PTO/SB/57 (01-18)
Approved for use through 11/30/2021. OMB 0651-0064
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 displays a valid OMB control number.

(Also referred to as FORM PTO-1465)

REQUEST FOR *EX PARTE* REEXAMINATION TRANSMITTAL FORM

Address to:
Mail Stop *Ex Parte* Reexam
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attorney Docket No.: 902/9 REX

Date: February 19, 2020

1. ☒ This is a request for *ex parte* reexamination pursuant to 37 CFR 1.510 of patent number 10,191,230 issued January 29, 2019. The request is made by:
   ☐ patent owner. ☒ third party requester.

2. ☒ The name and address of the person requesting reexamination is:
   Theodosios Thomas, NK Patent Law, 4917 Waters Edge Drive, Suite 275, Raleigh, NC 27606

3. Requester ☐ asserts small entity status (37 CFR 1.27) or ☐ certifies micro entity status (37 CFR 1.29). Only a patent owner requester can certify micro entity status. Form PTO/SB/15A or B must be attached to certify micro entity status.

4. This request is accompanied by payment of the reexamination fee as set forth in:
   ☐ 37 CFR 1.20(c)(2); **or**
   ☒ 37 CFR 1.20(c)(1). **In checking this box for payment of the fee set forth in 37 CFR 1.20(c)(1), requester asserts that this request has forty (40) or fewer pages and complies with all other requirements of 37 CFR 1.20(c)(1).**

   Payment of the reexamination fee is made by the method set forth below.
   a. ☐ A check in the amount of $_____ is enclosed to cover the reexamination fee;
   b. ☐ The Director is hereby authorized to charge the reexamination fee to Deposit Account No. _____;
   c. ☒ Payment by credit card. Form PTO-2038 is attached; **or**
   d. ☐ Payment made via EFS-Web.

   ☒ In addition, the Director is hereby authorized to charge any fee deficiencies to Deposit Account No. 50-6191.

5. ☒ Any refund should be made by ☐ check or ☒ credit to Deposit Account No. 50-6191. 37 CFR 1.26(c). If payment is made by credit card, refund must be to credit card account.

6. ☒ A copy of the patent to be reexamined having a double column format on one side of a separate paper is enclosed. 37 CFR 1.510(b)(4).

7. ☐ CD-ROM or CD-R in duplicate, Computer Program (Appendix) or large table
   ☐ Landscape Table on CD

This collection of information is required by 37 CFR 1.510. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) a request for reexamination. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 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: Mail Stop *Ex Parte* Reexam, 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.

US Conec EX1003
IPR2024-00120
U.S. Patent No. 10,191,230

8. ☐ Nucleotide and/or Amino Acid Sequence Submission
If applicable, items a. – c. are required.

a. ☐ Computer Readable Form (CRF)

b. Specification Sequence Listing on:

i. ☐ CD-ROM (2 copies) or CD-R (2 copies) **or**

ii. ☐ paper

c. ☐ Statements verifying identity of above copies.

9. ☐ A copy of any disclaimer, certificate of correction or reexamination certificate issued in the patent is included.

10. ■ Reexamination of claim(s) 1-25 is requested.

11. ■ A copy of every patent or printed publication relied upon is submitted herewith including a listing thereof on Form PTO/SB/08, PTO-1449, or equivalent.

12. ☐ An English language translation of all necessary and pertinent non-English language patents and/or printed publications is attached.

13. ■ The attached detailed request includes at least the following items:

a. A statement identifying each substantial new question of patentability based on prior patents and printed publications. 37 CFR 1.510(b)(1).

b. An identification of every claim for which reexamination is requested, and a detailed explanation of the pertinency and manner of applying the cited art to every claim for which reexamination is requested. 37 CFR1.510(b)(2).

14. ☐ A proposed amendment is included (only where the patent owner is the requester). 37 CFR 1.510(e).

15. ■ It is certified that the statutory estoppel provisions of 35 U.S.C. 315(e)(1) or 35 U.S.C. 325(e)(1) do not prohibit requester from filing this *ex parte* reexamination request. 37 CFR 1.510(b)(6).

16. Service

a. ■ It is certified that a copy of this request (if filed by other than the patent owner) has been served in its entirety on the patent owner as provided in 37 CFR 1.33(c).

The name and address of the party served are:
Senko Advanced Components, Inc., 450 Donald Lynch Blvd., Unit D, Marlborough, MA 01752

Date of Service: February 19, 2020

OR

b. ☐ A duplicate copy is enclosed since service on patent owner was not possible. An explanation of the efforts made to serve patent owner **is attached**. See MPEP 2220.

17. Correspondence Address: Direct all communication about the reexamination to:

☒ The address associated with Customer Number: 115007

OR

☐ Firm or Individual Name _____
(at the address identified below)

Address

City	State	Zip

Country

Telephone	Email

18. ☐ The patent is currently the subject of the following concurrent proceeding(s):

a. ☐ Copending reissue Application No. _____

b. ☐ Copending reexamination Control No. _____

c. ☐ Copending Interference No. _____

d. ☐ Copending litigation styled:

_____

_____

WARNING : Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

/Theodosios Thomas/ — Authorized Signature

February 19, 2020 — Date

Theodosios Thomas — Typed/Printed Name

45159 — Registration No.

☐ For Patent Owner Requester ☒ For Third Party Requester

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.

Ani Agrawal
Allyn Elliott
Greg Evans*
Laura Kiefer, PhD
Brian MacDonald, PhD*
Pat Mathavan

NK PATENT LAW

Doug Meier
Justin Nifong
Joe Shin
Ted Thomas
*Patent Agent

CERTIFICATE OF SERVICE

I, Theodosios Thomas, Attorney, NK Patent Law, certify that on the 19th day of February, 2020, a full and complete copy of the Request for *Ex Parte* Reexamination of U.S. Patent No. 10,191,230, was served upon Senko Advanced Components, Inc., 450 Donald Lynch Blvd., Unit D, Marlborough, MA 01752, by depositing in first class mail with the United States Postal Service.

This the 19th day of February, 2020.

BY: _____

Theodosios Thomas, Reg.No. 45159
NK Patent Law
4917 WAters Edge Drive, Suite 275
Raleigh, NC 27606
Tel: 919-348-2194
Fax: 919-882-8195

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

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	10191230
Filing Date	2018-01-30
First Named Inventor	Kimman Wong
Art Unit	-
Examiner Name	-
Attorney Docket Number	902/9 REX

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	10191230	B2	2019-01-29	Wong, et al.	
	2	8834038	B2	2014-09-16	Limbert, et al.	
	3	8641293	B2	2014-02-04	Lin, et al.	
	4	9028270	B1	2015-05-12	Vanderwoud	

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

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20160047993	A1	2016-02-18	Hioki, et al.	

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

FOREIGN PATENT DOCUMENTS

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]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10191230
	Filing Date	2018-01-30
	First Named Inventor	Kimman Wong
	Art Unit	-
	Examiner Name	-
	Attorney Docket Number	902/9 REX

	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

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	USPTO, Notice of Allowance for Application No. 15884,327 dated August 30, 2018	☐

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	10191230
	Filing Date	2018-01-30
	First Named Inventor	Kimman Wong
	Art Unit	-
	Examiner Name	-
	Attorney Docket Number	902/9 REX

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	/Theodosios Thomas/	Date (YYYY-MM-DD)	2019-02-19
Name/Print	Theodosios Thomas	Registration Number	45159

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 record s.

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:	
Filing Date:	
Title of Invention:	Optical Connectors with Reversible Polarity
First Named Inventor/Applicant Name:	Kimman Wong
Filer:	Theodosios Thomas/Donna Donovan
Attorney Docket Number:	902/9 REX

Filed as Large Entity

Filing Fees for ex parte reexam

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($)
Miscellaneous:				
REQUEST FOR EX PARTE REEXAM- STREAMLINED	1831	1	6000	6000
		Total in USD ($)		**6000**

Electronic Acknowledgement Receipt

EFS ID:	38626428
Application Number:	90014456
International Application Number:	
Confirmation Number:	3026
Title of Invention:	Optical Connectors with Reversible Polarity
First Named Inventor/Applicant Name:	Kimman Wong
Customer Number:	115007
Filer:	Theodosios Thomas/Donna Donovan
Filer Authorized By:	Theodosios Thomas
Attorney Docket Number:	902/9 REX
Receipt Date:	19-FEB-2020
Filing Date:	
Time Stamp:	12:26:40
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6000
RAM confirmation Number	E20202IC27068016
Deposit Account	506191
Authorized User	Donna Donovan

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

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Miscellaneous Incoming Letter	902-9REX-20200219-Reexam-Cover-Sheet.pdf	252582 d23301781f4418dbdb04ce7f8d7f3ea20c08d13c	no	4
Warnings:					
Information:					
2	Reexam Miscellaneous Incoming Letter	902-9REX-20200219-US1019230-ReExamination-Request.pdf	9455578 ae44a255d59cecf6b651f62fa506e409c20a84e4	no	140
Warnings:					
Information:					
3	Reexam Certificate of Service	902-9REX-20200219-Certificate-of-Service.pdf	306108 f6cb16ce45e5d1c702d08e068abd4d3644821761	no	1
Warnings:					
Information:					
4	Non Patent Literature	APPENDIX-B-Notice-of-Allowance-for-15884327.pdf	178948 57fd172967c24828bf1ec1f772f10ba336c8536a	no	5
Warnings:					
Information:					
5	Reexam - Info Disclosure Statement Filed by 3rd Party	902-9REX-20200219-IDS.pdf	67498 47fc5c6a95c012133547258283f62f9836b6ceb2	no	4
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	30269 255d8958996c694deab6d10676f6dd4908022505	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	10290983

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	U.S. Patent No. 10,191,230	Mail Stop *Ex Parte* Reexam
Inventors:	Kimman Wong, *et al.*	Attn: Central Reexamination Unit
Serial No.:	15/884,327	Commissioner for Patents
Filed:	January 30, 2018	P.O. Box 1450
Issued:	January 29, 2019	Alexandria, Virginia 22313-1450
Title:	"Optical Connectors with Reversible Polarity"	
Request for Reexamination Filing Date: February 13, 2020		

Request For *Ex Parte* Reexamination of U.S. Patent No. 10,191,230, Claims 1-25, Pursuant to 35 U.S.C. §§ 302-305 and 37 C.F.R. § 1.510,

TABLE OF CONTENTS

I. INTRODUCTION 2

II. CLAIMS FOR WHICH REEXAMINATION IS REQUESTED 4

III. CITATION OF PRIOR ART PRESENTED 4

IV. STATEMENT POINTING OUT EACH SUBSTANTIAL NEW QUESTION OF PATENTABILITY 6

V. DETAILED EXPLANATION OF THE PERTINENCY AND MANNER OF APPLYING THE CITED ART TO EVERY CLAIM FOR WHICH REEXAMINATION IS REQUESTED 7

VI. 37 C.F.R. § 1.510 (b)(5): CERTIFICATION THAT A COPY OF THE REQUEST HAS BEEN SERVED IN ITS ENTIRETY ON THE PATENT OWNER 39

VII. CERTIFICATION THAT THE STATUTORY ESTOPPEL PROVISIONS OF 35 U.S.C. § 315(e)(1) OR 35 U.S.C. § 325(e)(1) DO NOT PROHIBIT THE REQUESTER FROM FILING THE *EX PARTE* REEXAMINATION REQUEST 39

VIII. CONCLUSION 39

TABLE OF APPENDICES

Appendix	Shorthand	Description
A	The '230 Patent	U.S. Patent No. 10,191,230
B		Notice of Allowance for U.S. Patent No. 10,191,230
C	Limbert	U.S. Patent No. 8,834,038 to Limbert *et al.*
D	Lin	U.S. Patent No. 8,641.293 to Lin *et al.*
E	Vanderwoud	U.S. Patent No. 9,028,270 to Vanderwoud
F	Hioki	U.S. Published Application No. 2016/0047993 to Hioki *et al.*

I. INTRODUCTION

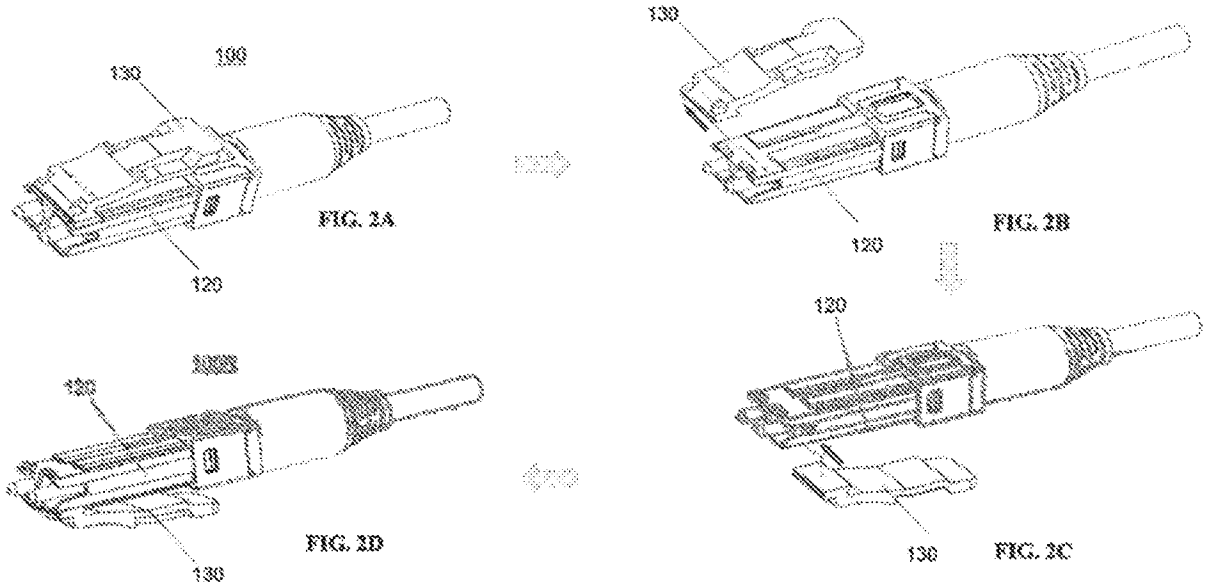
Pursuant to 35 U.S.C. §§ 302-305 and 37 C.F.R. § 1.510, *ex parte* reexamination is hereby requested of claims 1-25 of U.S. Patent No. 10,191,230 ("the '230 Patent," Appendix A).

A. Overview of the '230 Patent

The '230 Patent, entitled "Optical Connectors with Reversible Polarity," issued on January 29, 2019 from Patent Application No. 15/884,327 filed on January 30, 2018. The '230 Patent includes 25 claims. Claims 1, 9, 15, 19, and 23 are independent. Claims 2-8 depend from claim 1, claims 10-14 depend from claim 9, claims 16-18 depend from claim 15, claims 20-22 depend from claim 19, and claims 24 and 25 depend from claim 23. The claims are reproduced below in the analysis. During prosecution of the application that led to the '230 Patent no rejections were made to the claims.

The '230 Patent relates to reversible polarity fiber optic connectors having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules. Positioning removable elements such as latches, removable arms, or push-pull tabs on the first wall above the ferrules yields fiber optic connectors with a first polarity type, and positioning the removable elements on the second wall beneath the ferrules yields fiber optic connectors with a second, opposite polarity type. Various engagement mechanisms are provided on either the connector housing walls or on the removable elements, or both, to assist in affixing the removable element to the connector housing.

FIGS. 2A-2D (reproduced below) depict the process for changing the polarity of the fiber optic connector 100 from a first polarity shown in FIG. 2A to a second, opposite polarity, shown in FIG. 2D. The removable latch 130 may be removed from the latch coupling on the first exterior wall of the connector housing as shown in FIG. 2B, positioned adjacent the second exterior wall beneath the ferrules as shown in FIG. 2C, and then coupled with the latch coupling on the second exterior wall of the connector housing as shown in FIG. 2D, to yield a connector 100R having the opposite polarity of connector 100. In this manner, transmit and receive optical fibers may be reversed without necessitating any fiber twist or complex repositioning of the optical ferrules.



Claim 1, reproduced below, is an exemplary claim:

1. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a latch coupling positioned on each of the first and second exterior walls of the housing;

a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;

wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

B. Requirements for *Ex Parte* Reexamination under 37 C.F.R. § 1.510

In accordance with 37 C.F.R. § 1.510(b), this Request includes the following: an identification of the claims for which reexamination is requested (*see infra*, Section II); a citation of prior art presented and a copy of the patents relied upon (*see infra*, Section III); a statement pointing out each substantial new question (*see infra*, Section IV); a detailed explanation of the pertinence

and manner of applying the cited prior art to every claim for which reexamination is requested (*see infra*, Section V); a copy of the entire patent including the front face, drawings, and specification/claims (in double column format) for which reexamination is requested, and a copy of any disclaimer, certificate of correction, or reexamination certificate issued in the patent (*see* Appendix A); a copy of every patent or printed publication relied upon (see Appendices C-F); a certification of service pursuant to 37 C.F.R. § 1.510(b)(5) (*see infra*, Section VI); and a certification that the statutory estoppel provisions of 35 U.S.C. 315(e)(1) or 35 U.S.C. 325(e)(1) do not prohibit the requester from filing the *ex parte* reexamination request (*see infra*, Section VII). An electronic payment for the *ex parte* reexamination fee specified by 37 C.F.R. § 1.20(c)(1) is being paid at the time of filing this Request.

C. Applicable Law

The first inventor to file provisions of the Leahy-Smith America Invents Act ("AIA") applies to the '230 Patent since it has an effective filing date on or after March 16, 2013.

II. CLAIMS FOR WHICH REEXAMINATION IS REQUESTED

Requester seeks reexamination of claims 1-25 of the '230 Patent.

III. CITATION OF PRIOR ART PRESENTED

U.S. Patent No. 8,834,038 to Limbert *et al.* ("Limbert") and U.S. Published Application No. 2016/0047993 to Hioki *et al.* ("Hioki") are deemed most relevant to the '230 Patent. In addition, U.S. Patent Nos. 8,641.293 to Lin *et al.* ("Lin") and 9,028,270 to Vanderwoud ("Vanderwoud") each disclose some features of the claims. None of these references are of-record in the '230 Patent. All of these references were filed before the '230 Patent. Copies of these references are attached as Appendices C-F pursuant to 37 C.F.R. § 1.510(b)(3).

A. Limbert

Limbert is directed to a fiber optic connector arranged to be releasably connected to a fiber optic adaptor. The fiber optic connector includes a body configured to receive and terminate two optical fibers, and a latch mechanism provided on the body. As shown in Figure 4 (reproduced below), the latch mechanism 114 is releasably mountable on each of two opposing faces of the connector body 112 with location spigot 131 for mounting to the top or the bottom face of the body 112 to determine the polarity of the connector. (5:25-31.)

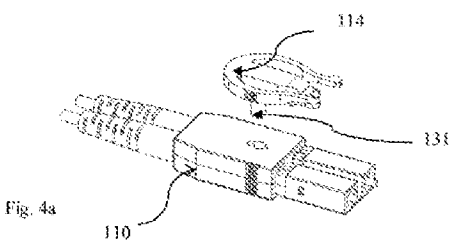


Fig. 4a

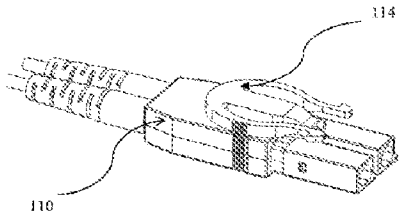
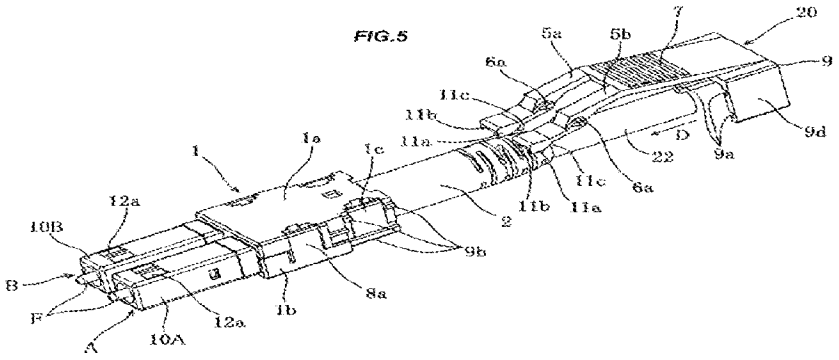


Fig. 4b

B. Hioki

Hioki is directed to an optical connector plug that is capable of interchanging positions of a pair of optical connectors (i.e., reversing polarity) (see abstract). As illustrated in FIG. 5, the lever coupler 20 (i.e., latch) is removable and installable on the top or bottom of holder 1 (i.e., housing). The lever coupler 20 can be rotated to engage either the top or bottom surface of holder to thereby change the positions of the pair of optical connectors A and B (i.e., reverse polarity).



C. Lin

Lin is directed to an optical fiber connector that includes a housing, a tab, a vertical portion, a horizontal portion, and a handle member. As illustrated in Figure 6 (reproduced to the right), when a pull is exerted at the handle 311, the U-shaped ring 315 is driven to pull the tab 126 of the connector. Since the pull of the U-shaped ring 315 will also cause the tab 126 to be pressed down, the latch 120 on the connector will be unlocked from the adapter the connector is plugged into. (4:66-5:16.)

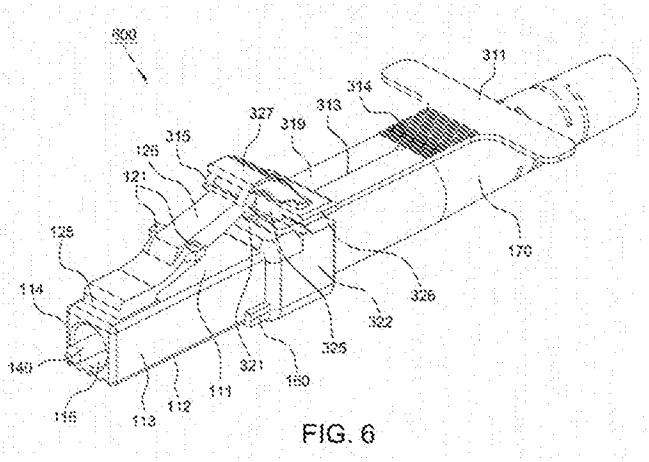


FIG. 6

D. Vanderwoud

Vanderwoud is directed to a pull tab actuator for use with a connector having a connector body and a latch member. With further reference to FIG. 6 reproduced below, when a handle 118 is pulled, the nub 130 travels along the ramped region 128 to lift or actuate the latch member 114, thereby disengaging the connector 110 from an associated device or component to which it is connected. It should be appreciated that in FIG. 6, the latch member 114 is shown in a latched position, and when actuated, the latch member 114 moves to an unlatched position. The latch member 114 is spring-biased to the latched position. Accordingly, when the pull tab actuator 116 is released, the latch member 114 returns to the latched position. (3:34-50.)

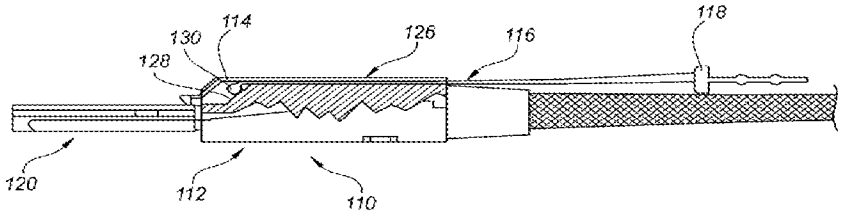


Fig. 6

IV. STATEMENT POINTING OUT EACH SUBSTANTIAL NEW QUESTION OF PATENTABILITY

A request for *ex parte* reexamination should be granted where "a substantial new question of patentability affecting any claim of the patent is raised by the request and the prior art cited therein." 37 C.F.R. § 1.515(a). Under 35 U.S.C. § 304, the Office must determine whether "a substantial new question of patentability" affecting any claim of the patent has been raised. In accordance with 37 CFR § 1.510(b)(1), "a statement pointing out each substantial new question of patentability based on prior patents and printed publications" is provided below.

For each substantial new question ("SNQ") presented below, for at least one patent or publication cited in each proposed ground of rejection, a statement of what the new noncumulative technological teaching is for every claim for which reexamination is requested is provided.

In the Notice of Allowance (Appendix B) mailed September 6, 2018, the Examiner stated as reasons for allowance, "[t]he prior art does not teach or suggest a removable latching system, removable arm system, or removable push-pull tab as set forth in the claimed combination of independent claim(s) 1, 9, and 15, 19, and 23, respectively" (p. 3). It therefore follows that a prior art reference or a combination of prior art references that disclose or render obvious these

features (in combination with the other features of the claims) would present a new non-cumulative technological teaching that would raise a substantial new question of patentability. Each of the statements below identifying a SNQ discusses where these new non-cumulative technological teachings can be found in at least one patent or publication cited in each proposed ground of rejection.

The Examiner also identified as the most pertinent art U.S. Patent Application Publication Nos. 2016/0349458 to Murray et al., 2015/0378113 to Good et al., and 2016/0116685 to Wong et al., stating that while Good "may be more pertinent, examiner sees the alignment mechanism in Good as not providing a latch that holds the connection sufficiently in place" and Murray "relies on a boot, and not a housing to provide connection for a latching mechanism," (p. 4). The grounds relied on in this opinion are not redundant and do not suffer from the purported deficiencies the Examiner identified.

SNQ 1: As detailed in the claim charts that follow, Limbert alone or in combination with Lin and/or Vanderwoud discloses a removable latching system, removable arm system, or removable push-pull tab, which raises a SNQ based on these new non-cumulative technological teachings.

SNQ 2: As detailed in the claim charts that follow, Hioki alone or in combination with Lin and/or Vanderwoud discloses a removable latching system, removable arm system, or removable push-pull tab, which raises a SNQ based on these new non-cumulative technological teachings.

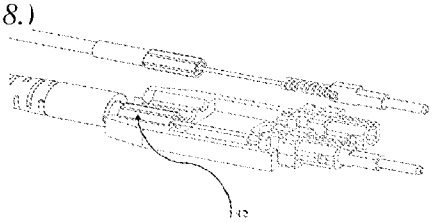
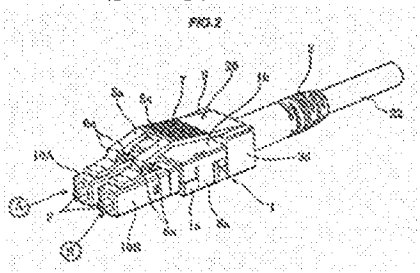
V. DETAILED EXPLANATION OF THE PERTINENCY AND MANNER OF APPLYING THE CITED ART TO EVERY CLAIM FOR WHICH REEXAMINATION IS REQUESTED

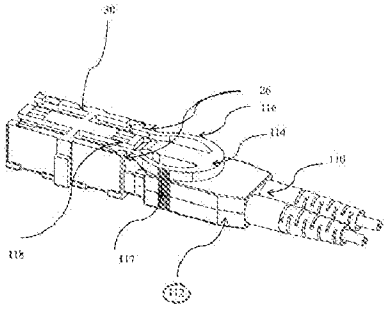
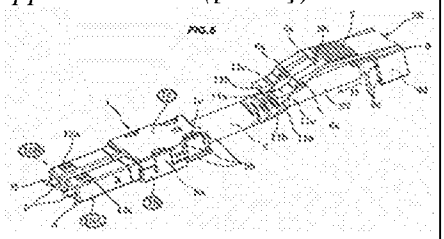
The request must set forth the pertinency and manner of applying cited prior art to every claim for which reexamination is requested. In accordance with 37 CFR 1.510(b)(2), the below discussion and claim charts include "[a]n identification of every claim for which reexamination is requested, and a detailed explanation of the pertinency and manner of applying the cited prior art to every claim for which reexamination is requested" with respect to claims 1-25 of the '230 Patent. The grounds of rejection proposed by this Request are listed in Table 1 immediately below and detailed in Table 2 further below.

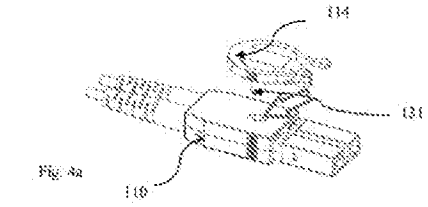
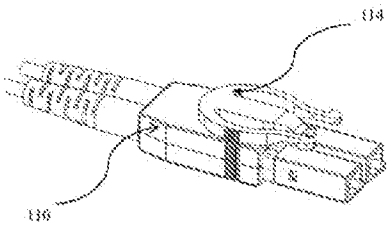
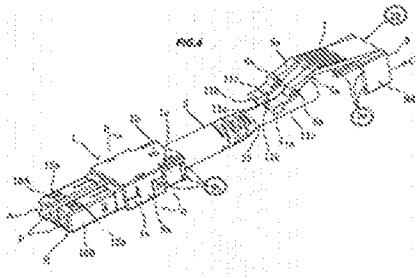
Table 1:

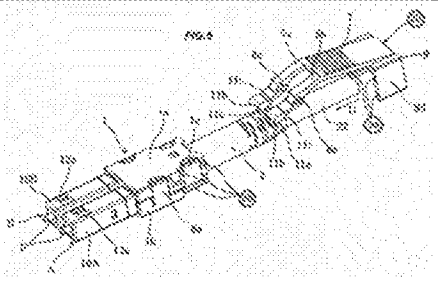
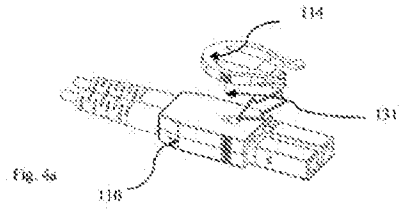
Ground	Proposed Grounds of Rejection
1	Claims 1, 2, 6, and 9 are anticipated by Limbert under AIA 35 U.S.C. § 102(a)(2)
2	Claims 3-5, 7, 8, 10, 12-16, 19, 20, and 22-25 are rendered obvious by Limbert in view of Lin under AIA 35 U.S.C. § 103(a)
3	Claims 17,18, 21 are rendered obvious by Limbert and Lin in view of Vanderwoud under AIA 35 U.S.C. § 103(a)
4	Claims 1 and 2 are anticipated by Hioki under AIA 35 U.S.C. § 102(a)(2)
5	Claims 3-16, 19, and 22-25 are rendered obvious by Hioki in view of Lin under AIA 35 U.S.C. § 103(a)
6	Claims 17, 18, and 21 are rendered obvious by Hioki and Lin in view of Vanderwoud under AIA 35 U.S.C. § 103(a)

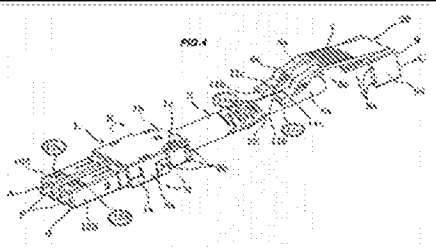
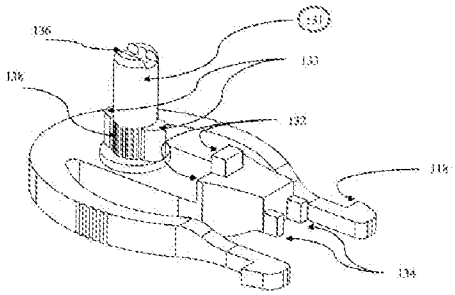
Table 2

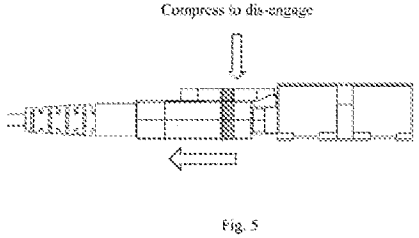
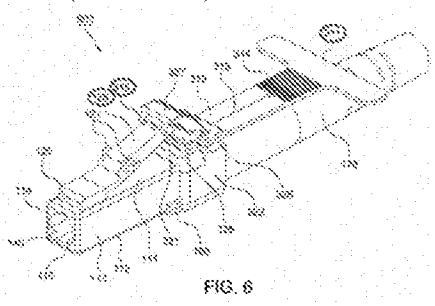
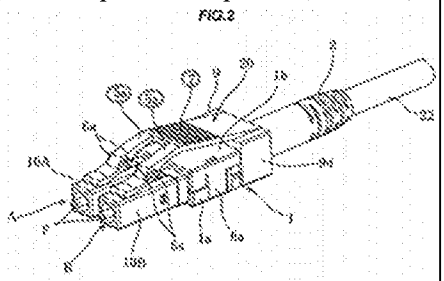
'230 Patent Claims	Grounds 1-3	Grounds 4-6
1. A reversible polarity fiber optic connector comprising:	Limbert discloses a fiber optic connector arranged to be releasably connected to a fiber optic adaptor (see Abstract). A latch mechanism is releasably mountable on either of the top or the bottom face of the body 112 to determine the polarity of the connector (see 5:25-31).	Hioki discloses an optical connector plug that is capable of interchanging positions of a pair of optical connectors (i.e., reversing polarity) (see abstract).
at least first and second optical ferrules;	As illustrated in Figure 8 (reproduced below), there are two ferrules. *In a further embodiment a universal design duplex cable is provided utilizing a venturi slot and fiber crimping for location of the components of the cable within the adaptor. The adapter venturi slot, allows the pre build of a fiber with a ferrule and then just the slotting of the package into the adaptor. (6:13-18.)*  Fig. 8	As illustrated in Figure 2 reproduced below, the optical connector plug includes a holder 1 that holds ferrule housings 10A and 10B of a pair of optical connectors A and B of a pair of optical fiber cables, and a boot 2 extending backward from the holder 1. ([0053].) 
a connector housing at least partially	As illustrated in Figure 8 above, a connector housing is at least	As can be seen from Figure 5 reproduced below, the holder

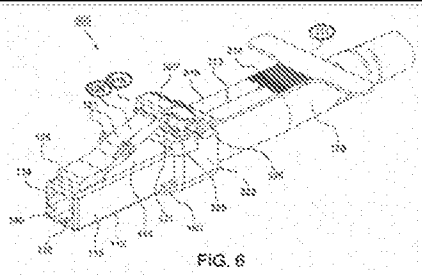
'230 Patent Claims	Grounds 1-3	Grounds 4-6
surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;	partially surrounding two ferrules. *The latch mechanism 114 comprises a pair of latch members, arms 116, mounted on an upper surface of the body 112 (4:42-43).*  Fig. 3	(connector housing) 1 surrounds the first and second optical ferrules and has a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. *[T]the holder 1 has an approximately square case shape in whole due to a vertically bisected structure of a halved lower holder 1a and a halved upper holder 1b ([0056]).* 
a latch coupling positioned on each of the first and second exterior walls of the housing;	The latch coupling is indicated by the arrow added to Figure 4a reproduced below. *FIG. 4 shows details of the mounting and arrangement of the latch mechanism 114 shown in FIG. 3, in order to accommodate the desire to alter the polarity of the patch cord connection. The latch mechanism 114 is configured to be releasably mountable on each of two opposing faces of the connector body 112 with location spigot 131 for mounting to the top or the bottom face of the body 112. Details and features include anti rotation fixings 132, 133 designed to locate and fix the latch mechanism 114 securely within the connector. (5:25-34.)*	Referring to Figure 5 above, the housing has recesses 12a on the top and bottom. *On the other hand, a pair of engaging recesses 12a and 12a for detachably engaging the engaging protrusions 11a and 11a of the latch levers 5a and 5a are formed in two upper and lower surfaces of the respective ferrule housings 10A and 10B of the pair of optical connectors A and B.* Note that the ferrule housings are considered part of the housing assembly. It is an obvious design choice to employ sub-housings for the ferrules as opposed to a single housing.

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	 Fig. 4a  Fig. 4b	
a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;	See latch 114 above.	As illustrated in Figures 4 and 5 reproduced below, a lever coupler (removable latch) 20 for engaging either of the first and second exterior wall latch couplings on the connector housing is disclosed. *Thus, the lever coupler 20 is slidably mounted on and demounted from the holder 1 (in a direction of an arrow C of FIG. 4 and a direction of an arrow D of FIG. 5) by engagement between the guide recess portions 9a and 9a and the guide protrusions 9b and 9b. ([0064].)* 

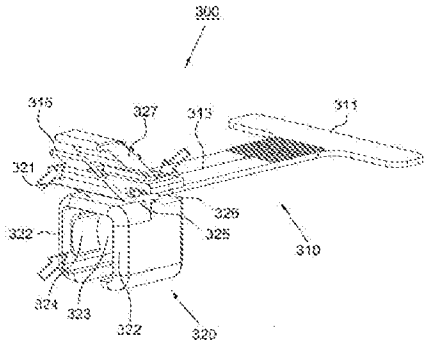
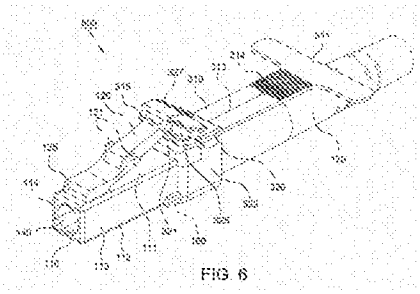
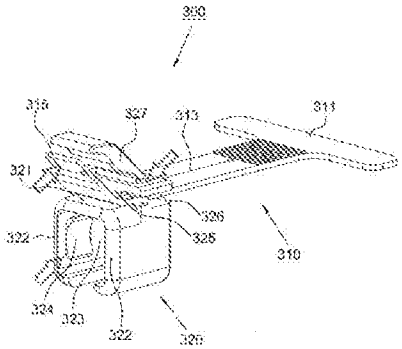
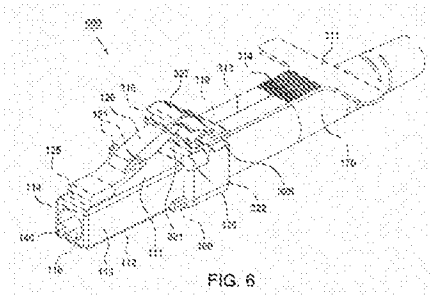
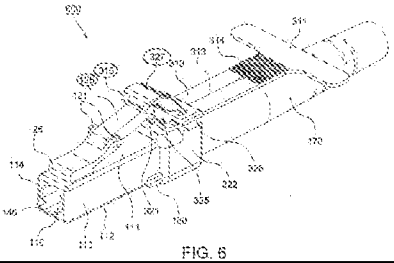
'230 Patent Claims	Grounds 1-3	Grounds 4-6
		
wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.	See above	As illustrated in Figures 4 and 5 above, the lever coupler (removable latch) 20, can be placed on either side of the housing. Note in Figure 4 A is on the left and B is on the right and are reversed in Figure 5. (*See* [0066].)
2. The reversible polarity fiber optic connector of claim 1, wherein		
each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and	As shown in Figure 4a reproduced below, the opening in the top and bottom surface of the housing (identified by the arrow) is a recess with slanted walls. 	As illustrated in Figure 4 reproduced below, recesses 12a have convex surfaces (angled walls). *Further, lower surfaces of the engaging protrusions 11a and 11a are formed on approximately arcuate concave surfaces when viewed from the front so as to correspond to each other, and inner bottom surfaces of the engaging recesses 12a and 12a are formed on convex surfaces so as to correspond to each other. ([0062].)*

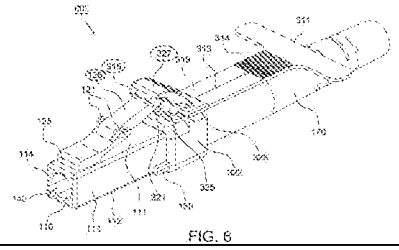
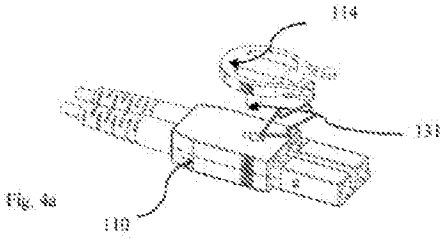
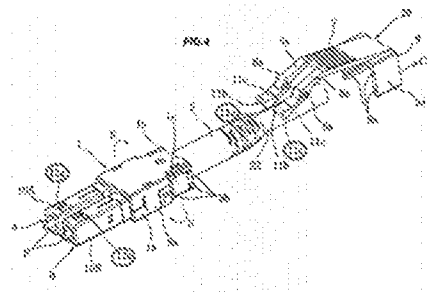
'230 Patent Claims	Grounds 1-3	Grounds 4-6
		
the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic connector is configured in the first polarity or the angled walls of the recess on the second exterior wall when the fiber optic connector is configured in the second polarity.	The spigot 131 of the latch 114 has angled walls. *To achieve symmetry and prevent rotation of the high density switchable horizontal latch, the latch has been designed with a primary key feature 136 on the location spigot 131. This locates into the corresponding keyway feature in the connector body. Precise alignment is achieved via the major anti-rotation feature 132 which locates onto the front edge of the connector body and down through the two connector channels. (5:40-47.)*  Fig. 4c	See above with respect to engaging protrusions 11a.
3. The reversible polarity fiber optic connector of claim 1, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to	Limbert discloses the depressing of the removable latch to dis-engage (unplug) the connector, as illustrated in Figure 5 reproduced below. *In a second embodiment illustrated in FIG. 5, a horizontal latch is sprung in the vertical plane allowing the known horizontal connection to be maintained but with release in the vertical direction. This means the*	Hioki discloses the depressing of the removable latch to dis-engage (unplug) the connector. *When the pair of optical connectors A and B are pulled out of the respective insertion openings of the optical adaptors, the operating lever 7 is pressed downward against the elasticity between the operating lever 7 and the latch levers 5a and 5a by*

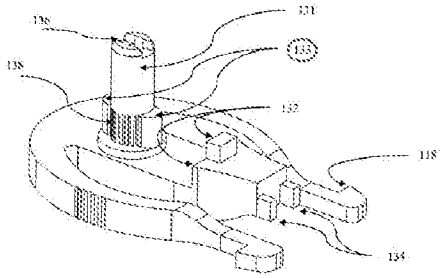
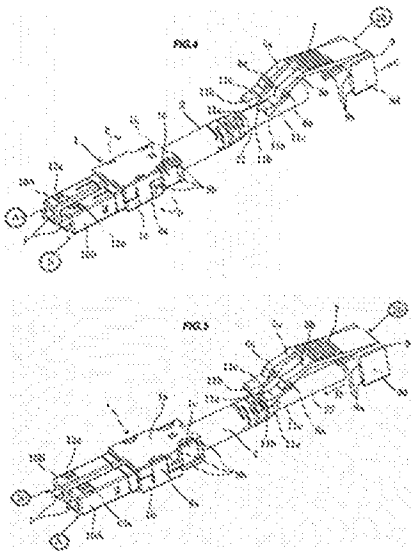
'230 Patent Claims	Grounds 1-3	Grounds 4-6
be depressed.	*connection and disconnection is effected through depression of the latch in the vertical plane. The latch mechanism 114 is located above the connector 112 and is raised in a free and disengaged position. The latch mechanism 114 is compressed in order to disengage the latch portions such as the retention lugs 118 from the adaptor 11. (5:65-6:7.)*  Fig. 5 Limbert does not explicitly disclose "a pull tab for engaging the removable latch." Lin discloses an optical connector that includes "a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed." As illustrated in Figure 6 (reproduced below), when a pull is exerted at the handle 311, the U-shaped ring 315 is driven to pull the tab 126 of the connector. Since the pull of the U-shaped ring 315 will also cause the tab 126 to be pressed down, the latch 120 on the connector will be unlocked from the adapter the connector is plugged into. (4:66-5:16.)  FIG. 6 A person having ordinary skill in	*hand. [See Figure 2 reproduced below]. Then, the latch levers 5a and 5a are pushed down along with the locking portions 6a and 6a projected on both sides of the middle portions thereof at the same time, and the locking portions 6a and 6a are disengaged from the locking grooves (not illustrated) provided for the optical adaptors. ([0069].)*  FIG.2 Hioki does not explicitly disclose "a pull tab for engaging the removable latch." Lin discloses an optical connector that includes "a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed." As illustrated in Figure 6 (reproduced below), when a pull is exerted at the handle 311, the U-shaped ring 315 is driven to pull the tab 126 of the connector. Since the pull of the U-shaped ring 315 will also cause the tab 126 to be pressed down, the latch on the connector will be unlocked from the adapter the connector is plugged into. (4:66-5:16.)

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	this art ("POSITA") would have found it obvious to include Lin's pull tab feature to Limbert's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Limbert's latch is depressed to unplug the connector. One reason to combine Limbert and Lin is a POSITA would know that employing a pull tab to depress Limbert's latch would be combining prior art elements according to known methods to yield predictable results.[1] A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	 FIG. 6 A POSITA would have found it obvious to include Lin's pull tab feature to Hioki's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Hioki's latch is depressed to unplug the connector. One reason to combine Hioki and Lin is a POSITA would know that employing a pull tab to depress Hioki's latch would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.
4. The reversible polarity fiber optic connector of claim 3, wherein the pull tab comprises at least a first opening and a seconding [*sic*] opening	Lin discloses the pull tab includes three openings, as illustrated in Figure 5 reproduced below (identified by added arrows). Figure 6 reproduced below illustrates the assembled connector.	Lin discloses the pull tab includes three openings, as illustrated in Figure 5 reproduced below (identified by added arrows). Figure 6 reproduced below illustrates the assembled connector.

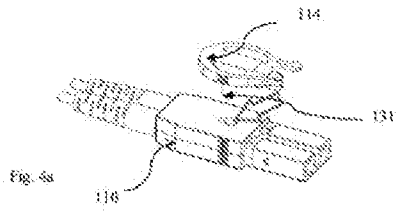
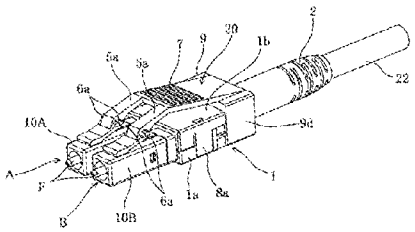
[1] KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 415-421, 82 USPQ2d 1385, 1395-97 (2007), see also MPEP 2143.

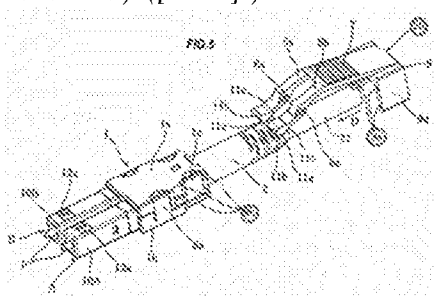
'230 Patent Claims	Grounds 1-3	Grounds 4-6
for engaging the removable latch;	 FIG. 5  FIG. 6	 FIG. 5  FIG. 6
wherein the first opening is configured to allow the connector housing and the removable latch to pass through; and	As shown above, the two leftmost arrows identifies two openings that meet the requirements of a first opening configured to allow the connector housing and the removable latch to pass through. It would have been an obvious design choice to combine these two openings into a single opening.	As shown above, the two leftmost arrows identifies two openings that meet the requirements of a first opening configured to allow the connector housing and the removable latch to pass through. It would have been an obvious design choice to combine these two openings into a single opening.
the second opening is configured to allow the removable latch to partially pass through.	As shown above, the rightmost arrow identifies a second opening configured to allow the latch to partially pass through.	As shown above, the rightmost arrow identifies a second opening configured to allow the latch to partially pass through.
5. The reversible polarity fiber optic connector of claim 3, wherein the pull tab further comprises a first deformable portion and a second deformable portion;	Lin's pull tab includes a first deformable portion 327 and second deformable portion 315 as shown in Figure 6 reproduced below.  FIG. 6	Lin's pull tab includes a first deformable portion 327 and second deformable portion 315 as shown in Figure 6 reproduced below.

