射滤波器 506 中的系数的调整 (下文进一步讨论)，并确定是否已实现收敛。适配电路 407 调整元件 402-404 的系数值并输出本地生成的信息 (LOCAL_INFO)，这包括发射滤波器系数调整和收敛状态。在系统支持使用

反向信道的情况下, LOCAL_INFO 被提供给以反向方向在数据通道上进行通信的本地收发器 500。本地收发器经由反向信道将发射滤波器调整和收敛状态传送到 CH_IN 信号源。在那种情况下, 所接收的信号包括来自 CH_IN 信号源的反向信道信息。分组信息提取器 408 检测反向信道信息 (BACK_INFO) 并将其传递至本地发射器 500。如下文进一步讨论, 在没有反向信道的情况下, 可经由主机接口将 LOCAL_INFO 传送到测试装置。一旦实现收敛, 接收器 400 就准备好开始正常操作。

[0036] 在图 5 中, 发射器 500 接收信道位或码元的块, 以便传送到 CH_IN 信号源 (图 4)。在正常操作期间, 多路复用器 502 将来自远程源 (在 TXD 总线上接收的) 的信道位或码元的块提供给并行到串行 (P2S) 电路 504。P2S 电路将这些块转换为数字数据流。发射滤波器 506 (也被称为预均衡滤波器) 将数字数据流转换为具有频谱整形的模拟电信号, 以对抗信道劣化。驱动器 508 放大模拟电信号以驱动信道输出 (CH_OUT) 节点。

[0037] 当前的 IEEE 标准在发射滤波器中提供高达四个抽头, 但是至少一些预期的电缆实施例在发射滤波器中采用高达 30 个或更多个抽头。此种“长抽头 (long-tap)”滤波器提供充分的均衡以供接收器使 FFE 滤波器最小化或者甚至消除 FFE 滤波器并实现显著的功率节省。

[0038] 如果得到支持, 则自动协商阶段可如 Y.Dai 等人所阐述的那样被实现。在训练阶段期间, 多路复用器 502 阻挡来自 TXD 总线的信息, 替代地向 P2S 电路 504 供应来自训练控制器 510 的训练帧。训练控制器 510 基于从本地接收器 400 接收的收敛状态和发射滤波器系数调整 (LOCAL_INFO) 来生成训练帧。也就是说, 除了训练模式之外, 训练帧还包括要由信道的远端使用的反向信道信息。注意, 即使在本地接收器指示已经发生滤波器收敛之后, 训练控制器 510 也可拖延训练阶段以跨通道和沿着信道的每个链路来协调训练阶段定时。训练帧包括由当前以太网标准 (IEEE 标准 802.3) 的相关部分指定的训练序列。

[0039] 训练控制器 510 进一步接受由本地接收器 400 从由本地端节点发送的接收训练帧中提取的反向信道信息 (BACK_INFO)。训练控制器将对应的调整应用于发射滤波器 506 的系数。在训练阶段结束时, 多路复用器 502

开始将 TXD 块转发到 P2S 电路 504。

[0040] 在说明性实现方式的前述上下文内，我们现在返回至图 3A 的框图。连接器 200、DRR 设备 202、MCU 设备 206 和开关 210 可被安装至浆状卡，即，被包封在连接器主体中的印刷电路卡。连接器 200 可以是符合例如 SFP、SFP-DD、QSFP、QSFP-DD、OSF 之类的可插拔模块标准中的任一者的可插拔模块。这些标准中的大部分包括使得主机能够经由主机总线来监视、调试或控制可插拔模块的双线接口（典型地，I2C 总线）。双线接口协议是主从协议，其中，预期主机是总线主并且预期模块是从。MCU 设备 206 作为 I2C 总线从进行操作，以与主机侧的 I2C 总线主进行通信。

10 [0041] MCU 设备 206 嵌入式闪存 207 中所存储的启动代码和固件来处置通电过程并协调包括 DRR 设备、开关 210 和功率管理芯片（未示出）的其他浆状卡的操作。DRR 设备本身包括协调其他片上部件的操作的嵌入式控制器 228，除此之外，该嵌入式控制器 228 还提供通道控制和接收器中的滤波器系数的适配。嵌入式控制器 228 经由高速内部总线访问寄存器 208，而 MCU 设备 206 经由诸如 I2C 总线或 MDIO 接口协议之类的双线接口来访问这些寄存器 208。嵌入式控制器 228 和 MCU 设备 206 可以通过读取和写入寄存器字段来相应地交换数据。