'230 Patent Claims	Grounds 1-3	Grounds 4-6
		 FIG. 6
wherein the first deformable portion is configured to cooperate with the second deformable portion to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.	The first deformable portion 327 and second deformable portion 315 cooperate to depress the removable latch 126.	The first deformable portion 327 and second deformable portion 315 cooperate to depress the removable latch 126.
6. The reversible polarity fiber optic connector of claim 1, wherein		
each of the latch couplings on the first and second exterior walls of the connector housing includes a groove; and	As shown in Figure 4a reproduced below, the latch coupling (identified by the arrow) includes two grooves to give it a key shaped appearance.  Fig. 4a	As illustrated in Figure 4 reproduced below, recesses 12a have convex surfaces that form a groove. *Further, lower surfaces of the engaging protrusions 11a and 11a are formed on approximately arcuate concave surfaces when viewed from the front so as to correspond to each other, and inner bottom surfaces of the engaging recesses 12a and 12a are formed on convex surfaces so as to correspond to each other. ([0062].)*  Note that the ferrule housings are

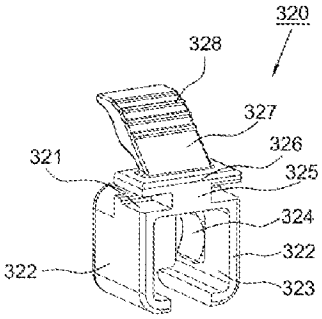
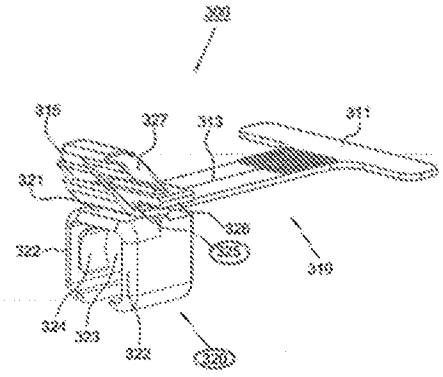
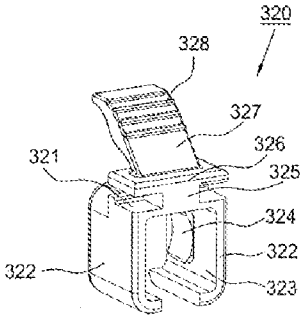
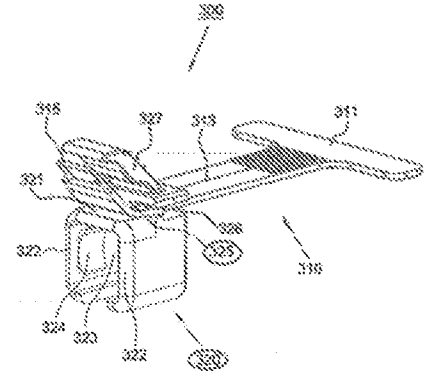
'230 Patent Claims	Grounds 1-3	Grounds 4-6
		considered part of the housing assembly. It is an obvious design choice to employ sub-housings for the ferrules as opposed to a single housing.
at least a projection for coupling with the groove on the first exterior wall when the fiber optic connector is configured in the first polarity or the groove on the second exterior wall when the fiber optic connector is configured in the second polarity.	The spigot 131 of the latch 114 shown in Figure 4c reproduced below includes anti rotation fixings 133 that couples with the grooves. *The latch mechanism 114 is configured to be releasably mountable on each of two opposing faces of the connector body 112 with location spigot 131 for mounting to the top or the bottom face of the body 112. Details and features include anti rotation fixings 132, 133 designed to locate and fix the latch mechanism 114 securely within the connector.*  Fig. 4c	See above as it refers to the engaging protrusions 11a (projection). As illustrated in Figures 4 and 5 below, the lever coupler (removable latch) 20, can be placed on either side of the housing. Note in Figure 4 A is on the left and B is on the right and are reversed in Figure 5. (See [0066].) 
7. The reversible polarity fiber optic connector of claim 6, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the reversible polarity fiber optic connector depresses the removable latch.	See claim 3.	See claim 3.
8. The reversible		

'230 Patent Claims	Grounds 1-3	Grounds 4-6
polarity fiber optic connector of claim 7, wherein the pull tab comprises:		
an opening for engaging the removable latch; and	See claim 4	See claim 4
a front protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.	See claim 4 where U-shaped ring 315 is the protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.	See claim 4 where U-shaped ring 315 is the protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.
9. A reversible polarity fiber optic connector with exchangeable arms for changing connector type comprising:	See Claim 1	See Claim 1
at least first and second optical ferrules;	See Claim 1	See Claim 1
a common connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;	See Claim 1	See Claim 1 Note that the ferrule housings are considered part of the common housing assembly. It is an obvious design choice to employ sub-housings for the ferrules as opposed to a single housing.
a coupling surface positioned on each of the first and second exterior walls of the common connector housing;	See Claim 1	See Claim 1
a removable arm for engaging either of the first and second exterior wall coupling surfaces on the	See Claim 1	See Claim 1

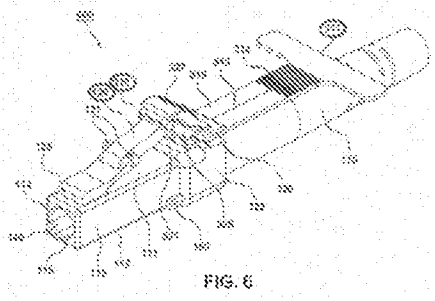
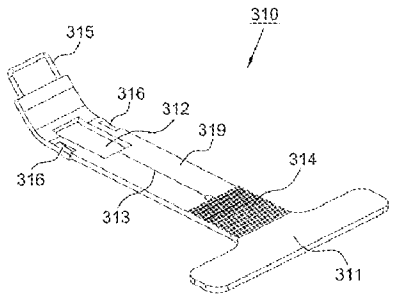
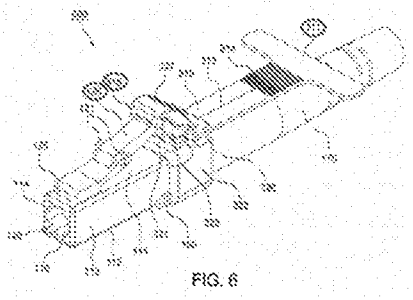
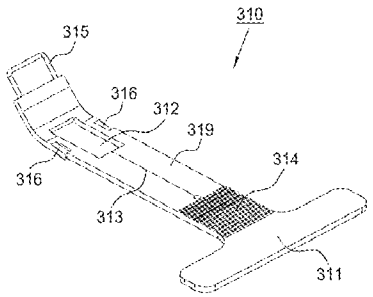
'230 Patent Claims	Grounds 1-3	Grounds 4-6
common connector housing, the removable arm including either a latch or a latch recess;		
wherein positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.	See Claim 1	See Claim 1
10. The reversible polarity fiber optic connector of claim 9 wherein positioning a removable arm with a latch on the coupling surface creates a latch-type connector and positioning a removable arm with a recess creates a recess-type connector.	As shown in Figure 4a reproduced below, the opening in the top and bottom surface of the housing (identified by the arrow) creates a latch-type connector.  A POSITA would appreciate that it is well known in this art that latches and recess are used to mate connectors to adapters and positioning one or the other type into the opening shown in Figure 4a is a matter of design choice.	As illustrated in Figure 2 reproduced below, recesses create a latch-type connector. FIG.2  A POSITA would appreciate that it is well known in this art that latches and recess are used to mate connectors to adapters and positioning one or the other type into the opening shown in Figure 4a is a matter of design choice.
11. The reversible polarity fiber optic connector of claim 9 wherein the housing includes a receiving track in the coupling surface and the		As illustrated in Figure 4 reproduced below, the holder 1 (housing) discloses or suggests "a receiving track in the coupling surface and the removable arm includes a projection for engaging in the receiving track in the

'230 Patent Claims	Grounds 1-3	Grounds 4-6
removable arm includes a projection for engaging in the receiving track in the coupling surface.		coupling surface." *Subsequently, as illustrated in FIG. 5, the lever coupler 20 is again installed on the top of the inverted holder 1 (which is a portion that is the lower surface of the holder 1 before the inversion) (in a direction of an arrow D of FIG. 5). In this case, the guide recess portions 9a and 9a of the mounting base 9 is caused to slide in an inserting direction (in the direction of the arrow D) while being engaged with the guide protrusions 9b and 9b of the holder 1 (or the halved lower holder 1a). ([0067].)*  Note that the receiving track is located on the latch and the protrusion is located on the side of the housing. Nevertheless, it would be an obvious design choice to instead locate the receiving track top (instead of side) of the housing and locate the protrusion on the latch.
12. The reversible polarity fiber optic connector of claim 9 further comprising a pull tab.	See claim 3	See claim 3
13. The reversible polarity fiber optic connector of claim 12 wherein the removable arm includes a latch and the pull tab is a	See claim 3	See claim 3

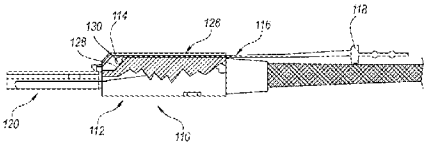
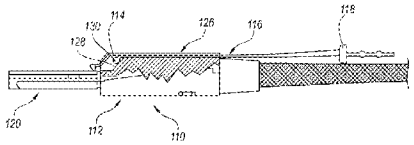
'230 Patent Claims	Grounds 1-3	Grounds 4-6
separate element from the removable arm.		
14. The reversible fiber optic connector of claim 12 wherein removable arm includes a recess and the pull tab is integrated with the removable arm.	See claim 3	See claim 3
15. A reversible polarity fiber optic connector comprising:	See Claim 1	See Claim 1
at least first and second optical ferrules;	See Claim 1	See Claim 1
a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;	See Claim 1	See Claim 1
a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing;	Limbert does not explicitly disclose "a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing" as it pertains to a push-pull tab (see elements below). Lin discloses with reference to Figures 4, 5, and 6 reproduced below: *Referring to FIGS. 4 and 5, the clip member 320 is flexible and made from plastic material...A vertical portion 325 extends upward from the horizontal member 321 and a horizontal portion 326 is formed on the vertical portion 325, wherein the horizontal portion 326 has a width greater than that of the vertical*	Hioki does not explicitly disclose "a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing" as it pertains to a push-pull tab (see elements below). Lin discloses with reference to Figures 4, 5, and 6 reproduced below: *Referring to FIGS. 4 and 5, the clip member 320 is flexible and made from plastic material...A vertical portion 325 extends upward from the horizontal member 321 and a horizontal portion 326 is formed on the vertical portion 325, wherein the*

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	portion 325, and the horizontal portion 326 and vertical portion 325 together have a cross section of "T" shape. A tab 327 extends from the horizontal portion 326 and has a rough surface 328 formed thereon. (3:64 - 4:14.)  FIG. 4 Lin further discloses: *In another embodiment, the clip member 320 of the optical fiber connector 600 may be bonded to the housing 110 of the connector 100. Specifically, the clip member 320 may be integrally formed with the housing 110. (4:52-56, see Figure 5 below.)*  FIG. 5 With reference to Figure 4, in such an arrangement the structure defined by 325, 326, and 327 becomes part of the housing surfaces and forms an aperture defined by 321, 325, and 326.	*horizontal portion 326 has a width greater than that of the vertical portion 325, and the horizontal portion 326 and vertical portion 325 together have a cross section of "T" shape. A tab 327 extends from the horizontal portion 326 and has a rough surface 328 formed thereon. (3:64 - 4:14.)*  FIG. 4 Lin further discloses: *In another embodiment, the clip member 320 of the optical fiber connector 600 may be bonded to the housing 110 of the connector 100. Specifically, the clip member 320 may be integrally formed with the housing 110. (4:52-56, see Figure 5 below.)*  FIG. 5 With reference to Figure 4, in such an arrangement the structure defined by 325, 326, and 327 becomes part of the housing

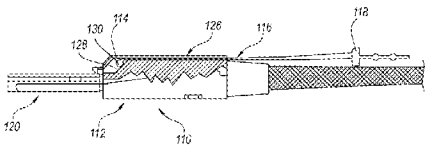
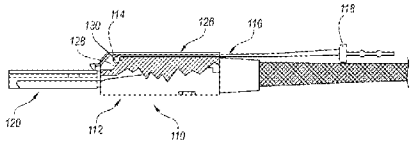
'230 Patent Claims	Grounds 1-3	Grounds 4-6
	A POSITA would have found it obvious to add Lin's pull tab feature and housing aperture to Limbert's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Limbert's latch is depressed to unplug the connector. One reason to combine Limbert and Lin is a POSITA would know that employing a pull tab to depress Limbert's latch would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	surfaces and forms an aperture defined by 321, 325, and 326. A POSITA would have found it obvious to add Lin's pull tab feature and housing aperture to Hioki's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Hioki's latch is depressed to unplug the connector. One reason to combine Hioki and Lin is a POSITA would know that employing a pull tab to depress Hioki's latch would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.
a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing;	As illustrated in Figure 5 reproduced above, Lin's pull tab includes a protrusion 326 for positioning through aperture 325. Lin discloses an optical connector that includes a push-pull tab. As illustrated in Figure 6 (reproduced below), when a pull is exerted at the handle 311, the U-shaped ring 315 is driven to pull the tab 126 of the connector. Since the pull of the U-shaped ring 315 will also cause the tab 126 to be pressed down, the latch 120 on the connector will be unlocked from the adapter the connector is plugged	As illustrated in Figure 5 reproduced above, Lin's pull tab includes a protrusion 326 for positioning through aperture 325. Lin discloses an optical connector that includes a push-pull tab. As illustrated in Figure 6 (reproduced below), when a pull is exerted at the handle 311, the U-shaped ring 315 is driven to pull the tab 126 of the connector. Since the pull of the U-shaped ring 315 will also cause the tab 126 to be pressed down, the latch 120 on the connector will be unlocked from the adapter the

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	into [where a push provides the opposite result]. (4:66-5:16.)  FIG. 6 Lin's pull tab is removable. *[With reference to Figure 3,w]hen desiring to mount the handle member 310 and clip member 320 at the optical fiber connector 100, the handle member 310 and clip member 320 may be first assembled together. The way of assembling the above two elements together is to pull open the slit 313 to enlarge the opening 312 and then to insert the tab 327 and horizontal portion 326 of the clip member 320 through the enlarged opening 312. Afterward, the pulling force exerted on the body 319 is removed and the vertical portion 325 is placed within the opening 312. (4:30-39.)*  FIG. 3	connector is plugged into [where a push provides the opposite result]. (4:66-5:16.)  FIG. 6 Lin's pull tab is removable. *[With reference to Figure 3,w]hen desiring to mount the handle member 310 and clip member 320 at the optical fiber connector 100, the handle member 310 and clip member 320 may be first assembled together. The way of assembling the above two elements together is to pull open the slit 313 to enlarge the opening 312 and then to insert the tab 327 and horizontal portion 326 of the clip member 320 through the enlarged opening 312. Afterward, the pulling force exerted on the body 319 is removed and the vertical portion 325 is placed within the opening 312. (4:30-39.)*  FIG. 3
wherein positioning the removable push-pull tab with its protrusion in the first aperture of	See above.	See above.

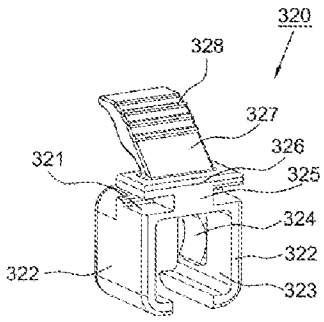
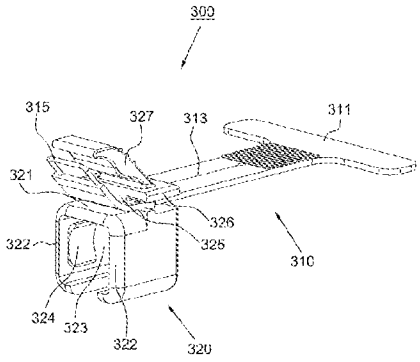
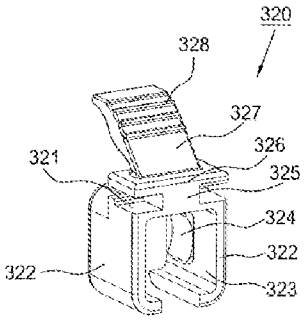
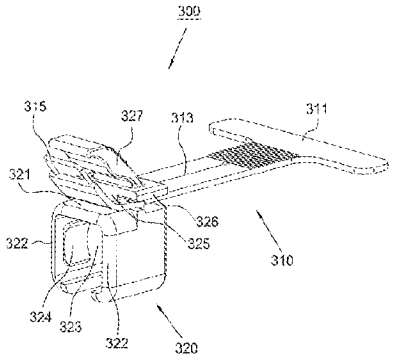
'230 Patent Claims	Grounds 1-3	Grounds 4-6
the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.		
16. The reversible polarity fiber optic connector of claim 15 further comprising first and second apertures respectively beneath the first and second exterior walls of the housing for receiving the protrusion.	See above.	See above.
17. The reversible polarity fiber optic connector of claim 15, further comprising a spring to urge the push-pull tab forward.	Limbert and Lin does not explicitly disclose this feature. Vanderwoud discloses a connector having a pull tab with a spring to urge the push-pull tab forward with reference to Figure 6 reproduced below. *With further reference to FIG. 6, the channel 126 includes a ramped region 128 which receives a nub 130 disposed on the pull tab actuator 116. The nub 130 is positioned in the channel 126 between the ramped region 128 and the latch member 114. Accordingly, when the handle 118 is pulled, the nub 130 travels along the ramped region 128 to lift or actuate the latch member 114, thereby*	Hioki and Lin does not explicitly disclose this feature. Vanderwoud discloses a connector having a pull tab with a spring to urge the push-pull tab forward with reference to Figure 6 reproduced below. *With further reference to FIG. 6, the channel 126 includes a ramped region 128 which receives a nub 130 disposed on the pull tab actuator 116. The nub 130 is positioned in the channel 126 between the ramped region 128 and the latch member 114. Accordingly, when the handle 118 is pulled, the nub 130 travels along the ramped region 128 to*

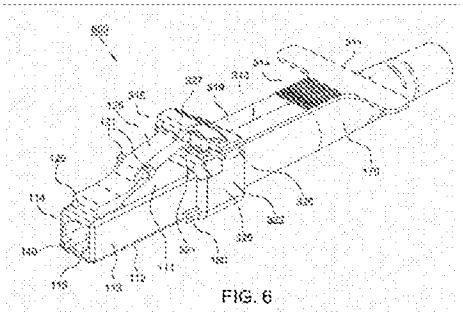
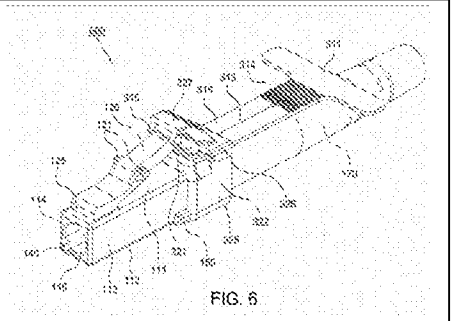
'230 Patent Claims	Grounds 1-3	Grounds 4-6
	disengaging the connector 110 from an associated device or component to which it is connected. It should be appreciated that in FIG. 6, the latch member 114 is shown in a latched position, and when actuated, the latch member 114 moves to an unlatched position. The latch member 114 is spring-biased to the latched position. For example, the latch member 114 can be comprised of a spring steel material, a suitable stainless steel such as S304, or other resilient yet flexible material. Accordingly, when the pull tab actuator 116 is released, the latch member 114 returns to the latched position. (3:34-50.)  Fig. 6 A POSITA would have found it obvious to add Vanderwoud's push-pull tab spring feature to the Limbert/Lin connector with pull tab. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Employing Vanderwoud's spring would provide for automatic return of the pull tab to the original position, thereby furthering Vanderwoud's stated need for a pull tab actuator which is more ergonomic and thus more easily engaged by a user (1:32-34). One reason to combine Limbert and	*lift or actuate the latch member 114, thereby disengaging the connector 110 from an associated device or component to which it is connected. It should be appreciated that in FIG. 6, the latch member 114 is shown in a latched position, and when actuated, the latch member 114 moves to an unlatched position. The latch member 114 is spring-biased to the latched position. For example, the latch member 114 can be comprised of a spring steel material, a suitable stainless steel such as S304, or other resilient yet flexible material. Accordingly, when the pull tab actuator 116 is released, the latch member 114 returns to the latched position. (3:34-50.)*  Fig. 6 A POSITA would have found it obvious to add Vanderwoud's push-pull tab spring feature to the Hioki/Lin connector with pull tab. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Employing Vanderwoud's spring would provide for automatic return of the pull tab to the original position, thereby furthering Vanderwoud's

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	Lin is a POSITA would know that employing a spring-biased pull tab to would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	stated need for a pull tab actuator which is more ergonomic and thus more easily engaged by a user (1:32-34). One reason to combine Hioki and Lin is a POSITA would know that employing a spring-biased pull tab to would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.
18. The reversible polarity fiber optic connector of claim 15, wherein the push-pull tab protrusion is retained by a housing latch, the housing latch being urged forward by a spring.	Limbert and Lin does not explicitly disclose this feature. Vanderwoud discloses a connector having a push-pull tab protrusion is retained by a housing latch, the housing latch being urged forward by a spring with reference to Figure 6 reproduced below. *With further reference to FIG. 6, the channel 126 includes a ramped region 128 which receives a nub 130 disposed on the pull tab actuator 116. The nub 130 is positioned in the channel 126 between the ramped region 128 and the latch member 114. Accordingly, when the handle 118 is pulled, the nub 130 travels along the ramped region 128 to lift or actuate the latch member 114, thereby disengaging the connector 110 from an associated device or component to which it is connected. It should be appreciated that in FIG. 6, the latch member 114 is shown in a latched position, and when actuated, the latch member 114 moves to an unlatched position. The latch member 114 is spring-biased to the*	Hioki and Lin does not explicitly disclose this feature. Vanderwoud discloses a connector having a push-pull tab protrusion is retained by a housing latch, the housing latch being urged forward by a spring with reference to Figure 6 reproduced below. *With further reference to FIG. 6, the channel 126 includes a ramped region 128 which receives a nub 130 disposed on the pull tab actuator 116. The nub 130 is positioned in the channel 126 between the ramped region 128 and the latch member 114. Accordingly, when the handle 118 is pulled, the nub 130 travels along the ramped region 128 to lift or actuate the latch member 114, thereby disengaging the connector 110 from an associated device or component to which it is connected. It should be appreciated that in FIG. 6, the latch member 114 is shown in a latched position, and when actuated, the latch member 114 moves to an unlatched position.*

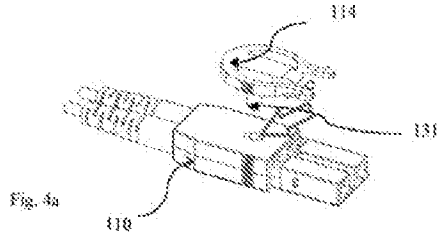
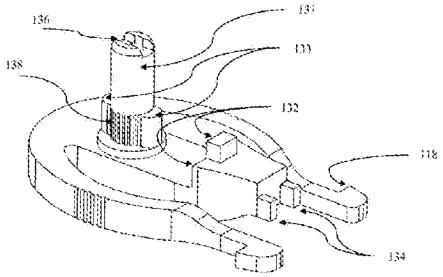
'230 Patent Claims	Grounds 1-3	Grounds 4-6
	latched position. For example, the latch member 114 can be comprised of a spring steel material, a suitable stainless steel such as S304, or other resilient yet flexible material. Accordingly, when the pull tab actuator 116 is released, the latch member 114 returns to the latched position. (3:34-50.)  Fig. 6 As discussed above in connection with claim 15, Lin's pull tab includes a protrusion 326 for positioning through aperture 325. A POSITA would have found it obvious to add Vanderwoud's push-pull tab spring feature to the Limbert/Lin connector with pull tab. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Employing Vanderwoud's spring would provide for automatic return of the pull tab to the original position, thereby furthering Vanderwoud's stated need for a pull tab actuator which is more ergonomic and thus more easily engaged by a user (1:32-34). One reason to combine Limbert and Lin is a POSITA would know that employing a spring-biased pull tab to would be combining prior art elements according to known methods to yield predictable results.	*The latch member 114 is spring-biased to the latched position. For example, the latch member 114 can be comprised of a spring steel material, a suitable stainless steel such as S304, or other resilient yet flexible material. Accordingly, when the pull tab actuator 116 is released, the latch member 114 returns to the latched position. (3:34-50.)*  Fig. 6 As discussed above in connection with claim 15, Lin's pull tab includes a protrusion 326 for positioning through aperture 325. A POSITA would have found it obvious to add Vanderwoud's push-pull tab spring feature to the Hioki/Lin connector with pull tab. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Employing Vanderwoud's spring would provide for automatic return of the pull tab to the original position, thereby furthering Vanderwoud's stated need for a pull tab actuator which is more ergonomic and thus more easily engaged by a user (1:32-34). One reason to combine Hioki and Lin is a POSITA would know that employing a spring-

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	biased pull tab to would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.
19. A reversible polarity fiber optic connector comprising:	See Claim 1	See claim 1
at least first and second optical ferrules;	See Claim 1	See Claim 1
a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;	See Claim 1	See Claim 1
a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing;	Limbert does not explicitly disclose "a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing" as it pertains to a push-pull tab (see elements below). Lin discloses with reference to Figures 4 and 5 below: *Referring to FIGS. 4 and 5, the clip member 320 is flexible and made from plastic material...A vertical portion 325 extends upward from the horizontal member 321 and a horizontal portion 326 is formed on the vertical portion 325, wherein the horizontal portion 326 has a width greater than that of the vertical portion 325, and the horizontal*	Hioki does not explicitly disclose "a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing" as it pertains to a push-pull tab (see elements below). Lin discloses with reference to Figures 4, 5, and 6 reproduced below: *Referring to FIGS. 4 and 5, the clip member 320 is flexible and made from plastic material...A vertical portion 325 extends upward from the horizontal member 321 and a horizontal portion 326 is formed on the vertical portion 325, wherein the horizontal portion 326 has a width*

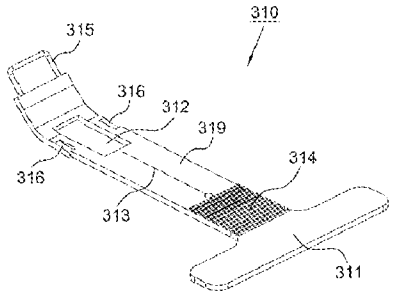
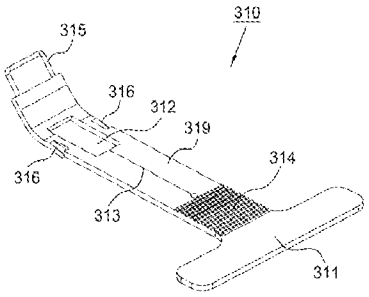
'230 Patent Claims	Grounds 1-3	Grounds 4-6
	portion 326 and vertical portion 325 together have a cross section of "T" shape. A tab 327 extends from the horizontal portion 326 and has a rough surface 328 formed thereon. (3:64 - 4:14.) *Furthermore, since the tab 327 of the clip member 320 extends to being positioned above the tab 126 of the connector 100, a press on the tab 327 may press down the tab 126 to unlock the latch 120 of the connector 100 from the reciprocal locking mechanism 230 of the adapter 200. (5:21-25.)*  FIG. 4  FIG. 5	*greater than that of the vertical portion 325, and the horizontal portion 326 and vertical portion 325 together have a cross section of "T" shape. A tab 327 extends from the horizontal portion 326 and has a rough surface 328 formed thereon. (3:64 - 4:14.)* *Furthermore, since the tab 327 of the clip member 320 extends to being positioned above the tab 126 of the connector 100, a press on the tab 327 may press down the tab 126 to unlock the latch 120 of the connector 100 from the reciprocal locking mechanism 230 of the adapter 200. (5:21-25.)*  FIG. 4  FIG. 5

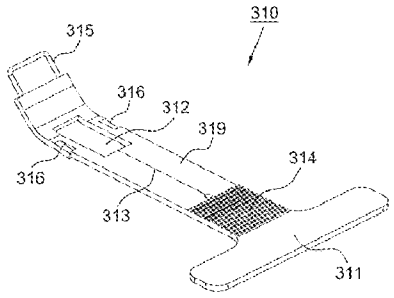
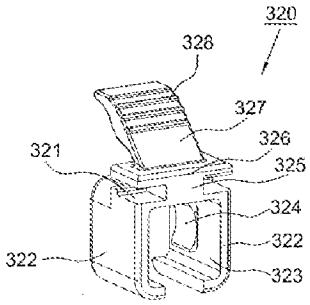
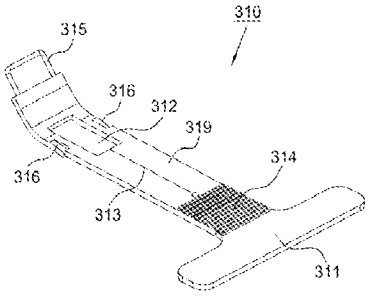
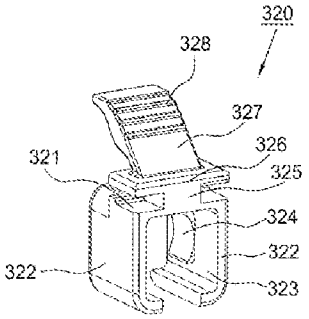
'230 Patent Claims	Grounds 1-3	Grounds 4-6
	 FIG. 6 Lin further discloses: *In another embodiment, the clip member 320 of the optical fiber connector 600 may be bonded to the housing 110 of the connector 100. Specifically, the clip member 320 may be integrally formed with the housing 110. (4:52-56.)* In such an arrangement the region defined by 325, 326, and 327 becomes part of the housing surfaces. In this defined region, at least tab 327 is flexible (since it can be pressed down into tab 126 to unlock the connector). Accordingly, the region defined by 325, 326, and 327 is a deformable region. A POSITA would have found it obvious to add Lin's pull tab feature and housing aperture to Limbert's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Limbert's latch is depressed to unplug the connector. One reason to combine Limbert and Lin is a POSITA would know that employing a pull tab to depress Limbert's latch would be combining prior art elements according to	 FIG. 6 Lin further discloses: *In another embodiment, the clip member 320 of the optical fiber connector 600 may be bonded to the housing 110 of the connector 100. Specifically, the clip member 320 may be integrally formed with the housing 110. (4:52-56.)* In such an arrangement the region defined by 325, 326, and 327 becomes part of the housing surfaces. In this defined region, at least tab 327 is flexible (since it can be pressed down into tab 126 to unlock the connector). Accordingly, the region defined by 325, 326, and 327 is a deformable region. A POSITA would have found it obvious to add Lin's pull tab feature and housing aperture to Hioki's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Hioki's latch is depressed to unplug the connector. One reason to combine Hioki and Lin is a POSITA would know that employing a pull tab to

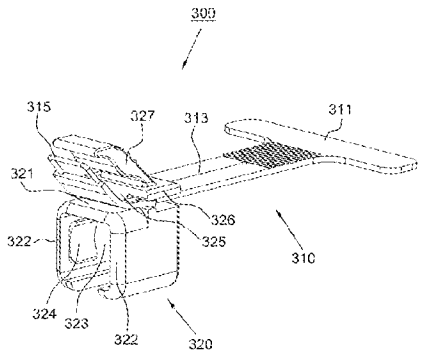
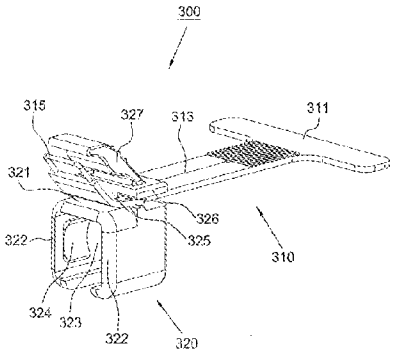
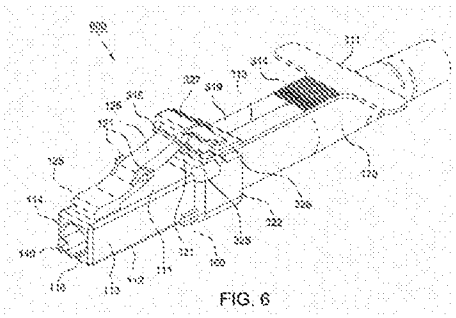
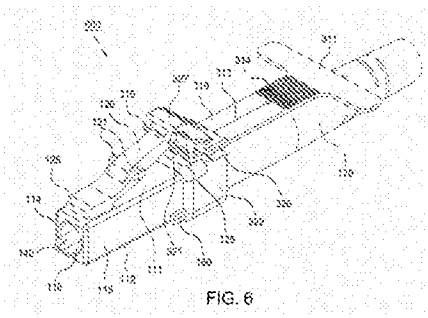
'230 Patent Claims	Grounds 1-3	Grounds 4-6
	known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	depress Hioki's latch would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.
a removable push-pull tab including a protrusion for positioning within though [*sic*] either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing;	As illustrated in Figure 5 reproduced above, Lin's pull tab includes a protrusion 326 for positioning through aperture 325.	As illustrated in Figure 5 reproduced above, Lin's pull tab includes a protrusion 326 for positioning through aperture 325.
wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.	See above	See above
20. The combination of the reversible polarity fiber optic connector of	Limbert discloses, in connection with Figures 4a and 4c reproduced below, removal of the latch using a	

'230 Patent Claims	Grounds 1-3	Grounds 4-6
claim 19 and a tool for deforming the deformable region of either the first exterior wall of the housing or the second exterior wall of the housing.	screwdriver (*see* 5:56-61). Limbert discloses a coarse spline 138 on latch 114 to create resistance when the latch 114 is inserted housing opening (identified by the arrow), thus deforming the opening. Limbert's tool, by removing latch 114 again deforms the opening back to or close to the original (pre latch insertion state).  Fig. 4a  Fig. 4c Limbert therefore discloses the use of a tool for deforming a deformable region. A POSITA would have found it obvious to use a tool as disclosed in Limbert on the Limbert/Lin deformable region to accomplish the same goal. One reason to make this modification is a POSITA would know that tools are commonly used on connectors as disclosed in Limbert and therefore employing a tool would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	

'230 Patent Claims	Grounds 1-3	Grounds 4-6
21. The reversible polarity fiber optic connector of claim 19, further comprising a spring to urge the push-pull tab forward.	See claim 17	See claim 17
22. The reversible polarity fiber optic connector of claim 19 further comprising first and second apertures respectively beneath the first and second exterior walls of the housing for receiving the protrusion from the deformable region.	See claim 19.	See claim 19.
23. A reversible polarity fiber optic connector comprising:	See Claim 1	See Claim 1
at least first and second optical ferrules;	See Claim 1	See Claim1
a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;	See Claim 1	See Claim 1
a removable push-pull tab;	Lin's pull tab is removable. *[With reference to Figure 3,w]hen desiring to mount the handle member 310 and clip member 320 at the optical fiber connector 100, the handle member 310 and clip member 320 may be first assembled together. The way of assembling the above two elements together is to pull open the slit 313 to enlarge the*	Lin's pull tab is removable. *[With reference to Figure 3,w]hen desiring to mount the handle member 310 and clip member 320 at the optical fiber connector 100, the handle member 310 and clip member 320 may be first assembled together. The way of assembling the above two elements together is to pull open*

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	opening 312 and then to insert the tab 327 and horizontal portion 326 of the clip member 320 through the enlarged opening 312. Afterward, the pulling force exerted on the body 319 is removed and the vertical portion 325 is placed within the opening 312. (4:30-39.)  FIG. 3	*the slit 313 to enlarge the opening 312 and then to insert the tab 327 and horizontal portion 326 of the clip member 320 through the enlarged opening 312. Afterward, the pulling force exerted on the body 319 is removed and the vertical portion 325 is placed within the opening 312. (4:30-39.)*  FIG. 3
a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall;	Limbert does not explicitly disclose "a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall" as it pertains to a push-pull tab (see elements below). Lin discloses with reference to Figures 3-6 below: *Referring to FIGS. 4 and 5, the clip member 320 is flexible and made from plastic material...A vertical portion 325 extends upward from the horizontal member 321 and a horizontal portion 326 is formed on the vertical portion 325, wherein the horizontal portion 326 has a width greater than that of the vertical portion 325, and the horizontal portion 326 and vertical portion 325 together have a cross section of "T" shape. A tab 327 extends from the horizontal portion 326 and has a rough surface 328 formed thereon. (3:64 - 4:14.)* *[With reference to Figure 3,w]hen desiring to mount the handle*	Hioki does not explicitly disclose "a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall" as it pertains to a push-pull tab (see elements below). Lin discloses with reference to Figures 3-6 reproduced below: *Referring to FIGS. 4 and 5, the clip member 320 is flexible and made from plastic material...A vertical portion 325 extends upward from the horizontal member 321 and a horizontal portion 326 is formed on the vertical portion 325, wherein the horizontal portion 326 has a width greater than that of the vertical portion 325, and the horizontal portion 326 and vertical portion 325 together have a cross section of "T" shape. A tab 327 extends from the horizontal portion 326 and has a rough surface 328 formed thereon. (3:64 - 4:14.)*

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	member 310 and clip member 320 at the optical fiber connector 100, the handle member 310 and clip member 320 may be first assembled together. The way of assembling the above two elements together is to pull open the slit 313 to enlarge the opening 312 and then to insert the tab 327 and horizontal portion 326 of the clip member 320 through the enlarged opening 312. Afterward, the pulling force exerted on the body 319 is removed and the vertical portion 325 is placed within the opening 312. (4:30-39.)  FIG. 3  FIG. 4	*[With reference to Figure 3,w]hen desiring to mount the handle member 310 and clip member 320 at the optical fiber connector 100, the handle member 310 and clip member 320 may be first assembled together. The way of assembling the above two elements together is to pull open the slit 313 to enlarge the opening 312 and then to insert the tab 327 and horizontal portion 326 of the clip member 320 through the enlarged opening 312. Afterward, the pulling force exerted on the body 319 is removed and the vertical portion 325 is placed within the opening 312. (4:30-39.)*  FIG. 3  FIG. 4

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	 FIG. 5	 FIG. 5
	 FIG. 6 Lin further discloses: *In another embodiment, the clip member 320 of the optical fiber connector 600 may be bonded to the housing 110 of the connector 100. Specifically, the clip member 320 may be integrally formed with the housing 110. (4:52-56.)* In such an arrangement the structure defined by 321, 325, and 326, becomes part of the housing surfaces and acts to retain the pull tab 310. A POSITA would have found it obvious to add Lin's pull tab feature and housing aperture to Limbert's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not] enough space for a user's fingers to press	 FIG. 6 Lin further discloses: *In another embodiment, the clip member 320 of the optical fiber connector 600 may be bonded to the housing 110 of the connector 100. Specifically, the clip member 320 may be integrally formed with the housing 110. (4:52-56.)* In such an arrangement the structure defined by 321, 325, and 326, becomes part of the housing surfaces and acts to retain the pull tab 310. A POSITA would have found it obvious to add Lin's pull tab feature and housing aperture to Hioki's latch mechanism. A POSITA would have been motivated to make this modification because, as disclosed in Lin, "when many the [connectors] are mounted on a panel with close spacing to each other, it is likely that there is [not]

'230 Patent Claims	Grounds 1-3	Grounds 4-6
	the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Limbert's latch is depressed to unplug the connector. One reason to combine Limbert and Lin is a POSITA would know that employing a pull tab to depress Limbert's latch would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.	enough space for a user's fingers to press the tab [] of the latch [] and then pull out the connector" (2:26-29). Like Lin, Hioki's latch is depressed to unplug the connector. One reason to combine Hioki and Lin is a POSITA would know that employing a pull tab to depress Hioki's latch would be combining prior art elements according to known methods to yield predictable results. A POSITA could have combined the elements as claimed using known methods. Moreover, a POSITA would have recognized that the results of the combination were predictable.
wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.	See above	See above
24. The reversible polarity fiber optic connector of claim 23 wherein the first and second push-pull tab retainers each include a projection.	As illustrated in Figures 3-6 reproduced above, Lin's pull tab includes a projection 326 in the retaining structure defined by 321, 325, and 326.	As illustrated in Figures 3-6 reproduced above, Lin's pull tab includes a projection 326 in the retaining structure defined by 321, 325, and 326.
25. The reversible polarity fiber optic	See above	See above

'230 Patent Claims	Grounds 1-3	Grounds 4-6
connector of claim 23 wherein each projection is a clip for receiving a portion of the push-pull tab.		

VI. 37 C.F.R. § 1.510 (b)(5): CERTIFICATION THAT A COPY OF THE REQUEST HAS BEEN SERVED IN ITS ENTIRETY ON THE PATENT OWNER

A complete copy of this request has been served on the Patent Owner in accordance with 37 C.P.R. § 1.510(b)(5) at the correspondence address shown in PAIR on this date:

Senko Advanced Components, Inc.

450 Donald Lynch Blvd

Unit D

Marlborough, Ma 01752

VII. CERTIFICATION THAT THE STATUTORY ESTOPPEL PROVISIONS OF 35 U.S.C. § 315(e)(1) OR 35 U.S.C. § 325(e)(1) DO NOT PROHIBIT THE REQUESTER FROM FILING THE *EX PARTE* REEXAMINATION REQUEST

The statutory estoppel provisions of 35 U.S.C. § 315(e)(1) or 35 U.S.C. § 325(e)(1) do not prohibit the requester from filing this *ex parte* reexamination request.

VIII. CONCLUSION

In view of the foregoing, it is respectfully submitted that SNQs for claims 1-25 of the '230 Patent have been established by this request. Accordingly, the Office is requested to grant this Request and initiate an *Ex Parte* Reexamination. Claims 1-25 should be reexamined and rejected under AIA 35 U.S.C. §§ 102 and 103 based on all the grounds discussed above.

DEPOSIT ACCOUNT:

The Commissioner is hereby authorized to charge any additional fees, or credit any overpayment, associated with the filing of this paper to Deposit Account No. 50-6191.

Dated: February 19, 2020

By: /Theodosios Thomas R45159/

Theodosios Thomas, Reg. No. 45,159

Customer No: 115007

APPENDIX A

US010191230B2

(12) **United States Patent**
Wong et al.

(10) **Patent No.: US 10,191,230 B2**
(45) **Date of Patent: Jan. 29, 2019**

(54) **OPTICAL CONNECTORS WITH REVERSIBLE POLARITY**

(71) Applicant: **SENKO Advanced Components, Inc.**, Marlborough, MA (US)

(72) Inventors: **Kimman Wong**, Hong Kong (HK); **Jeffrey Gniadek**, Northbridge, MA (US); **Kazuyoshi Takano**, Southborough, MA (US); **Siu Kei Ma**, Hong Kong (HK)

(73) Assignee: **Senko Advanced Components, Inc.**, Marlborough, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/884,327**

(22) Filed: **Jan. 30, 2018**

(65) **Prior Publication Data**

US 2018/0217340 A1 Aug. 2, 2018

Related U.S. Application Data

(60) Provisional application No. 62/581,961, filed on Nov. 6, 2017, provisional application No. 62/546,920, filed on Aug. 17, 2017, provisional application No. 62/485,042, filed on Apr. 13, 2017, provisional application No. 62/463,901, filed on Feb. 27, 2017, provisional application No. 62/463,898, filed on Feb. 27, 2017, provisional application No. 62/457,150,
(Continued)

(51) **Int. Cl.**
G02B 6/38 (2006.01)

(52) **U.S. Cl.**
CPC ***G02B 6/3893*** (2013.01); ***G02B 6/3821*** (2013.01)

(58) **Field of Classification Search**
CPC G02B 6/38; G02B 6/3821; G02B 6/3893
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,721,945 A 3/1973 Hults
4,327,964 A 5/1982 Haesly et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2495693 A1 4/2004
CN 2836038 Y 11/2006
(Continued)

OTHER PUBLICATIONS

EP Search Report and Opinion dated Mar. 2015 EP 14187661.
(Continued)

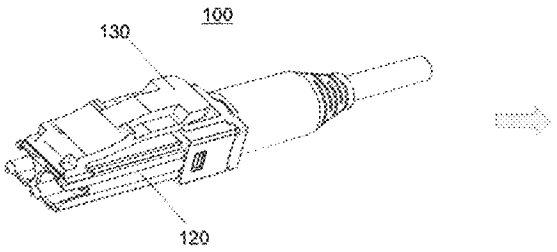
Primary Examiner — Andrew Jordan

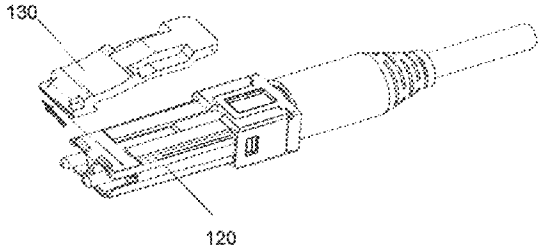
(74) *Attorney, Agent, or Firm* — Edward S. Jarmolowicz, Esq.

(57) **ABSTRACT**

Reversible polarity fiber optic connectors are provided having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules. Positioning removable elements such as latches, removable arms, or push-pull tabs on the first wall above the ferrules yields fiber optic connectors with a first polarity type, and positioning the removable elements on the second wall beneath the ferrules yields fiber optic connectors with a second, opposite polarity type. Various engagement mechanisms are provided on either the connector housing walls or on the removable elements, or both, to assist in affixing the removable element to the connector housing.

25 Claims, 22 Drawing Sheets





Related U.S. Application Data

filed on Feb. 9, 2017, provisional application No. 62/452,147, filed on Jan. 30, 2017.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,478,473	A *	10/1984	Frear	H01R 13/622 439/312
4,762,388	A	8/1988	Tanaka et al.	
4,764,129	A	8/1988	Jones et al.	
4,840,451	A	6/1989	Sampson et al.	
4,872,736	A	10/1989	Myers et al.	
4,979,792	A	12/1990	Weber et al.	
5,026,138	A *	6/1991	Boudreau	G02B 6/4202 385/51
5,041,025	A	8/1991	Haitmanek	
D323,143	S	1/1992	Ohkura et al.	
5,212,752	A	5/1993	Stephenson et al.	
5,265,181	A	11/1993	Chang	
5,289,554	A	2/1994	Cubukciyan et al.	
5,317,663	A	5/1994	Beard et al.	
5,335,301	A	8/1994	Newman et al.	
5,348,487	A	9/1994	Marazzi et al.	
5,444,806	A	8/1995	de Marchi et al.	
5,481,634	A	1/1996	Anderson et al.	
5,506,922	A	4/1996	Grois et al.	
5,521,997	A	5/1996	Rovenolt et al.	
5,570,445	A	10/1996	Chou et al.	
5,588,079	A	12/1996	Tanabe et al.	
5,684,903	A	11/1997	Kyomasu et al.	
5,687,268	A	11/1997	Stephenson et al.	
5,781,681	A	7/1998	Manning	
5,937,130	A	8/1999	Amberg et al.	
5,956,444	A	9/1999	Ouda et al.	
5,971,626	A	10/1999	Knodell et al.	
6,041,155	A	3/2000	Anderson et al.	
6,049,040	A	4/2000	Biles et al.	
6,134,370	A	10/2000	Childers et al.	
6,178,283	B1	1/2001	Weigel	
RE37,080	E	3/2001	Stephenson et al.	
6,206,577	B1	3/2001	Hall	
6,206,581	B1	3/2001	Driscoll et al.	
6,227,717	B1	5/2001	Ott et al.	
6,238,104	B1	5/2001	Yamakawa et al.	
6,247,849	B1	6/2001	Liu	
6,364,537	B1 *	4/2002	Maynard	G02B 6/3831 385/55
6,379,052	B1 *	4/2002	de Jong	G02B 6/3806 385/59
6,461,054	B1	10/2002	Iwase	
6,471,412	B1	10/2002	Belenkiy et al.	
6,478,472	B1	11/2002	Anderson et al.	
6,485,194	B1 *	11/2002	Shirakawa	G02B 6/381 385/78
6,530,696	B1	3/2003	Ueda	
6,551,117	B2	4/2003	Poplawski et al.	
6,579,014	B2	6/2003	Metlon et al.	
6,623,172	B1 *	9/2003	de Jong	G02B 6/3806 385/59
6,634,796	B2 *	10/2003	de Jong	G02B 6/3831 385/139
6,634,801	B1	10/2003	Waldron	
6,648,520	B2	11/2003	McDonald et al.	
6,682,228	B2	1/2004	Rathnam et al.	
6,695,486	B1	2/2004	Falkenberg et al.	
6,854,894	B1	2/2005	Yunker et al.	
6,865,362	B2	3/2005	Otsuka et al.	
6,869,227	B2 *	3/2005	Del Grosso	G02B 6/4471 385/71
6,872,039	B2	3/2005	Baus et al.	
6,935,789	B2	8/2005	Gross, III et al.	
7,036,993	B2	5/2006	Luther	
7,077,576	B2	7/2006	Luther	
7,090,406	B2	8/2006	Melton et al.	
7,090,407	B2	8/2006	Melton et al.	
7,091,421	B2	8/2006	Kukita et al.	
7,111,990	B2	9/2006	Melton et al.	
7,113,679	B2	9/2006	Melton et al.	
D533,504	S	12/2006	Lee	
D534,124	S	12/2006	Taguchi	
7,150,587	B2	12/2006	Luther et al.	
7,153,041	B2	12/2006	Mine et al.	
7,198,409	B2	4/2007	Smith et al.	
7,207,724	B2	4/2007	Gurreri	
D543,146	S	5/2007	Chen et al.	
7,258,493	B2	8/2007	Milette	
7,264,402	B2	9/2007	Theuerkorn	
7,281,859	B2	10/2007	Mudd	
D558,675	S	1/2008	Chein et al.	
7,315,682	B1	1/2008	En Lin et al.	
7,325,976	B2	2/2008	Gurreri et al.	
7,325,980	B2	2/2008	Pepe	
7,329,137	B2	2/2008	Martin et al.	
7,331,718	B2	2/2008	Yazaki et al.	
7,354,291	B2	4/2008	Caveney et al.	
7,371,082	B2	5/2008	Zimmel et al.	
7,387,447	B2	6/2008	Mudd	
7,390,203	B2	6/2008	Murano	
D572,661	S	7/2008	En Lin et al.	
7,431,604	B2	10/2008	Waters et al.	
7,463,903	B2	12/2008	Cody	
7,465,180	B2	12/2008	Kusuda et al.	
7,510,335	B1	3/2009	Su et al.	
7,513,695	B1	4/2009	Lin et al.	
7,540,666	B2	6/2009	Luther	
7,581,775	B2	7/2009	Lin et al.	
7,591,595	B2	9/2009	Lu et al.	
7,594,766	B1	9/2009	Sasser	
7,641,398	B2	1/2010	O'Riorden et al.	
7,695,199	B2	4/2010	Teo et al.	
7,699,533	B2	4/2010	Milette	
7,785,019	B2	8/2010	Lewallen	
7,824,113	B2	11/2010	Wong et al.	
7,867,395	B2	1/2011	Ekholm et al.	
D641,709	S	7/2011	Yamauchi	
8,152,385	B2 *	4/2012	de Jong	G02B 6/3879 385/53
8,186,890	B2	5/2012	Lu	
8,192,091	B2	6/2012	Hsu et al.	
8,202,009	B2	6/2012	Lin et al.	
8,251,733	B2	8/2012	Wu	
8,267,595	B2	9/2012	Lin et al.	
8,270,796	B2	9/2012	Nhep	
8,408,815	B2	4/2013	Lin et al.	
8,465,317	B2	6/2013	Gniadek et al.	
8,534,928	B2	9/2013	Cooke	
8,622,634	B2	1/2014	Arnold	
8,636,424	B2	1/2014	Kuffel et al.	
8,651,749	B2	2/2014	Dainese Junior et al.	
8,676,022	B2 *	3/2014	Jones	G02B 6/3849 385/139
8,678,670	B2	3/2014	takahashi	
8,727,638	B2	5/2014	Lee	
8,770,863	B2	7/2014	Cooke et al.	
9,310,569	B2 *	4/2016	Lee	G02B 6/3825
9,366,829	B2	6/2016	Czosnowski	
9,465,172	B2 *	10/2016	Shih	G02B 6/3879
9,557,495	B2 *	1/2017	Raven	G02B 6/3879
9,658,409	B2	5/2017	Gniadek	
9,709,753	B1	7/2017	Chang	
9,778,425	B2	10/2017	Nguyen	
9,798,084	B2	10/2017	Kuffel	
9,829,645	B2 *	11/2017	Good	G02B 6/3883
9,880,361	B2 *	1/2018	Childers	G02B 6/3831
9,946,035	B2 *	4/2018	Gustafson	G02B 6/3821
10,031,296	B2 *	7/2018	Good	G02B 6/3831
2001/0026661	A1 *	10/2001	de Jong	G02B 6/3831 385/56
2002/0191919	A1	12/2002	Nolan	
2003/0053787	A1	3/2003	Lee	
2004/0052473	A1	3/2004	Seo et al.	
2004/0136657	A1	7/2004	Ngo	
2004/0141693	A1	7/2004	Szilagyi et al.	
2004/0161958	A1	8/2004	Togami et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2004/0184741	A1*	9/2004	Del Grosso	G02B 6/3851 385/71
2004/0234209	A1	11/2004	Cox et al.	
2005/0111796	A1	5/2005	Matasek et al.	
2005/0141817	A1	6/2005	Yazaki et al.	
2005/0207709	A1*	9/2005	Del Grosso	G02B 6/4472 385/71
2006/0089049	A1	4/2006	Sedor	
2006/0127025	A1	6/2006	Haberman	
2006/0269194	A1	11/2006	Luther et al.	
2006/0274411	A1	12/2006	Yamauchi	
2007/0025665	A1	2/2007	Dean	
2007/0079854	A1	4/2007	You	
2007/0098329	A1	5/2007	Shimoji et al.	
2007/0149062	A1	6/2007	Long	
2007/0028409	A1	8/2007	Yamada	
2007/0230874	A1	10/2007	Lin	
2007/0232115	A1	10/2007	Burke et al.	
2007/0243749	A1	10/2007	Wu	
2008/0008430	A1	1/2008	Kewitsch	
2008/0044137	A1	2/2008	Luther et al.	
2008/0069501	A1	3/2008	Mudd et al.	
2008/0101757	A1	5/2008	Lin et al.	
2008/0226237	A1	9/2008	O'Riorden et al.	
2008/0267566	A1	10/2008	Lin et al.	
2009/0022457	A1	1/2009	De Jong et al.	
2009/0028507	A1	1/2009	Jones et al.	
2009/0196555	A1	8/2009	Lin et al.	
2009/0214162	A1	8/2009	O'Riorden et al.	
2009/0220197	A1	9/2009	Gniadek	
2010/0034502	A1	2/2010	Lu et al.	
2010/0092136	A1	4/2010	Nhep	
2010/0220961	A1*	9/2010	de Jong	G02B 6/3879 385/77
2010/0247041	A1	9/2010	Szilagyi	
2010/0322561	A1	12/2010	Lin et al.	
2011/0044588	A1	2/2011	Larson et al.	
2011/0131801	A1	6/2011	Nelson et al.	
2011/0177710	A1	7/2011	Tobey	
2012/0099822	A1	4/2012	Kuffel et al.	
2012/0189260	A1	7/2012	Kowalczyk et al.	
2012/0269485	A1	10/2012	Haley et al.	
2012/0301080	A1	11/2012	Gniadek	
2013/0071067	A1	3/2013	Lin	
2013/0089995	A1	4/2013	Gniadek et al.	
2013/0094816	A1	4/2013	Lin et al.	
2013/0121653	A1	5/2013	Shitama et al.	
2013/0170797	A1	7/2013	Ott	
2013/0183012	A1	7/2013	Cabanne Lopez et al.	
2013/0216185	A1	8/2013	Klavuhn et al.	
2013/0259429	A1	10/2013	Czosnowski et al.	
2013/0272671	A1*	10/2013	Jones	G02B 6/3831 385/139
2013/0308915	A1*	11/2013	Buff	G02B 6/4452 385/135
2013/0308916	A1*	11/2013	Buff	G02B 6/4452 385/135
2013/0322825	A1	12/2013	Cooke et al.	
2014/0016901	A1	1/2014	Lambourn et al.	
2014/0050446	A1	2/2014	Chang	
2014/0133808	A1	5/2014	Hill et al.	
2014/0334780	A1	11/2014	Nguyen et al.	
2014/0348477	A1	11/2014	Chang	
2015/0212282	A1*	7/2015	Lin	G02B 6/3893 385/76
2015/0241644	A1*	8/2015	Lee	G02B 6/3825 385/76
2015/0277059	A1*	10/2015	Raven	G02B 6/3879 385/78
2013/0378113		12/2015	Good et al.	
2015/0378113	A1	12/2015	Good et al.	
2016/0116685	A1*	4/2016	Wong	G02B 6/3825 385/56
2016/0216458	A1*	7/2016	Shih	G02B 6/3871
2016/0259135	A1	9/2016	Gniadek	
2017/0023746	A1*	1/2017	Good	G02B 6/3831
2017/0176691	A1*	6/2017	Childers	G02B 6/3831
2017/0254966	A1	9/2017	Gniadek	
2017/0293088	A1*	10/2017	Manes	G02B 6/3825
2017/0293089	A1*	10/2017	Gustafson	G02B 6/3821
2017/0293090	A1*	10/2017	Hopper	G02B 6/3821
2018/0128987	A1*	5/2018	Good	G02B 6/3883
2018/0156988	A1*	6/2018	Gniadek	G02B 6/387
2018/0156999	A1*	6/2018	Buff	G02B 6/4452
2018/0164511	A1*	6/2018	Childers	G02B 6/3831
2018/0172923	A1*	6/2018	Bauco	G02B 6/3873
2018/0172924	A1*	6/2018	Bauco	G02B 6/3873
2018/0172942	A1*	6/2018	Bauco	G02B 6/3873
2018/0217339	A1*	8/2018	Ma	G02B 6/3893
2018/0217340	A1*	8/2018	Wong	G02B 6/3893

FOREIGN PATENT DOCUMENTS

CN	201383588	Y	1/2010
CN	2026500189	U	12/2013
DE	202006011910	U1	3/2007
DE	102006019335	A1	10/2007
EP	1211537	A2	6/2002
EP	1245980	A2	10/2002
EP	1566674	A1	8/2005
GB	2111240	A	6/1983
JP	2008229545	A	10/2009
JP	2009276493	A	11/2009
TW	200821653	A	5/2008
WO	2001/79904	A2	10/2001
WO	2004/027485	A1	4/2004
WO	2008/112986	A1	9/2008
WO	2009/135787	A1	11/2009
WO	2010-024851	A2	3/2010
WO	2012/136702	A1	10/2012
WO	2012/162385	A1	11/2012
WO	2013/052070	A1	4/2013
WO	2014/028527	A2	2/2014
WO	2014/182351	A2	11/2014

OTHER PUBLICATIONS

EP Search Report and Opinion dated Feb. 2015 EP 14168005.
Fiber Optic Connectors and Assemblies Catalog 2009 Huber &Suhner.
Fiber Optic Interconnect Solutions Tactical Fiber Optic Connectors, Cables and Termini Glenair, 2006.
Fiber Optic Products Catalog Nov. 2007 Tyco Electronics.
ISR and Opinion dated Apr. 2012, PCT/US2012/058799.
ISR and Opinion dated Aug. 2012, PCT/US2012/039126.
ISR and Opinion dated Jan. 2016, PCT/US2013/54784.
ISR and Opinion dated Aug. 2014, PCT/US2014/041500.
ISR and Opinion dated May 2014, PCT/US2014/012137.
ISR and Opinion dated Aug. 2008, PCT/US2008/057023.
International Preliminary Report on Patentability dated Sep. 2017 from US2015/059458, dated Nov. 6, 2015.
ISR and Opinion dated Apr. 13, 2018 PCT/US2018/016049.
ISR and Opinion dated Feb. 2017, PCT/US2017/13286.
ISR and Opinion dated Aug. 2017, PCT/US2017/40178.
AFOP to introduce LC Slimpac(TM) Uniboot Connectors as high density connector solutions Aug. 26, 2014.

* cited by examiner

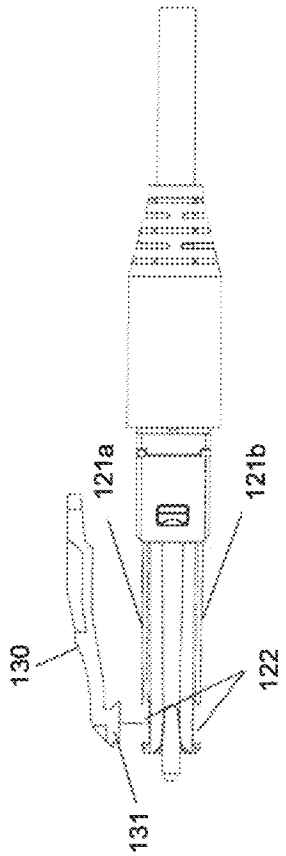


FIG. 1B

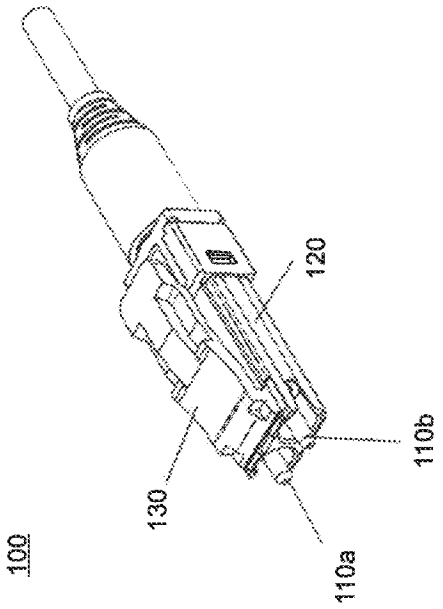


FIG. 1A

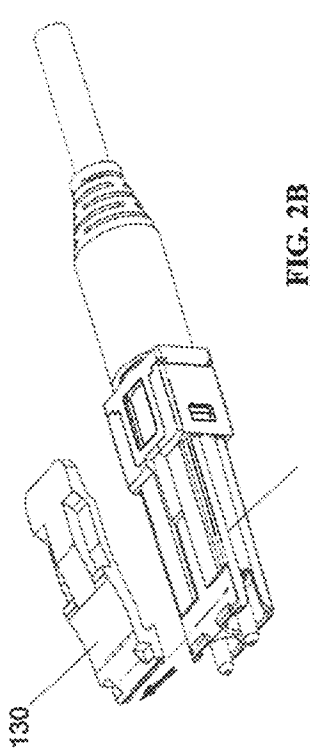


FIG. 2B

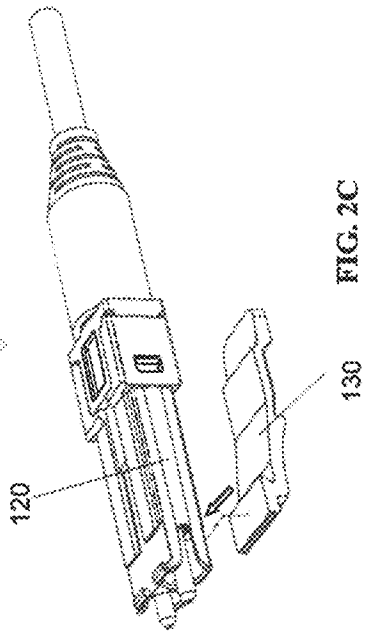


FIG. 2C

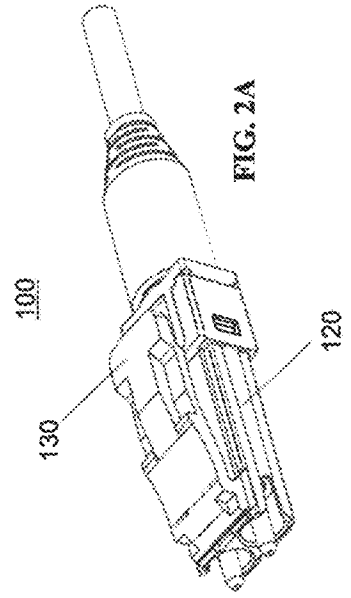


FIG. 2A

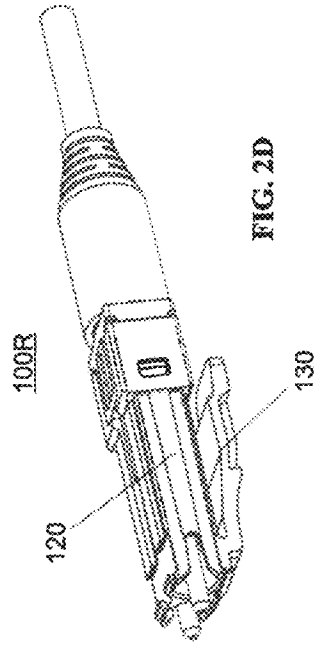


FIG. 2D

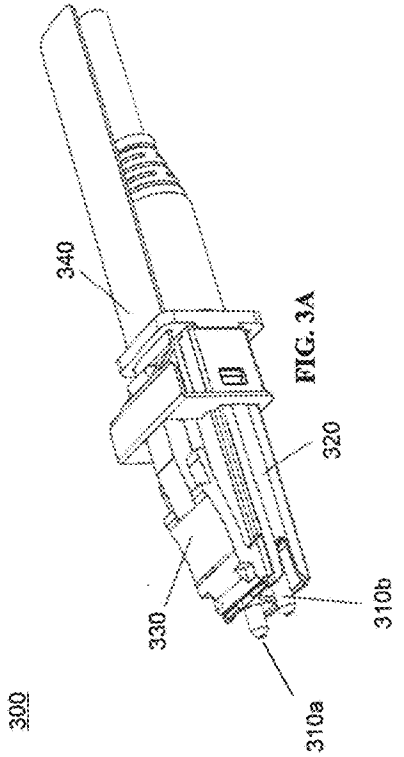


FIG. 3A

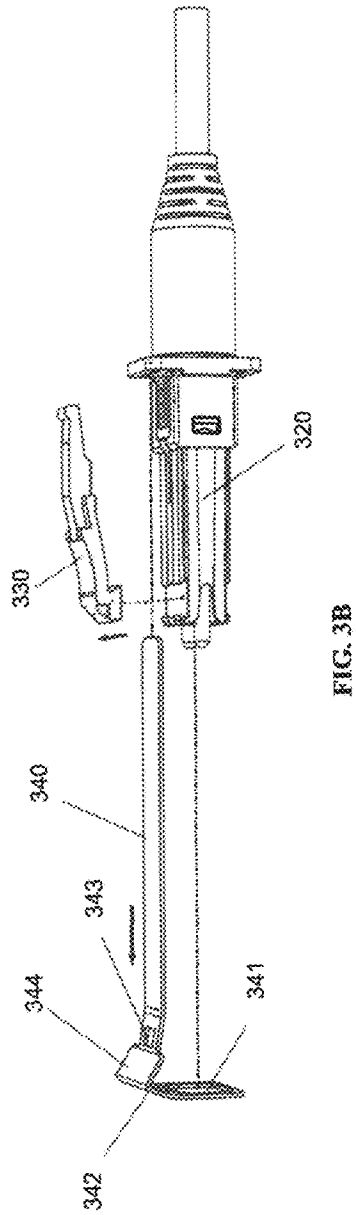


FIG. 3B

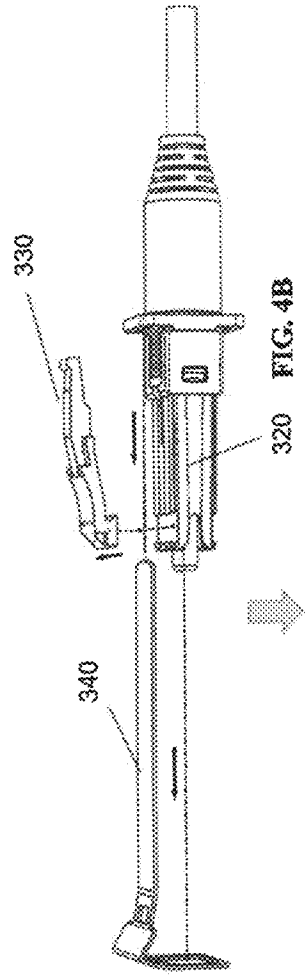


FIG. 4B

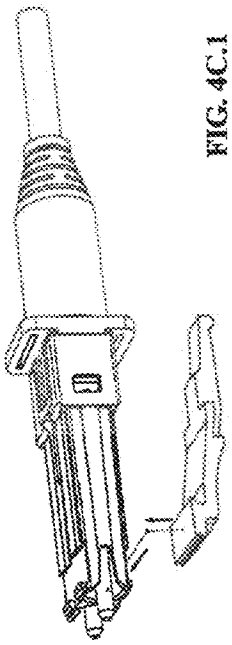


FIG. 4C.1

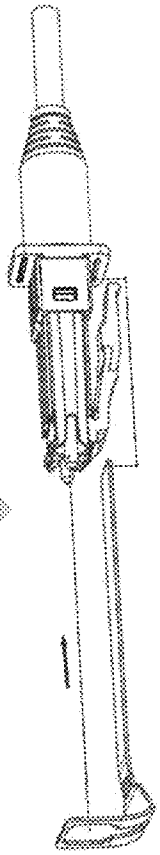


FIG. 4C.2

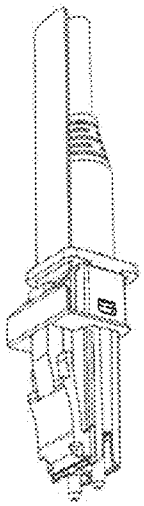


FIG. 4A

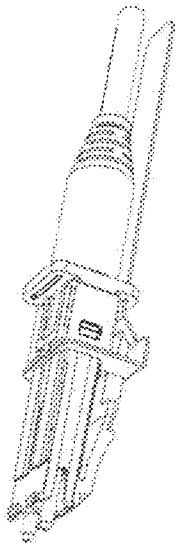


FIG. 4D

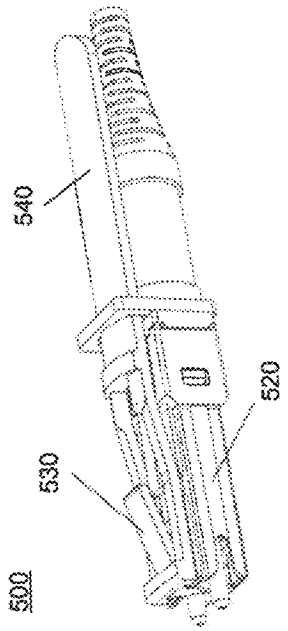


FIG. 5A

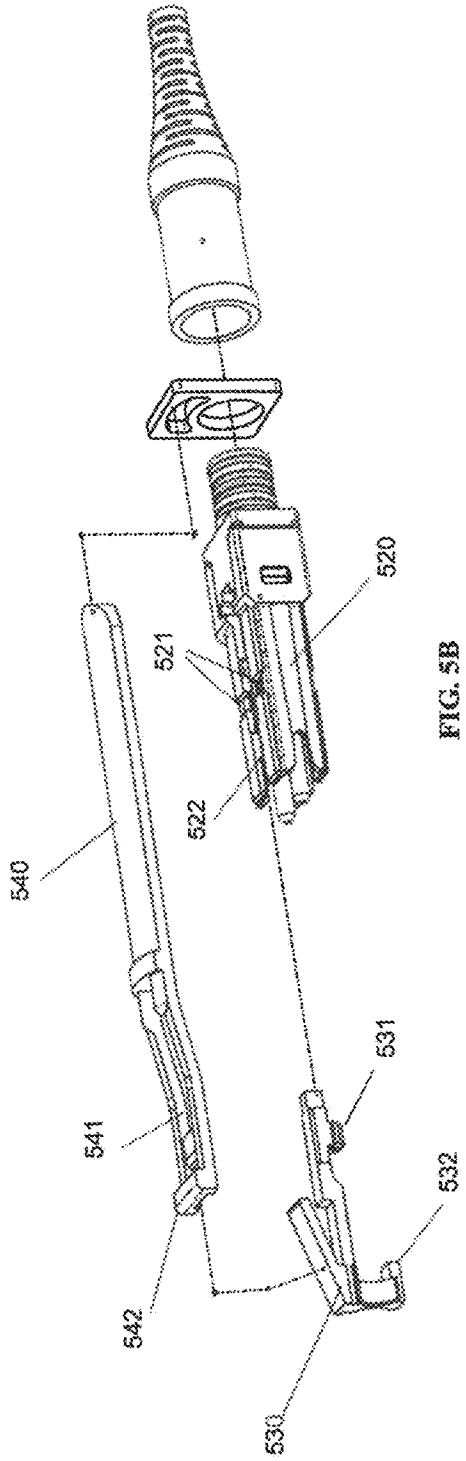


FIG. 5B

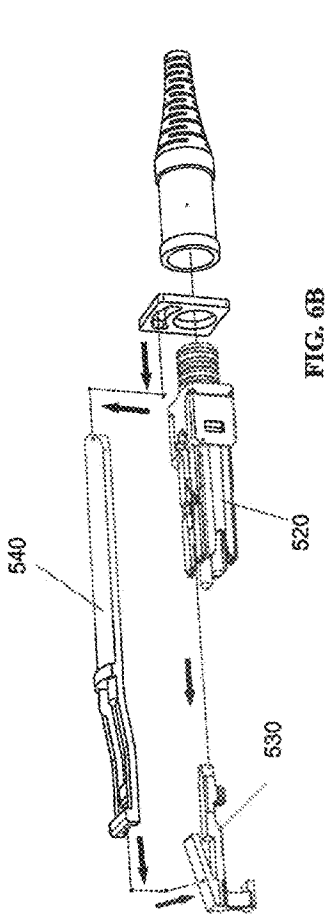


FIG. 6B

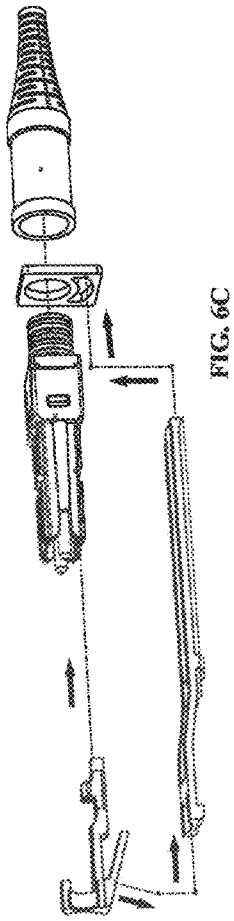


FIG. 6C

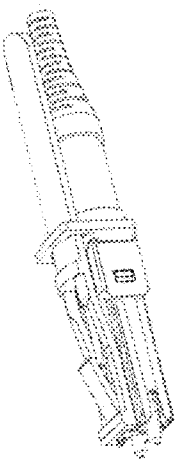


FIG. 6A

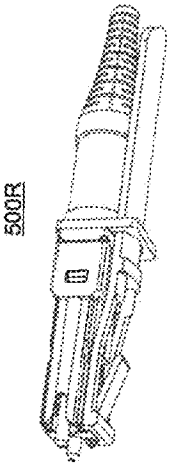


FIG. 6D

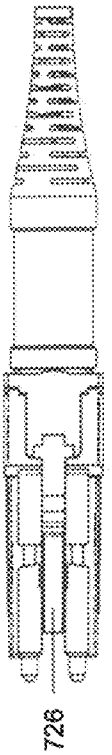


FIG. 7C

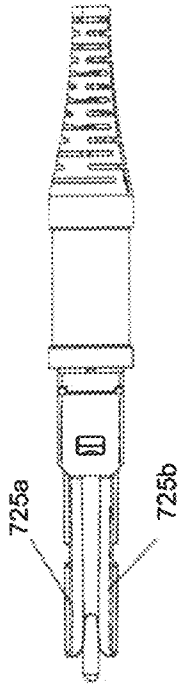


FIG. 7D

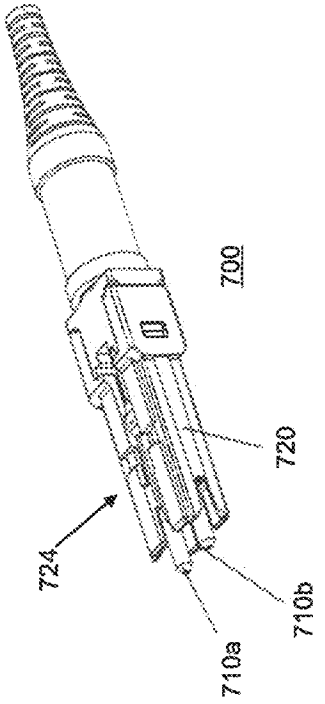


FIG. 7A

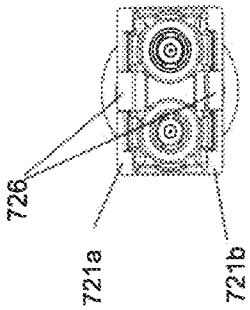


FIG. 7B

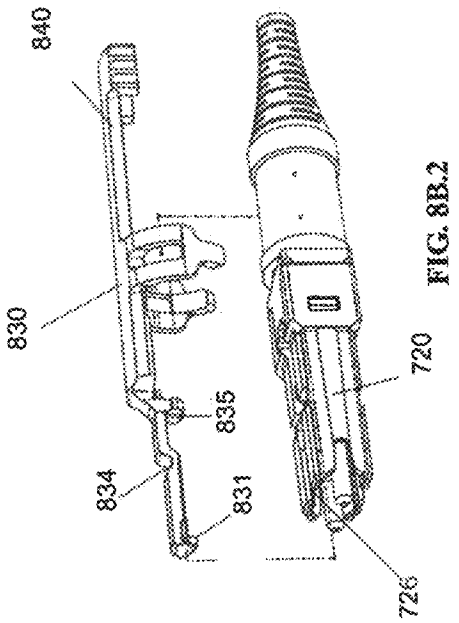


FIG. 8B.2

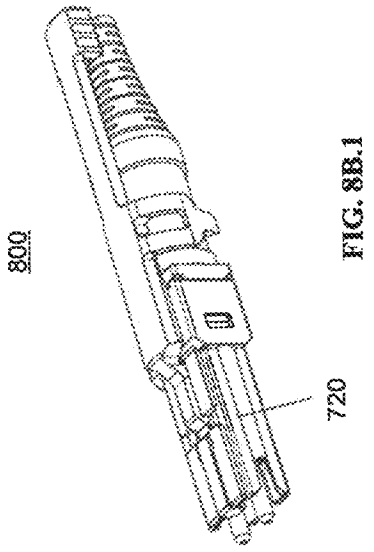


FIG. 8B.1

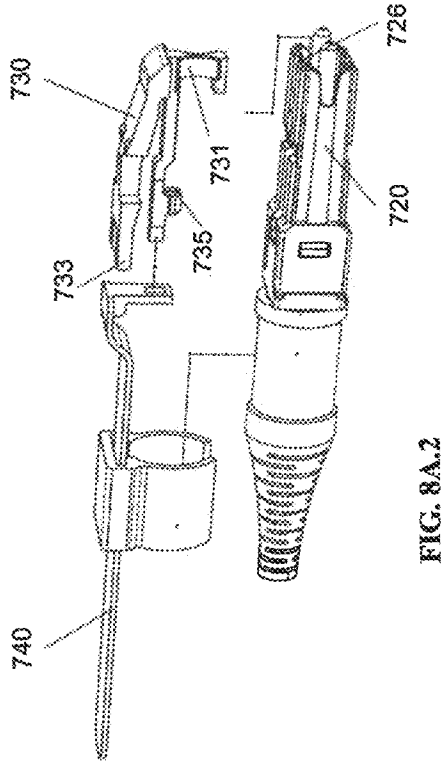


FIG. 8A.2

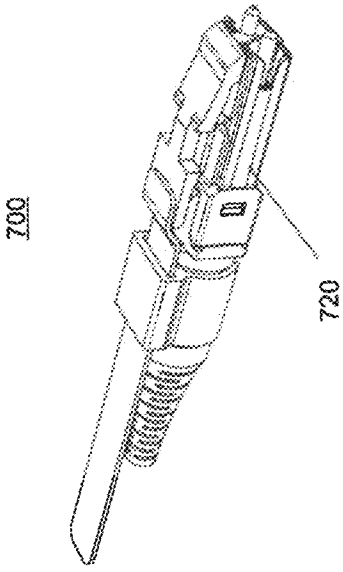


FIG. 8A.1

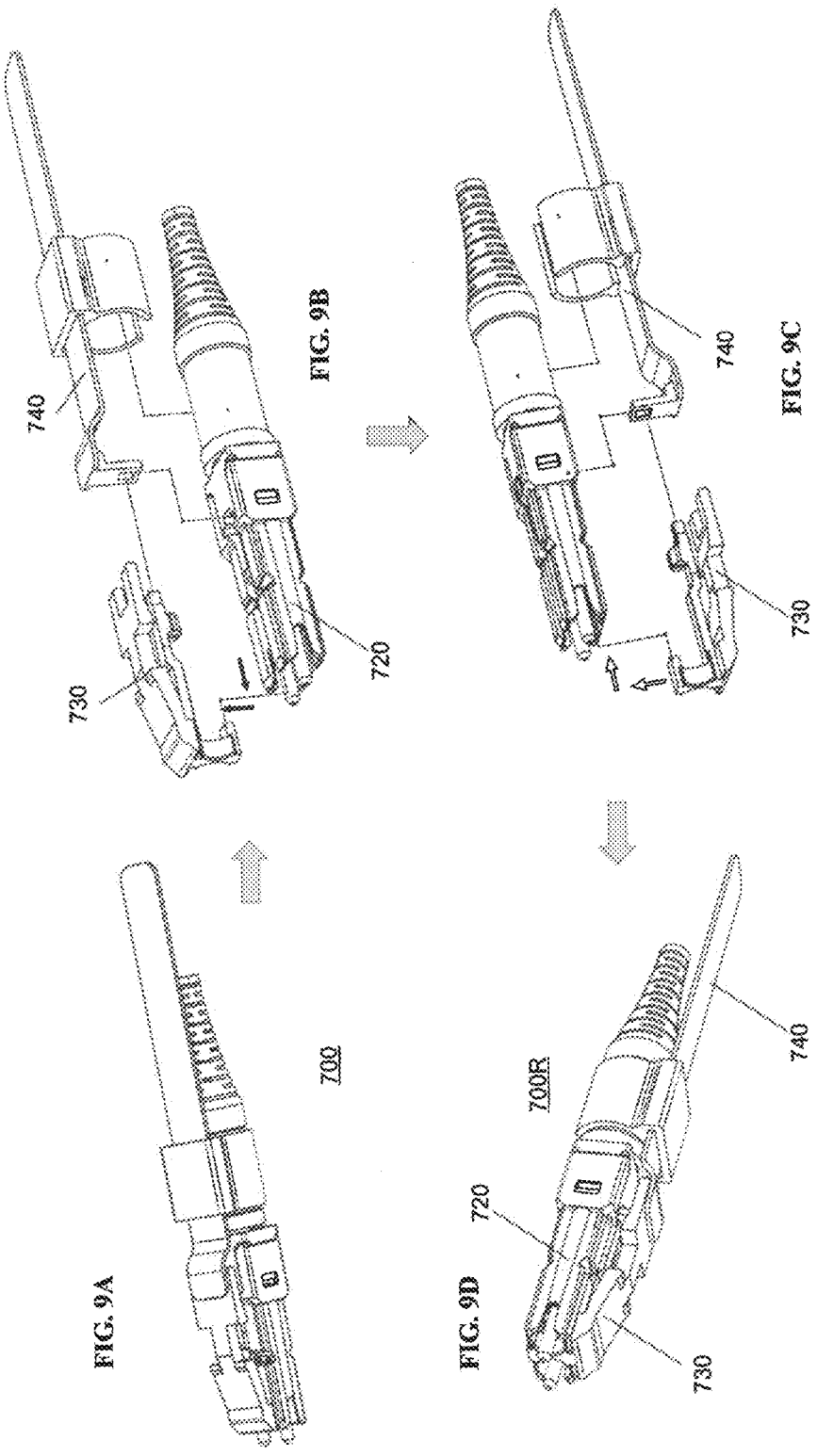


FIG. 9A

FIG. 9B

FIG. 9C

FIG. 9D

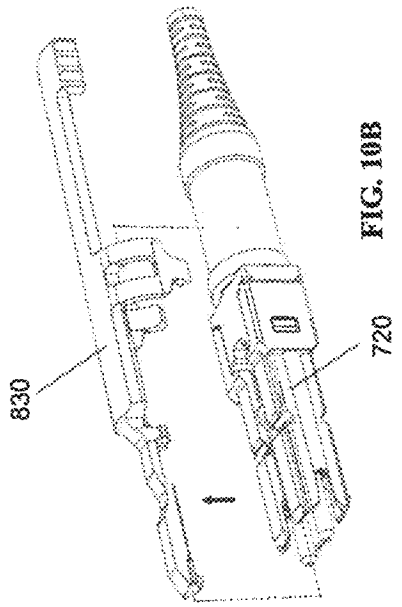


FIG. 10B

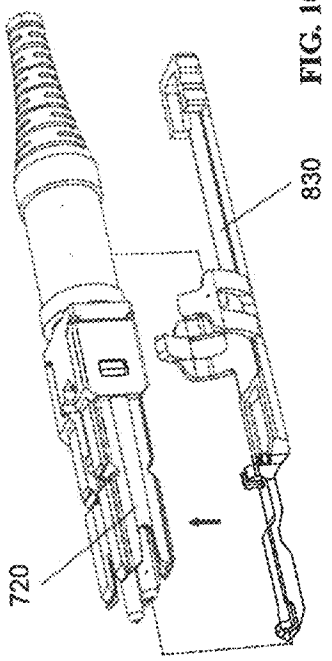


FIG. 10C

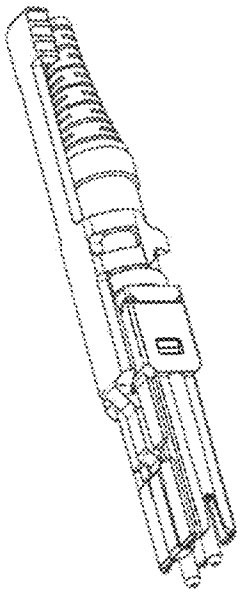


FIG. 10A

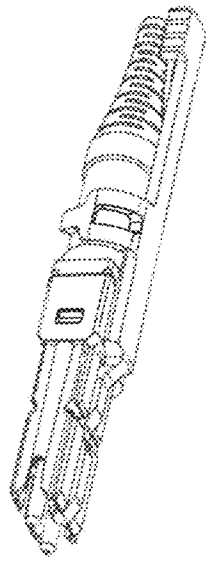


FIG. 10D

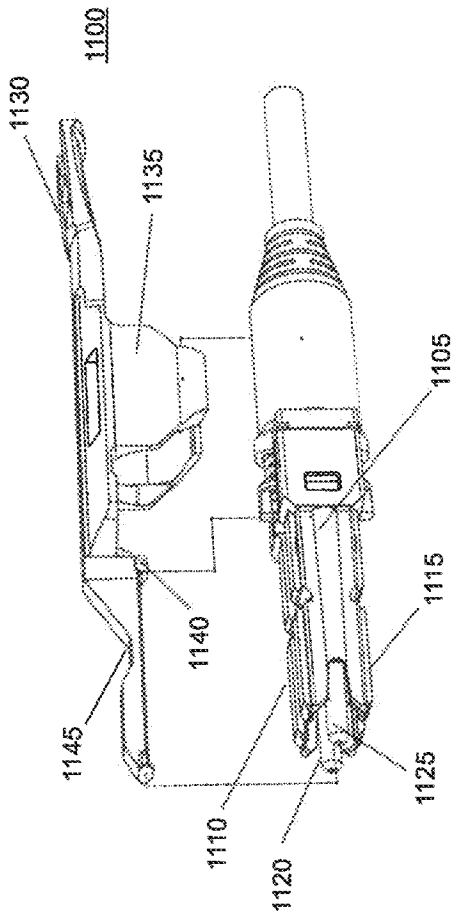


FIG. 11A

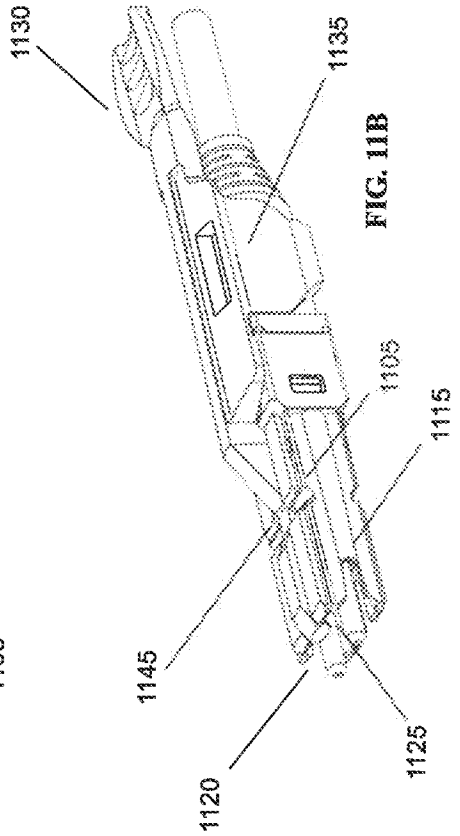


FIG. 11B

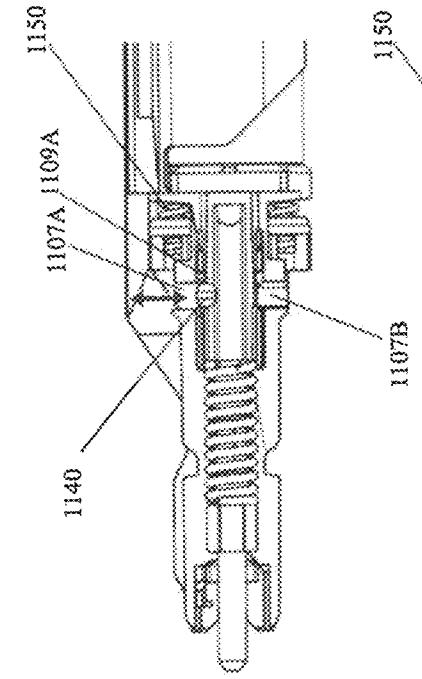


FIG. 12B

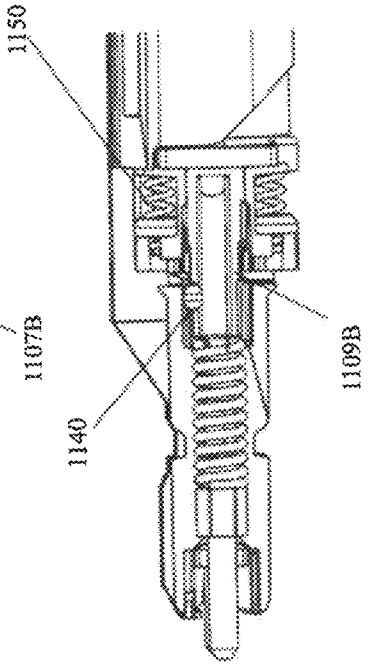


FIG. 12D

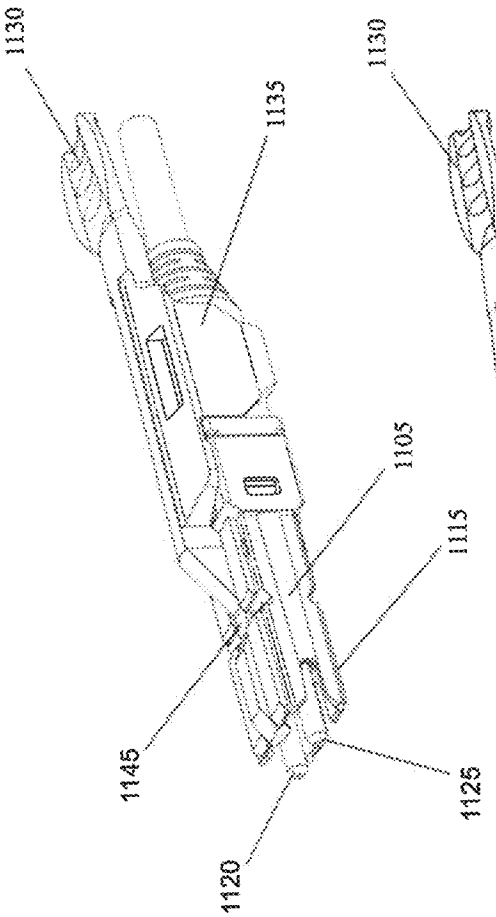


FIG. 12A

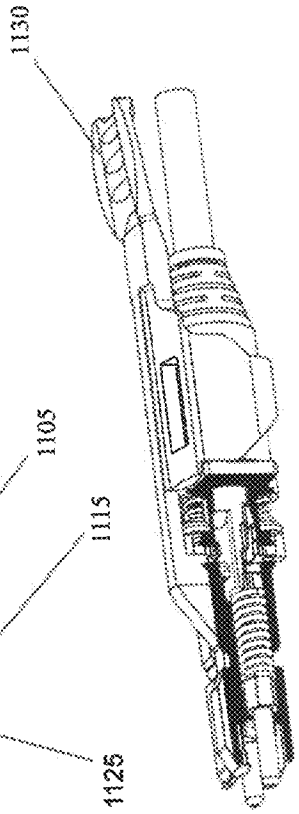


FIG. 12C

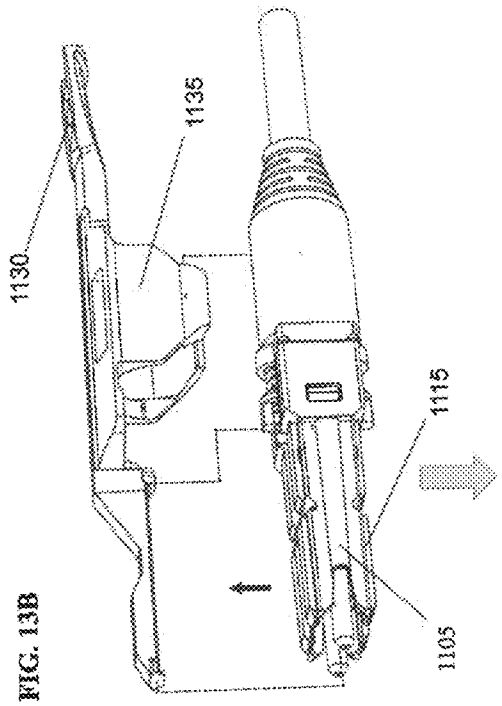


FIG. 13B

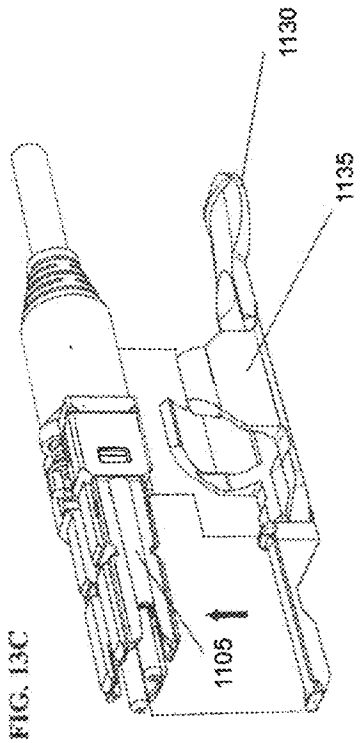


FIG. 13C

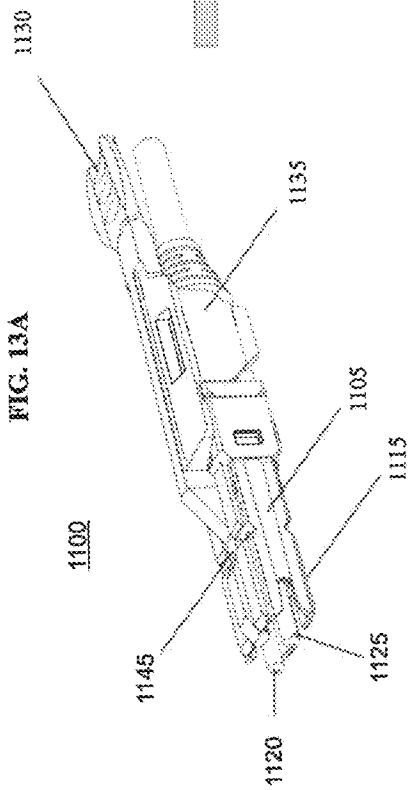


FIG. 13A

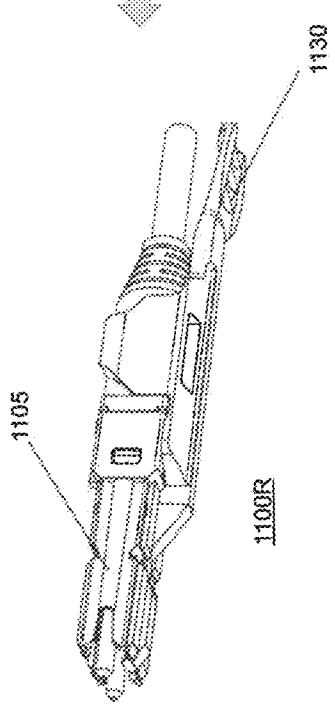


FIG. 13D

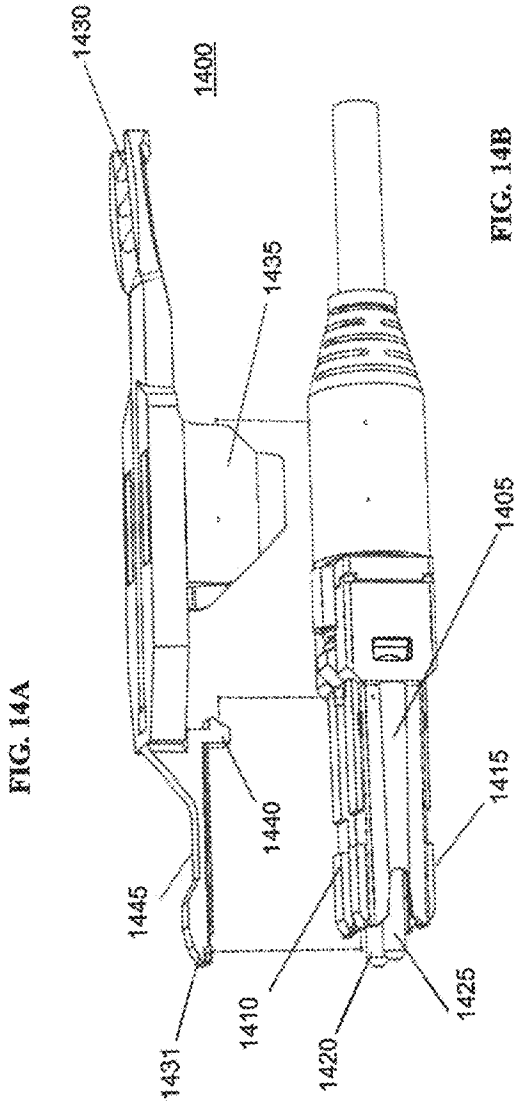


FIG. 14A

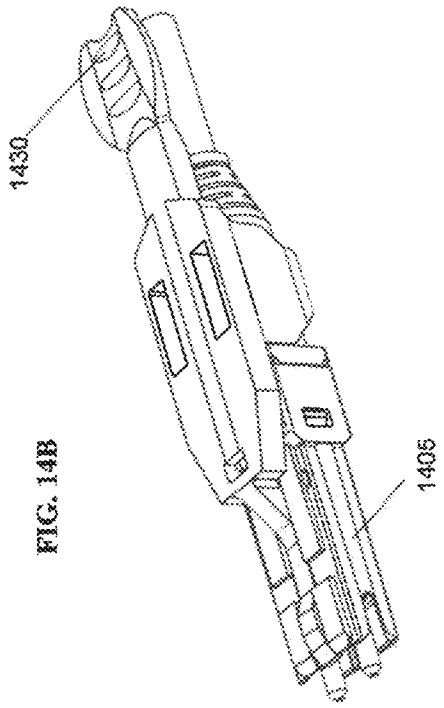


FIG. 14B

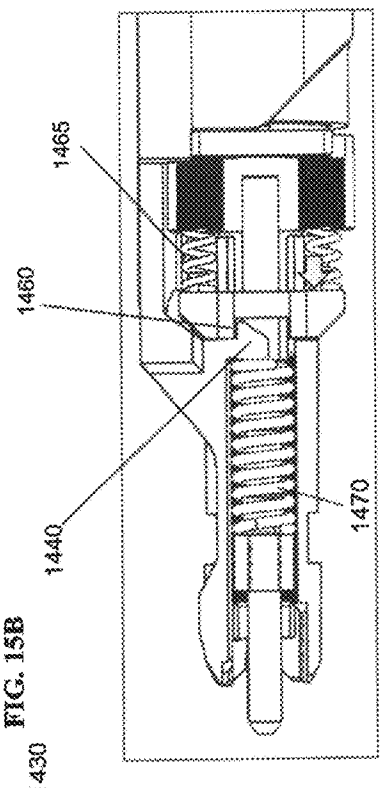


FIG. 15B

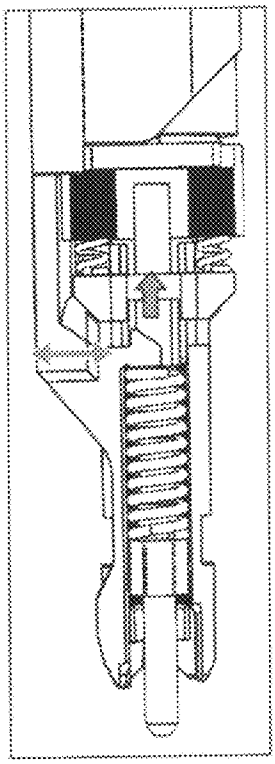


FIG. 15D

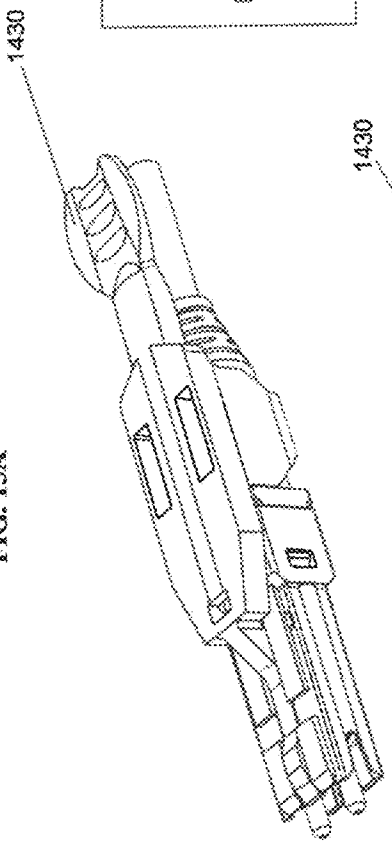


FIG. 15A

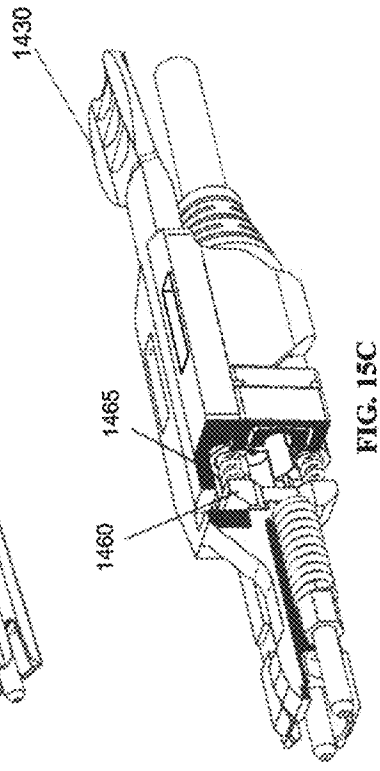


FIG. 15C

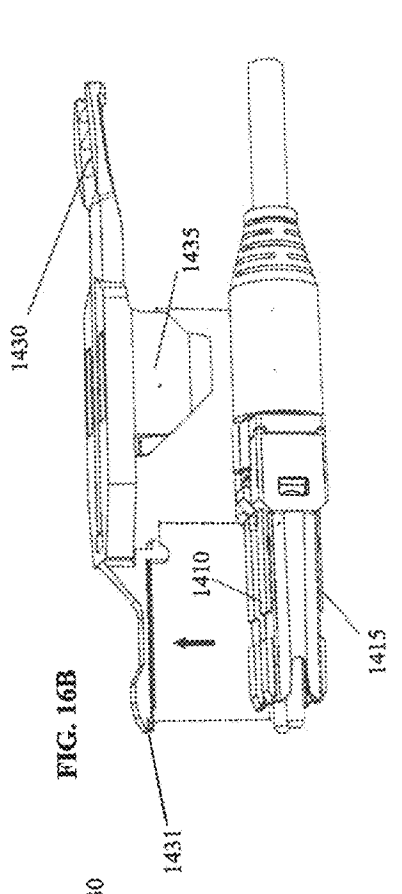


FIG. 16B

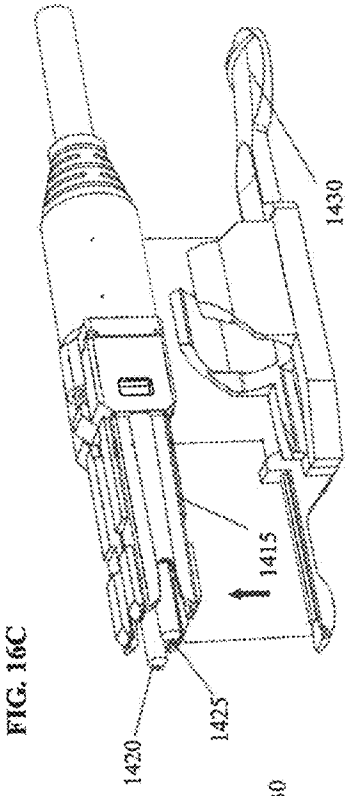


FIG. 16C

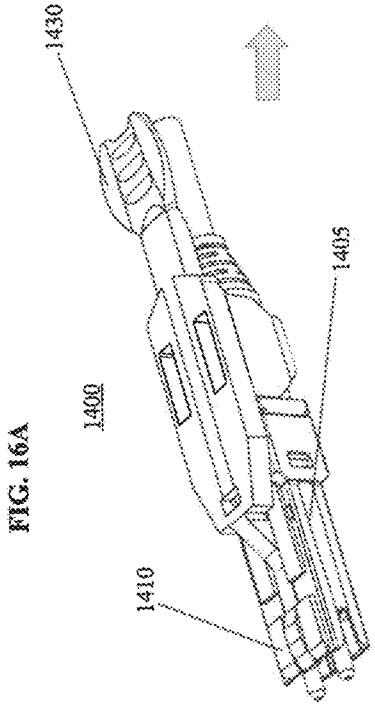


FIG. 16A

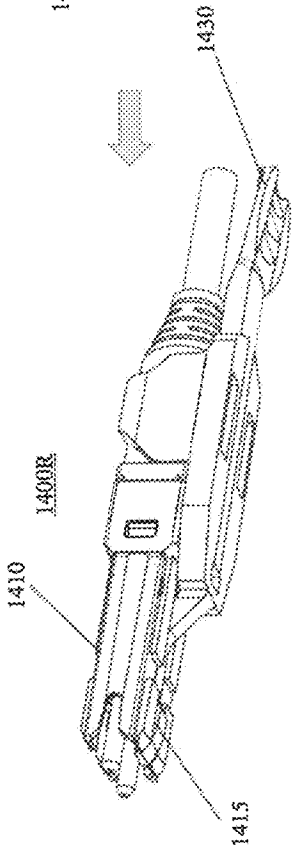


FIG. 16D

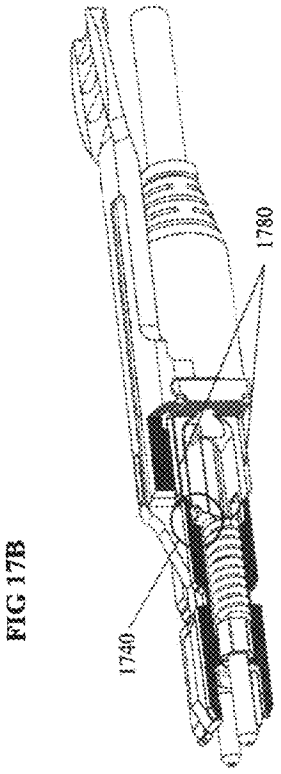


FIG 17B

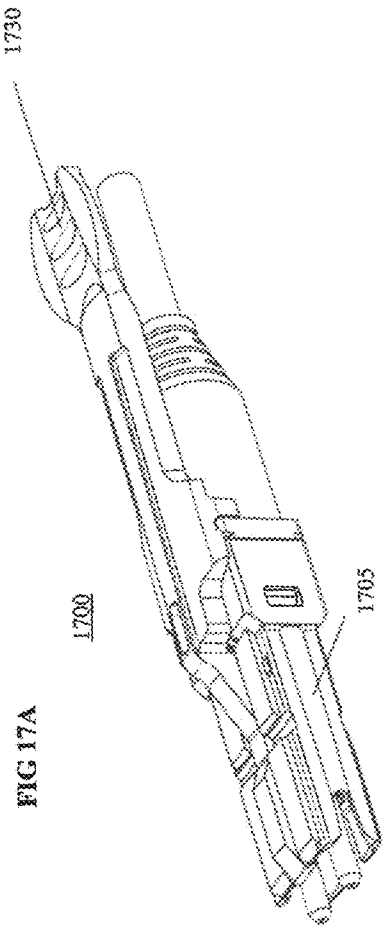


FIG 17A

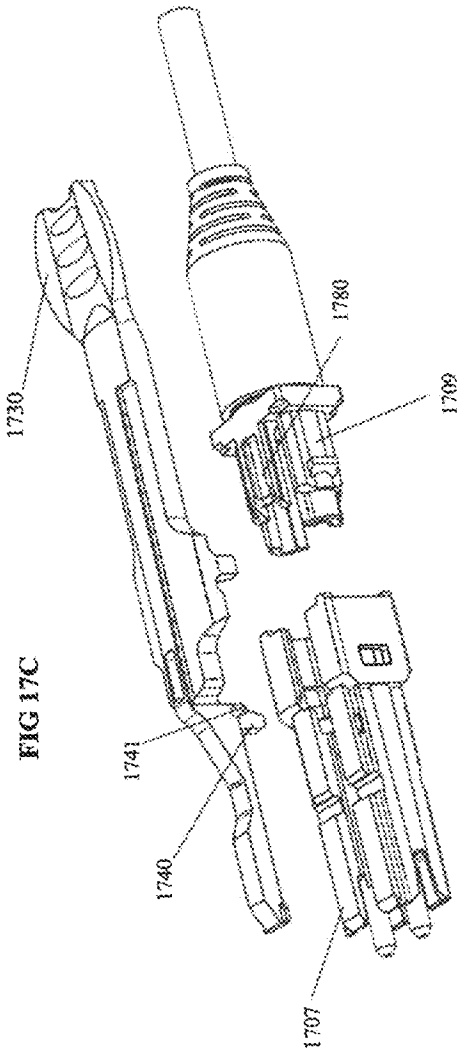


FIG 17C

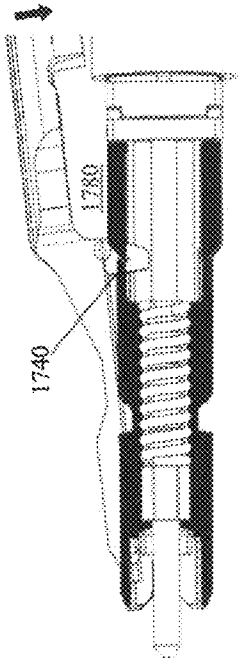


FIG 18B

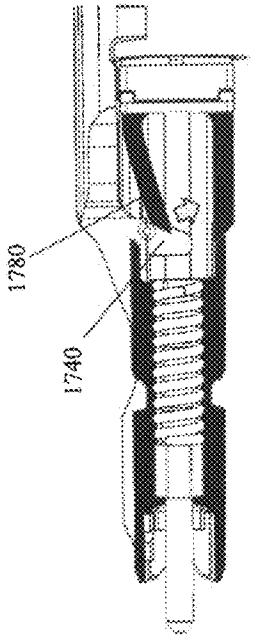


FIG. 18C

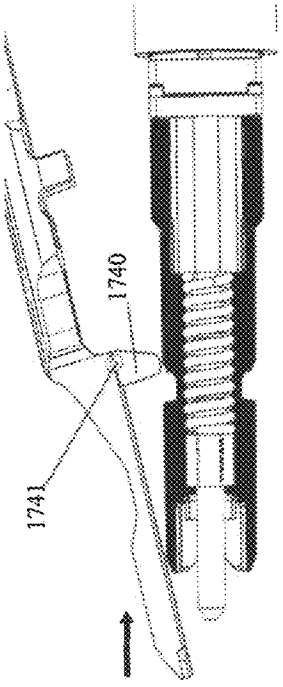


FIG. 18A

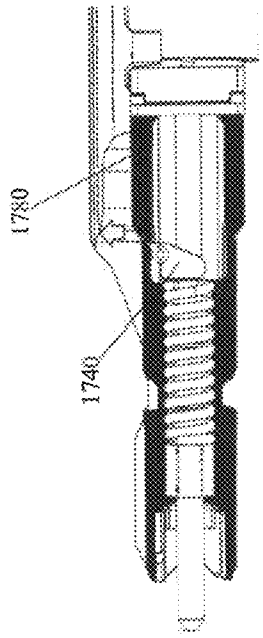


FIG. 18D

FIG. 19A

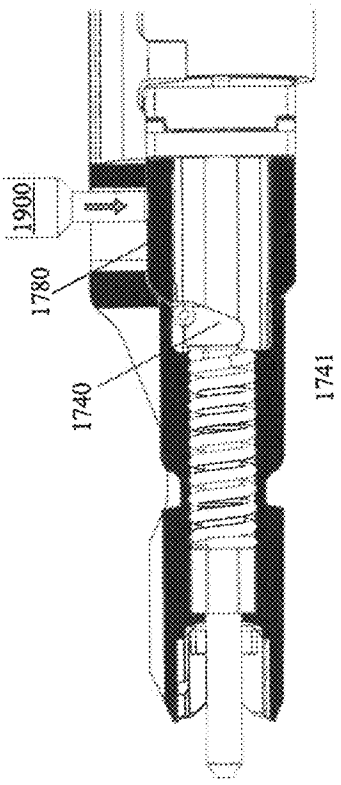
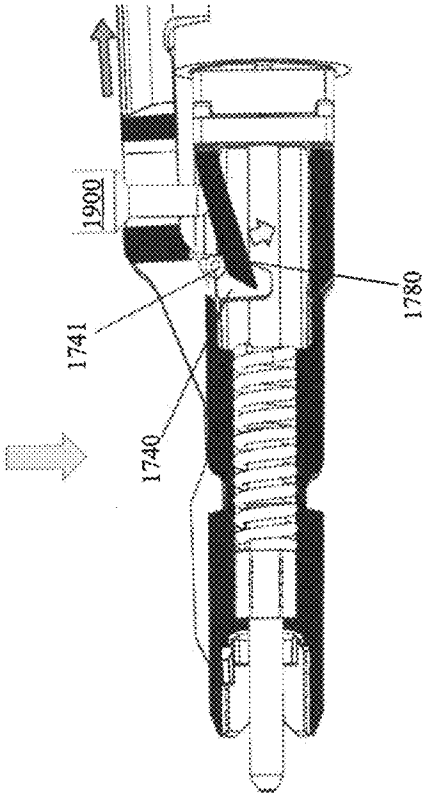


FIG. 19B



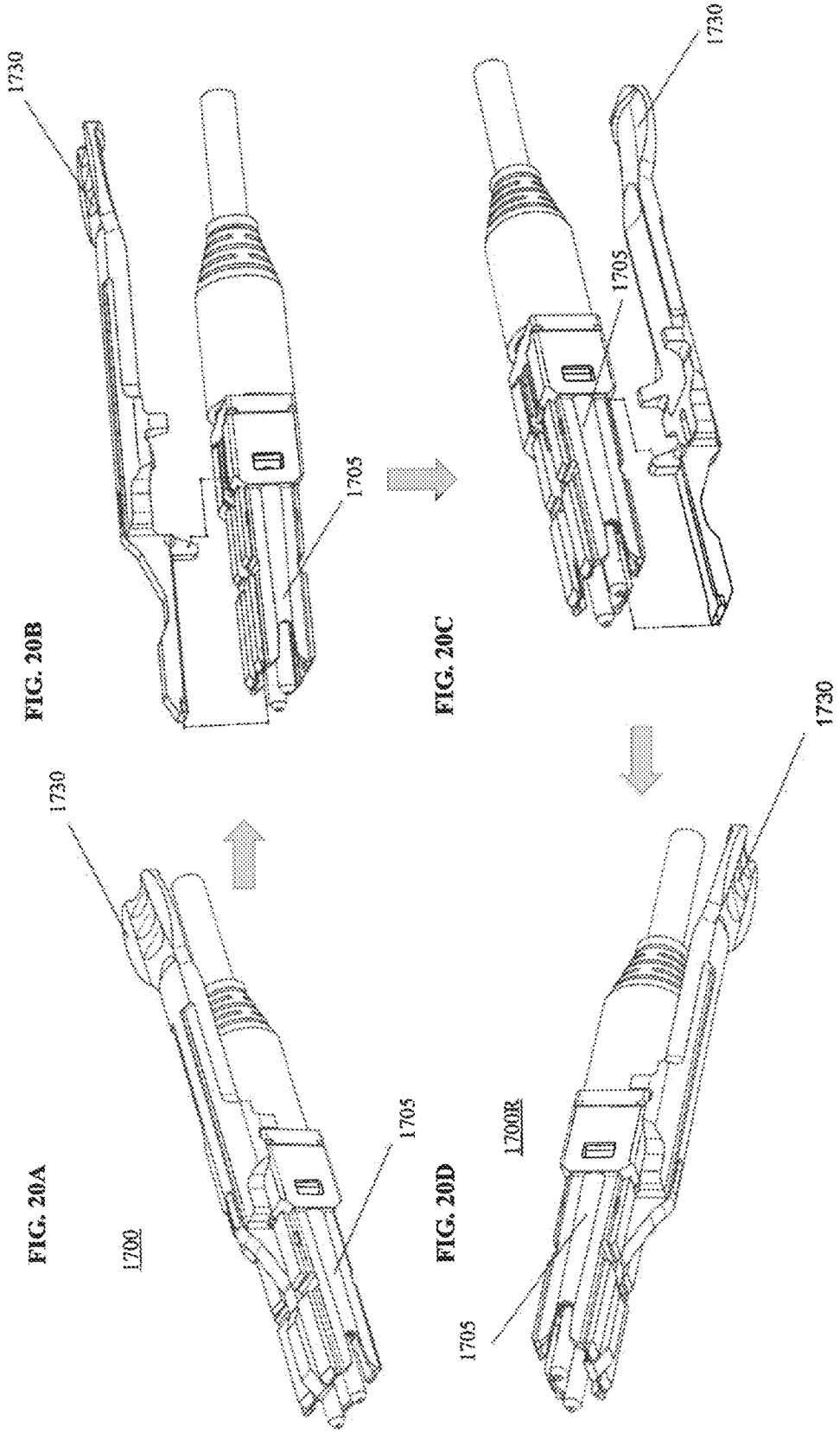


FIG. 20B

FIG. 20C

FIG. 20A

FIG. 20D

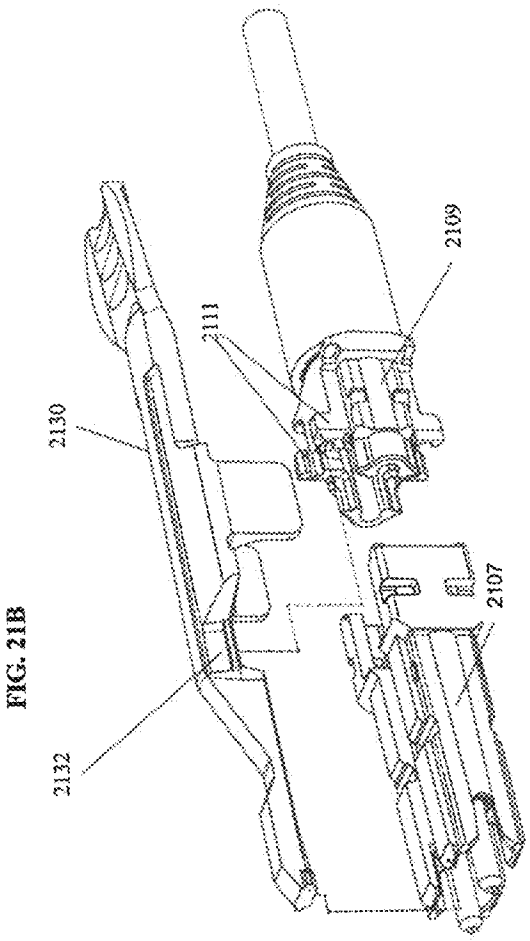


FIG. 21B

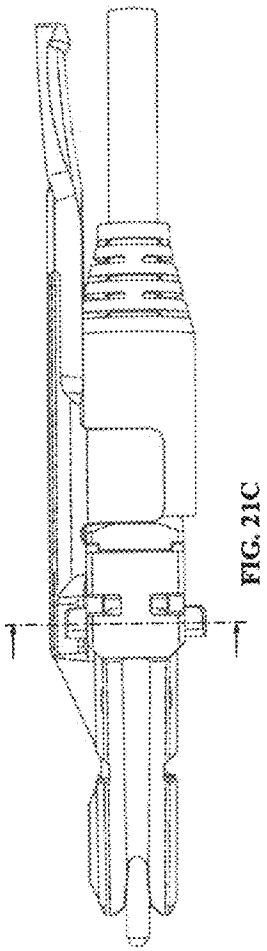


FIG. 21C

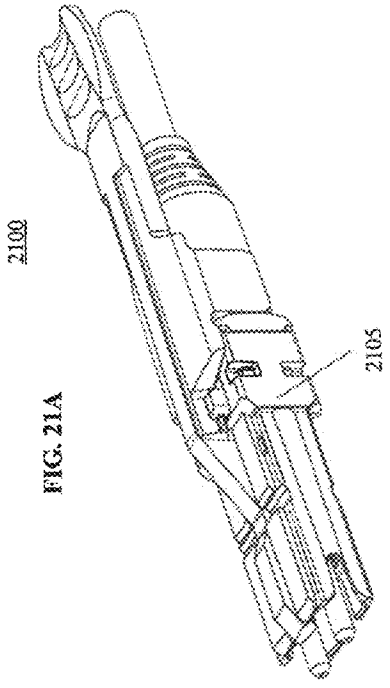


FIG. 21A

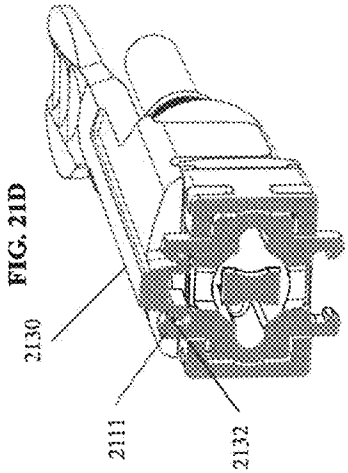


FIG. 21D

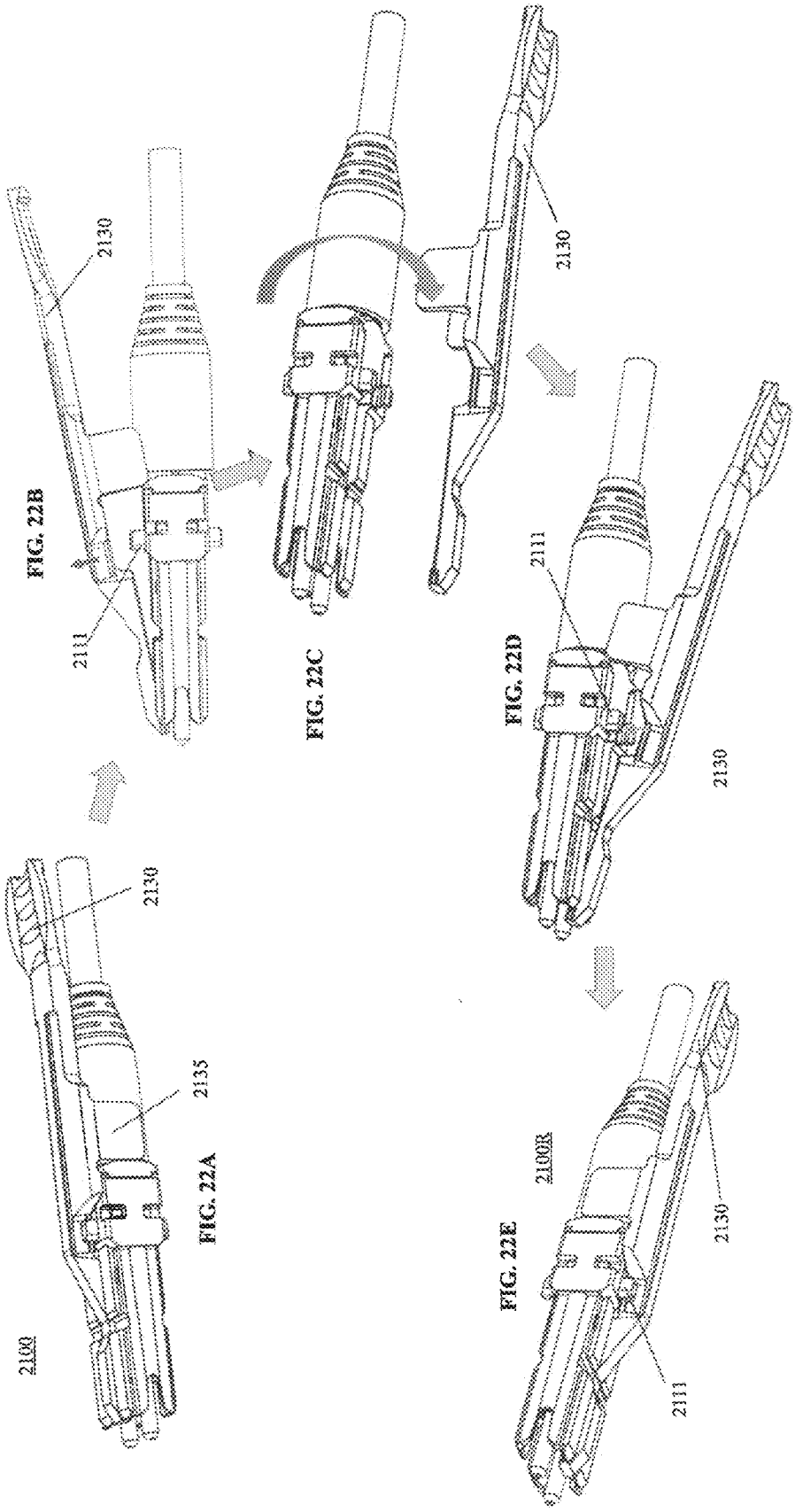


FIG. 22A FIG. 22B FIG. 22C FIG. 22D FIG. 22E

OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

The present application claims priorities to U.S. Provisional Patent Applications No. 62/452,147 filed Jan. 30, 2017, No. 62/457,150 filed Feb. 9, 2017, No. 62/463,898 filed Feb. 27, 2017, No. 62/463,901 filed Feb. 27, 2017, No. 62/485,042 filed Apr. 13, 2017, No. 62/546,920, filed Aug. 17, 2017, and No. 62/581,961 filed Nov. 6, 2017; the disclosures of which are incorporated herein by reference in their entireties.

FIELD OF THE INVENTION

The present disclosure relates generally optical connectors with reversible polarity.

BACKGROUND

The prevalence of the Internet has led to unprecedented growth in communication networks. Consumer demand for service and increased competition has caused network providers to continuously find ways to improve quality of service while reducing cost.

Certain solutions have included deployment of high-density interconnect panels. High-density interconnect panels may be designed to consolidate the increasing volume of interconnections necessary to support the fast-growing networks into a compacted form factor, thereby increasing quality of service and decreasing costs such as floor space and support overhead. However, room for improvement in the area of data centers, specifically as it relates to fiber optic connections, still exists. For example, manufacturers of connectors are always looking to reduce the size of the devices, while increasing ease of deployment, robustness, and modifiability after deployment. In particular, more optical connectors may need to be accommodated in the same footprint previously used for a smaller number of connectors in order to provide backward compatibility with existing data center equipment. For example, one current footprint is known as the small form-factor pluggable footprint (SFP). This footprint currently accommodates two LC-type ferrule optical connections. However, it may be desirable to accommodate four optical connections (two duplex connections of transmit/receive) within the same footprint. Another current footprint is the quad small form-factor pluggable (QSFP) footprint. This footprint currently accommodates four LC-type ferrule optical connections. However, it may be desirable to accommodate eight optical connections of LC-type ferrules (four duplex connections of transmit/receive) within the same footprint.

In communication networks, such as data centers and switching networks, numerous interconnections between mating connectors may be compacted into high-density panels. Panel and connector producers may optimize for such high densities by shrinking the connector size and/or the spacing between adjacent connectors on the panel. While both approaches may be effective to increase the panel connector density, shrinking the connector size and/or spacing may also increase the support cost and diminish the quality of service.

In a high-density panel configuration, adjacent connectors and cable assemblies may obstruct access to the individual release mechanisms. Such physical obstructions may impede the ability of an operator to minimize the stresses applied to the cables and the connectors. For example, these stresses may be applied when the user reaches into a dense group of connectors and pushes aside surrounding optical fibers and connectors to access an individual connector release mechanism with his/her thumb and forefinger. Overstressing the cables and connectors may produce latent defects, compromise the integrity and/or reliability of the terminations, and potentially cause serious disruptions to network performance.

Accordingly, there is a need for smaller fiber optic connectors that will meet the needs of future developments in smaller SFPs and are reconfigurable for flexible deployment.

SUMMARY OF THE INVENTION

In a first aspect, the present disclosure provides a reversible polarity fiber optic connector including at least first and second optical ferrules and a connector housing at least partially surrounding the first and second optical ferrules. The housing has a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. A latch coupling is positioned on each of the first and second exterior walls of the housing. A removable latch may engage either the first or second exterior wall latch coupling on the connector housing. Positioning the removable latch on the first exterior wall yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall yields a fiber optic connector with a second, opposite polarity.

In another aspect, the present disclosure provides a reversible polarity fiber optic connector with exchangeable arms for changing connector type. Thus, a common connector body may be formed into different connector types. The connector includes at least first and second optical ferrules and a common connector housing at least partially surrounding the first and second optical ferrules. The housing has a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. A coupling surface is positioned on each of the first and second exterior walls of the common connector housing. To create a connector, a removable arm engages either the first or second exterior wall coupling surface; the removable arm includes either a latch or a latch recess depending upon the type of optical connector to be formed. Further, positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second, opposite polarity.

In another aspect, the present disclosure provides a reversible polarity fiber optic connector with a push-pull tab. The connector includes at least first and second optical ferrules and has a connector housing at least partially surrounding the first and second optical ferrules. A first exterior wall is positioned above the first and second optical ferrules and a second exterior wall is positioned beneath the first and second optical ferrules. A first aperture is in the first exterior wall of the housing and a second aperture is in the second exterior wall of the housing. A removable push-pull tab includes a protrusion for positioning within either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing. Positioning the removable push-pull tab with its protrusion within the first aperture yields a fiber optic connector with a first polarity

and positioning the removable push-pull tab with its protrusion within the second aperture yields a fiber optic connector with a second, opposite polarity.

In yet another aspect, the present disclosure provides a reversible polarity fiber optic connector including at least first and second optical ferrules and a connector housing at least partially surrounding the first and second optical ferrules. A first exterior wall is positioned above the first and second optical ferrules and a second exterior wall is positioned beneath the first and second optical ferrules. A removable push-pull tab is provided. A first push-pull tab retainer is positioned on the first exterior wall and a second push-pull tab retainer is positioned on the second exterior wall. Positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second, opposite polarity.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a perspective view of one embodiment of a reversible polarity fiber optic connector according to some aspects of the present disclosure;

FIG. **1**B is a side view of the reversible polarity fiber optic connector of FIG. **3**A with the removable latch being removed from the connector housing;

FIG. **2**A is a perspective view of the reversible polarity fiber optic connector of FIG. **1**A;

FIG. **2**B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **2**A;

FIG. **2**C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **2**A;

FIG. **2**D is a perspective view of the fiber optic connector of FIG. **1**A with its polarity reversed;

FIG. **3**A is a perspective view of an embodiment of a reversible polarity fiber optic connector with a pull tab according to aspects of the present disclosure;

FIG. **3**B is an exploded view of the reversible polarity fiber optic connector of FIG. **3**A;

FIG. **4**A is a perspective view of the polarity of the reversible polarity fiber optic connector of FIG. **3**A;

FIG. **4**B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **4**A;

FIG. **4**C.**1** is an exploded view of positioning the latch in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **4**A;

FIG. **4**C.**2** is an exploded view of attaching the removed components of FIG. **4**B in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **4**A;

FIG. **4**D is a perspective view of the reversible polarity fiber optic connector of FIG. **4**A with its polarity reversed;

FIG. **5**A is a perspective view of another embodiment of a reversible polarity fiber optic connector with a pull tab according to aspects of the present disclosure;

FIG. **5**B is an exploded view of the reversible polarity fiber optic connector of FIG. **5**A;

FIG. **6**A is a perspective view of the polarity of the fiber optic connector of FIG. **5**A;

FIG. **6**B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **5**A;

FIG. **6**C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **6**A;

FIG. **6**D is a perspective view of the reversible polarity fiber optic connector of FIG. **6**A with its polarity reversed;

FIG. **7**A is a perspective view of a common connector housing of a reversible polarity fiber optic connector with exchangeable arms for changing connector type in an embodiment according to aspects of the present disclosure;

FIG. **7**B is the front view of the common connector housing of FIG. **7**A;

FIG. **7**C is the top view of the common connector housing of FIG. **7**A;

FIG. **7**D is the side view of the common connector housing of FIG. **7**A;

FIG. **8**A.**1** shows how the common connector housing of FIG. **7**A is used to create a latch-type connector;

FIG. **8**A.**2** is an exploded view of FIG. **8**A.**1**;

FIG. **8**B.**1** shows how the common connector housing of FIG. **7**A is used to create a recess-type connector;

FIG. **8**B.**2** is an exploded view of FIG. **8**B.**1**;

FIG. **9**A is a perspective view of FIG. **8**A.**1** of the polarity of the latch-type fiber optic connector of FIG. **8**A.**1**;

FIG. **9**B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **8**A.**1**;

FIG. **9**C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **8**A.**1**;

FIG. **9**D is a perspective view of the reversible polarity fiber optic connector of FIG. **8**A.**1** with its polarity reversed;

FIG. **10**A is a perspective view of FIG. **8**B.**1** of the polarity of the recess-type fiber optic connector of FIG. **8**B.**1**;

FIG. **10**B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **8**B.**1**;

FIG. **10**C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. **8**B.**1**;

FIG. **10**D is a perspective view of the reversible polarity fiber optic connector of FIG. **8**B.**1** with its polarity reversed;

FIGS. **11**A and **11**B respectively depict exploded and perspective views of a reversible polarity optical connector according to a further embodiment of the disclosure;

FIGS. **12**A-**12**D depict the operation of the reversible polarity optical connector of FIGS. **11**A and **11**B;

FIGS. **13**A-**13**D depict the process for changing the polarity of the optical connector of FIGS. **11**A and **11**B;

FIGS. **14**A and **14**B respectively depict exploded and perspective views of a reversible polarity optical connector according to a further embodiment of the disclosure;

FIGS. **15**-**15**D depict the operation of the reversible polarity optical connector of FIGS. **14**A and **14**B;

FIGS. **16**A-**16**D depict the process for changing the polarity of the optical connector of FIGS. **14**A and **14**B;

FIGS. **17**A-**17**C respectively depict perspective, partial cross-section, and exploded views of a reversible polarity optical connector according to a further embodiment of the disclosure;

FIGS. **18**A-**18**D depict the assembly of the push-pull tab to the connector body of the connector of FIGS. **17**A-**17**C;

FIGS. **19**A-**19**B depict the removal of the push-pull tab from the connector body using a tool;

FIGS. **20**A-**20**D depict the process for changing the polarity of the optical connector of FIGS. **17**A-**17**C.

DETAILED DESCRIPTION

This disclosure is not limited to the particular systems, devices and methods described, as these may vary. The terminology used in the description is for the purpose of describing the particular versions or embodiments only, and is not intended to limit the scope.

As used in this document, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art. Nothing in this disclosure is to be construed as an admission that the embodiments described in this disclosure are not entitled to antedate such disclosure by virtue of prior invention. As used in this document, the term "comprising" means "including, but not limited to."

The following terms shall have, for the purposes of this application, the respective meanings set forth below.

The connectors of the present disclosure may be configured for fiber optic transmission or electrical signal transmission. The connector may be any suitable type now known or later developed, such as, for example, a ferrule connector (FC), a fiber distributed data interface (FDDI) connector, an LC connector, a mechanical transfer (MT) connector, a square connector (SC) connector, an SC duplex connector, or a straight tip (ST) connector. The connector may generally be defined by a connector housing. In some embodiments, the housing may incorporate any or all of the components described herein.

Various embodiments described herein generally provide a remote release mechanism such that a user can remove cable assembly connectors that are closely spaced together without damaging surrounding connectors, accidentally disconnecting surrounding connectors, disrupting transmissions through surrounding connectors, and/or the like. Various embodiments also provide narrow pitch LC duplex connectors and narrow width multi-fiber connectors.

As discussed herein, current connectors may be improved by various means, such as, for example, reducing the footprint, increasing the structural strength, enabling polarity changes, etc. Various embodiments disclosed herein offer improvements over the current state of the art, as will be further discussed below.

In some embodiments, the fiber optic connector may be a narrow pitch duplex LC connector including two LC connectors. In some embodiments, such as that shown, the two LC connectors may comprise a single combined unit. In alternative embodiments, the LC connectors may be separate members, wherein an air gap exists between the two members, or wherein the two separate members are located adjacent and flush to each other (i.e., no air gap exists). In some embodiments, each of the LC connectors includes a respective ferrule and a respective extending member or modular arm. The connector may have a pitch of 4.8 mm, defined as the axis-to-axis distance between the central axes of the LC connectors. In other embodiments, the connector pitch may be less than that of the pitch of conventional connectors, for example less than 6.25 mm and less than about 5.25 mm. In some embodiments, the pitch may be about 4.8 mm or less.

In current designs, if a fiber optic connector, particularly a duplex connector, needs to have the ferrules rotated or swapped, for example, for exchanging transmit and receive optical fibers, it can be a time consuming and difficult process. Generally, if a duplex connector needs to be rotated, current systems require twisting the individual LC connector tips 180 degrees. However, this process also twists the fibers that enter the connector tip. Twisting the fiber at any stage of the connection can cause wear and/or damage to the delicate fibers. Thus, most systems involve an alternative solution, wherein the duplex connector is partially or completely disassembled in order to access the ferrules or fibers and manually relocate them within the duplex connector. However, swapping ferrules side to side is a delicate operation. In order to prevent damage to the internal fibers, great care must be taken. Thus, this operation usually requires specialized tools and preparation time to perform safely and accurately.

Therefore, embodiments as described herein, allow for easy, quick, and safe swapping of the left and right side ferrules in a connector. Thus, embodiments discussed herein allow for a change in polarity of the duplex connector without twisting the fibers or performing any complex disassembly of the duplex connector.

FIGS. **1**A and **1**B depict a fiber optic connector with reversible polarity according to one aspect of the present disclosure. As shown in FIG. **1**A, a reversible polarity fiber optic connector may include first and second optical ferrules **110***a* and **110***b* and a connector housing **120** at least partially surrounding the first and second optical ferrules. A removable latch **130** is depicted in FIG. **1**A in its assembled state and in FIG. **1**B removed from the connector housing **120**.

FIG. **1**B is a side view of the reversible polarity fiber optic connector of FIG. **1**A with the removable latch **130** being separated from the connector housing. As shown, the connector housing **120** may have a first exterior wall **121***a* positioned above the first and second optical ferrules and a second exterior wall **121***b* positioned beneath the first and second optical ferrules. A latch coupling **122** is positioned on each of the first and second exterior walls of the housing. The removable latch **130** may include a protrusion **131** for engaging the housing latch coupling **122**. In particular, the latch coupling **122** may include angled walls that interact with slanted edges of the protrusion **131** to prevent accidental disassembly of the latch **130**. Although the latch coupling **122** is depicted as a recess on the housing accommodating a latch protrusion, these elements may be reversed with the latch including a recess and the housing including a protrusion. Other mechanical coupling mechanisms may be used to interconnect the housing and the removable latch. For example, an embodiment may involve a coupling system wherein the removable latch is inserted into a recess in the connector housing and twisted (e.g., 90°, 180°, etc.) to secure the latch to the recess. Alternative coupling may use a more complex shape. For example, a u-shaped recess in the connector housing may engage a cooperatively-shaped projection in the latch that is inserted and fed through the u-shape until secure. It should thus be understood, that any system or method of coupling may be used to attach the removable latch to the connector housing, including various locations (e.g., sliding from the front, sides, back, bottom, top, etc.).