[0042] 为了开发和调试电缆电子设备的操作，期望主机具有对所有 SerDes 参数的访问，这些 SerDes 参数包括 DRR 设备的每个面向主机和面向中心的接口通道的发射滤波器和接收滤波器的系数、噪声和误差统计（包括均衡误差、定时误差、码元误差率、以及分组损失率）、链路事件日志、以及缓冲器内容。然而，如果 DRR 设备需要经由寄存器与 MCU 通信并且 MCU 随后需要将数据传送至主机，则传送该信息所要求的时间过高。

25 [0043] 相应地，每个连接器被提供有数个特征来促进调试，以加速对 DRR 设备的主机访问并增强电缆的通信性能。这些特征包括：发射滤波器预训练、经加速的调试数据捕捉以及 MCU 旁路开关。这些特征各自参考图 6 的流程图进行描述。

[0044] 图 6 示出了说明性的电缆制造方法。该方法开始于框 602，在框 602 中，将电缆电绳中的导体对的端部电连接至浆状卡，并且更具体地，电连

接至第一 DRR 设备和第二 DRR 设备的面向中心的接口。该连接可由将线端部焊接至桨状卡（DRR 设备被安装在其上）上的焊盘的自动化装备完成。在框 604 中，装备将每个桨状卡封装在用于网络电缆的相应端部连接器中。如先前所提到，端部连接器可以是例如 SFP、SFP-DD、QSF、QSFP-DD 或 OSF 可插拔模块。端部连接器适于与主机设备的网络接口端口配合，并包括与端口中的匹配插座电连接的插头。

[0045] 在框 606 中，装备对电缆进行测试以验证是否符合性能规范并确定依赖于电缆的均衡参数以供面向中心的发射器和接收器集合 222 使用。该测试通过将每个电缆的端部连接器插接到自动化测试装备（ATE）的对应端口中来执行。当连接器接收功率时，MCU 芯片从诸如内部闪存之类的非易失性存储器检取用于其自身的固件代码，执行该固件代码以协调其他连接器部件的启动和操作。内部闪存可进一步包括用于 DRR 设备的嵌入式控制器的固件，并且如果如此，则 MCU 芯片经由诸如 I2C 或 MDIO 之类的双线总线将该固件传送到嵌入式控制器。在一些预期的实施例中，双线总线支持 I2C 协议和更快速的 MDIO 协议两者，并且 DRR 设备按需求从一种协议切换至另一种协议。一旦固件已经被加载，则 MCU 芯片指令嵌入式控制器执行该固件。一旦 MCU 芯片和 DRR 设备两者都在工作，则端部连接器如先前在上文中所描述地操作。

[0046] 信道估计和均衡是高带宽通信的关键要素。尽管面向主机的发射器和接收器仅需要应对可忽略的信号失真，但是面向中心的发射器和接收器一般将不得不适应严重的信号衰减和失真。如参考图 4 所描述，可使用 CTLE、FFE 和 DFE 元件的组合在接收器中执行均衡化。尽管此类均衡化是非常有效的，但是具有严重信号失真的信号可要求在 FFE 滤波器和 DFE 反馈滤波器中使用许多滤波器抽头（和系数），导致过高水平的功耗和损耗。使用发射器均衡滤波器（又称为预均衡、预失真或预整形）使得能够在接收滤波器中使用远远更少的抽头，从而潜在地使 FFE 滤波器能够整体地被省略。尽管在发射器中实现了附加的滤波器抽头，但是净结果是由于包括避免通常与接收器侧均衡相关联的噪声增强和具有减小的位宽的数字滤波在内的数个因素而实现了功耗水平的显著降低。

[0047] 在框 606 中，DRR 设备将它们的发射和接收滤波器参数设置为

初始默认值。当通信链路被建立时，面向中心的发射和接收器可任选地参与训练阶段以对滤波器系数值进行适配。替代地或附加地，自动化测试装备可开始发射和接收诸如例如伪随机二进制序列（PRBS）之类的训练模式，实现任选的对滤波器系数的适配。作为又一替代或附加方案，可在自动化测试装备将所收集的误差测量与训练模式相关时维持滤波器系数值，以估计残余的码间干扰（ISI）。可以将此类残余 ISI 估计与滤波器系数设置的指示组合，以直接或迭代地确定最佳发射和接收滤波器系数值。