FIGS. **2**A-**2**D depict the process for changing the polarity of the fiber optic connector of FIG. **1**A from a first polarity, FIG. **2**A to a second, opposite polarity, FIG. **2**D. The removable latch **130** may be removed from the latch coupling on the first exterior wall of the connector housing, FIG. **2**B, positioned adjacent the second exterior wall on beneath the ferrules, FIG. **2**C, and then coupled with the latch coupling on the second exterior wall of the connector

housing to yield a connector **100**R, FIG. **2**D, having the opposite polarity of connector **100**. In this manner, transmit and receive optical fibers may be reversed without necessitating any fiber twist or complex repositioning of the optical ferrules.

In typical embodiments, the latch of the connector housing is required to be flexible. Thus, when a latch and a connector housing (e.g., duplex connector) are built as one unified member (as is currently done), the fiber optic connector is built of a similar flexible or less rigid material. Building the connector housing out of a plastic or polymeric material, limits the amount of rigidity that it can have. Thus, as fiber optic connectors continue to reduce in size, the strength of the housing has been reduced. Therefore, it would be advantageous to build the connector housing out of a more robust material while still allowing the latch to remain flexible. In order to accomplish this, in some embodiments according to aspects of the present disclosure, the connector housing may be manufactured out of a very rigid or strong material (e.g., steel, graphene, carbon, metal alloys, or any material of suitable properties). Because the connector housing and the removable latch need only interlock with each other, the removable latch may still be made out of a more flexible material. Thus, the removable nature of the latch disclosed herein allow for a more robust and secure overall design when dealing with the shrinking footprint of fiber optic connectors.

FIG. **3**A is a perspective view of another embodiment of a reversible polarity fiber optic connector **300**. As shown, the reversible polarity fiber optic connector may further comprise a pull tab **340** for engaging a removable latch **330**. The pull tab **340** depresses the latch **330** as the tab is pulled in a direction away from the fiber optic ferrules.

FIG. **3**B is an exploded view of the reversible polarity fiber optic connector of FIG. **3**A. As shown, the pull tab **340** may comprise a first opening **341** and a second opening **344**. The first opening **341** is configured to allow the connector housing and the removable latch to pass through while the second opening is configured to accommodate the tip of the latch. The pull tab may further comprise a first deformable portion **342** and a second deformable portion **344**. In operation, the first deformable portion **342** cooperates with the second deformable portion **344** to depress the removable latch when the pull tab is pulled in a direction away from the ferrules.

FIGS. **4**A-**4**D depict the process for changing the polarity of the fiber optic connector **300** from a first polarity, FIG. **4**A to a second polarity **300**R, FIG. **4**D. The pull tab **340** may be disengaged from the connector housing **320** and the removable latch **330** on the first exterior wall of the connector housing, FIG. **2**B. The removable latch is then detached from the latch coupling on the first exterior wall of the connector housing, FIG. **4**C.**1**. Next, the removable latch is engaged with the latch coupling on the second exterior wall of the connector housing, beneath the ferrules, FIG. **4**C.**2**. Finally, the pull tab **340** is positioned surrounding the connector housing and engaging the removable latch tip, resulting in the assembled optical connector **300**R having polarity opposite to that of connector **300**, FIG. **4**D.

FIGS. **5**A and **5**B are a perspective view and exploded view, respectively, of another embodiment of a reversible polarity fiber optic connector **500**. The connector **500** includes a connector housing **520**, a latch **530**, and a pull tab **540**. On the first and second exterior walls of connector housing **520** are latch couplings that include a groove **522**. A recess **521** is also provided in the housing. The latch **530** includes a protrusion **531** that is received within groove **522**. The latch further includes a projection **532** that is received in the housing between the optical ferrules. The pull tab **540** includes an opening **541** for engaging the removable latch **530**. A front protrusion **542** is configured to depress the removable latch **530** when the pull tab is pulled in a direction away from the ferrule side of the optical connector.

FIGS. **6**A-**6**D depict the process for changing the polarity of the fiber optic connector **500** from a first polarity, FIG. **6**A to a second polarity, FIG. **6**D. The pull tab **540** is disengaged from the connector housing and the removable latch **530** on the first exterior wall of the connector housing, FIG. **6**B, and the removable latch is decoupled from the latch coupling on the first exterior wall of the connector housing. Then the removable latch may be coupled with the latch coupling on the second exterior wall of the connector housing, beneath the optical ferrules in FIG. **6**C, and the pull tab **540** is engaged with the connector housing and the removable latch on the second exterior wall of the connector housing to create reverse polarity connector **500**R, FIG. **6**D.

It is of interest within the optical connectivity industry to have multiple styles of optical connectors for multiple purposes and/or multiple implementation styles. Thus, in order to more easily provide flexibility, a solution is needed that allows for on-the-fly, in-the-field, or in manufacturing modification of the connector. The below embodiment provides a universal type fiber optic connector which has a unique housing design that allows for different latches or arms to be attached.

FIG. **7**A is a perspective view of a common connector housing **720** of a reversible polarity fiber optic connector **700** with exchangeable arms for changing connector type in an embodiment according to aspects of the present disclosure. As shown, the reversible polarity fiber optic connector may comprise first and second optical ferrules **710***a* and **710***b* and the common connector housing **720** at least partially surrounding the first and second optical ferrules.

FIGS. **7**B, **7**C and **7**D are the front view, top view and side view, respectively, of the common connector housing **720**. As shown, the common connector housing may have a first exterior wall **725***a* positioned above the first and second optical ferrules and a second exterior wall **725***b* positioned beneath the first and second optical ferrules. The connector housing **720** may further have a coupling surface **724** positioned on each of the first and second exterior walls and include a receiving track **726** in the coupling surface.

FIG. **8**A.**1** shows the common connector housing **720** used to create a latch-type connector **700** and FIG. **8**B.**1** shows the common connector housing **720** used to create a recess-type connector **800**. Both of connectors **700** and **800** include a removable arm **730** or **830** for engaging either of the first and second exterior wall coupling surfaces **724** on the connector housing, FIGS. **8**A.**2** and **8**B.**2** respectively. The removable arms **730** and **830** may each respectively include a projection **735** or **835** for engaging in the receiving track **726** of the coupling surface **724**, FIGS. **8**A.**2** and **8**B.**2** respectively. As with the previous embodiments, positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with the opposite polarity.

Still referring to FIGS. **8**A.**2** and **8**B.**2** respectively the removable arms may include either a latch or a recess: removable arm **730** includes a latch **733** while removable arm **830** includes a recess **834**. Thus, a latch-type connector **700** is created through assembly of the removable latch arm to the common connector body **720** as shown in FIG. **8**A.**1**

and a recess-type connector **800** is created through assembly of the removable recess arm to the common connector body **720** as shown in FIG. **8**B.**1**.

The fiber optic connector may further include a pull tab. When a removable arm with a latch **730** is positioned on the coupling surface of the common connector housing **720** to create a latch-type connector **700**, the pull tab **740** is a separate element from the removable arm, FIG. **8**A.**2**. When a removable arm includes a recess **830** is positioned on the coupling surface of the common connector housing **720** to create a recess-type connector **800**, the pull tab **840** is integrated with the removable arm, FIG. **8**B.**2**.

FIGS. **9**A-**9**D depict the process for changing the polarity of the latch-type fiber optic connector from a first polarity **700**, FIG. **9**A to a second polarity **700**R, FIG. **9**D. The sub-assembly of the removable arm **730** and the pull tab **740** may be decoupled from the coupling surface **724** of the first exterior wall of the connector housing, FIG. **9**B. Then the sub-assembly of the removable arm **730** and the pull tab **740** may be coupled with the coupling surface of the second exterior wall of the connector housing, FIG. **9**C, creating the opposite polarity connector **700**R.

FIGS. **10**A-**10**C depicts the process for changing the polarity of the recess-type fiber optic connector **800** from a first polarity, FIG. **10**A to a second polarity, FIG. **10**D. The removable arm **830** with a recess and a pull tab as an integral structure may be decoupled from the coupling surface **724** of the first exterior wall of the connector housing, FIG. **10**B. Then the removable arm may be coupled with the coupling surface **724** of the second exterior wall of the common connector housing **720**, FIG. **10**C to create opposite polarity optical connector **800**R, FIG. **10**D.

FIGS. **11**A and **11**B depict a further embodiment **1100** of the reversible polarity optical connectors of the present disclosure. In FIG. **11**A, a push-pull tab **1130** may interconnect with either a first exterior wall **1110** of housing **1105** or with a second exterior wall **1115** of housing **1105**. Ferrules **1120** and **1125** are at least partially surrounded by housing **1105** and may be LC connectors in an embodiment. As in previous embodiments, the push-pull tab may include a tab recess **1145**. Alternatively, push-pull tab **1130** may include a latch (not shown). Various features of the push-pull tab **1130** are provided to assist in affixing the push-pull tab to the first exterior wall **1110** or the second exterior wall **1115** of the housing **1105**. This includes push-pull tab clips **1135** that clip onto the optical connector, optionally in a boot region, and protrusion **1140** that fits within a first aperture, **1109**A, beneath the housing exterior wall **1110** or a second aperture, **1109**B, beneath housing exterior wall **1115** (to be discussed in more detail below), and projection **1131** for inserting into the housing between ferrules **1120** and **1125**. Each of these features is fully reversible such that the push-pull tab is easily removed and repositioned on the opposite exterior wall to change polarity of the connector.

As best seen in FIGS. **12**B and **12**D, push-pull tab protrusion **1140** may be inserted into first aperture **1109**A of housing **1105** through a first exterior housing aperture **1107**A. Alternatively, in the reverse-polarity configuration, the push-pull tab protrusion **1140** may be inserted into second housing aperture **1109**B through second exterior housing aperture **1107**B. When the push-pull tab **1130** is moved forward, the protrusion slides within the aperture **1109**A or **1109**B, as shown in FIG. **12**B. To maintain the push-pull tab in a forward-biased position, tab position spring **1150** is provided. During insertion or removal of the protrusion **1140**, tab position spring **1150** is compressed, depicted in FIG. **12**B. When the position spring **1150** is in its relaxed (uncompressed) position, FIGS. **12**C and **12**D, the protrusion **1140** is slid forward within the aperture **1109**A or **1109**B.

To change polarity of the optical connector **1100**, FIGS. **13**A-**13**D, the push-pull tab **1130** is removed by withdrawing the protrusion **1140** from the housing **1105** through exterior housing aperture **1107**A along with detaching clips **1135** and decoupling projection **1131**, thus releasing the push-pull tab from the first exterior housing wall **1110** (FIG. **138**). The push-pull tab is moved toward second exterior housing wall **1115** and the protrusion **1140** is inserted into aperture **1109**B through exterior housing aperture **1107**B in FIG. **13**C. Projection **1131** is fitted between ferrules **1120** and **1125** and clips **1135** are affixed to the connector. The resultant connector **1100**R of **13**D is of opposite polarity to the connector **1100** of FIG. **13**A.

Various alternatives to the protrusion **1140** of optical connector **1100** may be used in the optical connectors of this disclosure. For example, the protrusion may be provided by the connector housing with receiving elements provided in the push-pull tab. Variations to the shape of the projection and apertures may be made without affecting the function of the reversible-polarity connector.

Another alternative embodiment is depicted in FIGS. **14**A and **14**B in which a hook-shaped protrusion **1440** is provided for engagement within the connector housing. As in the previous embodiment, the push-pull tab **1430** includes a tab recess **1445**, connector-attachment clips **1435** and projection **1431** for positioning between ferrules **1420** and **1425**. In FIG. **14**B, the push-pull tab **1430** is positioned on first exterior housing wall **1410** and has a first polarity. In this position, the hook-shaped protrusion **1440** engages a housing projection **1460**, held in a forward-biased position by push-pull tab position spring **1465**, as seen in FIGS. **15**B and **15**D. To release the protrusion **1440**, push-pull tab position spring **1465** is compressed in FIG. **15**C such that housing projection **1460** is retracted sufficiently to allow removal of protrusion **1440** through the housing **1405**, FIG. **15**D.

To change polarity of the optical connector **1400** from the first polarity of FIG. **16**A, the push-pull tab **1430** is removed by withdrawing the protrusion **1440** from the housing **1405** through the housing along with detaching clips **1435** and decoupling projection **1431**, thus releasing the push-pull tab from the first exterior housing wall **1110** (FIG. **16**B). The push-pull tab is moved toward second exterior housing wall **1415** and the protrusion **1440** is inserted into the housing **1405**. Projection **1431** is fitted between ferrules **1420** and **1425** and clips **1435** are affixed to the connector in FIG. **16**C. The resultant connector **1400**R of FIG. **16**D is of opposite polarity to the connector of FIG. **16**A.

Protrusions from a push-pull tab may be inserted into a housing via features other than a housing aperture. Such a connector is depicted in FIG. **17** and features a deformable housing region to allow entry of a push-pull tab protrusion during affixing of the push-pull tab to the connector housing. As seen in FIG. **17**A, the connector **1700** includes a connector housing **1705** which may optionally include a back body housing portion **1709** for connecting with a housing front portion **1707** (FIG. **17**C). The back body housing portion **1709** includes a deformable region **1780**, seen in the partial cross-section of FIG. **17**B and the perspective view of FIG. **17**C. The push-pull tab **1730** includes a protrusion **1740** with a projection **1741** extending therefrom.

Turning to FIG. **18**, to affix the push-pull tab to the connector housing, the protrusion **1740** penetrates the deformable region **1780** (FIG. **18**B) causing the deformable

region to yield and accept entry of the protrusion **1740** into the housing. As the projection **1741** enters the housing as depicted in FIG. **18**C, the deformable region **1780** returns to its original position (FIG. **18**D), securing the push-pull tab **1730** to the connector housing.

Removal of the push-pull tab **1730** is depicted in FIGS. **19**A and **19**B. A removal tool **1900**, which may be shaped similar to a small screwdriver, depresses deformable region **1780**, allowing projection **1741** to slide along an edge of the deformable region **1780**, followed by the protrusion **1740**, releasing the push-pull tab **1730**.

To change polarity of the optical connector **1700** from the first polarity of FIG. **20**A, the push-pull tab **1730** is removed in FIG. **20**B by using the removal tool technique depicted in FIGS. **19**A and **19**B. The push-pull tab is moved toward the second exterior housing wall and the protrusion **1740** is inserted into the housing **1705** through the deformable region **1780** in FIG. **20**C. The resultant connector **1700**R of FIG. **20**D is of opposite polarity to the connector of FIG. **20**A.

In another aspect of the disclosure, a retaining member may be provided in the connector housing to retain a push-pull tab. As seen in FIGS. **21**A-**21**D, a connector **2100** having a housing **2105** is provided with a housing front portion **2107** and a back portion **2109**. FIG. **21**A depicts an assembled connector **2100** with housing **2105**. FIG. **21**B depicts an exploded view of connector **2100** of FIG. **21**A. Push-pull tab **2130** has a receiving surface **2132**, which during use of connector **2100** provides a surface over which retainer **2111** can slide across during tab movement. Extending from the housing back portion is a retainer **2111** which may include a pair of retaining clips, as shown, or any other structure configured to retain the push-pull tab **2130**. FIG. **21**C depicts connector **2100** showing a section view cut given by the arrows and broken line near the proximal end of connector **2100**. Optionally, when the retainer **2111** includes clips, the clips may be hook-shaped as seen in the cross-sectional view of FIG. **21**D. As shown in FIG. **21**D, receiving surface **2132** may be a recess with a protrusion along the edge that engages the hook-shaped edge of the clips.

FIG. **22**A through FIG. **22**E depicts the operation of polarity change for connector **2100** of FIG. **21**A-FIG. **21**D. FIG. **22**A depicts connector **2100** with pull-push tab clips **2135** (opposing side not shown) engaged around connector. To operate connector **2100**, user can move push-pull tab **2130** forward or toward front of connector or backward or toward rear of connector, and as describe in FIG. **21** above tab moves along connector receiving surface **2123**. This engages or releases connector **2100** from a receptacle as is known in the art. To change the polarity of connector **2100** from the polarity depicted in FIG. **22**A to the second, opposite polarity of FIG. **22**E, the retainer **2111** is removed from receiving surface **2132**. Referring to FIG. **21**B, lifting push-pull tab **2130** in direction of up-arrow, separates retainer **2111** from receiving surface. As shown in FIG. **22**C, push-pull tab clips separate from the connector as the retainer is removed. Continuing with FIG. **22**C, push-pull tab **2130** is moved to the opposite housing exterior wall in FIG. **22**C. FIG. **22**D depicts receiving surface **2132** engages with the retainer **2111**. In FIG. **21**E the assembled connector **2100**R having the opposite polarity to the connector of FIG. **22**A is depicted, fully assembled. Retainer **2111** is in contact with receiving surface **2132**, and push-pull tab **2130** is secured to connector body, as show in FIG. **22**E.

In the above detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other embodiments may be used, and other changes may be made, without departing from the spirit or scope of the subject matter presented herein. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, separated, and designed in a wide variety of different configurations, all of which are explicitly contemplated herein.

The present disclosure is not to be limited in terms of the particular embodiments described in this application, which are intended as illustrations of various aspects. Many modifications and variations can be made without departing from its spirit and scope, as will be apparent to those skilled in the art. Functionally equivalent methods and apparatuses within the scope of the disclosure, in addition to those enumerated herein, will be apparent to those skilled in the art from the foregoing descriptions. Such modifications and variations are intended to fall within the scope of the appended claims. The present disclosure is to be limited only by the terms of the appended claims, along with the full scope of equivalents to which such claims are entitled. It is to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting.

With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (for example, bodies of the appended claims) are generally intended as "open" terms (for example, the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," et cetera). While various compositions, methods, and devices are described in terms of "comprising" various components or steps (interpreted as meaning "including, but not limited to"), the compositions, methods, and devices can also "consist essentially of" or "consist of" the various components and steps, and such terminology should be interpreted as defining essentially closed-member groups. It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to embodiments containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (for example, "a" and/or "an" should be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation is explic-

itly recited, those skilled in the art will recognize that such recitation should be interpreted to mean at least the recited number (for example, the bare recitation of "two recitations," without other modifiers, means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, et cetera" is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (for example, "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, et cetera). In those instances where a convention analogous to "at least one of A, B, or C, et cetera" is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (for example, "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, et cetera). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

In addition, where features or aspects of the disclosure are described in terms of Markush groups, those skilled in the art will recognize that the disclosure is also thereby described in terms of any individual member or subgroup of members of the Markush group.

As will be understood by one skilled in the art, for any and all purposes, such as in terms of providing a written description, all ranges disclosed herein also encompass any and all possible subranges and combinations of subranges thereof. Any listed range can be easily recognized as sufficiently describing and enabling the same range being broken down into at least equal halves, thirds, quarters, fifths, tenths, et cetera As a non-limiting example, each range discussed herein can be readily broken down into a lower third, middle third and upper third, et cetera As will also be understood by one skilled in the art all language such as "up to," "at least," and the like include the number recited and refer to ranges which can be subsequently broken down into subranges as discussed above. Finally, as will be understood by one skilled in the art, a range includes each individual member. Thus, for example, a group having 1-3 cells refers to groups having 1, 2, or 3 cells. Similarly, a group having 1-5 cells refers to groups having 1, 2, 3, 4, or 5 cells, and so forth.

Various of the above-disclosed and other features and functions, or alternatives thereof, may be combined into many other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art, each of which is also intended to be encompassed by the disclosed embodiments.

The invention claimed is:

1. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a latch coupling positioned on each of the first and second exterior walls of the housing;

a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;

wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

2. The reversible polarity fiber optic connector of claim **1**, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and

the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic connector is configured in the first polarity or the angled walls of the recess on the second exterior wall when the fiber optic connector is configured in the second polarity.

3. The reversible polarity fiber optic connector of claim **1**, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed.

4. The reversible polarity fiber optic connector of claim **3**, wherein the pull tab comprises at least a first opening and a seconding opening for engaging the removable latch;

wherein the first opening is configured to allow the connector housing and the removable latch to pass through; and

the second opening is configured to allow the removable latch to partially pass through.

5. The reversible polarity fiber optic connector of claim **3**, wherein the pull tab further comprises a first deformable portion and a second deformable portion;

wherein the first deformable portion is configured to cooperate with the second deformable portion to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

6. The reversible polarity fiber optic connector of claim **1**, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes a groove; and

at least a projection for coupling with the groove on the first exterior wall when the fiber optic connector is configured in the first polarity or the groove on the second exterior wall when the fiber optic connector is configured in the second polarity.

7. The reversible polarity fiber optic connector of claim **6**, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the reversible polarity fiber optic connector depresses the removable latch.

8. The reversible polarity fiber optic connector of claim **7**, wherein the pull tab comprises:

an opening for engaging the removable latch; and

a front protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

9. A reversible polarity fiber optic connector with exchangeable arms for changing connector type comprising:

at least first and second optical ferrules;

a common connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a coupling surface positioned on each of the first and second exterior walls of the common connector housing;

a removable arm for engaging either of the first and second exterior wall coupling surfaces on the common connector housing, the removable arm including either a latch or a latch recess;

wherein positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

10. The reversible polarity fiber optic connector of claim **9** wherein positioning a removable arm with a latch on the coupling surface creates a latch-type connector and positioning a removable arm with a recess creates a recess-type connector.

11. The reversible polarity fiber optic connector of claim **9** wherein the housing includes a receiving track in the coupling surface and the removable arm includes a projection for engaging in the receiving track in the coupling surface.

12. The reversible polarity fiber optic connector of claim **9** further comprising a pull tab.

13. The reversible polarity fiber optic connector of claim **12** wherein the removable arm includes a latch and the pull tab is a separate element from the removable arm.

14. The reversible fiber optic connector of claim **12** wherein removable arm includes a recess and the pull tab is integrated with the removable arm.

15. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing;

a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

16. The reversible polarity fiber optic connector of claim **15** further comprising first and second apertures respectively beneath the first and second exterior walls of the housing for receiving the protrusion.

17. The reversible polarity fiber optic connector of claim **15**, further comprising a spring to urge the push-pull tab forward.

18. The reversible polarity fiber optic connector of claim **15**, wherein the push-pull tab protrusion is retained by a housing latch, the housing latch being urged forward by a spring.

19. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing;

a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

20. The combination of the reversible polarity fiber optic connector of claim **19** and a tool for deforming the deformable region of either the first exterior wall of the housing or the second exterior wall of the housing.

21. The reversible polarity fiber optic connector of claim **19**, further comprising a spring to urge the push-pull tab forward.

22. The reversible polarity fiber optic connector of claim **19** further comprising first and second apertures respectively beneath the first and second exterior walls of the housing for receiving the protrusion from the deformable region.

23. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a removable push-pull tab;

a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall;

wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

24. The reversible polarity fiber optic connector of claim **23** wherein the first and second push-pull tab retainers each include a projection.

25. The reversible polarity fiber optic connector of claim **23** wherein each projection is a clip for receiving a portion of the push-pull tab.

* * * * *

APPENDIX B

Notice of Allowability	Application No. 15/884,327	Applicant(s) WONG et al.	
	Examiner ANDREW JORDAN	Art Unit 2883	AIA 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 IDS of 5/21/18.
   ☐ 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 1-25 . 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 areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

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

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

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

Attachment(s)

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

/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 January 30, 2017, the date of the earliest priority application (United States provisional patent application serial number 62/452,147) for any claims which are fully supported under the first paragraph of 35 U.S.C. 112 by the provisional application.

The effective filing date of this AIA application is seen as January 30, 2018, the actual filing date, for any claims that are not fully supported by the foregoing provisional application or by any other of the several other provisional applications to which benefit is claimed.

The claims originally filed **March 23, 2018** in response to the notice to file corrected application papers of March 13, 2018 are entered, currently outstanding, and subject to examination.

Claims 1-25 are currently pending.

No claims have been withdrawn.

No claims have been cancelled.

Claims 1-25 are currently outstanding and subject to examination.

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

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 1-25 are allowed.

Allowable Subject Matter

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

The prior art does not teach or suggest a removable latching system, removable arm system, or removable push-pull tab as set forth in the claimed combination of independent claim(s) 1, 9, and 15, 19, and 23, respectively.

The following references are seen as pertinent to the present application:

U.S. Patent Application Publication No. 2016/0349458 of Murray et al. (Murray);

U.S. Patent Application Publication No. 2015/0378113 of Good et al. (Good);

and

U.S. Patent Application Publication No. 2016/0116685 of Wong et al. (Wong).

While the (apparently) corresponding international application PCT/US2018/016049 indicates that the Good reference may be more pertinent, examiner sees the alignment mechanism in Good as not providing a latch that holds the connection sufficiently in place. The Murray reference relies on a boot, and not a housing to provide connection for a latching mechanism.

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 US 20180217340 A1 of August 2, 2018 is cited, as are several patent publications sharing inventors with the present application.

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 optical connectors, including those addressing polarity and reversal thereof.

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 http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (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
(571) 270-1571 (Pacific time)
August 30, 2018

APPENDIX C

US008834038B2

(12) **United States Patent**
Limbert et al.

(10) **Patent No.: US 8,834,038 B2**
(45) **Date of Patent: Sep. 16, 2014**

(54) **FIBER OPTIC CONNECTOR**

(71) Applicant: **Ridgemount Technologies Ltd.**, Oxfordshire (GB)

(72) Inventors: **Mark John Limbert**, Northamptonshire (GB); **Christopher Russel Peters**, Buckinghamshire (GB)

(73) Assignee: **Ridgemount Technologies Ltd.**, Launton (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 27 days.

(21) Appl. No.: **13/678,686**

(22) Filed: **Nov. 16, 2012**

(65) **Prior Publication Data**

US 2014/0056562 A1 Feb. 27, 2014

(30) **Foreign Application Priority Data**

Aug. 24, 2012 (EP) 12181763

(51) **Int. Cl.**
G02B 6/36 (2006.01)
G02B 6/38 (2006.01)
G02B 6/42 (2006.01)

(52) **U.S. Cl.**
CPC ***G02B 6/36*** (2013.01); ***G02B 6/3878*** (2013.01); ***G02B 6/3879*** (2013.01); *G02B 6/3825* (2013.01); *G02B 6/3893* (2013.01); *G02B 6/3831* (2013.01); *G02B 6/4246* (2013.01); *G02B 6/4292* (2013.01)
USPC **385/77**; 385/59

(58) **Field of Classification Search**
USPC 385/59, 77
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,037,175	A	8/1991	Weber	
7,373,031	B2 *	5/2008	Wang et al.	385/14
7,785,018	B2 *	8/2010	Jones et al.	385/73
2002/0168148	A1	11/2002	Gilliland et al.	
2009/0220198	A1	9/2009	Sheau Tung Wong et al.	

FOREIGN PATENT DOCUMENTS

DE	102011005792	9/2011
EP	0633485	1/1995
EP	0848267	6/1998
GB	2239104	6/1991
WO	W02011/073953	6/2011

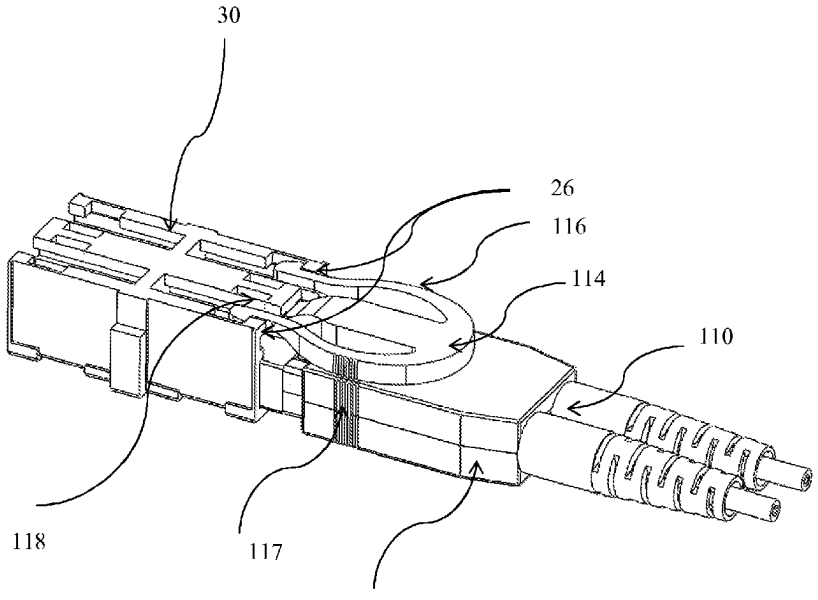
* cited by examiner

Primary Examiner — Omar Rojas
(74) *Attorney, Agent, or Firm* — Gordon & Jacobson, PC

(57) **ABSTRACT**

A fiber optic connector arranged to be releasably connected to a fiber optic adaptor. The fiber optic connector includes a body configured to receive and terminate two optical fibers, and a latch mechanism provided on the body. The latch mechanism is configured for releasable engagement with each of two sockets of the fiber optic adaptor. The latch mechanism of the fiber optic connector is configured for actuation in a direction laterally across the body.

13 Claims, 11 Drawing Sheets



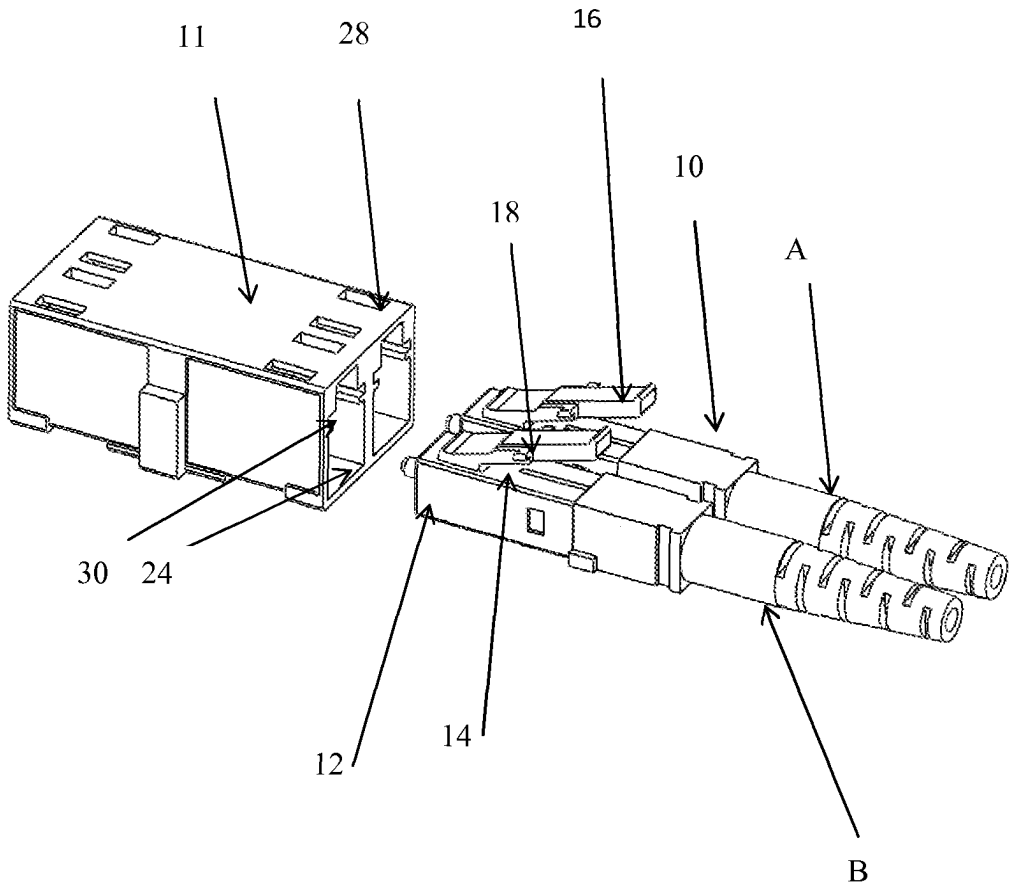


Fig. 1

PRIOR ART

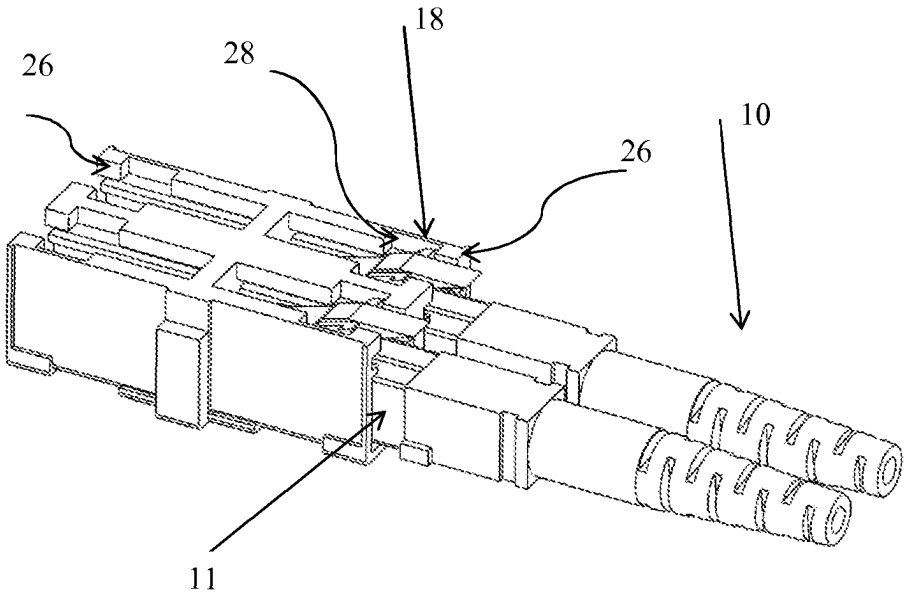


Fig. 2

PRIOR ART

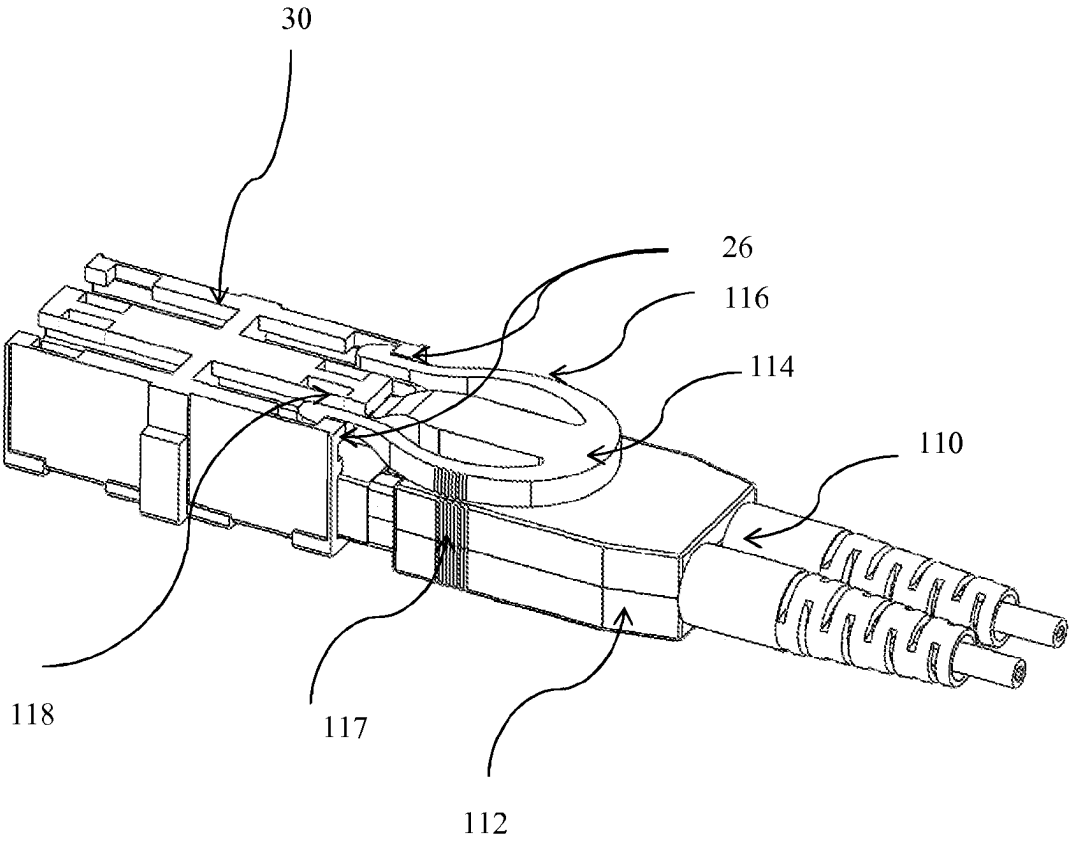


Fig. 3

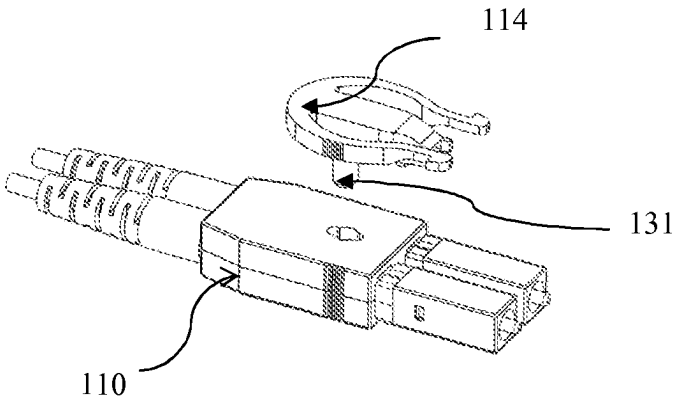


Fig. 4a

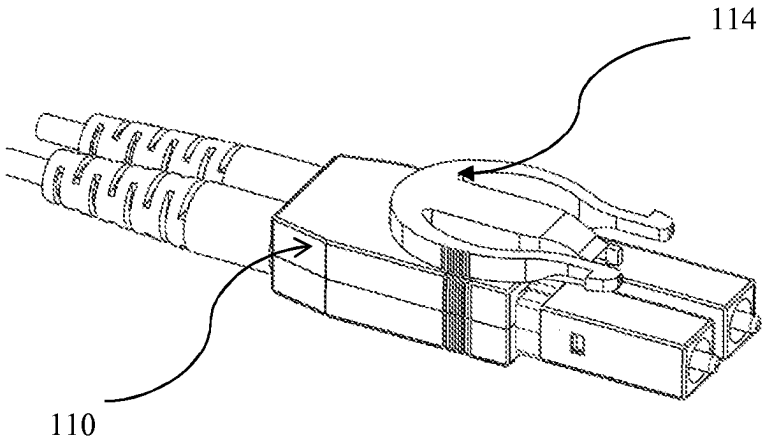


Fig. 4b

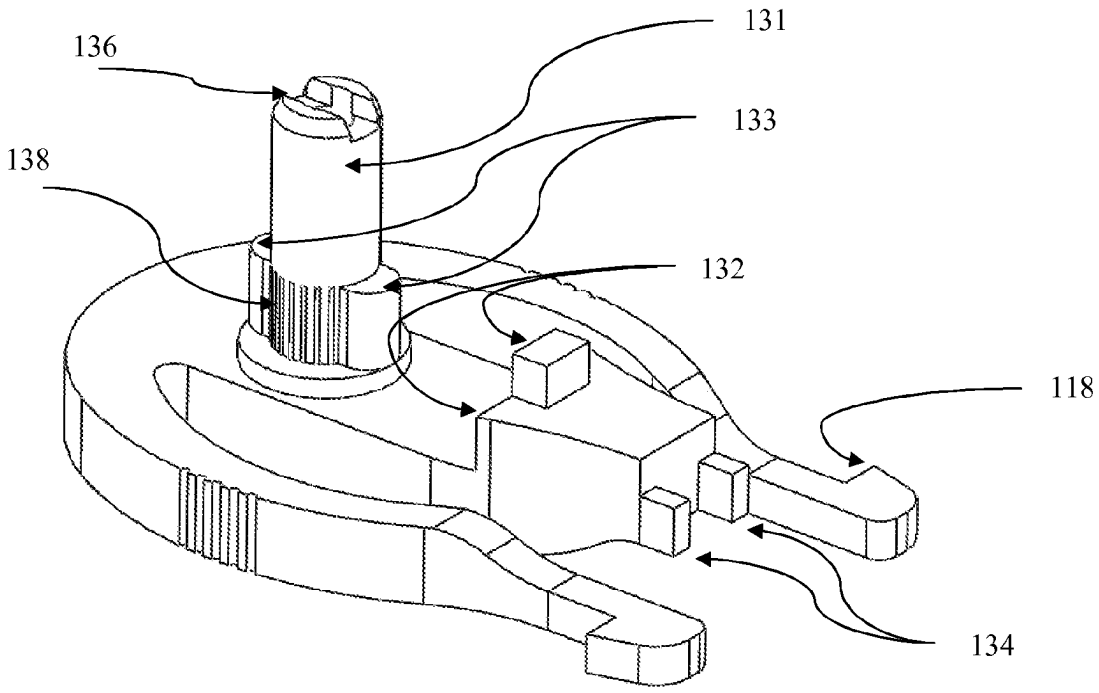


Fig. 4c

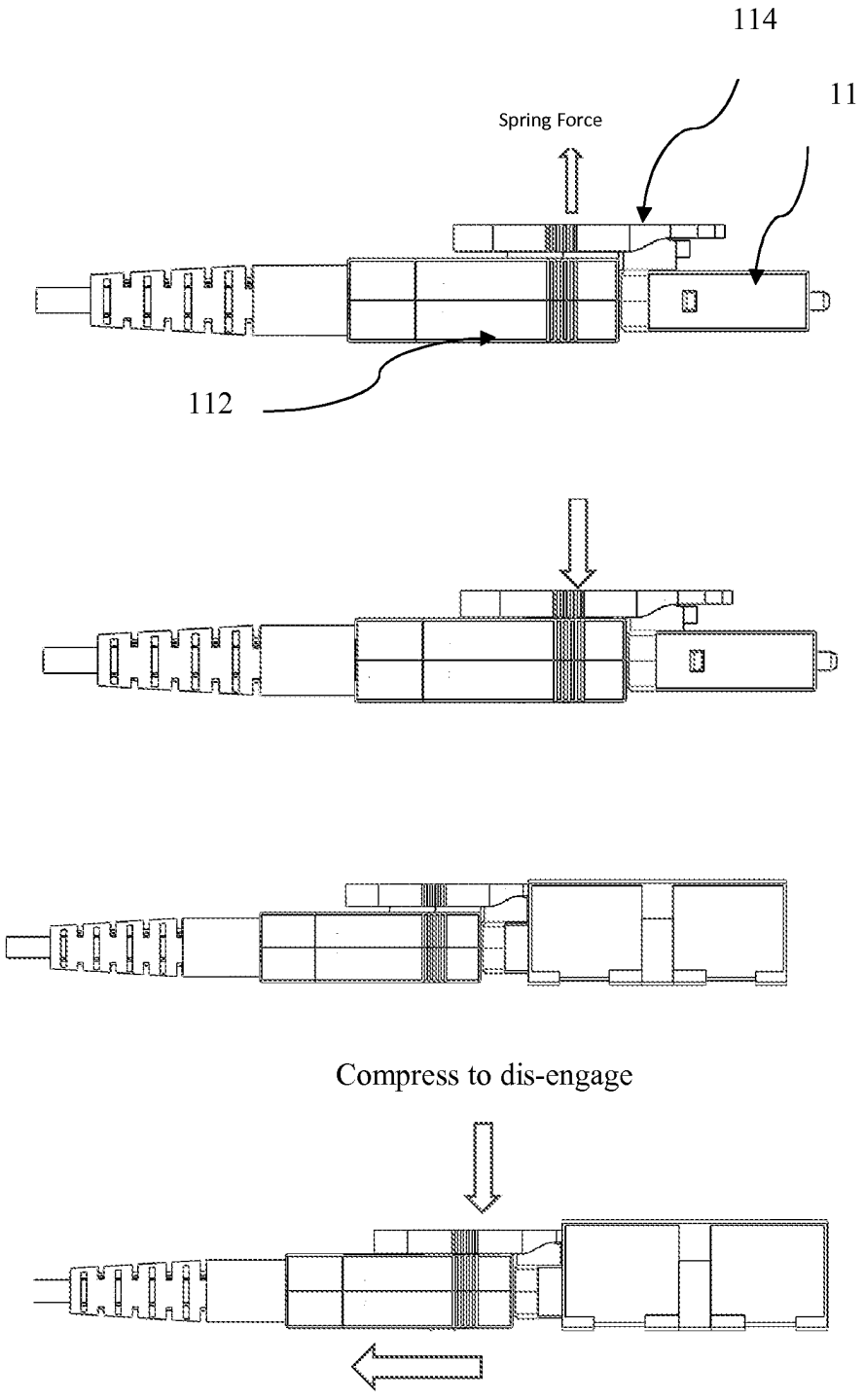


Fig. 5

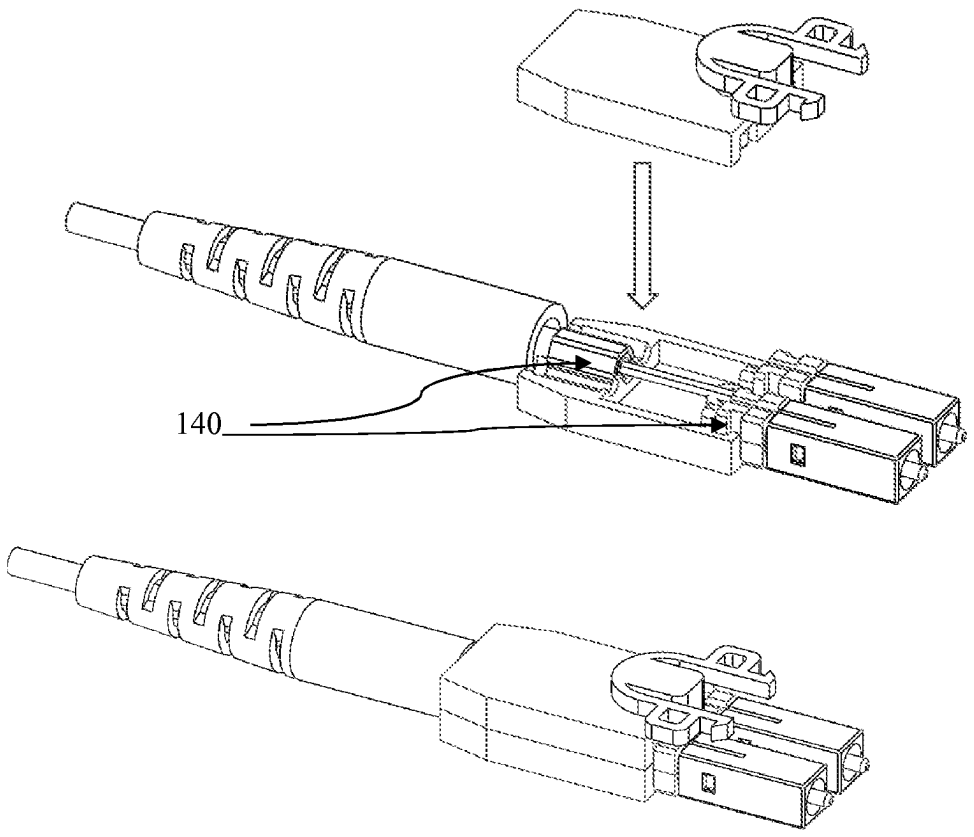


Fig. 6

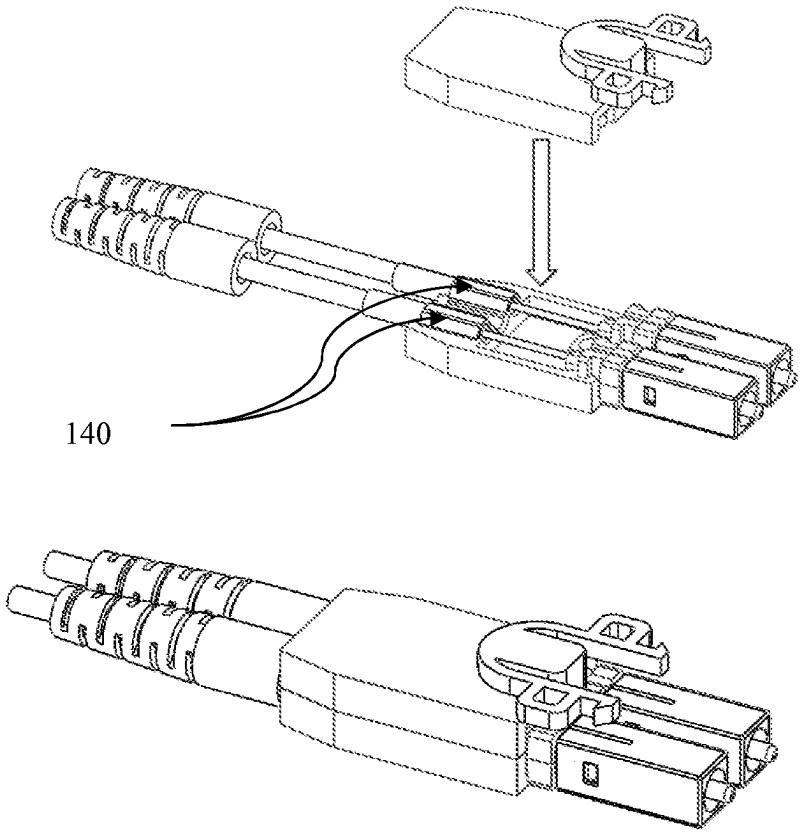


Fig. 7

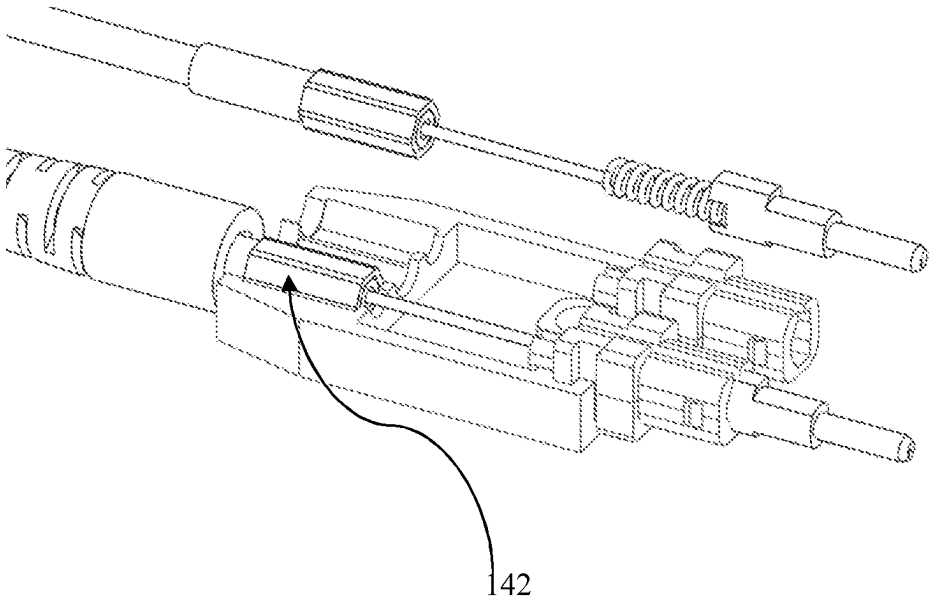


Fig. 8

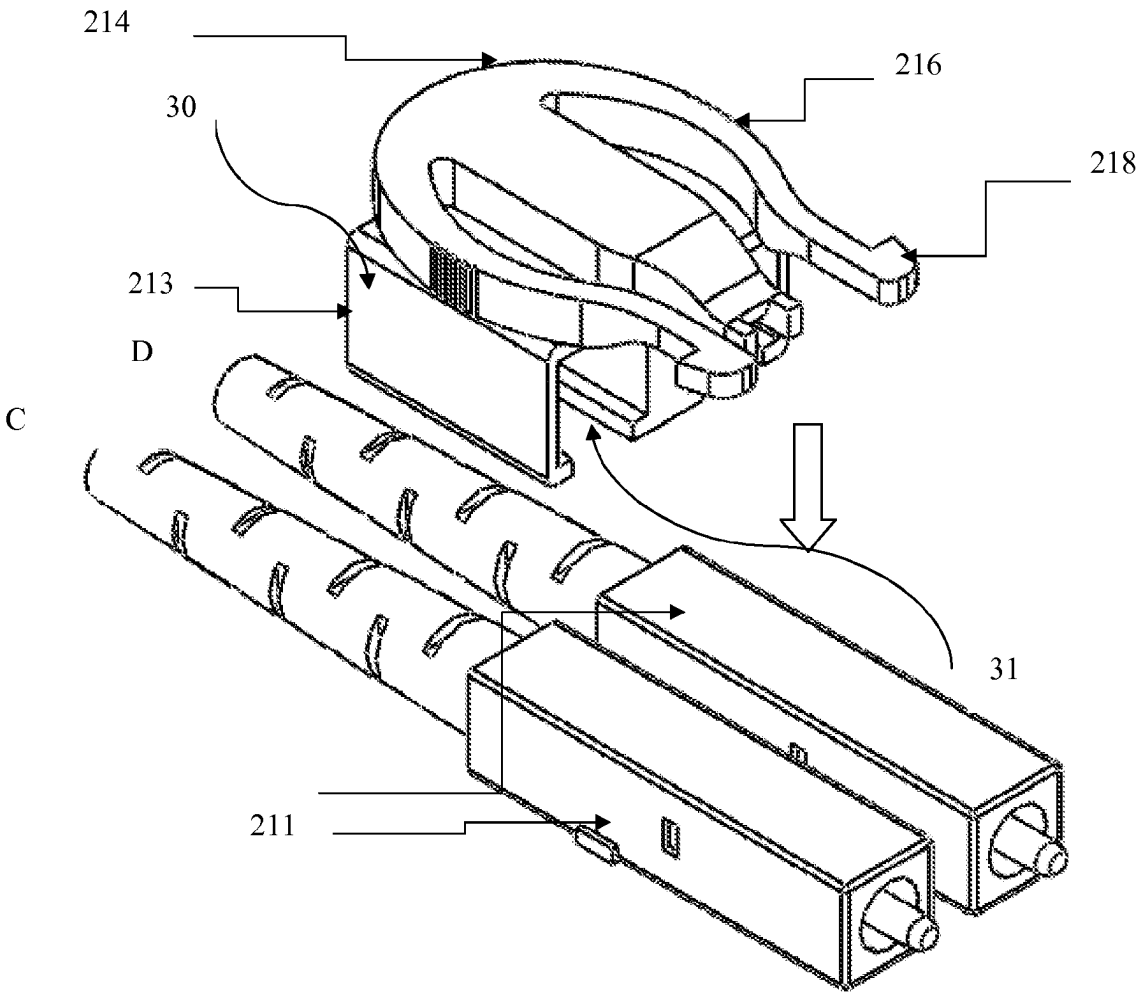
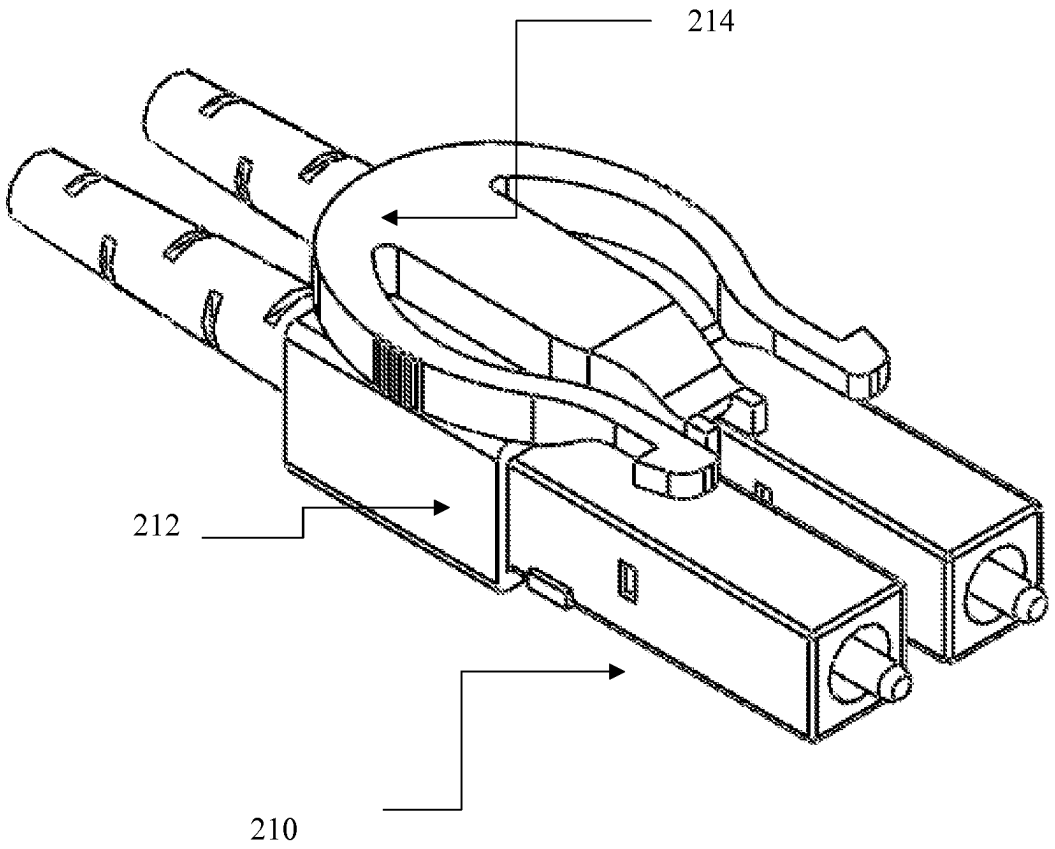


Fig. 9a

Fig. 9b



FIBER OPTIC CONNECTOR

BACKGROUND

1. Field

The present application relates to a fiber optic connector. The present application also relates to a fiber optic adaptor unit comprising a fiber optic adaptor and a fiber optic connector.

2. Related Art

Fiber optic connections such as patch cords and interconnects are known to be made with a standard LC (Lucent Technology) Connector incorporating a latch operating in a vertical plane. In use, the user actuates the connector by depressing the connector latch in a direction vertically towards the body to disengage the connector from a corresponding adaptor. Vertical action depressing the latch allows separation of the fiber optic connector from the adaptor.

SUMMARY

According to a first aspect of the present application, a fiber optic connector is provided that is releasably connected to a fiber optic adaptor. The fiber optic connector includes a body configured to receive and terminate two optical fibers and a latch mechanism provided on the body. The latch mechanism is configured for releasable engagement with each one of two sockets of the fiber optic adaptor. The latch mechanism is also configured for actuation in a direction laterally across the body.

The provision of a latch mechanism configured for releasable engagement and actuation in a direction laterally across the body allows the connector to latch in the horizontal plane. In high density applications connectors can be stacked one on another, making access to a vertical latch, and the disconnection of a connector from an adaptor, very difficult. Additional equipment to address the resulting inefficient stacking includes over-sleeves. Horizontal actuation of the latch mechanism allows freedom in the design of the cabling, configuration, density and number of overall connectors for example and in applications with a high density of cables and interconnects the release mechanism for the latch is accessible with ease.

LC connectors are available as a single or simplex version. The fiber optic connector in an embodiment of the present application comprises two simplex units held together with a brace or clamp. In this configuration, the fiber optic connector is arranged to receive and terminate two optical fibers. The brace component creates a duplex unit at a desired pitch. The body of the fiber optic connector of the present application can be defined to include a single element duplex connector and the arrangement comprising single units in a braced pair.

In an embodiment, the latch mechanism comprises a pair of latch members, each latch member configured to releasably engage with one side of a respective socket of the fiber optic adaptor. This allows for secure connection using the minimum number of parts of the fiber optic adaptor. The other side(s) of each respective socket of the fiber optic adaptor remains unused in the latching and is available, with other portions of the fiber optic connector, for securing or stabilization functions. Outer sides or shoulders of the fiber optic adaptor are preferably used for making the latch and connection.

In an embodiment, each latch member comprises a retention face arranged to cooperate with a portion of a keyway of a respective adaptor socket.

This means that in an embodiment the latch mechanism is urged into the standard shaped keyway of an adaptor cavity and can cooperate with a portion of the keyway of the adaptor socket so that the shaped retention face can latch and engage with a portion of the keyway. This allows efficient latching with a minimum number of parts and enables use by and with using existing LC connectors.

In an embodiment, a fiber optic connector further comprises a location member provided between the pair of latch members. The location member is arranged to engage with a central portion of the fiber optic adaptor between the sockets of the fiber optic adaptor, to thereby locate and retain the connector engagement with the adaptor. In this way, the central portion of the fiber optic adaptor between the adaptor sockets acts as a location feature and provides a way of achieving accurate placement of the adaptor with the connector. The location member prevents rotation of the horizontal latch and connector body relative to the adaptor. The rigidity of the central portion of the connector is utilized to improve the overall stability and rigidity of the connector body. Additional shaped protrusions at other positions on the connector can be used to further support and locate the connector with the adaptor, in particular within a corresponding portion of the keyway of the adaptor.

In an embodiment, each latch member comprises an arm having a generally curved shape, the arms being arranged to curve generally towards one another, each arm being tapered to finish at a retention face. The tapered arms and curved shape are convenient for user actuation and manipulation. In an embodiment latch members are arranged to flex towards each other under the action of a lateral force and a retention face of each latch member is configured to be urged out of contact with a portion of a keyway of a respective adaptor socket under the action of a lateral force. The action and movement of the latch members can be controlled by force applied by a user.

In an embodiment, a fiber optic connector latch mechanism is releasably mountable on each of two opposing faces of the connector body. A transceiver device enables transmit and receive signals to be passed to and from the same device with a two port connection interface in an optical network. Where multiple connection points are present in the network a requirement to switch or cross-connect polarity of the connector ports can be met with the present connector by fitting the connector latch mechanism to either the bottom or to the top of the connector body. This results in the switch of the fiber ports of the connector without requiring a separate specific replacement patch cord connector; either straight (non-crossed) patch cord or crossed patch cord. This feature allows ease of conversion of a crossed polarity patch cord to a straight patch cord in optical networks.

The latch mechanism of a further embodiment further comprises a mounting spigot including one or more anti-rotation side flanges, the mounting spigot and the side flanges are configured for selectable location in first and second mounting sockets provided in the said two faces of the connector body, the mounting spigot and the said flange being configured to engage with the respective mounting socket to secure the latch mechanism to the connector body and hinder rotation of the connector.

In this arrangement the adaptor and connector are protected from rotation and external torque from optical fiber so the mounting and anti-rotation features this arrangement can add rigidity to the connector and adaptor package.

In an embodiment the latch mechanism is further configured for actuation in a direction towards the connector body, the latch mechanism being moveable between an engagement

position at a first separation from the connector body and a release position at a second, smaller separation from the connector body in which the latch mechanism is disengaged from the adaptor sockets. The vertical movement of the latch mechanism provides an alternative disengagement technique and can be useful in space limited applications and situations.

The removal and relatching of connectors during maintenance and reconfiguration becomes a simple servicing operation requiring servicing personnel to carry minimal tools or equipment.

The latch mechanism of the embodiment is mounted on a resilient member for movement between engaged and released positions. In particular, this allows the user to latch the adaptor within the connector in a floating free position raised above the connector body and to compress the latch in a vertical plane to disengage the adaptor from the connector. This can mean fewer latching parts and components.

According to a second aspect of the present application, there is provided a fiber optic adaptor unit comprising a fiber optic adaptor having first and second adaptor sockets and a fiber optic connector as described above.

Embodiments of the application will now be described in detail, by way of example only, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an existing known coupling mechanism for a fiber optic connector and an adaptor, shown prior to connection.

FIG. **2** is a perspective, partial cut away view of an existing known coupling mechanism for a fiber optic connector and an adaptor, shown with the connector latched and connected to the adaptor.

FIG. **3** is a perspective view of a fiber optic connector with a latch mechanism of the present application.

FIG. **4***a* is a perspective view of the latch mechanism of FIG. **3**.

FIG. **4***b* is a detailed mounted view of the latch mechanism of FIG. **3**.

FIG. **4***c* is a detailed underside view of the latch mechanism of FIG. **3**.

FIG. **5** is a horizontal latch, actuated vertically.

FIG. **6** is a useful design, with multiple cable variants; and a common connector body.

FIG. **7** is a useful design, with a duplex cable variant and fiber crimping for location of the components of the cable within the adaptor.

FIG. **8** is an embodiment utilizing a venturi slot and fiber crimping for location of the components of the cable within the adaptor.

FIG. **9***a* is a perspective view of an alternative connector with a latch mechanism according to the present application.

FIG. **9***b* is a detailed mounted view of the connector and latch mechanism of FIG. **9***a*.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. **1** and **2**, there is shown an LC connector **10**. The connector **10** comprises an elongate body **12** configured to receive and terminate two optical fibers A, B, and a latch mechanism **14**. The latch mechanism **14** comprises a latch arm **16**, mounted on an upper surface and at the connection end of the body **12**. The latch arm **16** is sprung or biased away from the body **12** in a vertical direction. Each latch arm **16** includes a pair of latch retention lugs **18** extending laterally either side of each of the arms **16**. The adaptor **11** to which the connector **10** is to be mated comprises an elongate body **22** bounding an opening **24**. The opening **24** corresponds in size and shape to a connector body **12** so as to receive and terminate two optical fibers. The elongate body **22** includes at least one pair of retention shoulders **26** and at least one retention cavity **28**. The retention shoulders **26** are formed as part of an indent or recess in a channel **30** or keyway within the adaptor **11**. The latch retention lugs **18** are each sized and arranged to cooperate and fit with the channel **30** and a retention cavity **28**. The retention lugs **18** are accommodated within the channel **30** and on latching are held in place by a retention shoulder **26** within a retention cavity **28**.

The latch mechanism of FIGS. **1** and **2** operates in the vertical plane and the latch mechanism is configured for actuation in a direction vertically up the body. In use, the connector **10** is guided and urged towards the adaptor **11**, usually by a user during installation or maintenance. The sprung or biased portion of the latch arm **16** contacts the front top surface of the adaptor **11**. As the connector **10** is pushed further into the adaptor **11**, the latch retention lugs **18** slide along inside the channel or keyway **30**. On reaching the standard latch keyway and retention cavity **28** the biased nature of the retention lugs **18** is such that they move out of the channel **30** and spring upward into the retention cavity **28** to create a latch. The retention lugs **18** engage with the retention cavity **28** and bear against retention shoulders **26**, to effect the latch that holds the connector **10** and the adaptor **11** together.

The vertical movement of the latch arm **16** in a downward direction will release and remove the retention lugs **18** from the retention cavity **28**, thereby unlatching the connector body **12** and so allowing the withdrawal of the connector **10** from the adaptor **11**.

Although the above connection is described for a duplex connector and adaptor a similar arrangement and structure has been used for a connector mated with an adaptor with a single latch.

Turning now to FIG. **3** and the latch mechanism of the present invention, the adaptor **11** and the connector body **110** are as described above for a vertical latch and similar numerals will be used for similar parts in the following description.

The latch mechanism **114** comprises a pair of latch members, arms **116**, mounted on an upper surface of the body **112**. The arms **116** are shaped to curve generally towards one another. Each arm **116** is tapered to finish at a retention face. Each latch arm **116** is also arranged to be sprung or biased horizontally away from the body **112**. Each latch arm **116** includes a pair of latch retention lugs **118** extending laterally either side of each of the arms **116**. The adaptor **11** to which the connector **110** is to be mated comprises an elongate body **22** bounding an opening **24**. The opening **24** corresponds in size and shape to a connector body **112** so as to receive and terminate two optical fibers. The elongate body **22** includes at least one pair of retention shoulders **26** and at least one retention cavity **28**. The retention shoulders **26** are formed as part of an indent or recess in a channel **30** or keyway within the adaptor **11**. The latch retention lugs **118** are each sized and arranged to cooperate and fit with the channel **30** and a retention cavity **28**. The retention lugs **118** are accommodated within the channel **30** and on latching are held in place by a retention shoulder **26** within a retention cavity **28**.

The latch mechanism of FIG. **3** operates in the horizontal plane and the latch mechanism is configured for actuation in a direction laterally across the body. The latch mechanism of FIG. **3** is for use instead of the vertically actuated connector described above, the previous latch is removed so as to avoid interfering with the new coupling. In use, the connector **110**

will be guided and urged towards the adaptor **11**, usually by a user during installation or maintenance. The sprung or biased portion of the latch arm **116** contacts the front top surface of the adaptor **11**. As the connector **110** is pushed further into the adaptor **11**, the angled faces of the latch retention lugs **118** are urged into the retention cavity **28** and the keyway channel **30** of the adaptor. The retention lugs **118** slide along inside the channel or keyway **30**. On reaching the standard latch keyway and retention cavity **28** the biased nature of the retention lugs **18** is such that they move out of the channel **30** and spring outwards into the retention cavity **28** to create a latch. The retention lugs **118** engage with the retention cavity **28** and bear against retention shoulders **26**, to effect the latch that holds the connector **110** and the adaptor **11** together.

The latch arms **116** are capable of flexing towards each other under the action of lateral force. The latch arms **116** feature protruding release points **117**, at which a user can apply pressure laterally across the body for disengagement. The release and unlatch action lateral movement of the latch arm **116** in an inward direction will release and remove the retention lugs **118** from the retention cavity **28**, thereby unlatching the connector body **112** from the adaptor and so allowing the withdrawal of the connector **110** from the adaptor **11**.