[0048] 在框 608 中，自动化测试器装备“烧录（burn）”闪存或者以其他方式将滤波器系数的初始默认值编程为是框 606 中标识的最佳值。DRR 设备与 ATE 之间的通信（例如，用于收集信道估计信息并细化默认系数值）经由被内置到连接器插头的引脚中的双线接口发生。优选地，双线接口支持公知的 I2C 协议，以用于使接受度最大化。然而，I2C 协议可能被限制到 1 MHz 的最大时钟速率，从而限制信息收集过程的带宽并拖延 ATE 确定和编程最佳滤波器系数值所要求的时间。相应地，至少一个预期的实施例还支持使用 MDIO 接口协议，该 MDIO 接口协议可以采用高达至少 10 MHz 的时钟速率，从而显著地减少由 ATE 要求的时间。ATE 可使用 I2C 协议建立与 MCU 芯片的初始通信，随后，ATE 和 MCU 芯片可在信道表征和固件编程持续期间协调到更快速的 MDIO 协议的动态切换。

[0049] 双线接口使得 ATE 能够与 MCU 芯片进行通信，并且任选地，双线接口依赖于 MCU 芯片来访问 DRR 设备寄存器。该两个步骤的过程可拖延测试和调试操作的持续时间。为了使 ATE 能够获得对 DRR 设备的直接访问，至少一些预期的实施例包括旁路开关 210。ATE 初始地建立与 MCU 芯片 206 的通信并且指令 MCU 芯片 206 闭合旁路开关 210，从而将从连接器插头开始的双线总线缩短为从 DRR 设备开始的双线总线。MCU 设备 206 可继续监视总线，以检测 ATE 何时希望终止旁路操作。旁路开关优选地是模拟开关，但其他开关实现方式也将是合适的。

[0050] 在一些实施例中，在使用 I2C 协议的初始链接期间，ATE 与 MCU 通信。ATE 向 MCU 中的特定地址写入以启用调试模式，使得 MCU 闭合旁路开关并启用 ATE 与 DRR 设备之间的直接通信。在此时刻，ATE 可切换到

MDIO 协议来与 DRR 设备进行通信，以利用速度增强。在诸如现场调试之类的其他情形下，主机可能不支持使用 MDIO 协议并且可继续采用 I2C 来用于与 DRR 设备的通信。

[0051] 一旦滤波器系数值已经被编程，则电缆制造过程在名义上是完成的。然而，在实践中，期望验证电缆的适当的操作，并且在检测到任何故障的情况下，期望对该故障的潜在原因进行调试。相应地，所图示的方法包括框 610，其中，电缆被手动地或电气地“拔出”并“重新插接”到相同或不同的插座中以重启电缆硬件。作为重启的部分，滤波器系数被设置为来自闪存的它们的默认值。ATE 对电缆应用测试数据序列以验证适当的操作。如果未检测到错误（诸如例如，不足的信号裕度、过大的码元错误率、丢失分组、或链路故障），则电缆操作被验证并且过程完成。然后可以将电缆封装并出售给期望稳健性能的客户。

[0052] 另一方面，如果在该点处检测到错误，或者任选地，如果稍后在该字段中检测到这些错误，则 ATE 或主机可在框 612 中触发调试转储。ATE 或主机使用双线总线来写入 MCU 芯片中的寄存器，以发起调试转储。在接收到转储命令之后，MCU 芯片可通过写入 DRR 设备中相关联的寄存器来触发对嵌入式控制器的中断。该中断使得嵌入式控制器捕捉存储器中所有的 serdes 参数。这些 serdes 参数可包括例如，链路状态、频率偏移、信号裕度（也称为眼睛高度）。

[0053] 由于 DRR 设备中的存储器主要是易失性存储器（SRAM），因此 DRR 设备在框 614 中向寄存器逐字地写入所捕捉的信息，使得 ATE 或主机能够经由双线总线来检取所捕捉的信息和/或使得 MCU 芯片能够读取该信息并将该信息存储在非易失性存储器（缓存）中。如果使用任一选项，可能在主机缺少用于解析和分析调试转储的设施的领域中，则电缆稍后可以被插接到从非易失性存储器检取所捕捉的信息的自动化测试装备中。