FIG. **4** shows details of the mounting and arrangement of the latch mechanism **114** shown in FIG. **3**, in order to accommodate the desire to alter the polarity of the patch cord connection. The latch mechanism **114** is configured to be releasably mountable on each of two opposing faces of the connector body **112** with location spigot **131** for mounting to the top or the bottom face of the body **112**. Details and features include anti rotation fixings **132**, **133** designed to locate and fix the latch mechanism **114** securely within the connector.

Further details include the two central shoulders normally used for standard connector are left clear. This is achieved through the high density switchable horizontal latch being mounted centrally in the duplex connector and having symmetry about the central axis.

To achieve symmetry and prevent rotation of the high density switchable horizontal latch, the latch has been designed with a primary key feature **136** on the location spigot **131**. This locates into the corresponding keyway feature in the connector body. Precise alignment is achieved via the major anti-rotation feature **132** which locates onto the front edge of the connector body and down through the two connector channels. This feature adds strength to the latch body.

To further strengthen the coupling between the connector **110** and adaptor **11** when connected, the latch **114** has a rigid central feature with two protruding keys **134**. This set of central location features **134** on the latch mechanism are accommodated in between the central portion of the adaptor **11**, and locate into the two central, now redundant, keyways. Overall this arrangement increases support and rigidity in the connector/adaptor combination.

The high density switchable horizontal latch is retained in the body simply by using a coarse spline feature **138** to create resistance when inserting into the main connector body. Removal is from the base side and is achieved by inserting a screwdriver blade into the keyway on the key **136** of spigot **131**, or equivalent pushing out the latch **114**. The latch **114** is designed as a disposable item of limited use and hence will not be repeatable switched. It is likely that at best it will be fitted twice.

In a second embodiment illustrated in FIG. **5**, a horizontal latch is sprung in the vertical plane allowing the known horizontal connection to be maintained but with release in the vertical direction. This means the connection and disconnection is effected through depression of the latch in the vertical plane. The latch mechanism **114** is located above the connector **112** and is raised in a free and disengaged position. The latch mechanism **114** is compressed in order to disengage the latch portions such as the retention lugs **118** from the adaptor **11**.

A further embodiment is one having multiple cable variants within one common connector body. The features of the multiple cable are achieved through three hexagonal location features **140** inside the connector body as illustrated in FIGS. **6** and **7**. The crimp is located in the central hexagonal profile.

In a further embodiment a universal design duplex cable is provided utilizing a venturi slot and fiber crimping for location of the components of the cable within the adaptor. The adapter venturi slot, allows the pre build of a fiber with a ferrule and then just the slotting of the package into the adaptor. The crimp **142** is located on the outer portion of hexagonal profiles.

In a further embodiment illustrated in FIGS. **9***a* and **9***b* the connector **210** is shown terminating or receiving two optical fibers C, D. The connector **210** comprises two single units **211** forming the connector body **212** along with a brace member **213**. The brace member **213** is arranged so as to clamp or fix the single units **211** also known as simplex connectors, together. The brace member **213** enables a simplex connector to be used in a duplex application. The brace member **213** comprises an elongate body **30** enclosing an opening **31**. The opening **31** is of a size corresponding to the outer dimensions of the simplex connectors **211**. In use the latch **214** is fitted to and arranged on the brace member **213** and the brace member **213** is slid or clipped over the simplex connectors **211** to secure the connector unit together. FIG. **9***b* shows the braced connector unit **210** with the horizontal latch mechanism **214**. The horizontal latch feature has been described above and the functionality and features of the connector unit **210**, latch **214** and retention lugs **216** are similar to those described above with reference to FIGS. **4** and **5**. The operation of the braced connector unit **210** with the adaptor **11** will be as described above.

There have been described and illustrated herein several embodiments of a fiber optic connector. While particular embodiments of the invention have been described, it is not intended that the invention be limited thereto, as it is intended that the invention be as broad in scope as the art will allow and that the specification be read likewise. For example, there may be different shapes of fixing and orientation. There may be any number of mounting sockets, the location and orientation of the mounting sockets can be varied. The latch members and the Latch member arm components may be of any one of a variety of shapes; curved, tapered, blocked. Other material combinations may be envisaged. One or more connectors may be utilized and different connectors may be envisaged. It will therefore be appreciated by those skilled in the art that yet other modifications could be made to the provided invention without deviating from its spirit and scope as claimed.

What is claimed is:

1. A fiber optic connector arranged to be releasably connected to a fiber optic adaptor having two sockets, the fiber optic connector comprising:

a body configured to receive and terminate two optical fibers;

a latch mechanism provided on the body, the latch mechanism being configured for releasable engagement with each of the two sockets of the fiber optic adaptor, and the

latch mechanism being configured for actuation in a direction laterally across the body; and

cooperating structural elements on the latch mechanism and two opposing faces of the body for releasably mounting the latch mechanism on each of the two opposing faces of the body.

2. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism comprises a pair of latch members, each latch member configured to releasably engage with one side of a respective one of the two sockets of the fiber optic adapter.

3. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism comprises a pair of latch members, each latch member comprises a retention face arranged to cooperate with a portion of a keyway of a respective socket of the fiber optic adaptor.

4. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism comprises a pair of latch members, each latch member comprises a retention face shaped to latch and engage with a portion of a keyway of the respective socket of the fiber optic adaptor.

5. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism comprises a pair of latch members and the connector further comprises a location member provided between the pair of latch members, the location member arranged to engage with a central portion of the fiber optic adaptor between the two sockets of the fiber optic adaptor, to thereby locate and retain the connector in engagement with the fiber optic adaptor.

6. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism comprises a pair of latch members, each latch member comprises an arm having a generally curved shape, the arms being arranged to curve generally towards one another, each arm being tapered to finish at a retention face.

7. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism comprises a pair of latch members, the latch members are arranged to flex towards each other under the action of lateral force.

8. A fiber optic connector as claimed in claim **4**, wherein:

the retention face of each latch member is configured to be urged out of contact with a portion of a keyway of the respective socket of the fiber optic adaptor under the action of a lateral force.

9. A fiber optic connector as claimed in claim **4**, wherein:

each latch member comprises a release portion located on a side of the latch member, the release portion is responsive to an external lateral force, so as to urge each latch member and its retention face towards each other.

10. A fiber optic connector as claimed in claim **1**, wherein:

the cooperating structural elements include a mounting spigot including one or more anti rotation side flanges as well as first and second mounting sockets provided on each of the two opposing faces of the body, wherein the mounting spigot and side flange are configured for selectable location in the first and second mounting sockets, and wherein the mounting spigot and said flange are configured to engage with the respective mounting socket to secure the latch mechanism to the body and hinder rotation of the connector.

11. A fiber optic connector as claimed in claim **1**, wherein:

the latch mechanism is further configured for actuation in a direction towards the body, the latch mechanism being movable between an engagement position at a first separation from the body and a release position at a second, smaller separation from the body in which the latch mechanism is disengaged from the sockets of the fiber optic adaptor.

12. A fiber optic adaptor unit comprising:

a fiber optic adaptor having two sockets; and

a fiber optic connector arranged to be releasably connected to the fiber optic adaptor, the fiber optic connector including a body configured to receive and terminate two optical fibers, a latch mechanism provided on the body, and cooperating structural elements on the latch mechanism and two opposing faces of the body for releasably mounting the latch mechanism on each of the two opposing faces of the body;

wherein the latch mechanism is configured for releasable engagement with each of the two sockets of the fiber optic adaptor, and the latch mechanism is configured for actuation in a direction laterally across the body.

13. A fiber optic connector arranged to be releasably connected to a fiber optic adaptor having two sockets, the fiber optic connector comprising:

a body configured to receive and terminate two optical fibers; and

a latch mechanism provided on the body, the latch mechanism being configured for releasable engagement with each of the two sockets of the fiber optic adaptor, and the latch mechanism being configured for actuation in a direction laterally across the body;

wherein the latch mechanism comprises a pair of latch members, each latch member including an arm having a generally curved shape, the arms being arranged to curve generally towards one another, each arm being tapered to finish at a retention face.

* * * * *

APPENDIX D

US008641293B2

(12) **United States Patent**
Lin et al.

(10) **Patent No.: US 8,641,293 B2**
(45) **Date of Patent: Feb. 4, 2014**

(54) **OPTICAL FIBER CONNECTOR AND APPARATUS OF FACILITATING TO PULL OUT OPTICAL FIBER CONNECTOR**

(75) Inventors: **Sung An Lin**, Miaoli County (TW); **Sung Chi Lin**, Miaoli County (TW)

(73) Assignee: **Ezontek Technologies Co., Ltd.**, New Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 106 days.

(21) Appl. No.: **13/450,566**

(22) Filed: **Apr. 19, 2012**

(65) **Prior Publication Data**

US 2013/0216188 A1 Aug. 22, 2013

(30) **Foreign Application Priority Data**

Feb. 20, 2012 (TW) ..... 101105477 A

(51) **Int. Cl.**
G02B 6/38 (2006.01)

(52) **U.S. Cl.**
USPC **385/77**; 385/53; 385/76; 385/78

(58) **Field of Classification Search**
USPC 385/53, 76, 77, 78
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,218,828	B2 *	5/2007	Feustel et al.	385/135
7,500,790	B2	3/2009	Erdman et al.	
7,526,172	B2 *	4/2009	Gniadek et al.	385/135
7,553,089	B2	6/2009	Gurreri et al.	

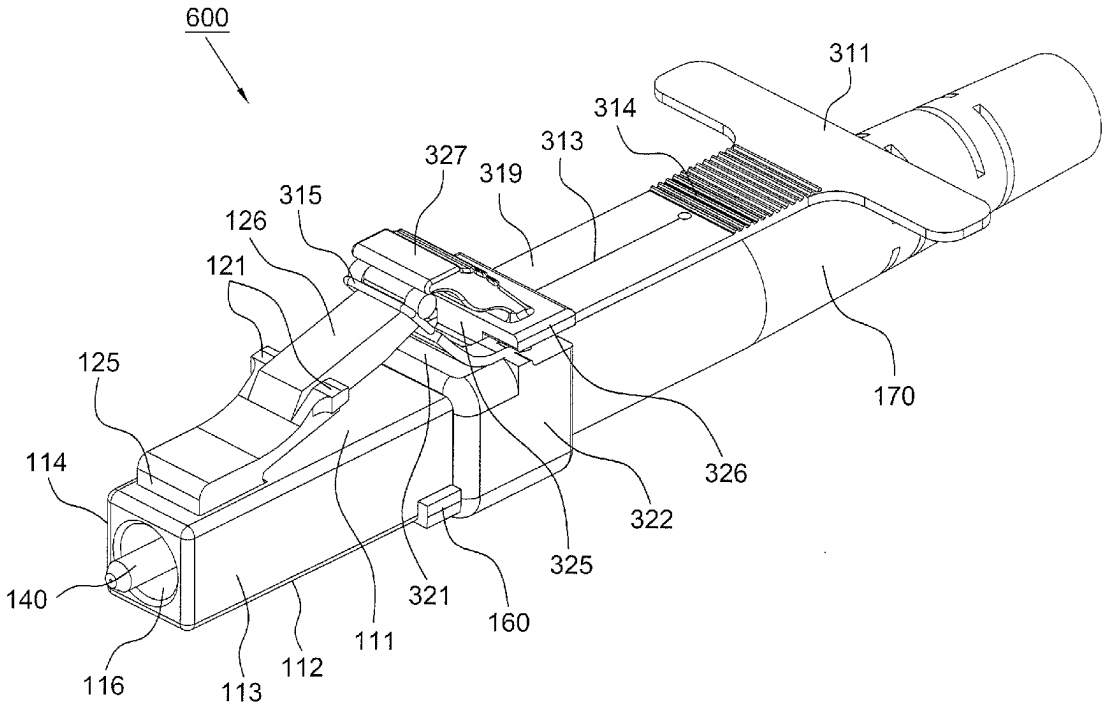
* cited by examiner

Primary Examiner — Jennifer Doan

(57) **ABSTRACT**

An optical fiber connector according to the present disclosure includes a housing, a tab, a vertical portion, a horizontal portion and a handle member. According to the optical fiber connector of the present disclosure, wherein a pull at the handle member may pull out the optical fiber connector from the optical fiber adapter without need to press a tab on the optical fiber connector directly.

11 Claims, 5 Drawing Sheets



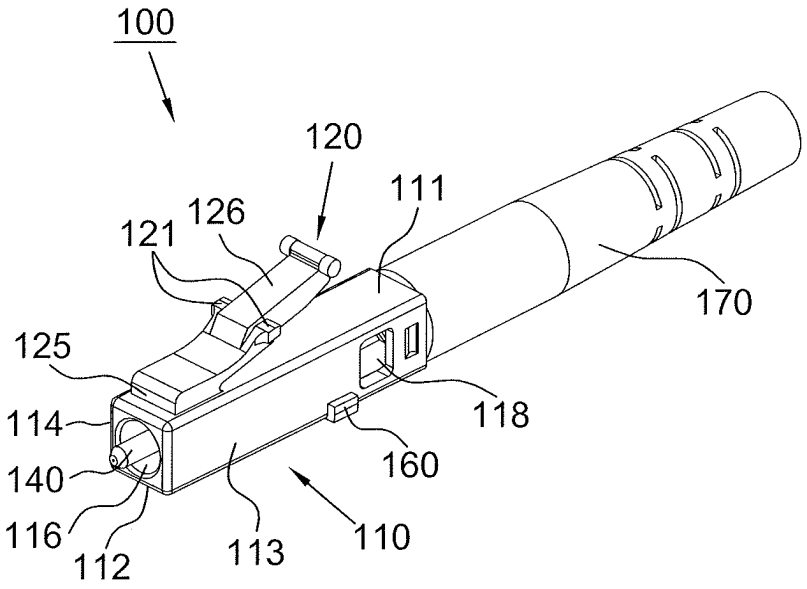


FIG. 1 (PRIOR ART)

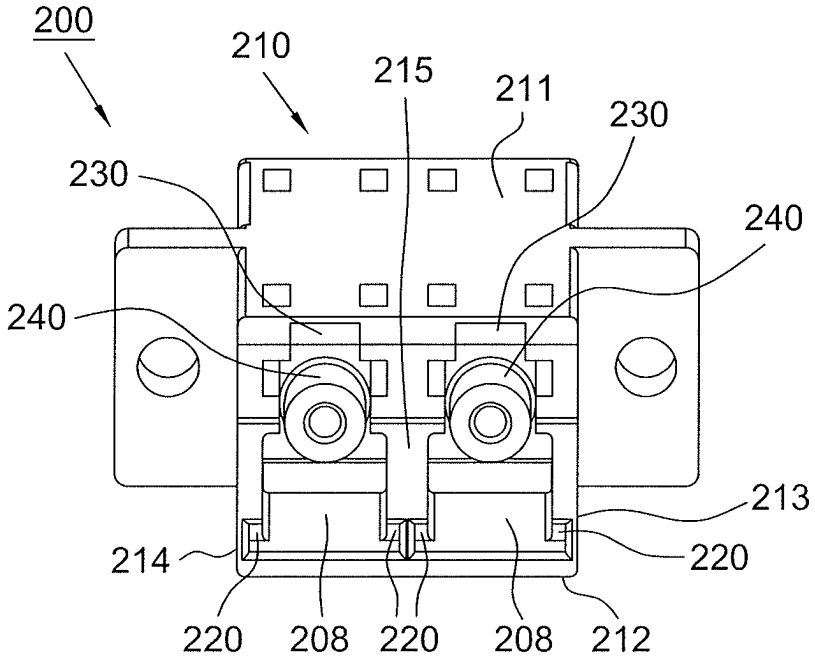


FIG. 2 (PRIOR ART)

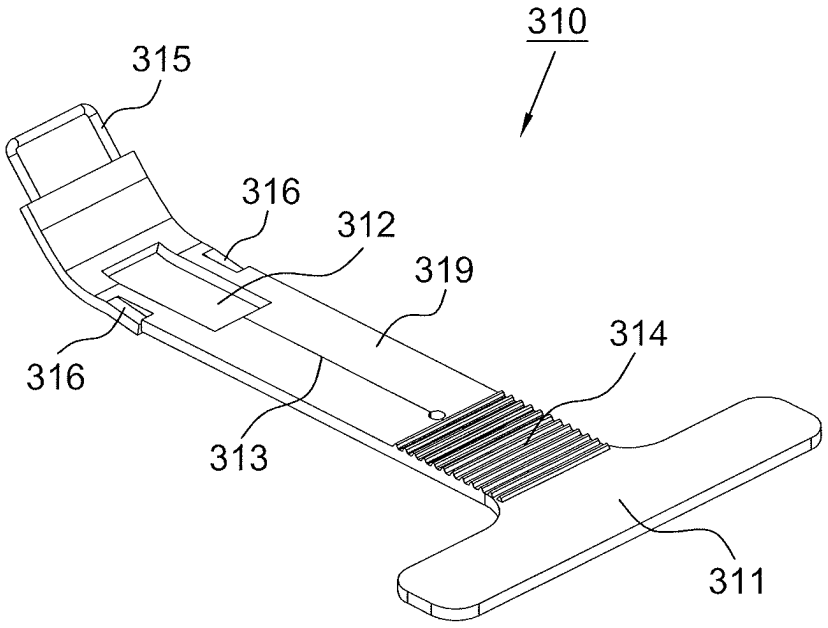

310
315
316
312
319
314
316
313
311

FIG. 3

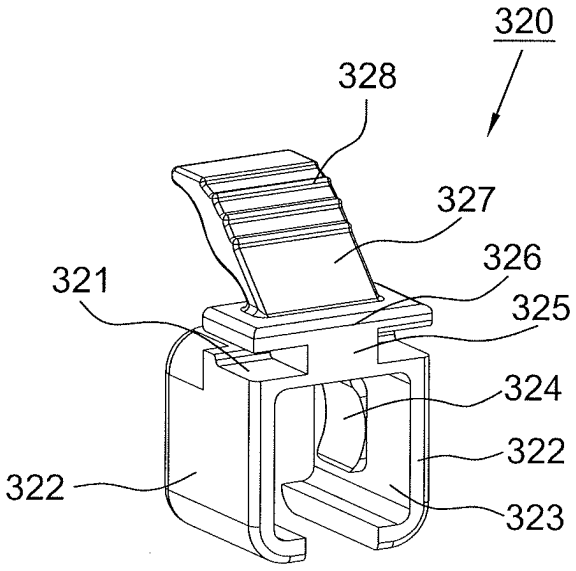

320
328
327
326
321
325
324
322
322
323

FIG. 4

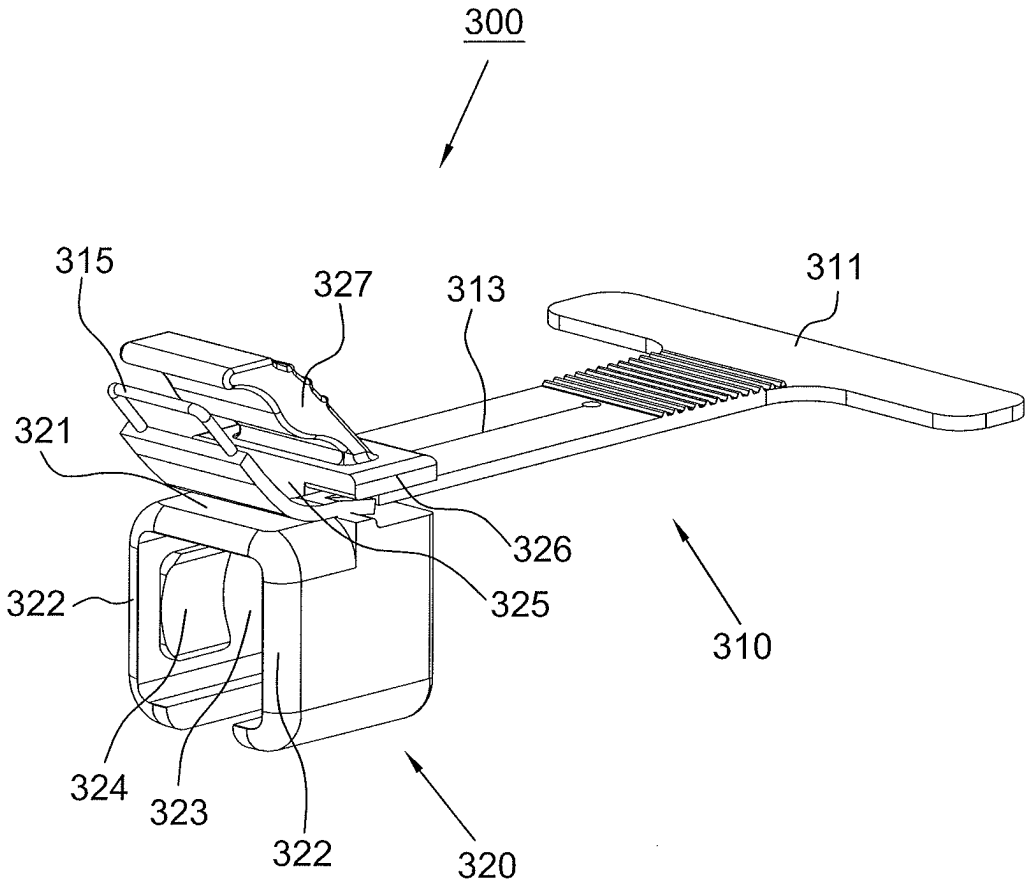


FIG. 5

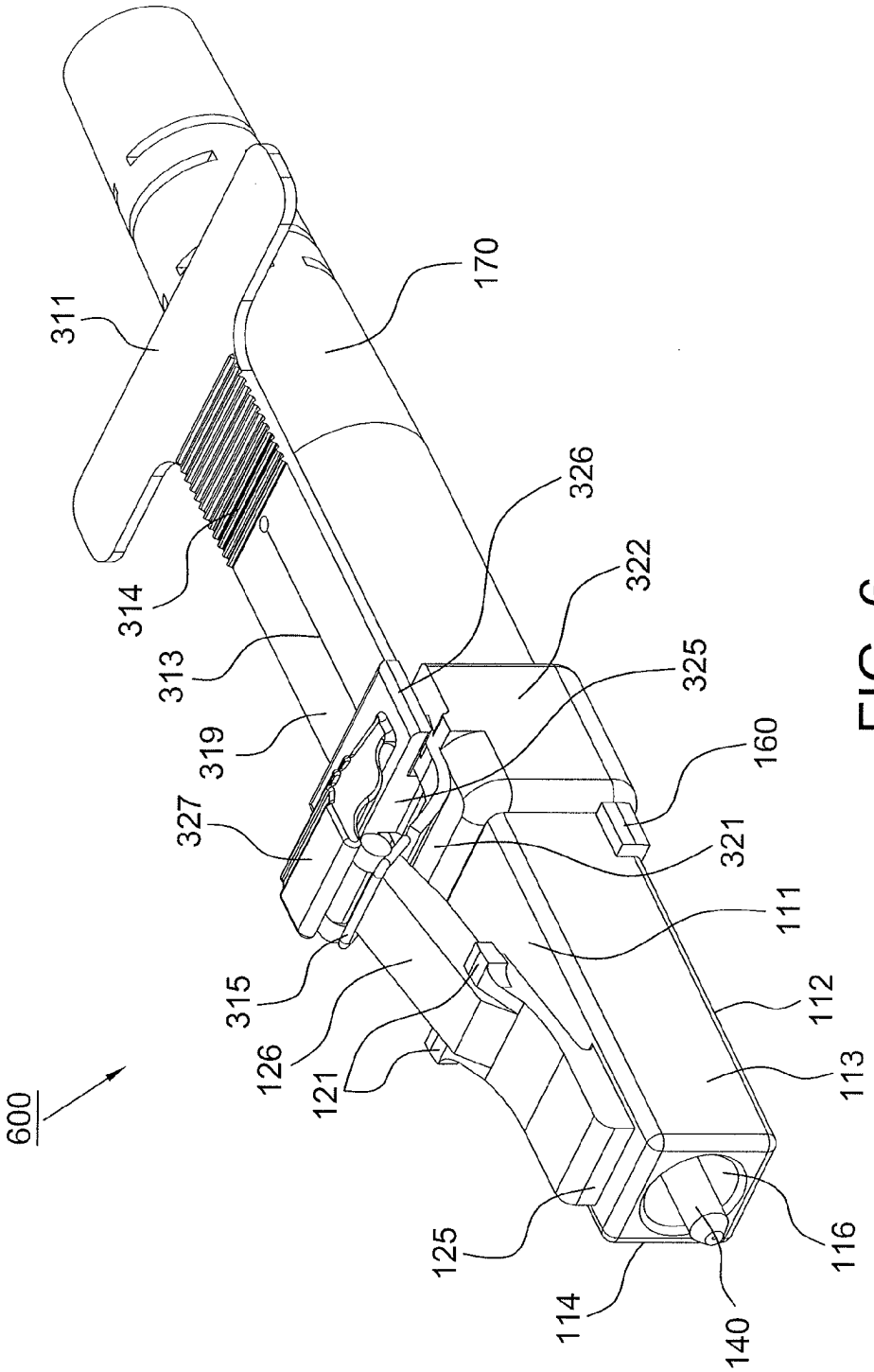

600
311
170
326
322
314
313
325
319
160
327
321
111
315
112
126
121
113
125
116
114
140

FIG. 6

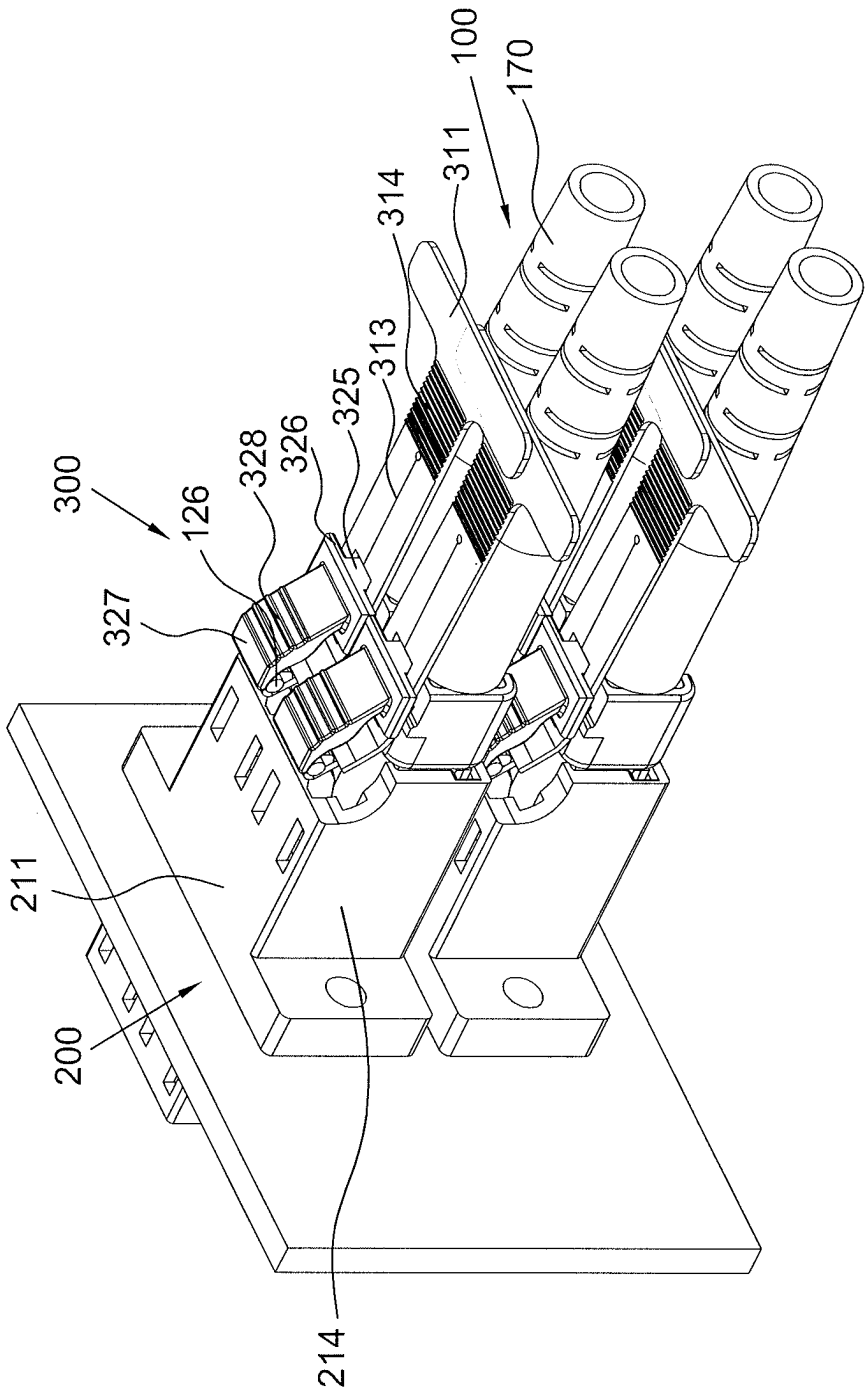


FIG. 7

OPTICAL FIBER CONNECTOR AND APPARATUS OF FACILITATING TO PULL OUT OPTICAL FIBER CONNECTOR

CROSS REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of Taiwan Patent Application Serial Number 101105477 filed Feb. 20, 2012, the full disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an optical fiber connector and apparatus of facilitating to pull out optical fiber connector.

2. Description of the Related Art

Optical fiber connectors are an essential part of substantially all optical fiber communication systems. For instance, such connectors are used to join segments of fiber into longer lengths, to connect fiber to active devices such as radiation sources, detectors and repeaters, and to connect fiber to passive devices such as switches and attenuators. The principal function of optical fiber connectors is to hold an optical fiber such that its core is axially aligned with the optical path of the device to which the connector is mating (herein "mating device"). This way, the light from one fiber is optically coupled to the optical path of the mating device.

A typical connector comprises a housing containing a ferrule which holds one or more fibers. The ferrule is biased forward in the housing such that, when the connector is mated to the mating device, the fiber in the ferrule urges against the optical path of the mating device. There are many different prior art connectors currently available for establishing such optical connections, including, for example, SC, ST and FC connectors and more-recent "small form factor" designs such as MTRJ, MU, LC, MPX and MPO-type connectors.

Referring to FIG. **1**, a conventional LC type optical fiber connector **100** has a generally rectangular shape with a square cross section. The connector **100** includes a rectangular hollow housing **110** comprised of a top side-wall **111**, a bottom side-wall **112**, a right side-wall **113** and a left side-wall **114**, wherein the right side-wall **113** faces the left side-wall **114** and connects with the bottom side-wall **112** and the top side-wall **111**. A latch **120** is molded into the top side-wall **111** and includes a living hinge **125** which allows a tab **126** to be moved up and down in a direction perpendicular to the central axis of the connector **100**. The latch **120** includes a pair of protrusions **121** that are positioned on opposing sides of the tab **126**. In addition, a ferrule **140** protrudes from a circular opening **116** on the front end of the housing **110**. A spring is located inside the housing **110** to allow the ferrule **140** to move back and forth through the opening **116** (not shown in the figure). A pair of protrusions **160** is positioned on the right side-wall **113** and left side-wall **114**, respectively. A rectangular opening **118** is formed on each of the right side-wall **113** and left side-wall **114**. A boot **170** extends from a rear end of the housing **110**.

Referring to FIG. **2**, a conventional LC type optical fiber adapter **200**, such as an LC duplex adapter includes a generally rectangular housing **210**. The housing **210** has an axial cavity defined by a top side-wall **211**, a bottom side-wall **212**, a right side-wall **213** and a left side-wall **214**. The axial cavity is divided into two halves by a compartment wall **215** that is parallel to the right side-wall **213** and left side-wall **214** and connects with the top side-wall **211** and bottom side-wall **212**. The half of the axial cavity defined by the top side-wall **211**, bottom side-wall **212**, compartment wall **215** and right side-wall **213** is named as the right axial cavity and the other half of the axial cavity defined by the top side-wall **211**, bottom side-wall **212**, compartment wall **215** and left side-wall **214** is named as the left axial cavity. Each of the right and left axial cavities has an opening **208**. A pair of indentations **220** mating with the protrusions **160** on the connector **100** is arranged in the left axial cavity on the left side-wall **214** and compartment wall **215**, respectively. Similarly, the indentations **220** are also arranged in the right axial cavity on the right side-wall **213** and compartment wall **215**, respectively. When the connector **100** of FIG. **1** is fully inserted into the adapter **200** through either of the openings **208**, the protrusions **160** on the connector **100** will be placed in the indentations **220**. Two hollow cylinders **240** are axially positioned in the right and left axial cavities respectively to receive the ferrule **140** of the connector **100**. In addition, the adapter **200** further includes reciprocal locking mechanisms **230** which, referring to FIG. **1**, mate with the latch **120**, thereby securely interlocking the connector **100** with the adapter **200** when the connector **100** is completely inserted into the adapter **200**. Afterward, a press on the tab **126** is necessary in order to pull the connector **100** out from the adapter **200**.

However, when many the connector **100** are mounted on a panel with close spacing to each other, it is likely that there is no enough space for a user's fingers to press the tab **126** of the latch **120** and then pull out the connector **100**.

Accordingly, there exists a need to provide a solution to solve the aforesaid problems.

SUMMARY OF THE INVENTION

The present disclosure provides an apparatus of facilitating to pull out optical fiber connector, wherein a pull at the handle member may pull out the optical fiber connector from the optical fiber adapter without need to press the tab on the optical fiber connector directly.

In one embodiment, the apparatus of facilitating to pull out optical fiber connector according to the present disclosure includes a clip member and a handle member. The clip member includes a first horizontal portion, two first vertical portions, a second vertical portion and a second horizontal portion. The first horizontal portion is configured to be in contact with a top side-wall of a housing of the optical fiber connector. The first vertical portions extend downward from the first horizontal portion, wherein the first vertical portions are configured to be in contact with right and left side-walls of the housing of the optical fiber connector, respectively. The second vertical portion extends upward from the first horizontal portion. The second horizontal portion is formed on the second vertical portion, wherein the second horizontal portion has a width greater than that of the second vertical portion. The handle member includes a body, a handle connecting with the body, and a ring. The body has an opening formed thereon, wherein the second vertical portion is positioned within the opening, and the opening has a width smaller than that of the second horizontal portion of the clip member. The ring connects with the body and is positioned to enclose the tab of the optical fiber connector.

According to the apparatus of the present disclosure, wherein the handle member is flexible. A slit is formed on the body and is in communication with the opening. The slit is configured to allow the second horizontal portion to insert through the opening when the slit is pulled open to enlarge the opening.

According to the apparatus of the present disclosure, wherein the handle of the handle member is T-shaped.

According to the apparatus of the present disclosure, wherein the handle member has two protruding portions extending downward from two opposing sides of the body, respectively.

According to the apparatus of the present disclosure, wherein the clip member further includes a tab formed on the second horizontal portion. The tab on the second horizontal portion is configured to be pressed on the tab of the optical fiber connector.

According to the apparatus of the present disclosure, wherein the clip member further includes two protrusions formed on the first vertical portions, respectively. The two protrusions face each other.

The present disclosure further provides an optical fiber connector.

In one embodiment, the optical fiber connector according to the present disclosure includes a housing, a tab, a vertical portion, a horizontal portion and a handle member. The housing includes a top side-wall, a bottom side-wall, a right side-wall and a left side-wall, wherein the top side-wall faces the bottom side-wall and connects with the right and left side-walls. The tab extends from the top side-wall. The vertical portion extends upward from the top side-wall and the horizontal portion is formed on the vertical portion, wherein the horizontal portion has a width greater than that of the vertical portion. The handle member includes a body, a handle and a ring. The body has an opening formed thereon, wherein the vertical portion on the top side-wall is positioned within the opening and the opening has a width smaller than that of the horizontal portion. The handle connects with the body. The ring connects with the body, wherein the ring is positioned to enclose the tab on the top side-wall.

The foregoing, as well as additional objects, features and advantages of the disclosure will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevated perspective view of a conventional LC type optical fiber connector.

FIG. **2** is an elevated perspective view of a conventional duplex LC type optical fiber adapter.

FIG. **3** is an elevated perspective view of the handle member of the apparatus of facilitating to pull out optical fiber connector according to the present disclosure.

FIG. **4** is an elevated perspective view of the clip member of the apparatus of facilitating to pull out optical fiber connector according to the present disclosure.

FIG. **5** is an elevated perspective view of the apparatus of facilitating to pull out optical fiber connector according to the present disclosure.

FIG. **6** is an elevated perspective view of the optical fiber connector according to the present disclosure.

FIG. **7** is an elevated perspective view illustrating that the optical fiber connectors of the present disclosure are inserted into optical fiber adapters.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **3**, **4** and **5**, the apparatus **300** of facilitating to pull out optical fiber connector includes a handle member **310** and a clip member **320**. Referring to FIGS. **4** and **5**, the clip member **320** is flexible and made from plastic material. The clip member **320** includes a pair of vertical portions **322** extend downward from a horizontal portion **321**, wherein the horizontal portion **321** and vertical portions **322** together define an accommodation room **323**. Two protrusions **324** facing each other are formed within the accommodation room **323** and on the vertical portions **322**, respectively. A vertical portion **325** extends upward from the horizontal member **321** and a horizontal portion **326** is formed on the vertical portion **325**, wherein the horizontal portion **326** has a width greater than that of the vertical portion **325**, and the horizontal portion **326** and vertical portion **325** together have a cross section of "T" shape. A tab **327** extends from the horizontal portion **326** and has a rough surface **328** formed thereon.

Referring to FIGS. **3** and **5**, the handle member **310** is flexible and made from plastic material. The handle member **310** includes a generally rectangular body **319**. The body **319** has an upwarping front section and a rear section connecting with a T-shaped handle **311**, wherein the handle **311** has a rough surface **314** formed thereon. An opening **312** is formed on the body **319**, wherein the opening **312** has a width that is smaller than the width of the horizontal portion **326** and is greater than the width of the vertical portion **325** of the clip member **320**. A slit **313** is formed on the body **319** in a lengthwise direction, wherein the slit **313** is in communication with the opening **312**. A U-shaped ring **315** is provided at the front section of the body **319**. Two protruding portions **316** extend downward from two opposing sides of the body **319**, respectively.

When desiring to mount the handle member **310** and clip member **320** at the optical fiber connector **100**, the handle member **310** and clip member **320** may be first assembled together. The way of assembling the above two elements together is to pull open the slit **313** to enlarge the opening **312** and then to insert the tab **327** and horizontal portion **326** of the clip member **320** through the enlarged opening **312**. Afterward, the pulling force exerted on the body **319** is removed and the vertical portion **325** is placed within the opening **312**. FIG. **5** illustrates the apparatus **300** of the present disclosure.

After the handle member **310** and clip member **320** are assembled together, the clip member **320** is forced to clip to the housing **110** of the optical fiber connector **100** and the U-shaped ring **315** of the handle member **310** is forced to enclose the tab **126** of the connector **100**. When the clip member **320** clips to the connector **100**, the horizontal portion **321** is positioned on the top side-wall **111** of the connector **100** and the vertical portions **322** are in tight contact with the right and left side-walls **113**, **114**, respectively. The protrusions **324** on the vertical portions **322** are positioned within the rectangular openings **118** on the right and left side-walls **113**, **114** of the connector **100**, respectively. FIG. **6** illustrates the optical fiber connector **600** of the present disclosure. In another embodiment, the clip member **320** of the optical fiber connector **600** may be bonded to the housing **110** of the connector **100**. Specifically, the clip member **320** may be integrally formed with the housing **110**.

According to the present disclosure, a pull at the handle member **310** may drive the clip member **320** to move when the apparatus **300** is mounted at the optical fiber connector **100**. Since the protrusions **324** of the clip member **320** are positioned within the openings **118** on the housing **110**, the protrusions **324** will be in contact with inner walls of the opening **118** when the handle member **310** is pulled. Therefore, the clip member **320** is not pulled out from the connector **100**.

Referring to FIGS. **6** and **7**, when the apparatus **300** of the present disclosure is mounted at the connector **100**, a pull at

the handle **311** of the handle member **310** may pull out the connector **100** from the optical fiber adapter **200**. When a pull is exerted at the handle **311**, the U-shaped ring **315** will is driven to pull the tab **126** of the connector **100**. Since the pull of the U-shaped ring **315** will also cause the tab **126** to be pressed down, the latch **120** on the connector **100** will be unlocked from the reciprocal locking mechanism **230** of the adapter **200**. If the pull at the handle **311** is continued, the protrusions **324** of the clip member **320** will drive the connector **100** to move to cause the connector **100** to be pulled out from the adapter **200**. In addition, the protruding portions **316** will be in contact with the horizontal portion **321** of the clip member **320** when the handle **311** is pulled. This arrangement may also help the handle member **310** pull the clip member **320**. The rough surface **314** on the handle **311** is provided to increase a friction between a user's finger and the handle **311**.

According to the present disclosure, when the apparatus **300** is mounted at the optical fiber connector **100**, a pull at the handle member **310** may pull out the connector **100** from the optical fiber adapter **200** without need to press the tab **126** directly. Furthermore, since the tab **327** of the clip member **320** extends to being positioned above the tab **126** of the connector **100**, a press on the tab **327** may press down the tab **126** to unlock the latch **120** of the connector **100** from the reciprocal locking mechanism **230** of the adapter **200**.

According to the present disclosure, since the width of the opening **312** on the handle member **310** is smaller than that of the horizontal portion **326** of the clip member **320**, the handle member **310** will not be separated from the clip member **320**.

According to the apparatus of the present disclosure, a pull at the handle member may pull out the optical fiber connector from the optical fiber adapter without need to press the tab on the optical fiber connector directly. In addition, the apparatus of the present disclosure may be mounted at a regular optical fiber connector. There is no need to use a special optical fiber connector at which the apparatus of the present disclosure may mount.

Although the preferred embodiments of the disclosure have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the disclosure as disclosed in the accompanying claims.

What is claimed is:

1. An optical fiber connector, comprising:

a housing having a top side-wall, a bottom side-wall, a right side-wall and a left side-wall, wherein the top side-wall faces the bottom side-wall and connects with the right and left side-walls;

a first tab extending from the top side-wall of the housing;

a vertical portion extending upward from the top side-wall;

a horizontal portion formed on the vertical portion, wherein the horizontal portion has a width greater than the width of the vertical portion; and

a handle member, comprising:

a body having an opening formed thereon, wherein the vertical portion on the top side-wall is positioned within the opening, and the opening has a width smaller than the width of the horizontal portion;

a handle connecting with the body; and

a ring connecting with the body, wherein the ring is positioned to enclose the first tab on the top side-wall.

2. The optical fiber connector as claimed in claim **1**, wherein the handle member is flexible, a slit is formed on the body and is in communication with the opening, the slit is configured to allow the horizontal portion to insert through the opening when the slit is pulled open to enlarge the opening.

3. The optical fiber connector as claimed in claim **1**, wherein the handle of the handle member is T-shaped.

4. The optical fiber connector as claimed in claim **1**, wherein the handle member has two protruding portions extending downward from two opposing sides of the body, respectively.

5. The optical fiber connector as claimed in claim **1**, further comprising a second tab formed on the horizontal portion, wherein the second tab extends to being positioned above the first tab.

6. An apparatus of facilitating to pull out an optical fiber connector, the optical fiber connector includes a housing having a top side-wall, a bottom side-wall, a right-wall and a left side-wall, a tab extending from the top side-wall of the housing, the apparatus comprising:

a clip member, comprising:

a first horizontal portion configured to be in contact with the top side-wall of the housing:

two first vertical portions extending downward from the first horizontal portion, the first vertical portions being configured to be in contact with the right and left side-walls, respectively;

a second vertical portion extending upward from the first horizontal portion; and

a second horizontal portion formed on the second vertical portion, wherein the second horizontal portion has a width greater than the width of the second vertical portion; and

a handle member, comprising:

a body having an opening formed thereon, wherein the second vertical portion is positioned within the opening, and the opening has a width smaller than the width of the second horizontal portion of the clip member;

a handle connecting with the body; and

a ring connecting with the body, wherein the ring is positioned to enclose the tab of the optical fiber connector.

7. The apparatus as claimed in claim **6**, wherein the handle member is flexible, a slit is formed on the body and is in communication with the opening, the slit is configured to allow the second horizontal portion to insert through the opening when the slit is pulled open to enlarge the opening.

8. The apparatus as claimed in claim **6**, wherein the handle of the handle member is T-shaped.

9. The apparatus as claimed in claim **6**, wherein the handle member has two protruding portions extending downward from two opposing sides of the body, respectively.

10. The apparatus as claimed in claim **6**, wherein the clip member further comprises a tab formed on the second horizontal portion, and the tab on the second horizontal portion is configured to be pressed on the tab of the optical fiber connector.

11. The apparatus as claimed in claim **6**, wherein the clip member further comprises two protrusions formed on the first vertical portions, respectively, the two protrusions face each other.

* * * * *

APPENDIX E

US009028270B1

(12) **United States Patent**
Vanderwoud

(10) **Patent No.: US 9,028,270 B1**
(45) **Date of Patent: May 12, 2015**

(54) **PULL TAB ACTUATOR FOR CONNECTORS**

(71) Applicant: **Facebook, Inc.**, Menlo Park, CA (US)

(72) Inventor: **Michael Vanderwoud**, Menlo Park, CA (US)

(73) Assignee: **Facebook, Inc.**, Menlo Park, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/061,658**

(22) Filed: **Oct. 23, 2013**

(51) **Int. Cl.**
H01R 13/633 (2006.01)

(52) **U.S. Cl.**
CPC ***H01R 13/6335*** (2013.01)

(58) **Field of Classification Search**
CPC H01R 13/6272; H01R 13/6275; H01R 13/641
USPC 439/352
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,207,823	B1 *	4/2007	Yang	439/352
7,238,040	B1 *	7/2007	Wu	439/352
7,281,937	B2	10/2007	Reed et al.	
7,318,740	B1 *	1/2008	Henry et al.	439/352
D566,651	S	4/2008	Chan et al.	
7,354,124	B2 *	4/2008	Oshima et al.	347/5
7,354,292	B1 *	4/2008	Lloyd et al.	439/352
7,445,484	B2	11/2008	Wu	
7,473,124	B1 *	1/2009	Briant et al.	439/352
7,666,023	B2	2/2010	Wu	
7,771,225	B1 *	8/2010	Wu	439/352
8,202,122	B2 *	6/2012	Wu	439/607.47
D675,573	S	2/2013	Farris-Gilbert et al.	
D675,992	S	2/2013	Farris-Gilbert et al.	
8,475,198	B2 *	7/2013	Wu	439/352
8,475,199	B2 *	7/2013	Wang et al.	439/353
8,506,319	B2 *	8/2013	Ritter et al.	439/352
D695,226	S	12/2013	De Iuliis et al.	
8,668,515	B2 *	3/2014	Wu	439/352
8,740,637	B2 *	6/2014	Wang et al.	439/352
2006/0189197	A1 *	8/2006	Reed et al.	439/352
2007/0243749	A1 *	10/2007	Wu	439/352
2009/0291584	A1	11/2009	Wu	
2012/0052712	A1 *	3/2012	Wang et al.	439/352
2013/0344722	A1	12/2013	Lloyd et al.	
2014/0193993	A1 *	7/2014	Meng et al.	439/352

OTHER PUBLICATIONS

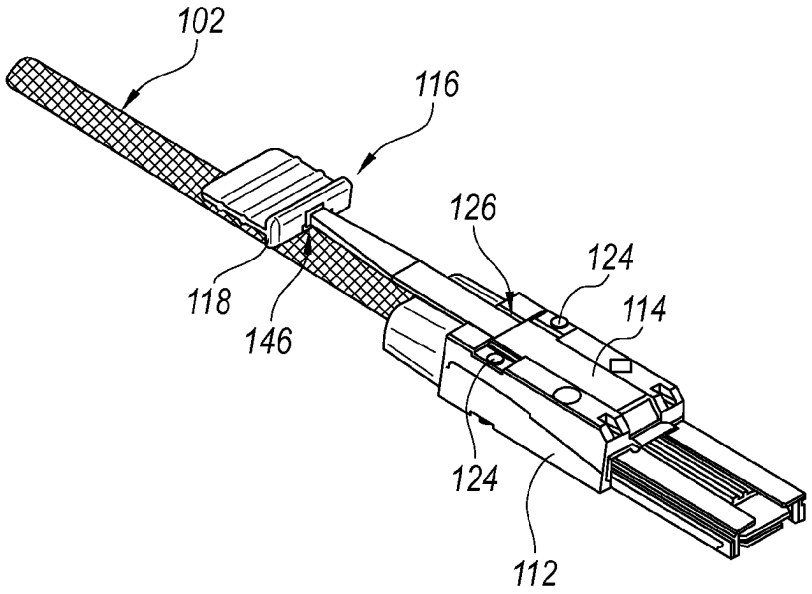
U.S. Appl. No. 29/468,754 by Vanderwoud, M., filed Oct. 2, 2013.
Non-Final Office Action mailed Dec. 29, 2014, for U.S. Appl. No. 29/468,754 of Vanderwoud, M., filed Oct. 2, 2013.
(Continued)

Primary Examiner — Gary Paumen
(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

Technology is provided for a pull tab actuator for use with a connector having a connector body and a latch member. The pull tab actuator comprises an elongate tab having a tab thickness and opposed first and second end portions. A handle having a height greater than the tab thickness is disposed on the first end portion and extends laterally from the elongate tab. A nub is disposed on the second end portion and is positioned between the connector body and the latch member. The nub is operative to actuate the latch member when the handle is pulled.

20 Claims, 9 Drawing Sheets



(56) **References Cited**

OTHER PUBLICATIONS

Notice of Allowance mailed Dec. 29, 2014, for U.S. Appl. No. 29/468,754 of Vanderwoud, M., filed Oct. 2, 2013.

FCI High Speed I/O & Cable Assemblies Assemblies, FCI Product Presentation, Cable Assembly Offerings, High Speed—mini-SAS / SATA, pp. 13-17, Jan. 2010. [Accessed on Feb. 11, 2015: http://www.mouser.com/new/fci/fci_mini-sas/].

* cited by examiner

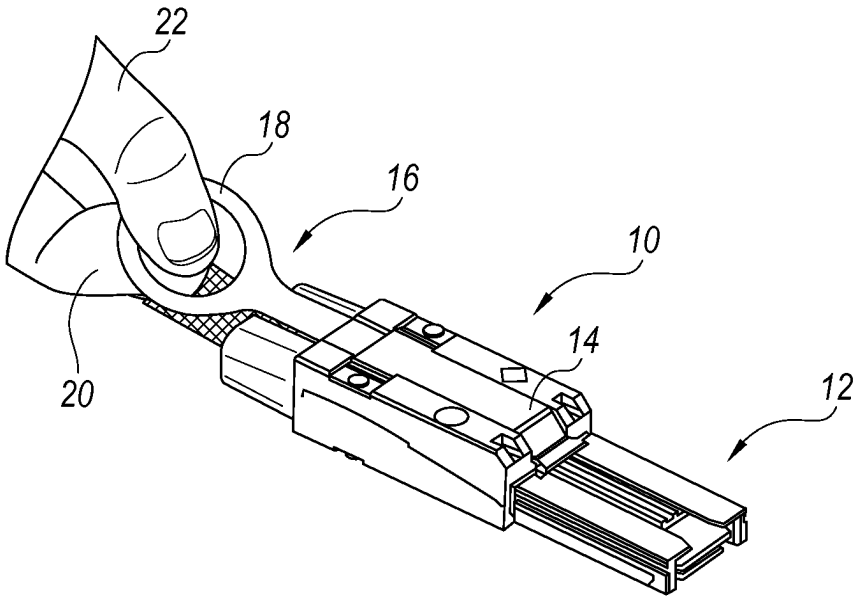


Fig. 1
PRIOR ART

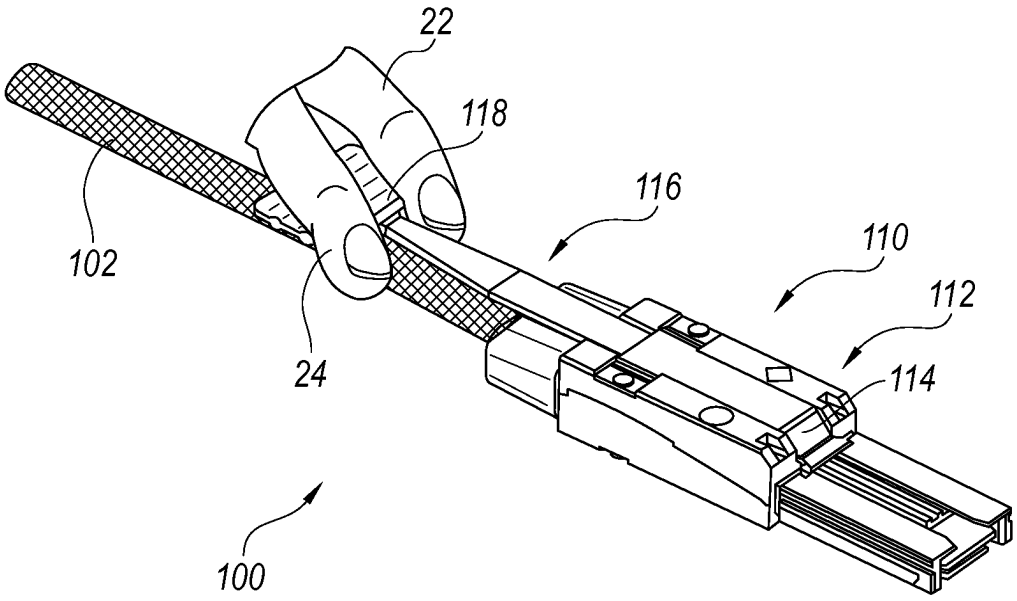


Fig. 2

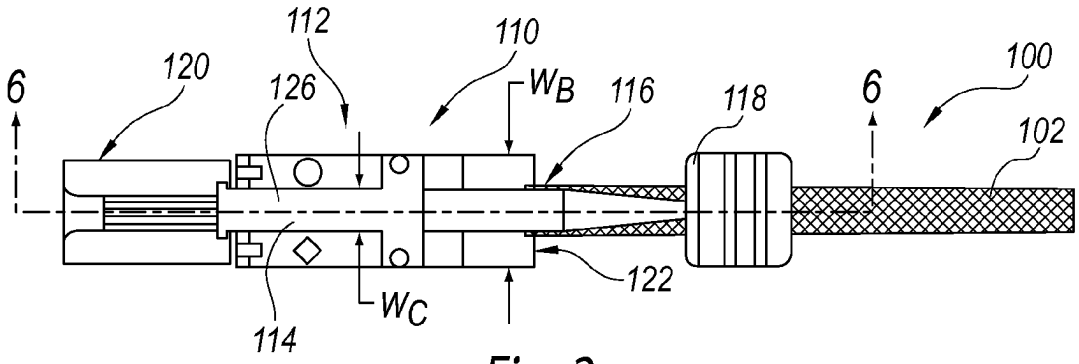


Fig. 3

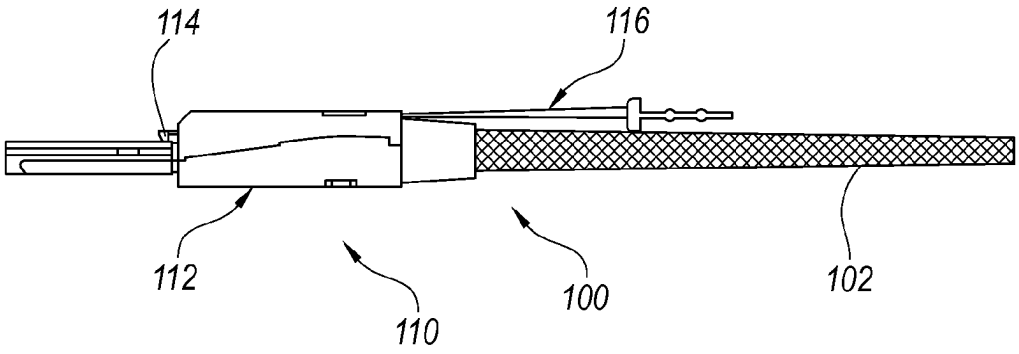


Fig. 4

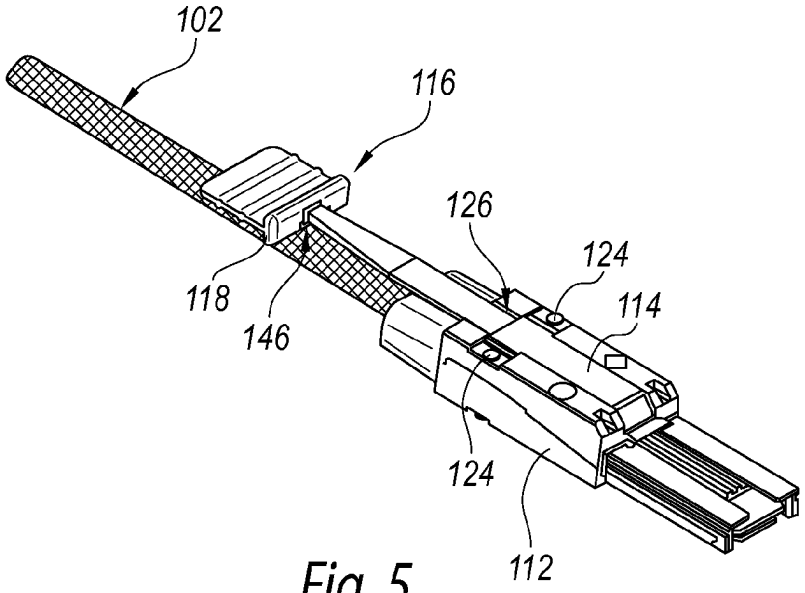


Fig. 5

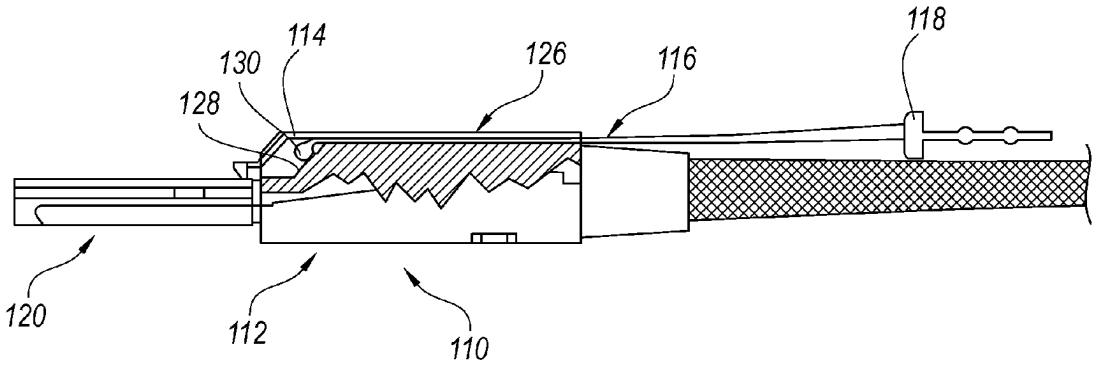


Fig. 6

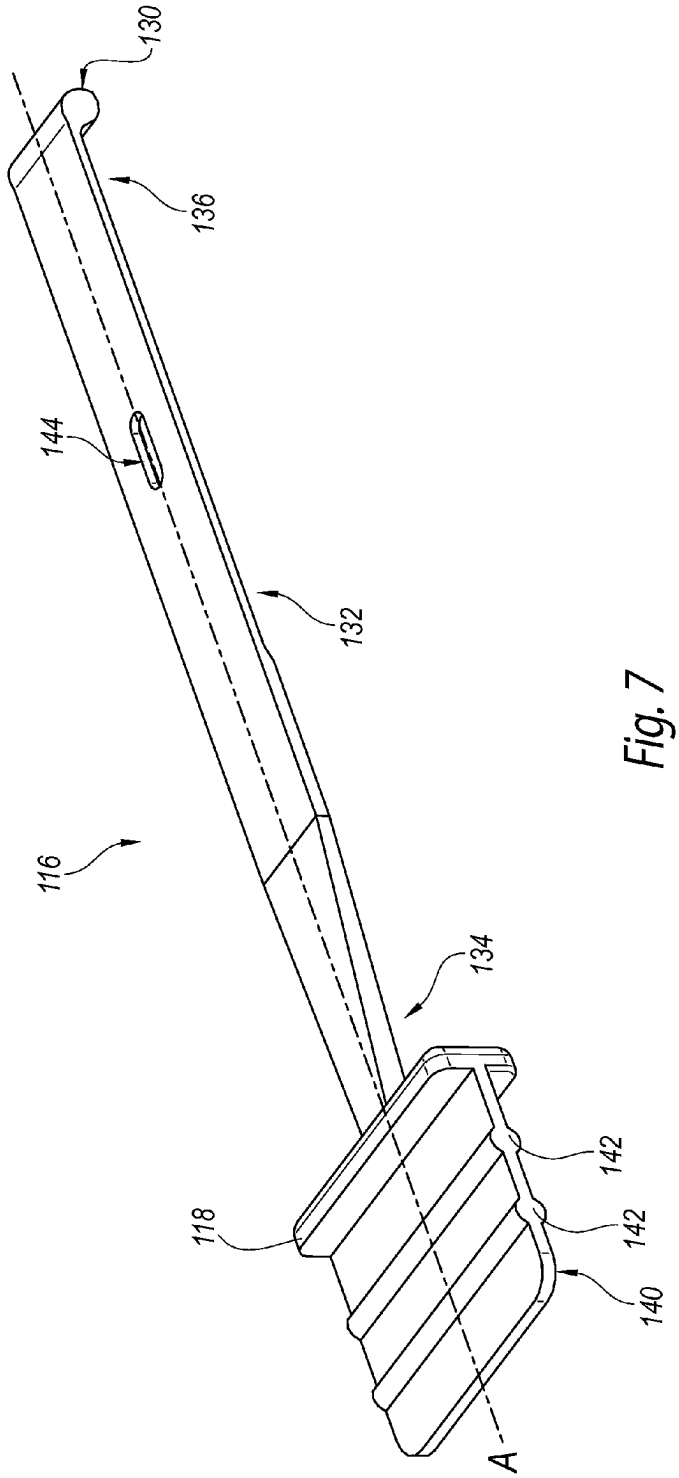

130
136
144
132
116
134
118
142
142
140
A

Fig. 7

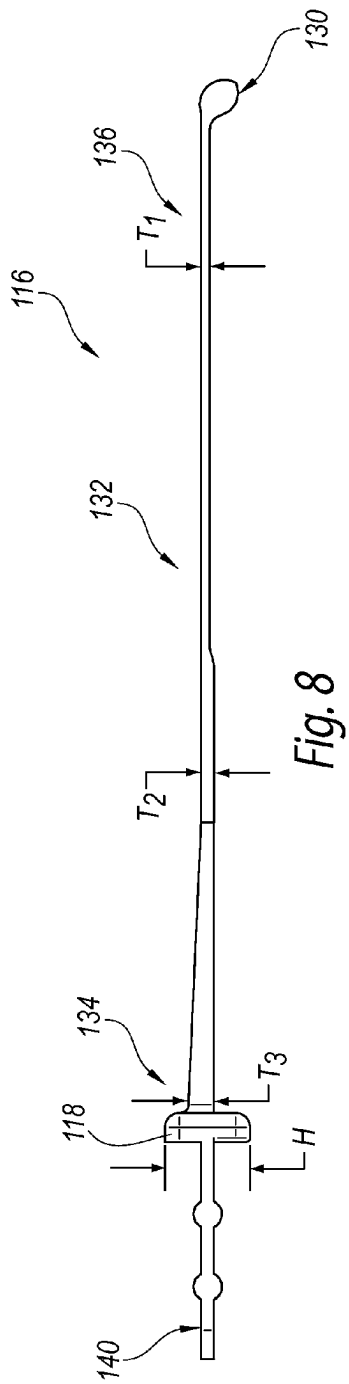

130
136
T1
116
132
T2
134
T3
118
H
140

Fig. 8

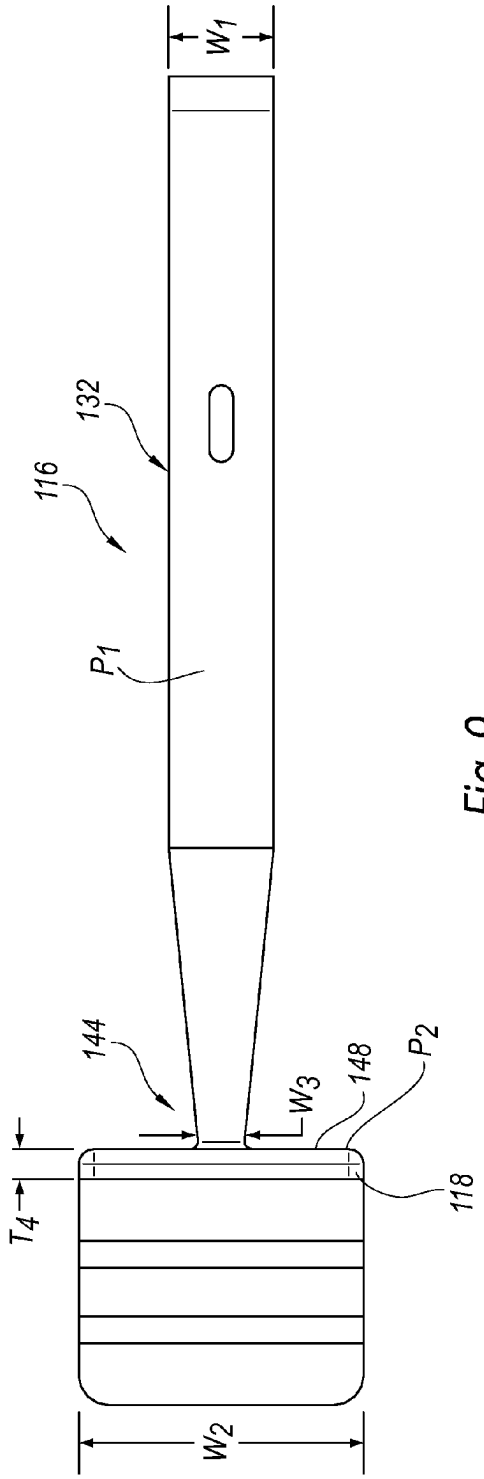


Fig. 9

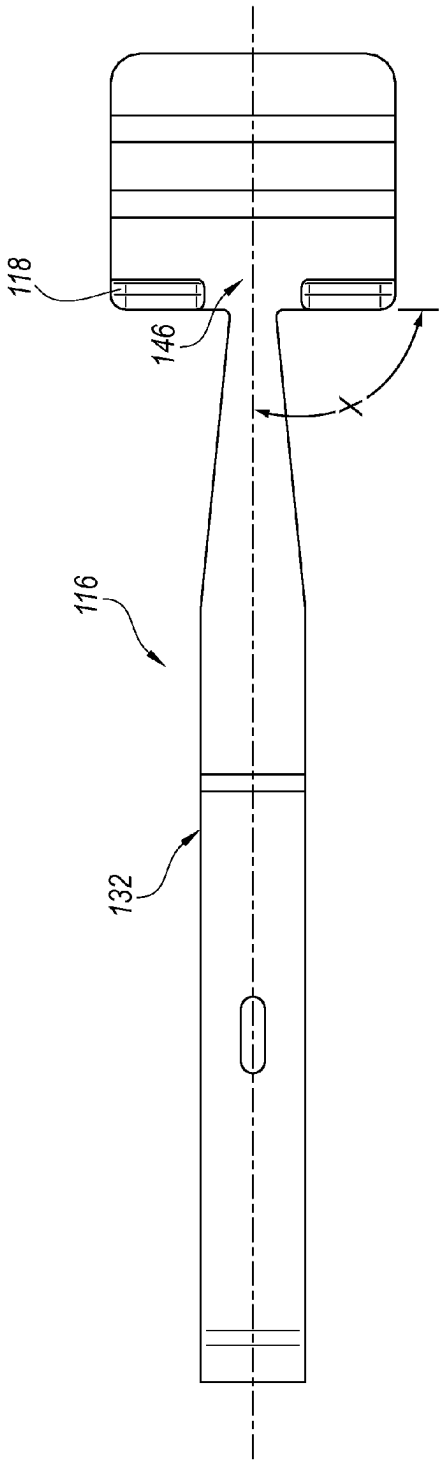


Fig. 10

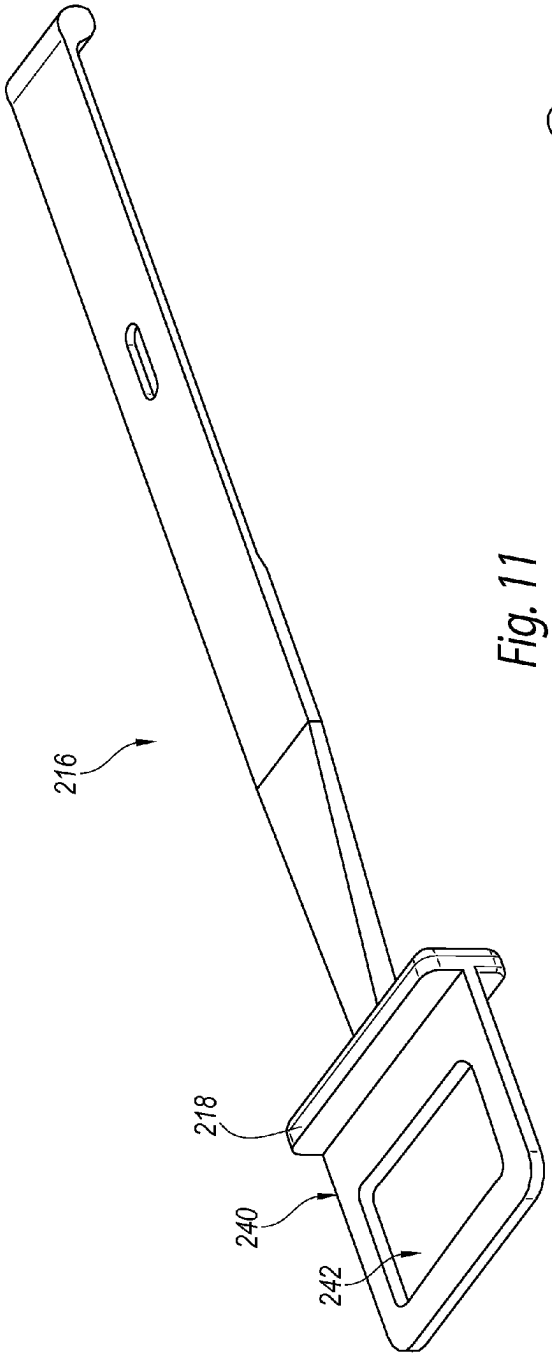


Fig. 11

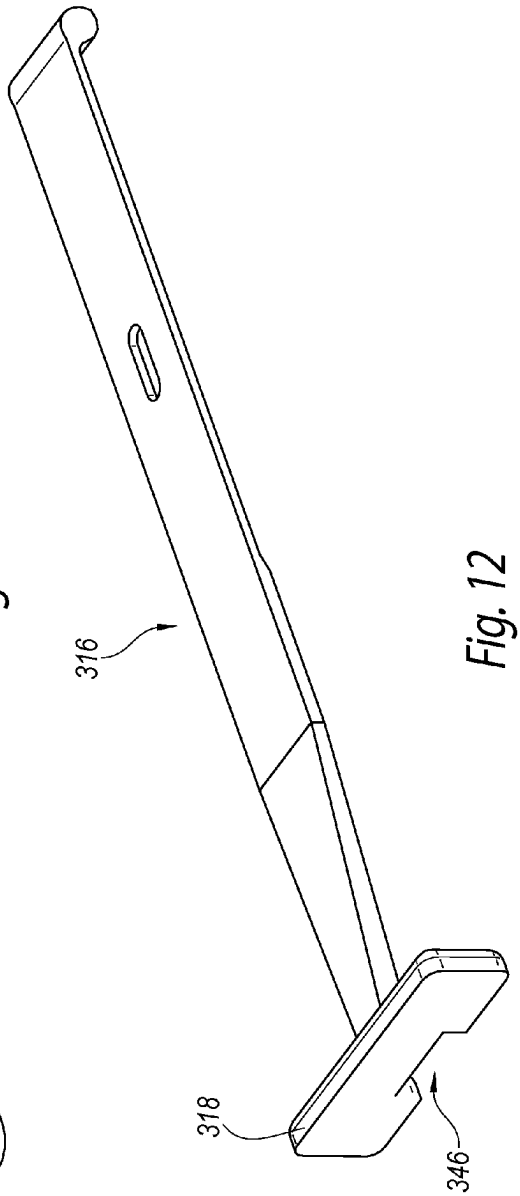


Fig. 12

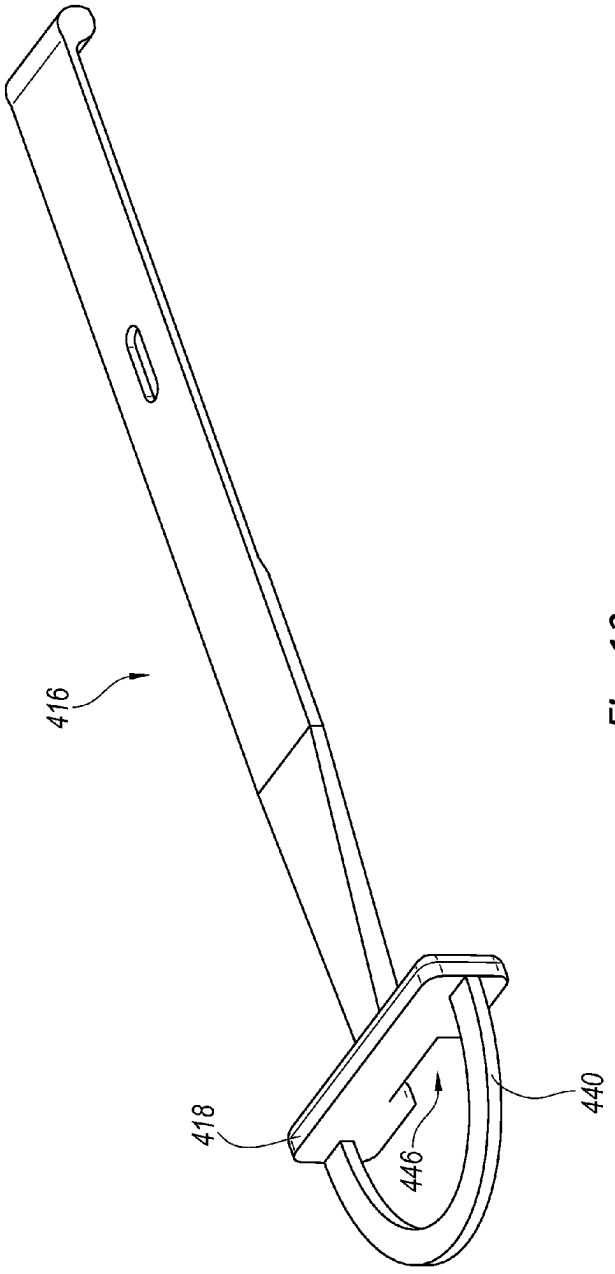


Fig. 13

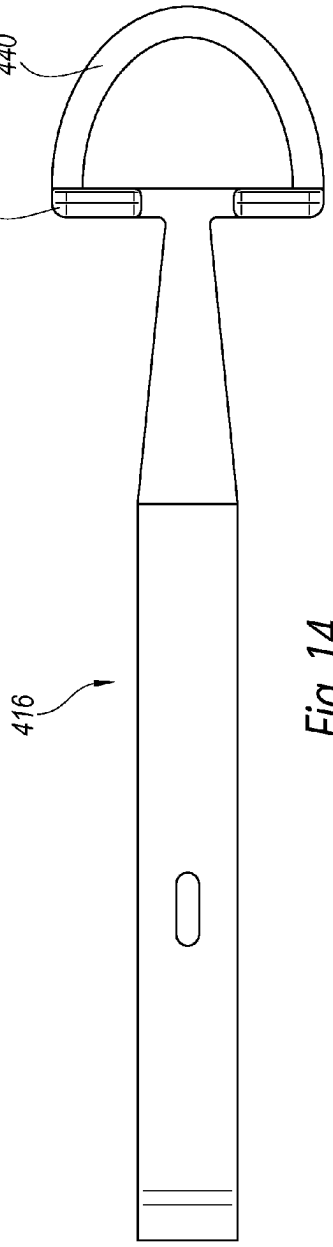


Fig. 14

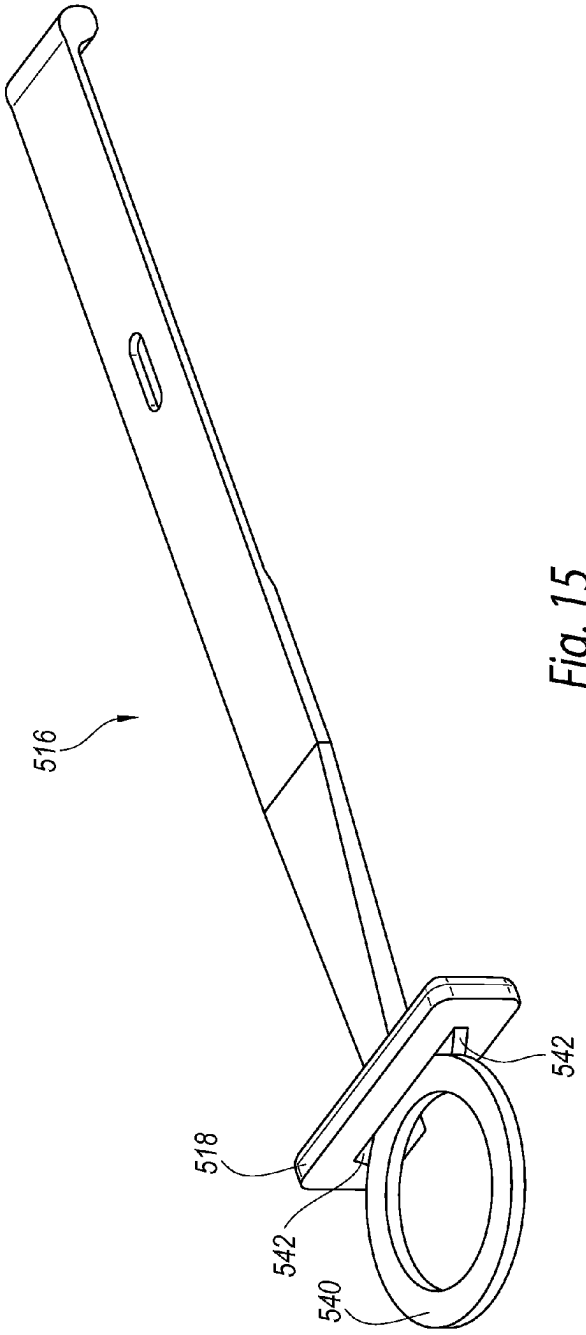


Fig. 15

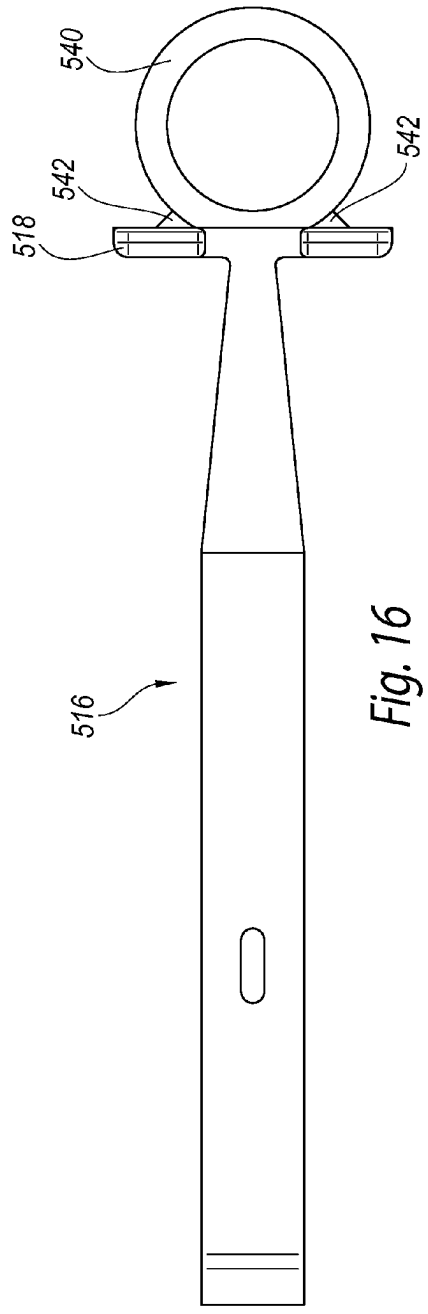


Fig. 16

PULL TAB ACTUATOR FOR CONNECTORS

TECHNICAL FIELD

This patent application generally relates to data cable connectors, and more specifically, to an ergonomic data cable connector pull tab actuator.

BACKGROUND

Electrical connectors allow convenient connection and disconnection of electrical devices and components. In a networking environment, for example, connectors connect data cables between network devices. FIG. **1** illustrates a traditional data cable connector **10**. Connector **10** is a standard external mini SAS type data cable connector. Connector **10** includes a connector body **12** and a latch member **14**. Latch member **14** is actuated by a traditional style pull tab **16** which includes a ring portion **18**. In order to release the connector **10** from a mating device, a user pulls tab **16** by engaging ring portion **18** with a thumb **20** and index finger **22**, as shown. Pulling the tab **16** actuates latch member **14**, thereby releasing the connector from the mating device.

Traditional pull tabs, such as pull tab **16**, are typically thin, ribbon-like tabs. These pull tabs typically require a pinching motion to grasp the pull tab. While these traditional pull tabs are functional in that they disengage the connector from the associated device or component, traditional ring tabs are generally only accessible from one side of the cable and are difficult to grasp. Users with larger hands and/or fingers may find it particularly difficult to grasp traditional pull tabs with the requisite pinching motion. While these existing pull tabs are functional, there is a need for a pull tab actuator which is more ergonomic and thus more easily engaged by a user.

BRIEF DESCRIPTION OF THE DRAWINGS

The pull tab actuators introduced here may be better understood by referring to the following Detailed Description in conjunction with the accompanying drawings, in which like reference numerals indicate identical or functionally similar elements:

FIG. **1** is a perspective view of a prior art connector having a traditional pull tab.

FIG. **2** is a perspective view of a cable assembly incorporating a pull tab actuator according to a representative embodiment of the present technology.

FIG. **3** is a top plan view of the cable assembly shown in FIG. **2**.

FIG. **4** is a side view in elevation of the cable assembly shown in FIGS. **2** and **3**.

FIG. **5** is a perspective view of the cable assembly shown in FIGS. **2-4**.

FIG. **6** is a partial cross-section of the connector shown in FIG. **3** taken about line **6-6**.

FIG. **7** is a perspective view of the pull tab actuator shown in FIGS. **2-6**.

FIG. **8** is a side view in elevation of the pull tab actuator shown in FIG. **7**.

FIG. **9** is a top plan view of the pull tab actuator shown in FIGS. **7** and **8**.

FIG. **10** is a bottom plan view of the pull tab actuator shown in FIGS. **7-9**.

FIG. **11** is a perspective view of a pull tab actuator according to another representative embodiment.

FIG. **12** is a perspective view of a pull tab actuator according to a further representative embodiment.

FIG. **13** is a perspective view of a pull tab actuator according to yet another representative embodiment.

FIG. **14** is a top plan view of the pull tab actuator shown in FIG. **13**.

FIG. **15** is a perspective view of a pull tab actuator according to another representative embodiment.

FIG. **16** is a top plan view of the pull tab actuator shown in FIG. **15**.

The headings provided herein are for convenience only and do not necessarily affect the scope or meaning of the claimed invention. Further, the drawings have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be expanded or reduced to help improve the understanding of the embodiments of the present invention. Moreover, while the disclosed technology is amenable to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and are described in detail below. The intention, however, is not to limit the invention to the particular embodiments described. On the contrary, the invention is intended to cover all modifications, equivalents, and alternatives falling within the scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION

Overview

Technology is disclosed for a pull tab actuator for use with a connector having a connector body and a latch member ("the technology"). In various embodiments, the pull tab actuator comprises an elongate tab with a handle (e.g., T-handle) disposed on one end and a nub disposed on the opposite end. The nub is positioned between the connector body and the latch member and actuates the latch member when the handle is pulled.

In various embodiments, the handle has a height greater than a thickness of the tab and extends laterally from the elongate tab. In various embodiments, the handle includes an engagement surface facing the connector body that is configured to receive a user's index and middle fingers. In various embodiments, the elongate tab defines a first plane, and the handle defines a second plane normal to the first plane.

General Description

Various examples of the devices introduced above will now be described in further detail. The following description provides specific details for a thorough understanding and enabling description of these examples. One skilled in the relevant art will understand, however, that the techniques discussed herein may be practiced without many of these details. Likewise, one skilled in the relevant art will also understand that the technology can include many other obvious features not described in detail herein. Additionally, some well-known structures or functions may not be shown or described in detail below so as to avoid unnecessarily obscuring the relevant description.

The terminology used below is to be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of some specific examples of the invention. Indeed, some terms may even be emphasized below; however, any terminology intended to be interpreted in any restricted manner will be overtly and specifically defined as such in this section.

Turning now to the figures, FIG. **2** illustrates a cable assembly **100** including a connector **110** having a pull tab actuator

116 according to a representative embodiment. The cable assembly **100** includes at least one connector **110** and a cable **102**. As with the traditional connector **10** described above with respect to FIG. **1**, the connector **110** includes a connector body **112** and a latch member **114**. In various embodiments, the connector body **112** can be an external SAS or mini SAS style of connector. The pull tab actuator **116** includes a handle **118** configured to receive a user's index finger **22** and middle finger **24**. Thus, the pull tab actuator **116** is operative to actuate the latch member **114** when a user pulls on the handle **118**. Although the representative embodiments are described herein with respect to SAS style connector bodies, various aspects of the disclosed technology may be applied to other connector configurations such as, for example, and without limitation, DAC connectors.

With further reference to FIGS. **3** and **4**, the connector body **112** includes a terminal end portion **120**, a cable receptacle **122**, and a channel **126** extending along an outer surface of the connector body **112**. The pull tab actuator **116** is positioned in the channel **126** between the connector body **112** and the latch member **114**. As shown in FIG. **3**, the connector body **112** has a width W_B, and channel **126** has a width W_C. As shown in the figures, the pull tab actuator **116**, as well as the latch member **114**, have a width approximately equal to the channel width W_C.

Referring to FIG. **5**, the latch member **114** is attached to the connector body **112** and extends along at least a portion of the channel **126**. In some embodiments, the latch member **114** is attached to the connector body **112** with appropriate fasteners, such as rivets **124**. Also shown in FIG. **5**, the handle **118** includes a notch **146** configured to receive the cable **102**. The notch **146** helps keep the pull tab actuator **116** centered in position along the cable **102**.

With further reference to FIG. **6**, the channel **126** includes a ramped region **128** which receives a nub **130** disposed on the pull tab actuator **116**. The nub **130** is positioned in the channel **126** between the ramped region **128** and the latch member **114**. Accordingly, when the handle **118** is pulled, the nub **130** travels along the ramped region **128** to lift or actuate the latch member **114**, thereby disengaging the connector **110** from an associated device or component to which it is connected. It should be appreciated that in FIG. **6**, the latch member **114** is shown in a latched position, and when actuated, the latch member **114** moves to an unlatched position. The latch member **114** is spring-biased to the latched position. For example, the latch member **114** can be comprised of a spring steel material, a suitable stainless steel such as S**304**, or other resilient yet flexible material. Accordingly, when the pull tab actuator **116** is released, the latch member **114** returns to the latched position.

As shown in FIG. **7**, the pull tab actuator **116** includes an elongate tab **132** having a longitudinal axis A with a first end portion **134** and an opposite second end portion **136**. The handle **118** is disposed on the first end portion **134**, and the nub **130** is disposed on the second end portion **136**. The nub **130** is an enlarged end portion of the elongate tab **132**. In this embodiment, the nub **130** is in the form of a lobe which extends across the width of the second end portion and depends downwardly from the second end portion and toward the ramped region **128** (see FIG. **6**). The elongate tab **132** also includes a slot **144** which is configured to engage a peg (not shown) within the channel **126**. The peg and slot arrangement limits the actuation stroke of the pull tab actuator **116**.

In some embodiments, the pull tab actuator **116** may also include a planar pinch grip **140** extending from the handle portion **118**. In this embodiment, the pinch grip **140** includes a plurality of gripping features **142**. The gripping features **142** extend laterally with respect to the axis A of the pull tab actuator **116**. In this embodiment, the gripping features are in the form of raised ridges; however, in other embodiments, the gripping feature can take different forms, such as, for example and without limitation, grooves, bumps, holes, divots, or the like.

As shown in FIG. **8**, the elongate tab **132** can have varying thicknesses. For example, the thickness can vary from a first thickness T_1 at the second end portion **136**, to a second thickness T_2, and finally to a third thickness T_3 at the first end portion **134**. Thickness T_1 allows the pull tab actuator **116** to be positioned in the channel **126** between the connector body **112** and the latch member **114** (see FIG. **6**). The thickness increases at T_2 and ramps up in thickness to T_3 in order to provide stiffness to the pull tab actuator **116**. It can be appreciated from the figure that handle **118** has a height H greater than the thickness of the elongate tab **132**.

As shown in FIG. **9**, the elongate tab **132** has a width W_1, and handle **118** has a width W_2. In various embodiments, the width W_1 of the elongate tab **132** is approximately equal to the width W_C of the channel **126** (see FIG. **3**). In another embodiment, the width W_2 of handle **118** can be approximately equal to the width W_B of the connector body **112** (see FIG. **3**). In some embodiments, elongate tab **132** includes a neck portion **144** having a width W_3 adjacent to handle **118** that is less than W_1. The neck portion **144** provides additional engagement surface area for the user's fingers to engage the handle **118**. Also shown in FIG. **9**, the handle **118** has a thickness T_4, selected in conjunction with height H (see FIG. **8**), to provide sufficient stiffness to the handle **118** to resist bending or breaking under the pulling force necessary to actuate the latch member **114** (see FIG. **6**). In various embodiments, the pull tab actuator **116** can be comprised of any suitable material such as plastic, rubber, and metal, for example. In various embodiments, the pull tab actuator can comprise, for example and without limitation, nylon, acrylonitrile butadiene styrene (ABS), poly vinyl chloride (PVC), high-density polyethylene (HDPE), and the like.

The handle **118** includes an engagement surface **148** facing the connector body **112** that is configured to receive a user's index finger **22** and middle finger **24**, as explained above with respect to FIG. **2**. In some embodiments, the engagement surface **148** is normal to the longitudinal axis A of the elongate tab **132** (see FIG. **7**). In various embodiments, the elongate tab **132** defines a first plane P_1, and the handle **118** defines a second plane P_2 that is oriented normal to plane P_1.

As shown in FIG. **10**, the handle **118** extends laterally from elongate tab **132** at an angle X. In this embodiment, the handle **118** extends transversely, or orthogonally, from elongate tab **132** at an angle of approximately 90 degrees. It should be appreciated that in this configuration, the handle **118** can be described as a T-handle or T-tab. However, in other embodiments, the handle **118** can extend laterally at an acute angle or an obtuse angle. For example, the handle **118** may extend from elongate tab **132** at an angle ranging from between about 45 degrees to about 135 degrees.

FIG. **11** illustrates a pull tab actuator **216** according to another representative embodiment. In this embodiment, the pull tab actuator **216** includes a handle **218** and a pinch grip **240** extending from the handle. The pinch grip **240** includes an aperture **242** to facilitate gripping the pinch grip **240**. FIG. **12** illustrates a pull tab actuator **316** according to a further representative embodiment. The pull tab actuator **316** includes a handle **318** and a corresponding notch **346**. As can be appreciated from the figure, handle **318** does not include a pinch grip. FIGS. **13** and **14** illustrate a pull tab actuator **416** according to another representative embodiment. The pull tab

actuator **416** includes a handle **418** with a pinch grip in the form of an arcuate loop **440**. Handle **418** also includes a cable receiving notch **446** similar to notch **146** described above. FIGS. **15** and **16** illustrate a pull tab actuator **516** according to a still further representative embodiment. Pull tab actuator **516** includes a handle **518** with a loop pinch grip **540** extending therefrom. Pinch grip **540** is in the form of a circular loop having gussets **542** disposed between the pinch grip **540** and handle **518**.

Remarks

The above description and drawings are illustrative and are not to be construed as limiting. Numerous specific details are described to provide a thorough understanding of the disclosure. However, in some instances, well-known details are not described in order to avoid obscuring the description. Further, various modifications may be made without deviating from the scope of the invention. Accordingly, the invention is not limited except as by the appended claims.

Reference in this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the disclosure. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Moreover, various features are described which may be exhibited by some embodiments and not by others. Similarly, various requirements are described which may be requirements for some embodiments but not for other embodiments.

The terms used in this specification generally have their ordinary meanings in the art, within the context of the disclosure, and in the specific context where each term is used. It will be appreciated that the same thing can be said in more than one way. Consequently, alternative language and synonyms may be used for any one or more of the terms discussed herein, and any special significance is not to be placed upon whether or not a term is elaborated or discussed herein. Synonyms for some terms are provided. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this specification, including examples of any term discussed herein, is illustrative only and is not intended to further limit the scope and meaning of the disclosure or of any exemplified term. Likewise, the disclosure is not limited to various embodiments given in this specification. Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure pertains. In the case of conflict, the present document, including definitions, will control.

What is claimed is:

1. A pull tab actuator for use with a connector having a connector body and a latch member, the pull tab actuator comprising:
- an elongate tab having a tab thickness and opposed first and second end portions;
- a handle having a height greater than the tab thickness disposed on the first end portion and extending laterally from the elongate tab;
- a pinch grip extending from the handle and having a thickness less than the height of the handle; and
- a nub disposed on the second end portion and positioned between the connector body and the latch member, the nub being operative to actuate the latch member when the handle is pulled.

2. The pull tab actuator according to claim **1**, wherein the handle extends laterally from the elongate tab at an acute angle.

3. The pull tab actuator according to claim **1**, wherein the handle extends laterally from the elongate tab at an angle between about 45 degrees and about 135 degrees.

4. The pull tab actuator according to claim **1**, wherein the handle extends laterally from the elongate tab at an angle of approximately 90 degrees.

5. The pull tab actuator according to claim **1**, wherein the elongate tab includes a neck portion adjacent the handle.

6. The pull tab actuator according to claim **1**, wherein the pinch grip includes a plurality of transversely extending gripping features.

7. The pull tab actuator according to claim **6**, wherein the gripping features comprise ridges.

8. The pull tab actuator according to claim **6**, wherein the gripping features comprise grooves.

9. The pull tab actuator according to claim **1**, wherein the pinch grip comprises a loop.

10. A connector, comprising:
- a connector body including a cable receptacle, a terminal end portion, and a channel extending along an outer surface of the connector body, the channel including a ramped region proximate the terminal end portion;
- a latch member mounted to the connector body and extending along at least a portion of the channel; and
- a pull tab actuator including:
  - an elongate tab having a longitudinal axis and opposed first and second end portions;
  - a handle disposed on the first end portion and including an engagement surface normal to the longitudinal axis and facing the connector body configured to receive an index finger and a middle finger of a user;
  - a pinch grip extending from the handle and having a thickness less than a height of the handle; and
  - a nub disposed on the second end portion and positioned in the channel between the ramped region and the latch member and operative to actuate the latch member when the handle is pulled.

11. The connector according to claim **10**, wherein the handle portion includes a notch configured to receive a cable extending from the cable receptacle.

12. The connector according to claim **10**, wherein the second end portion of the elongate tab has a width approximately equal to a width of the channel.

13. The connector according to claim **10**, wherein the handle has a width approximately equal to a width of the connector body.

14. The connector according to claim **10**, wherein the nub is in the form of a lobe extending across a width of the second end portion.

15. A cable assembly, comprising:
- at least one connector including:
  - a connector body including a cable receptacle, a terminal end portion, and a channel extending along an outer surface of the connector body, the channel including a ramped region proximate the terminal end portion;
  - a latch member mounted to the connector body and extending along at least a portion of the channel; and
  - a pull tab actuator including:
    - an elongate tab having a longitudinal axis and opposed first and second end portions, wherein the elongate tab defines a first plane;
    - a handle disposed on the first end portion defining a second plane normal to the first plane;

a pinch grip extending from the handle and having a thickness less than a height of the handle; and

a nub disposed on the second end portion and positioned in the channel between the ramped region and the latch member and operative to actuate the latch member when the handle is pulled; and

a cable extending from the cable receptacle.

16. The cable assembly according to claim **15**, wherein the handle portion includes a notch configured to receive the cable.

17. The cable assembly according to claim **15**, wherein the second end portion of the elongate tab has a width approximately equal to a width of the channel.

18. The cable assembly according to claim **17**, wherein the first end portion of the elongate tab includes a neck portion adjacent the handle.

19. The cable assembly according to claim **18**, wherein the handle has a width approximately equal to a width of the connector body.

20. The cable assembly according to claim **19**, wherein the nub is in the form of a lobe extending across a width of the second end portion.

* * * * *

APPENDIX F

US 20160047993A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2016/0047993 A1

(43) Pub. Date: Feb. 18, 2016

HIOKI et al.

(54) **TWO CORE TYPE OPTICAL CONNECTOR PLUG**

(71) Applicant: **SANWA DENKI KOGYO CO., LTD.**, Tokyo (JP)

(72) Inventors: **Yasusuke HIOKI**, Tokyo (JP); **Takashi SATO**, Tokyo (JP)

(21) Appl. No.: **14/549,705**

(22) Filed: **Nov. 21, 2014**

(30) **Foreign Application Priority Data**

Aug. 13, 2014 (JP) 2014-164788

Publication Classification

(51) **Int. Cl.**
G02B 6/38 (2006.01)

(52) **U.S. Cl.**
CPC *G02B 6/3869* (2013.01)

(57) **ABSTRACT**

Provided is a two core type optical connector plug capable of simply interchanging positions of a pair of optical connectors disposed left and right.

The two core type optical connector plug includes a holder (**1**) that holds ferrule housings (**10**A, **10**B) of a pair of optical connectors (A, B) to become one body and houses core wires of a pair of optical fiber cables extending backward, a boot (**2**) that simultaneously protects the pair of optical fiber cables extending backward from the holder (**1**), and a lever coupler (**20**) that is formed to be mountable on or demountable from the holder (**1**). The lever coupler (**20**) is formed to connect a pair of latch levers (**5***a*, **5***a*) to a tip side of an operating lever (**7**) mounted on the holder (**1**) so as to correspond to the ferrule housings (**10**A, **10**B) and to provide elasticity.