[0054] 在框 616 中，ATE 向计算机提供所捕捉的信息，该所捕捉的信息使得工程师能够分析调试转储以标识故障的（多个）原因。在知道这些原因的情况下，工程师可以通过重新训练滤波器、通过更新固件和/或通过调整硬件设计来校正缺陷。



[0055] 这些技术大幅地减少了ATE充当主机的情况下制造设施中的测试时间。它们还可以加速对ATE或者还对客户交换机的调试过程。

[0056] 对本领域技术人员来说，一旦完全了解以上公开内容，则众多替代形式、等效物和修改方案将变得显而易见。旨在将权利要求书解释为涵盖
5 包含在所附权利要求书的范围内的所有这些替代形式、等效物和修改方案。

说明书附图

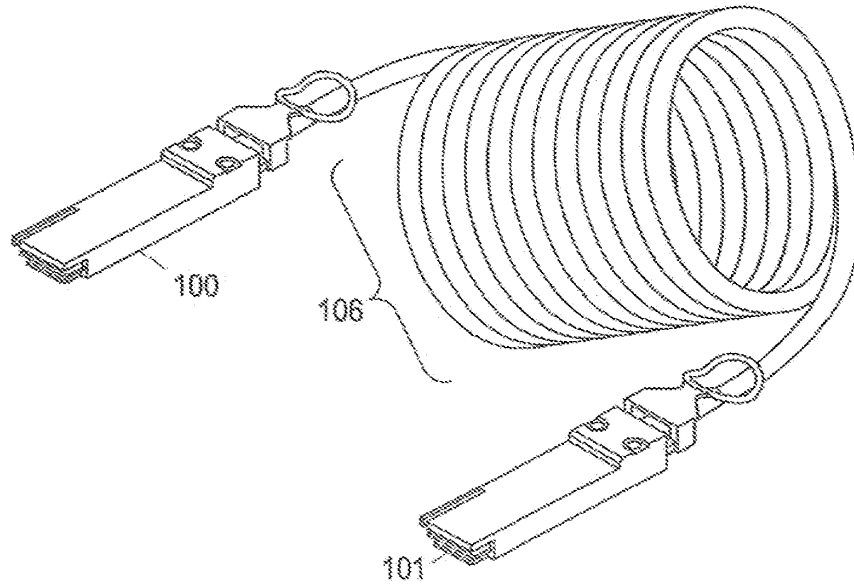


图 1

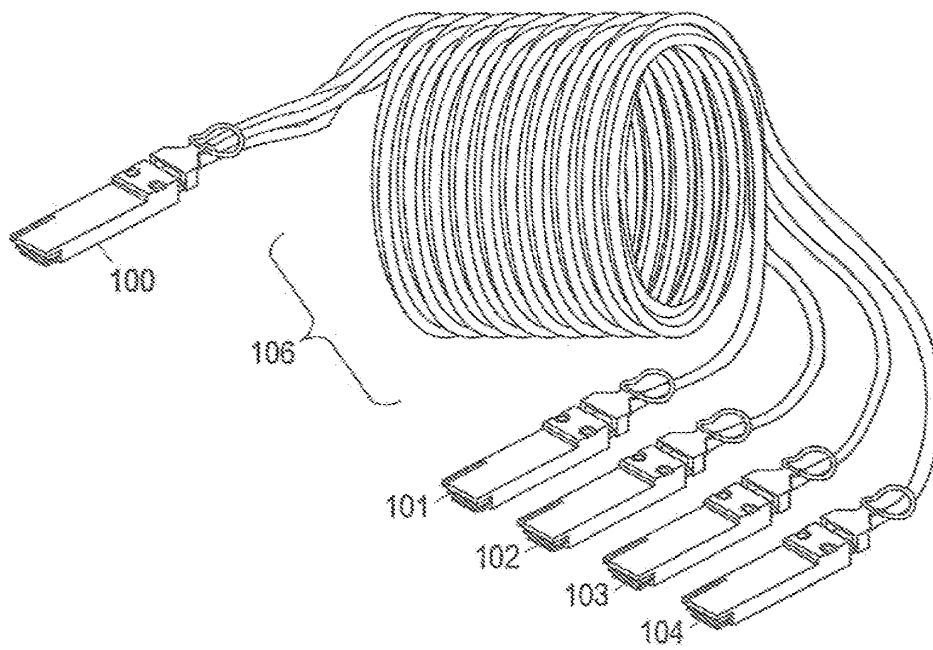


图 2

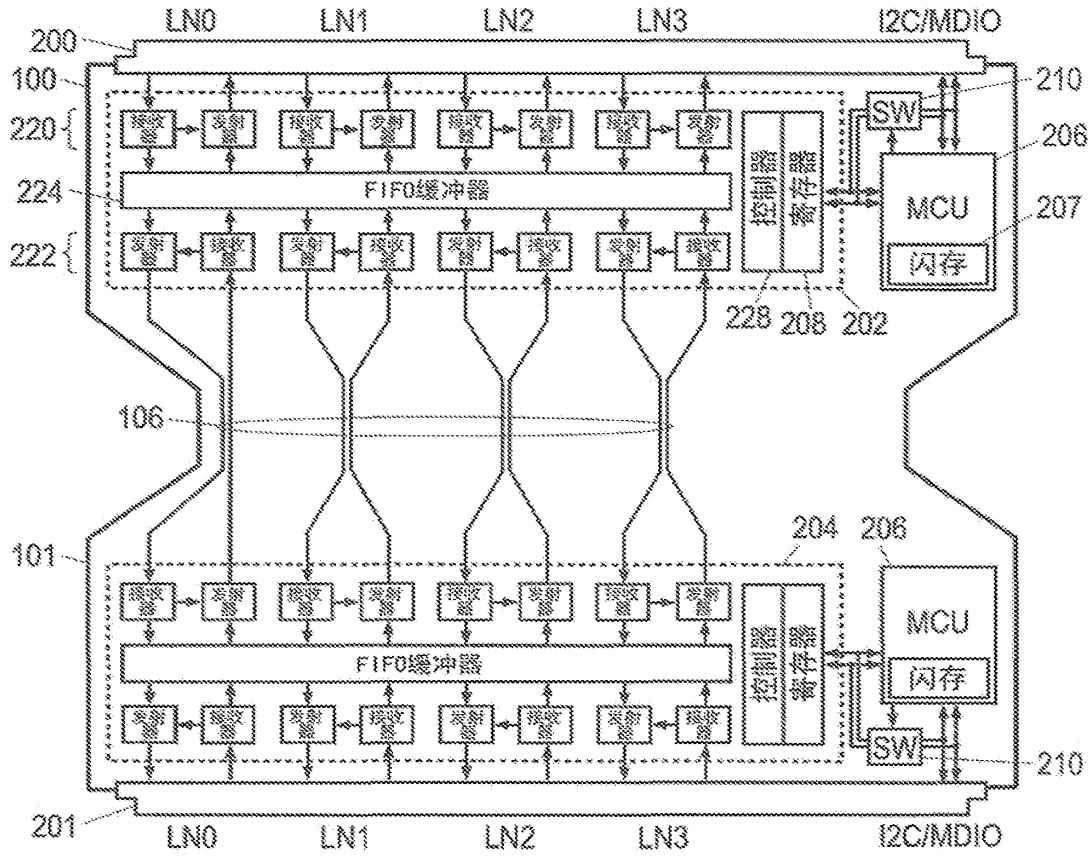


图 3A

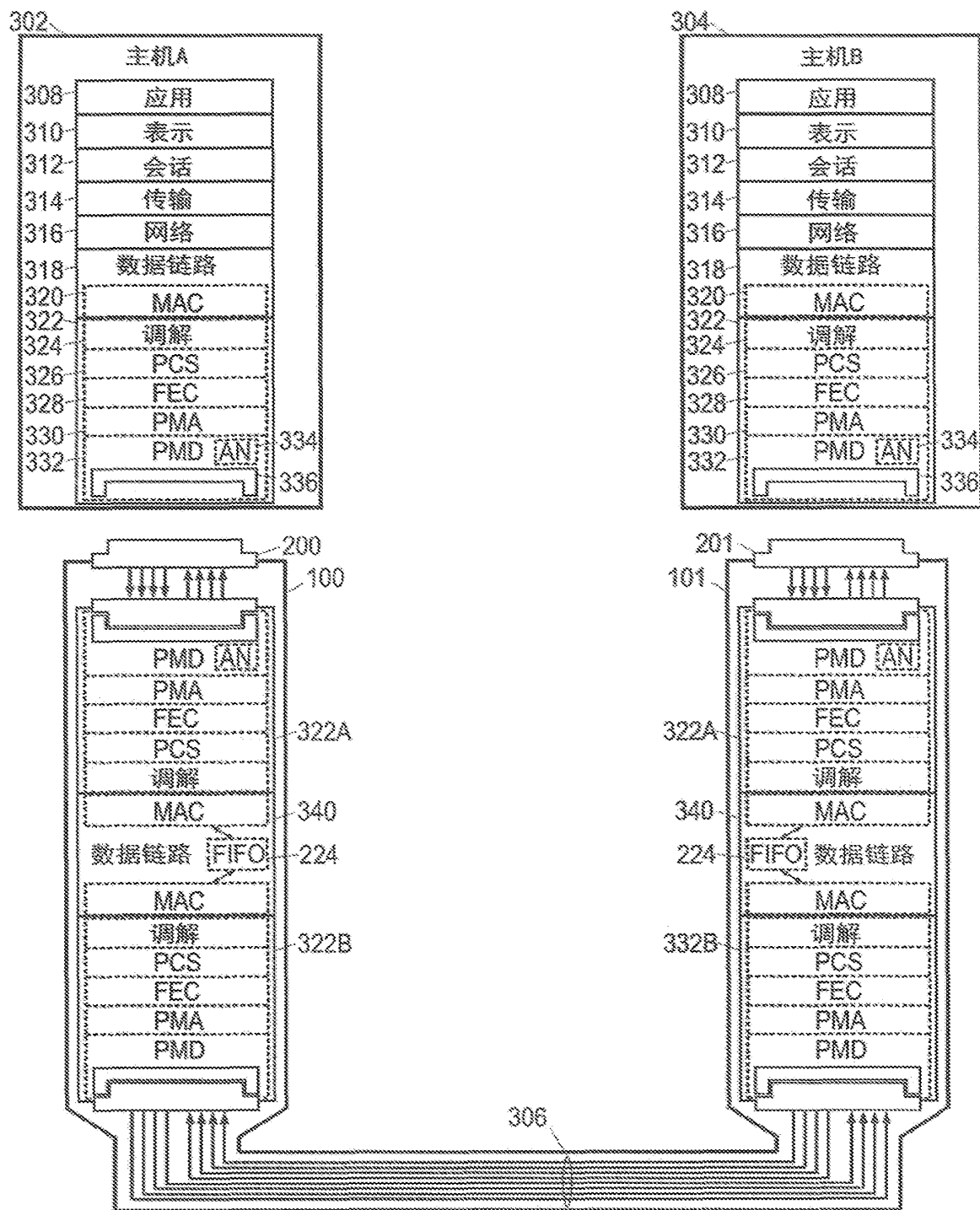


图 3B

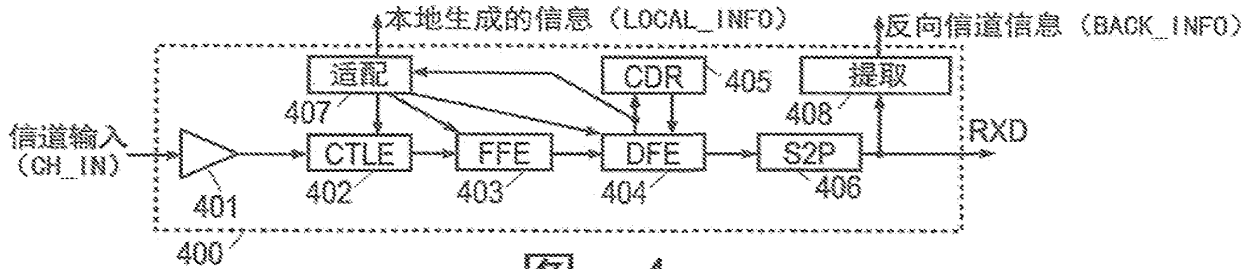


图 4

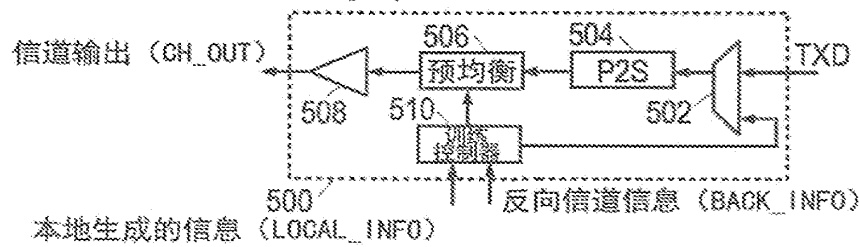


图 5

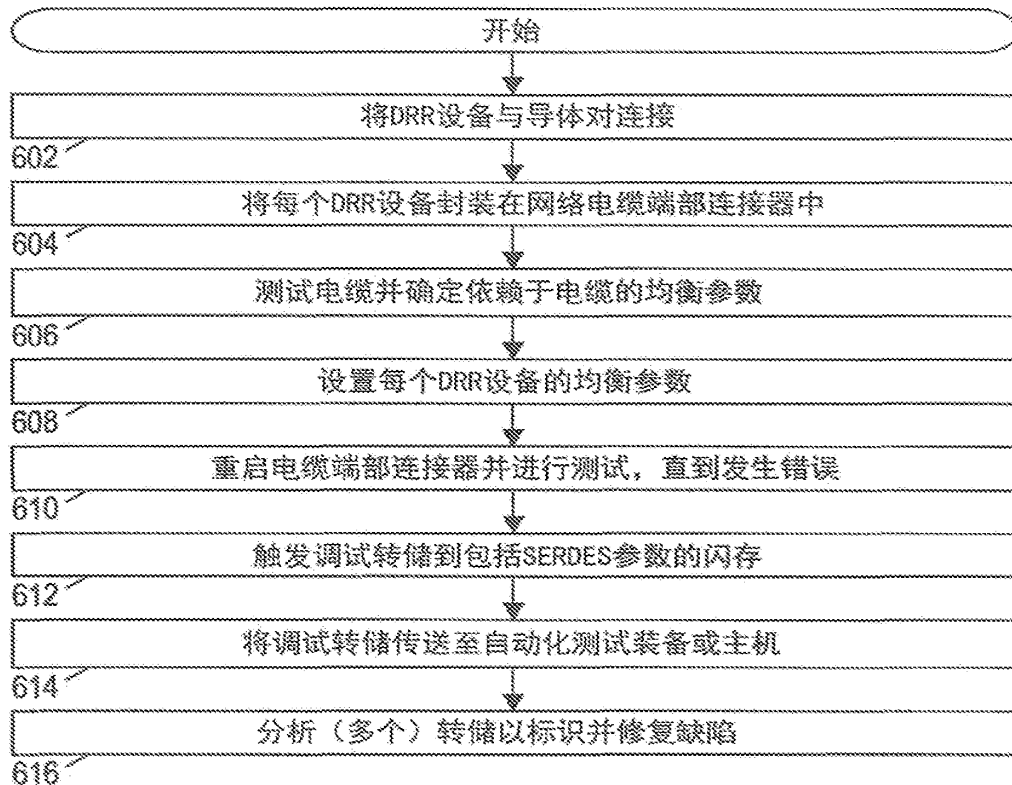


图 6



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ELECTRONIC PAYMENT RECEIPT

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16/698,935

RECEIPT DATE / TIME
05/14/2024 03:02:31 PM Z ET

ATTORNEY DOCKET #
20160.0038.NPUS00

Title of Invention

ACTIVE ETHERNET CABLE WITH PRESET PRE-EQUALIZATION

Application Information

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

PATENT # 10877233

CONFIRMATION # 1370

FILED BY BASAK GUZEL

PATENT CENTER # 65520966

AUTHORIZED BY Daniel Krueger

CUSTOMER # 63467

FILING DATE 11/27/2019

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Yifei DAI

Payment Information

PAYMENT METHOD
CARD / 2515

PAYMENT TRANSACTION ID
E20245DF03207403

PAYMENT AUTHORIZED BY
BASAK GUZEL

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1811	CERTIFICATE OF CORRECTION	160.00	1	160.00
1463	PETITIONS REQUIRING THE PETITION FEE SET FORTH IN 37 CFR 1.17(G) (GROUP II)	220.00	1	220.00
TOTAL AMOUNT:				\$380.00

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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.