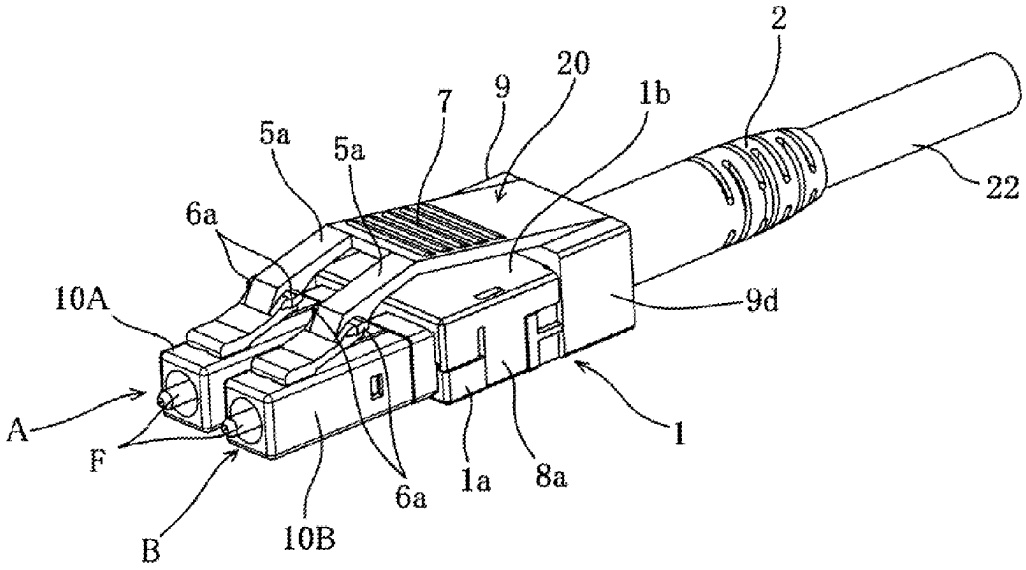


FIG.1

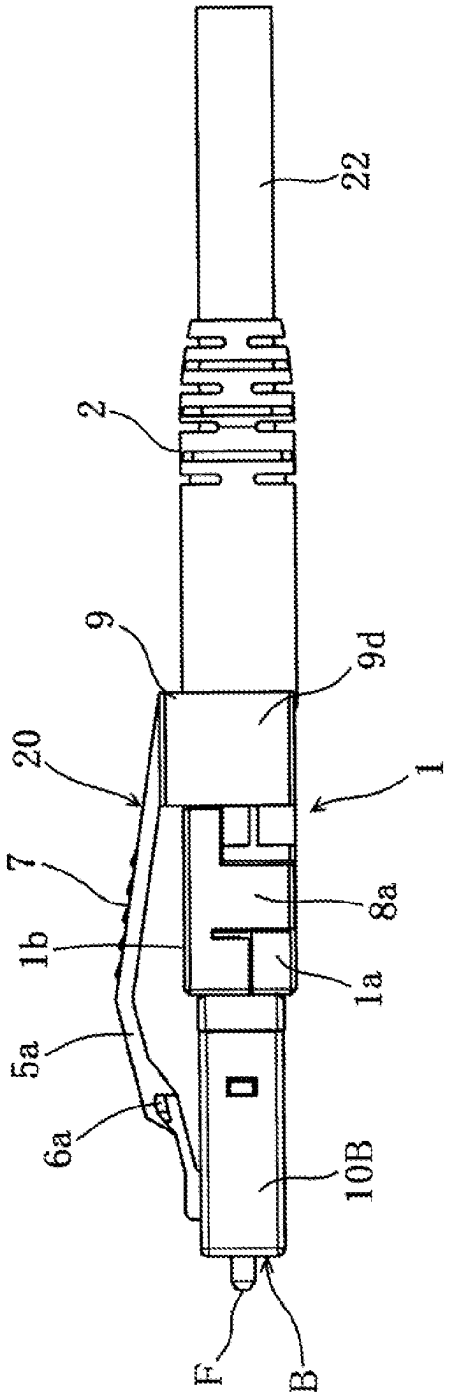


FIG.2

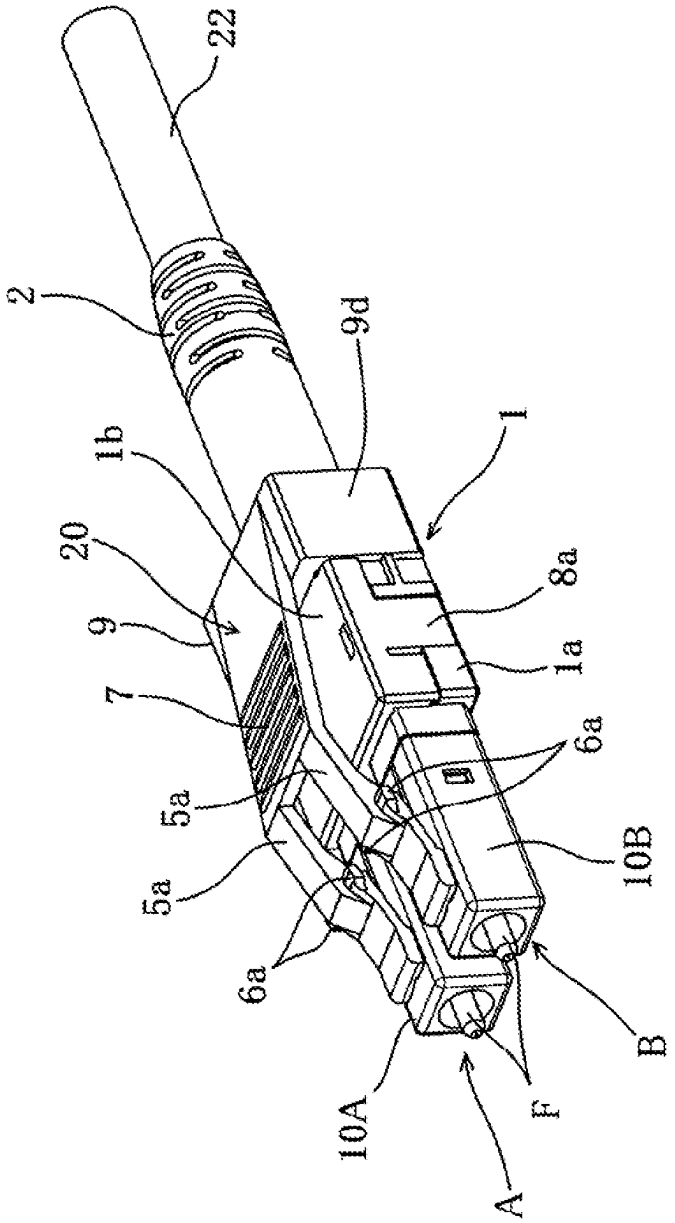
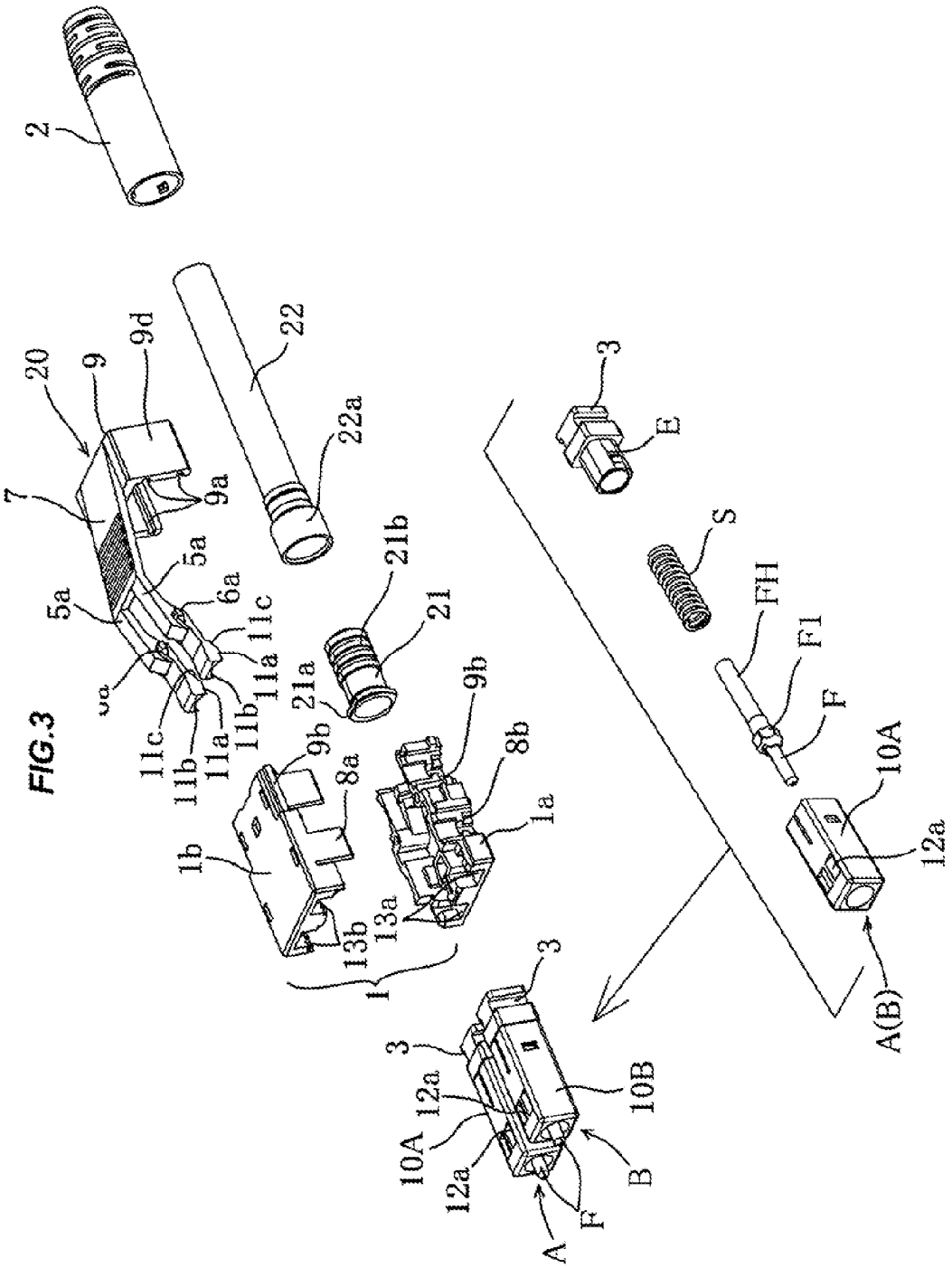


FIG.3


2
20
9
9d
7
9a
5a
5a
6a
11c
11a
11b
11c
11b
11a
21a
22
22a
21b
21
9b
8a
9b
8b
1a
1b
13b
13a
1
3
3
12a
10A
12a
10B
B
A
F
3
E
S
FH
F1
F
10A
12a
A(B)

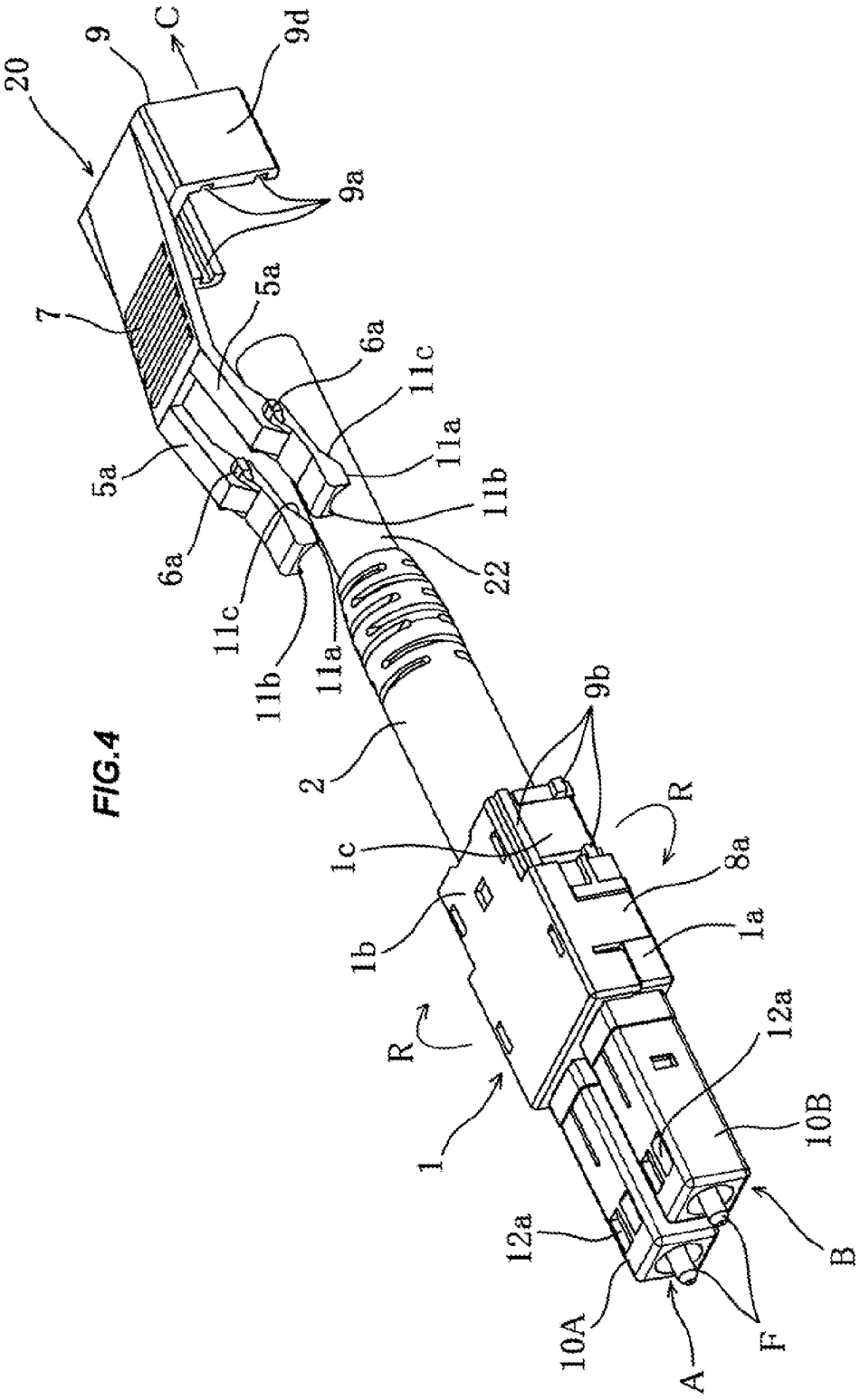


FIG.4

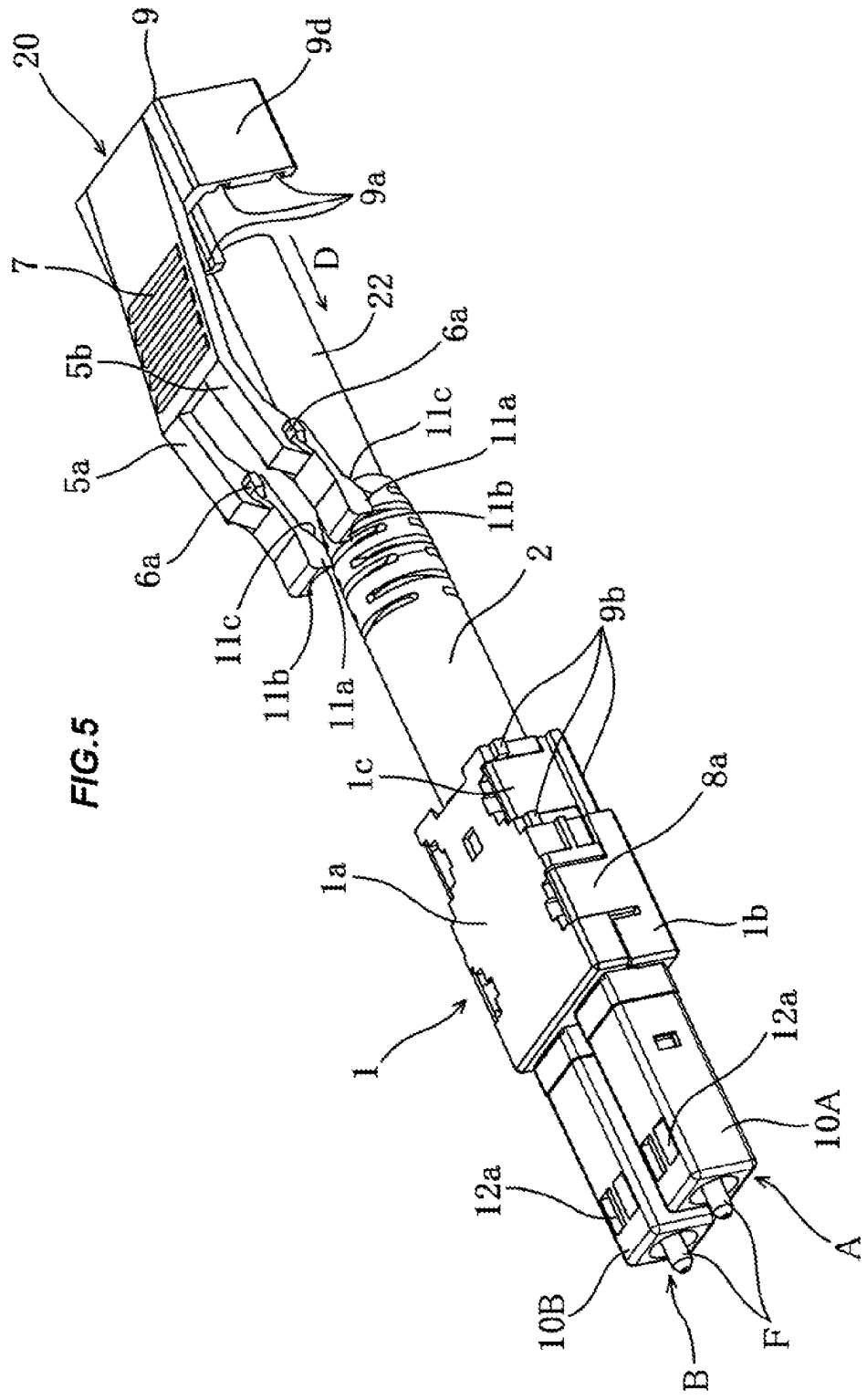
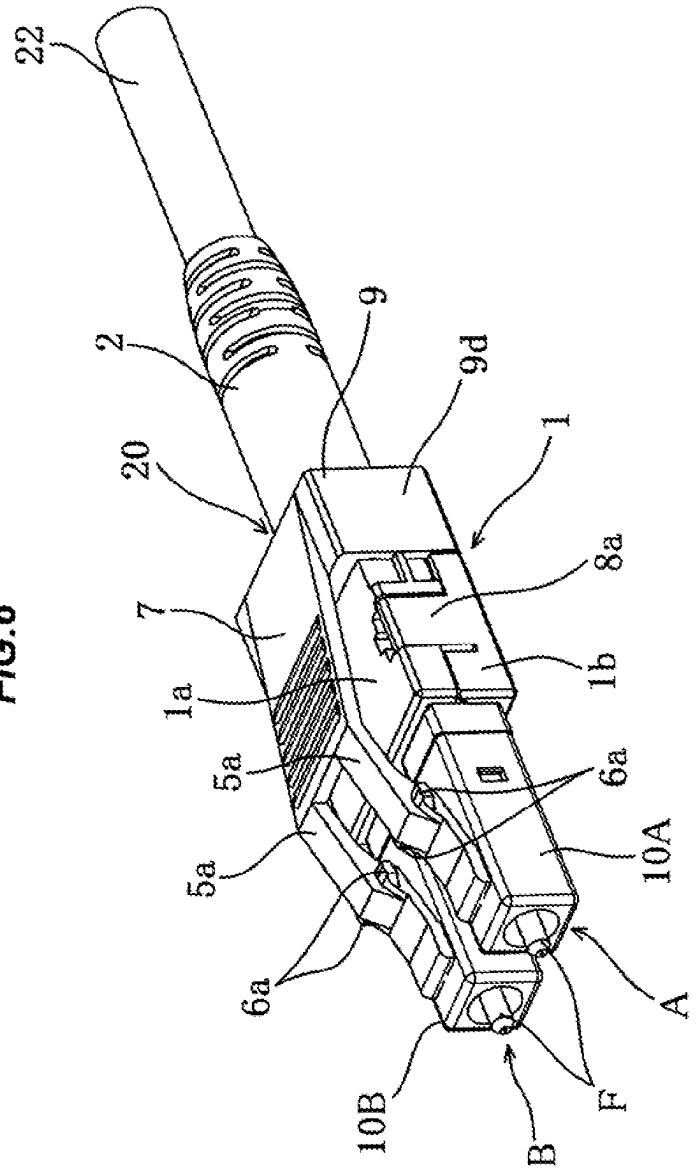

20
9
9d
9a
D
22
7
5b
6a
5a
11c
11a
11b
2
9b
8a
1c
1a
1b
12a
1
10A
12a
A
10B
B
F

FIG.5

FIG.6



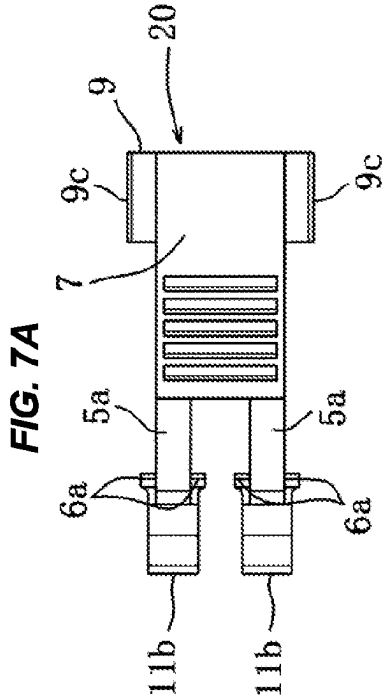


FIG. 7A

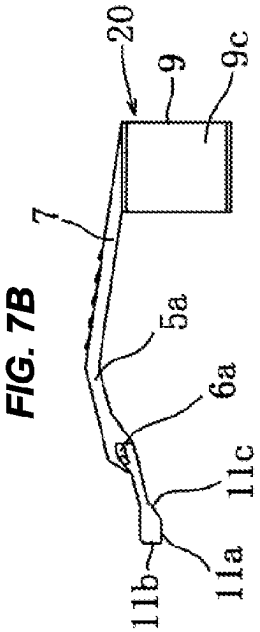


FIG. 7B

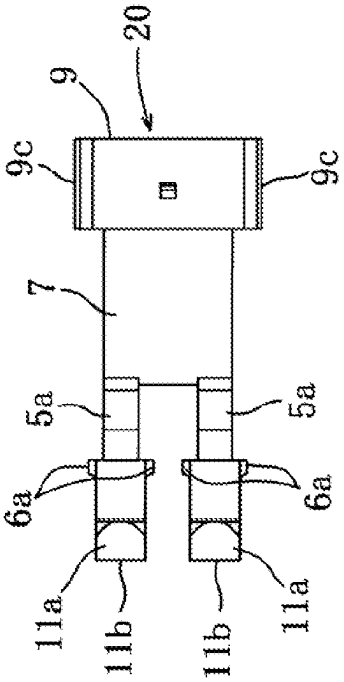


FIG. 7C

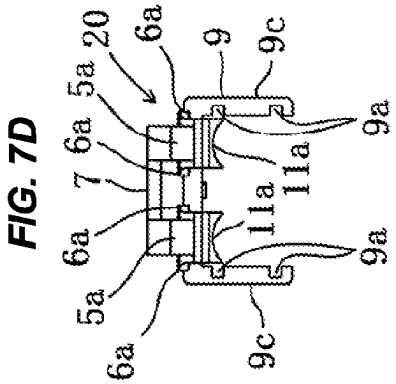


FIG. 7D

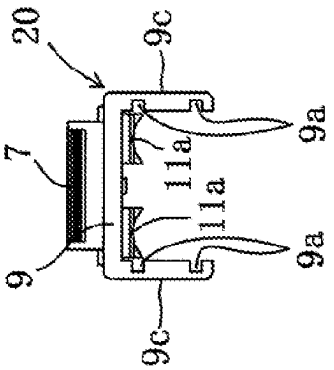


FIG. 7E

FIG.8

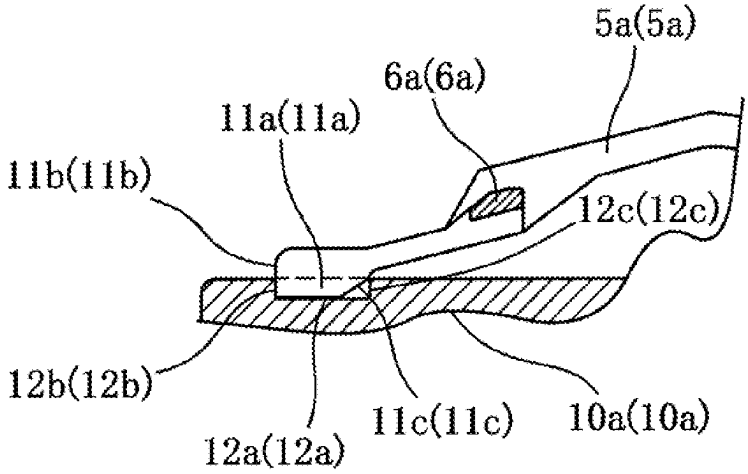

5a(5a)
6a(6a)
11a(11a)
11b(11b)
12c(12c)
12b(12b)
12a(12a)
11c(11c)
10a(10a)

FIG.9

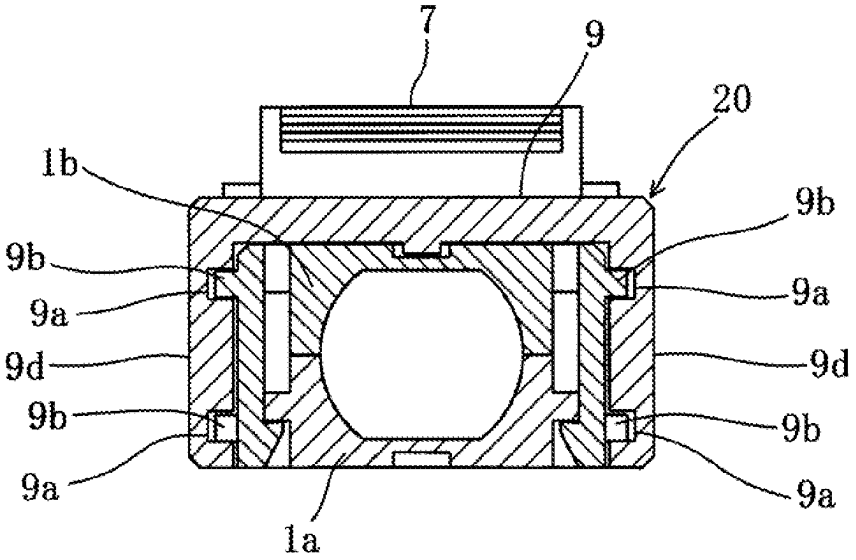

7
9
20
1b
9b
9b
9a
9a
9d
9d
9b
9b
9a
9a
1a

FIG.10

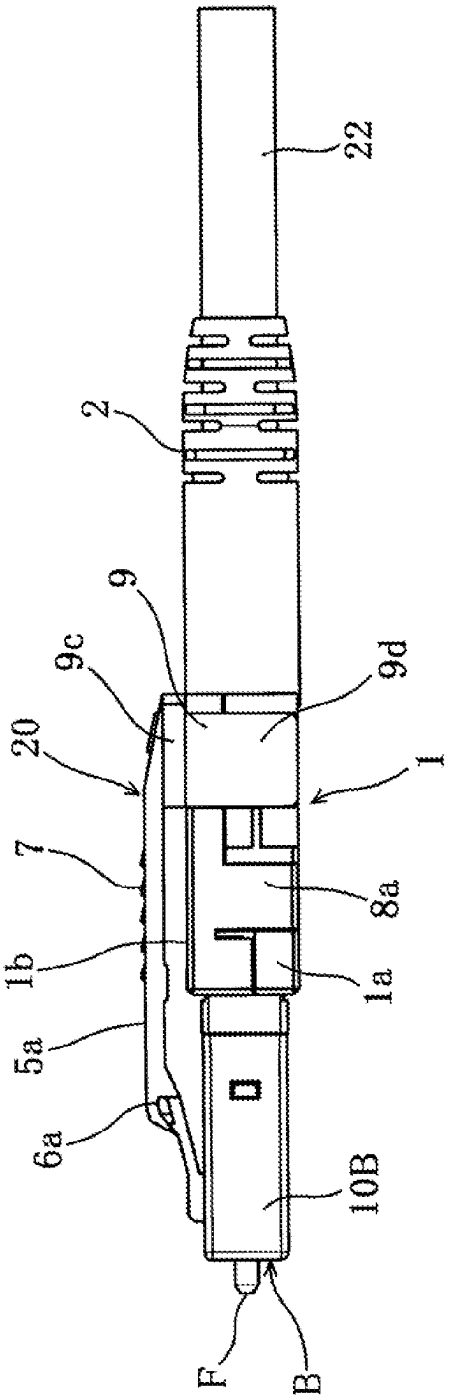


FIG.11

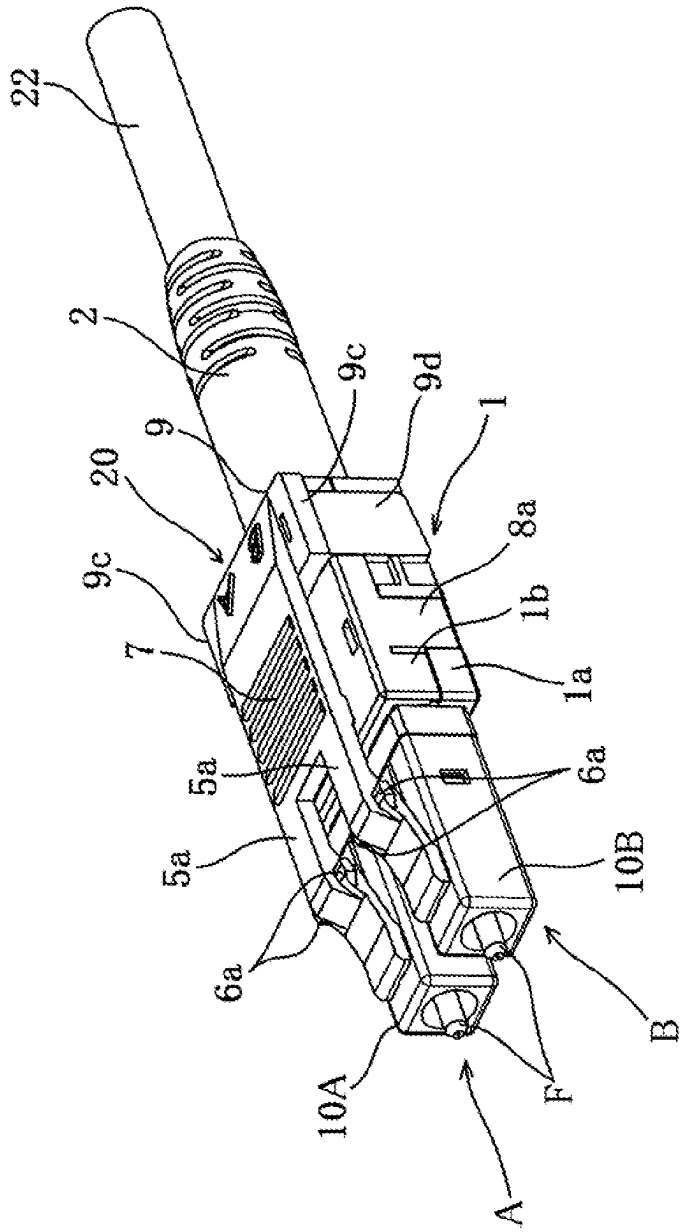
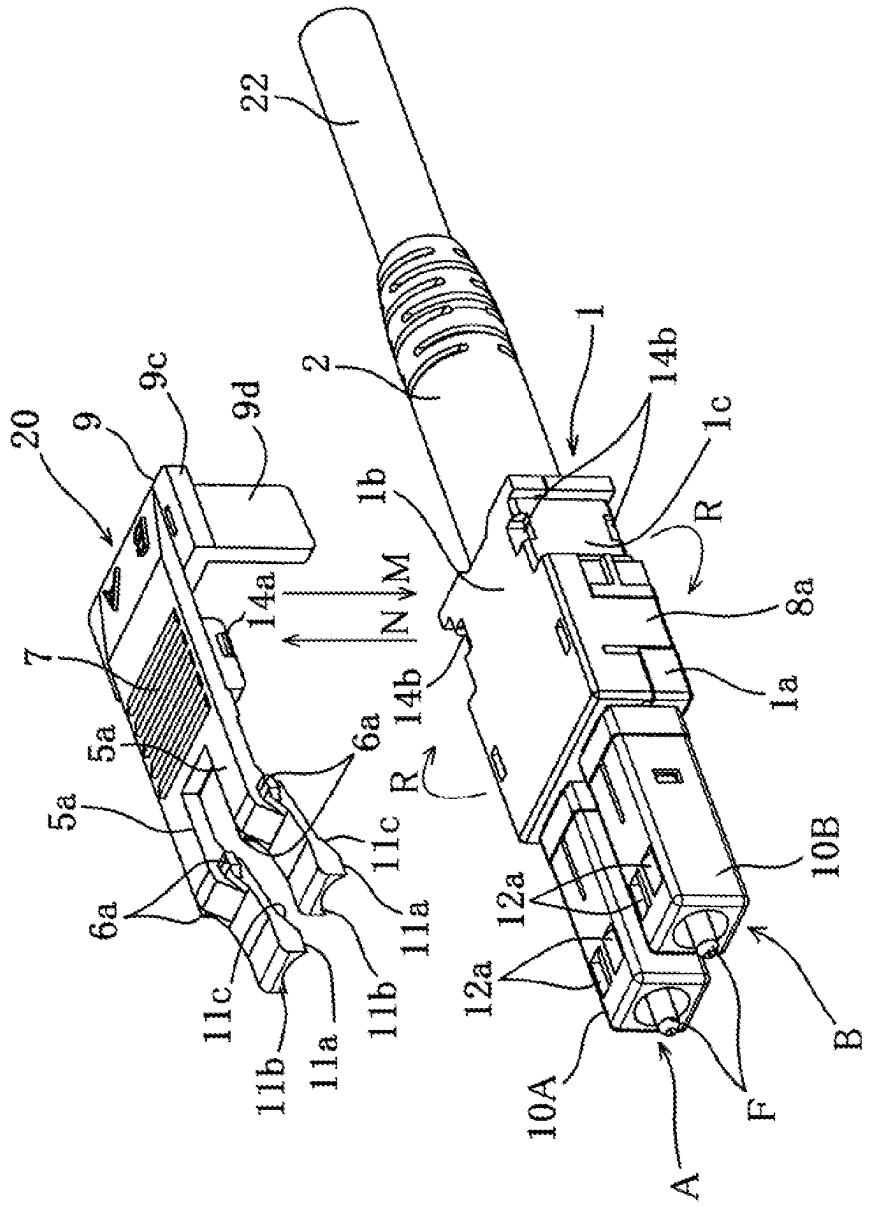


FIG.12


22
2
1
14b
1c
R
8a
1a
10B
B
F
A
10A
12a
12a
11b
11a
11c
6a
5a
5a
7
20
9
9c
9d
14a
N
M
1b
14b
R
6a
11c
11a
11b

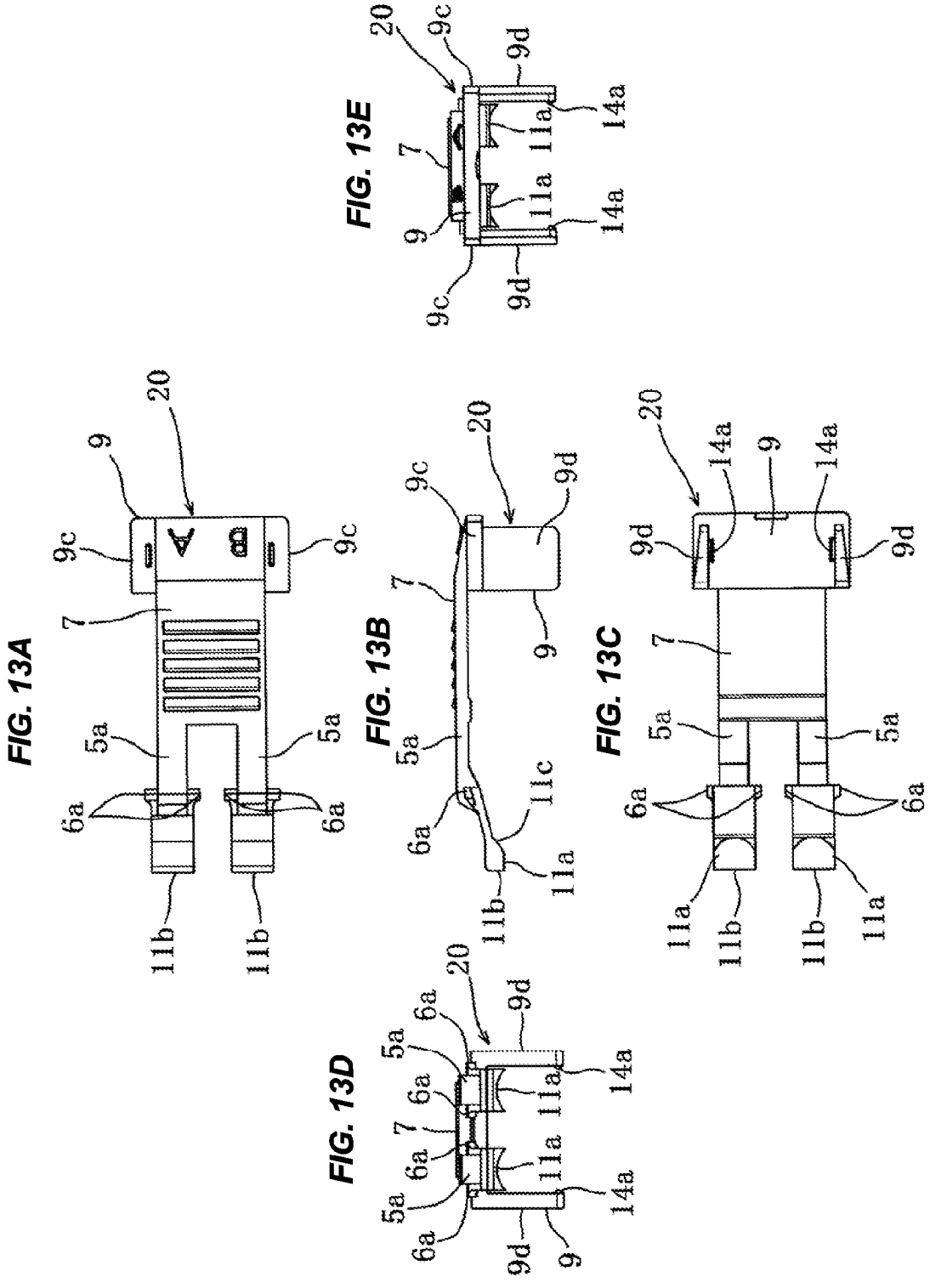

FIG. 13A
FIG. 13B
FIG. 13C
FIG. 13D
FIG. 13E
20
9
9c
9d
7
5a
6a
11a
11b
11c
14a

FIG.14

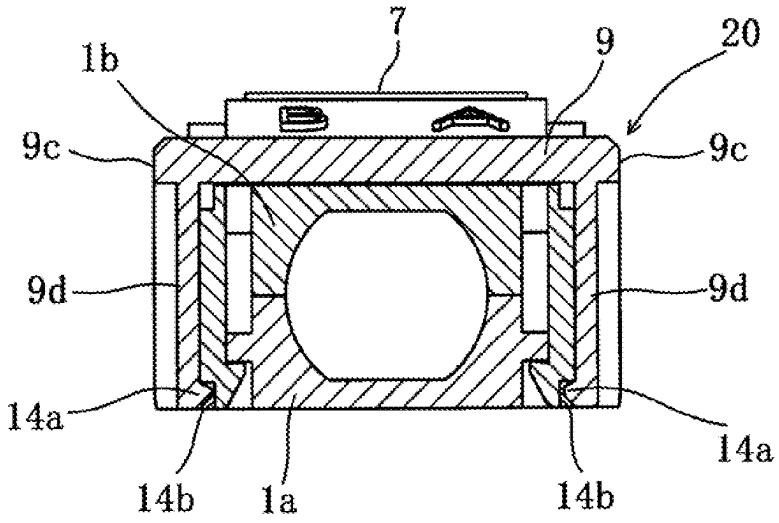


FIG. 15A

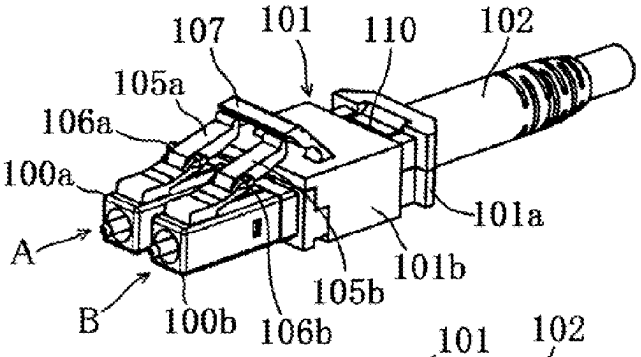


FIG. 15B

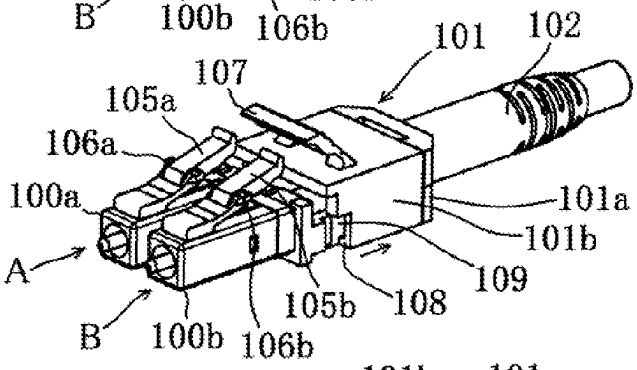


FIG. 15C

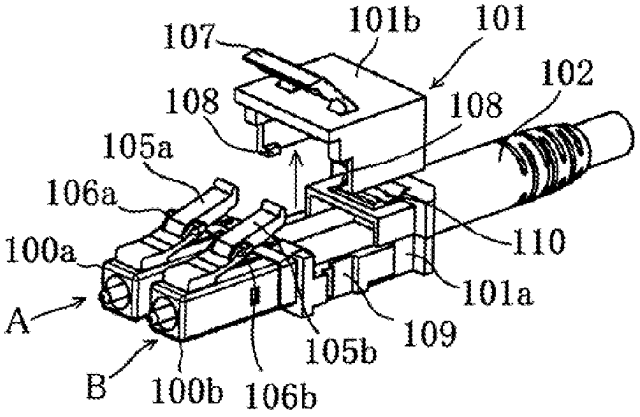


FIG. 15D

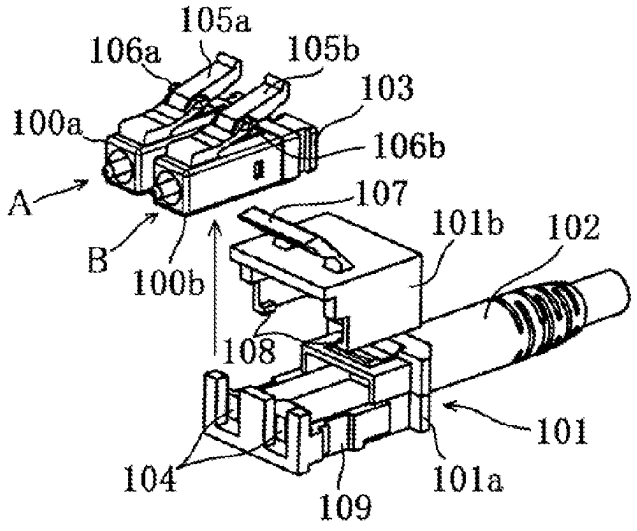


FIG. 15E

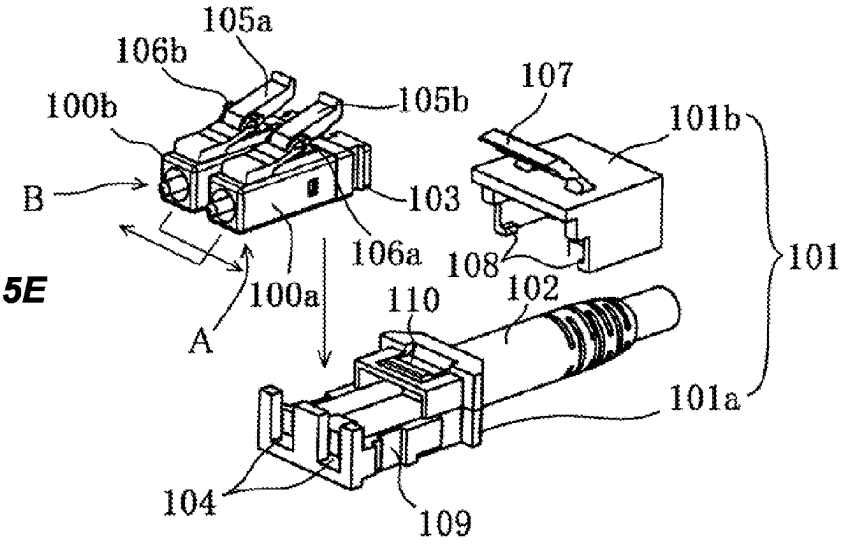


FIG. 15F

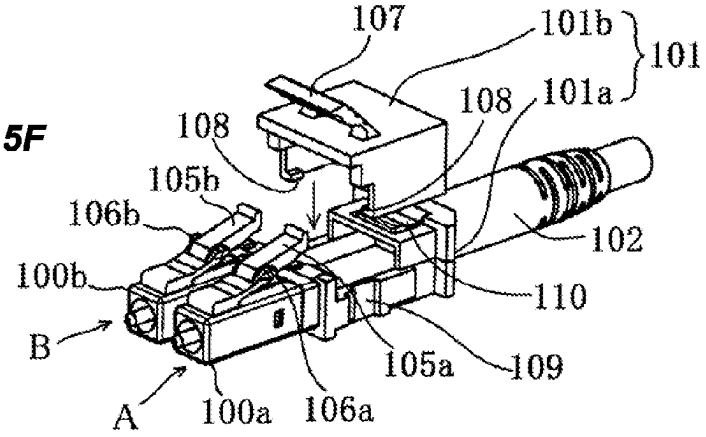
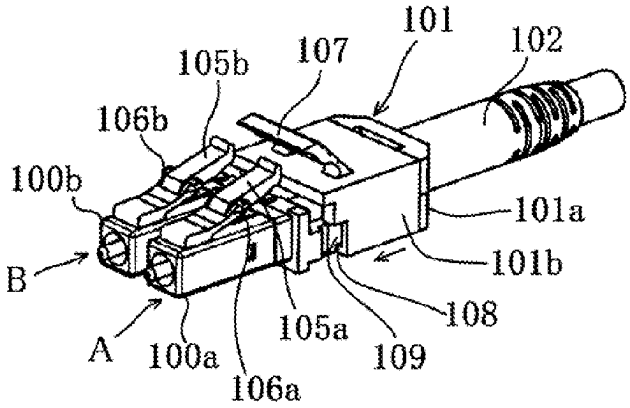


FIG. 15G



TWO CORE TYPE OPTICAL CONNECTOR PLUG

TECHNICAL FIELD

[0001] The present invention relates to a two core type optical connector plug that is used as chiefly a uniboot type for two-way communication and has a pair of LC type optical connectors.

BACKGROUND ART

[0002] Conventionally, with the spread of the Internet or the like, there is a sharp increase in the demand for a two core type optical connector unit that has an optical connector for input and an optical connector for output as a kind of optical connector and is used for two-way communication. The two core type optical connector plug creates a need to interchange sites for the pair of optical connectors for the purpose of polarity inversion thereof.

[0003] Thus, in recent years, in order to allow positions of the pair of optical connectors to be interchanged, the two core type optical connector plug is equipped with, as illustrated in FIGS. **15**A to **15**D and FIGS. **15**E to **15**G, a connector housing **101** that holds ferrule housings **100***a* and **100***b* of the pair of optical connectors A and B mounted on tips of a pair of optical fiber cables (not illustrated), and a single boot (uniboot structure) **102** that simultaneously protects the pair of optical fiber cables extending backward from the connector housing **101**.

[0004] The connector housing **101** has an approximately square case shape forming a vertically halved structure, and is held by engaging and suspending tie portions **103** formed at the rear of the respective ferrule housings **100***a* and **100***b* with and on concave portions **104** formed in the front of a lower connector housing halved body **101***a* and by sandwiching the tie portions **103** by means of an upper connector housing halved body **101***b*. Further, latch levers **105***a* and **105***b* having vertical elasticity from respective upper surfaces toward base end sides of the ferrule housings **100***a* and **100***b* run obliquely upward in one body. Each of the latch levers **105***a* and **105***b* is provided with locking protrusions **106***a* and **106***b* at opposite sides of an intermediate portion thereof. Locking grooves (not illustrated) formed in optical adaptors and the locking protrusions **106***a* and **106***b* are engaged, and thereby the optical connectors A and B are prevented from falling out of the optical adaptors.

[0005] An upper surface of the upper connector housing halved body **101***b* is provided with an operating lever **107** that has elasticity in a vertical direction and runs obliquely upward toward a tip side in one body. In this case, locking claws **108** that are mutually formed inward at left and right lower edges of the upper connector housing halved body **101***b* are inserted along guide recess portions **109** that are formed in left and right sidewalls of the lower connector housing halved body **101***a* in an oblongly recessed shape.

[0006] Thus, the upper connector housing halved body **101***b* is caused to slide along the left and right sidewalls of the lower connector housing halved body **101***a* in a slightly backward direction. Thereby, an elastic locking piece **110** provided for a rear upper surface of the lower connector housing halved body **101***a* presses down a rear edge of the upper connector housing halved body **101***b*, and simultaneously the locking claws **108** of the upper connector housing halved body **101***b* are engaged with front lower portions of the left and right sidewalls of the lower connector housing halved body **101***a* relative to positions of the guide recess portions **109** of the lower connector housing halved body **101***a*. In this case, the operating lever **107** is engaged with the latch levers **105***a* and **105***b* of the upper surfaces of the ferrule housings **100***a* and **100***b* so as to be covered from above.

[0007] When the positions of the pair of optical connectors are interchanged relative to the connector housing **101**, as illustrated in FIGS. **15**A and **15**B, first, the upper connector housing halved body **101***b* is caused to slide backward while the elastic locking piece **110** of the rear of the lower connector housing halved body **101***a* is being pressed down by hand. In this case, the locking claws **108** of the upper connector housing halved body **101***b* are left out of the front lower portions of the left and right sidewalls of the lower connector housing halved body **101***a*, and are located at the guide recess portions **109**.

[0008] Then, as illustrated in FIG. **15**C, the locking claws **108** of the upper connector housing halved body **101***b* are caused to slide upward along the guide recess portions **109**, and thereby the upper connector housing halved body **101***b* is pulled out of the lower connector housing halved body **101***a*. In this case, respective core wires (not illustrated) of the pair of optical fiber cables are exposed outside. Thereafter, as illustrated in FIG. **15**D, the ferrule housings **100***a* and **100***b* of the pair of optical connectors A and B are pulled upward from the lower connector housing halved body **101***a* along with the respective core wires of the pair of optical fiber cables.

[0009] As illustrated in FIG. **15**E, the positions of the pair of optical connectors A and B are changed left and right, and the tie portions **103** formed at the rear of the respective ferrule housings **100***a* and **100***b* are fitted into the concave portions **104** formed in the front of the lower connector housing halved body **101***a*. Then, as illustrated in FIG. **15**F, the upper connector housing halved body **101***b* is covered on the lower connector housing halved body **101***a*. In this case, the elastic locking piece **110** of the rear of the lower connector housing halved body **101***a* is being pressed down by a lower surface of the upper connector housing halved body **101***b*, and the locking claws **108** of the upper connector housing halved body **101***b* are inserted along the guide recess portions **109** of the lower connector housing halved body **101***a*.

[0010] Then, as illustrated in FIG. **15**G, the upper connector housing halved body **101***b* is caused to slightly slide forward along the left and right sidewalls of the lower connector housing halved body **101***a*. Thereby, the elastic locking piece **110** of the rear upper surface of the lower connector housing halved body **101***a* makes an elastic return to press the rear edge of the upper connector housing halved body **101***b*, and simultaneously the locking claws **108** of the upper connector housing halved body **101***b* move forward relative to the guide recess portions **109** of the lower connector housing halved body **101***a* and are engaged with the lower portions of the left and right sidewalls of the lower connector housing halved body **101***a*. In this case, the tie portions **103** of the rear of the respective ferrule housings **100***a* and **100***b* are held by the upper connector housing halved body **101***b*, and simultaneously the operating lever **107** is engaged with the latch levers **105***a* and **105***b* of the upper surfaces of the ferrule housings **100***a* and **100***b*.

[0011] Further, as the two core type optical connector plug based on another configuration capable of interchanging the positions of the pair of optical connectors, "a duplex optical fiber assembly suitable for polarity inversion and its method"

are known as described in, for instance, Patent Document 1. That is, according to Patent Document 1, the duplex optical fiber assembly is made up of first and second optical fiber connector assemblies in which a locking lever runs obliquely upward in one body, and a housing that has a vertically halved structure and receives the first and second optical fiber connector assemblies such that the optical fiber connector assemblies are independently rotated along longitudinal axes thereof for polarity inversion.

[0012] Furthermore, a lever body of a square case shape is provided in such a manner that an operating lever that is engaged with the locking lever and has vertical elasticity runs obliquely upward toward a tip side in one body. The optical fiber connector assemblies are vertically inverted relative to the housing, and simultaneously the lever body is also vertically inverted and mounted relative to the housings such that the locking lever and the operating lever are disposed opposite to each other. Then, the entire housing is vertically inverted such that the locking lever and the operating lever are directed upward together. Thereby, each optical fiber connector assembly is configured to be interchangeable left and right relative to the housing.

CITATION LIST

Patent Document

[0013] Patent Document 1: U.S. Pat. No. 8,152,385 B2

DISCLOSURE OF THE INVENTION

Problem to be Solved by the Invention

[0014] However, the aforementioned conventional connector housing (the former) has the square case shape forming the vertically halved structure. As such, when the positions of the pair of optical connectors are interchanged relative to the connector housing, these connector housings of the vertically halved structure should be separated from each other. For this reason, the respective core wires of the pair of optical fiber cables extending backward from the ferrule housings of the pair of optical connectors are exposed outside. As such, there is concern that an end user (or a person exchanging the optical connectors) casually touches the core wires to do damage to the core wires.

[0015] Further, in the case of Patent Document **1**, for the polarity inversion, each optical fiber connector assembly is rotated upside down (vertically inverted) relative to the housing, and simultaneously the lever body should also be vertically inverted and mounted relative to the housing such that the locking lever and the operating lever are disposed opposite to each other, and workability is inferior. Furthermore, there is concern that, in inverting each optical fiber connector assembly, the housings of the vertically halved structure are separated from each other, and the respective core wires of the pair of optical fiber cables are exposed outside like the former.

[0016] Therefore, the invention has been made keeping in mind conventional various circumstances as described above, and an object of the invention is to provide a two core type optical connector plug that is used for two-way communication and has a pair of optical connectors and that allows position of the pair of optical connectors to be simply interchanged.

Means for Solving Problem

[0017] To solve the above problem, a two core type optical connector plug of the invention includes: a holder configured to hold ferrule housings of a pair of optical connectors to become one body, and to house core wires of a pair of optical fiber cables extending backward from the ferrule housings; a boot configured to simultaneously protect the pair of optical fiber cables extending backward from the holder; and a lever coupler provided to be mountable on or demountable from the holder, wherein the lever coupler is formed such that a pair of latch levers are connected to a tip side of an operating lever mounted on a rear end of the lever coupler so as to correspond to the respective ferrule housings and provide elasticity.

[0018] Engaging recesses for detachably engaging engaging protrusions of tips of the pair of latch levers are formed in two upper and lower surfaces of each of the ferrule housings of the pair of optical connectors.

[0019] The engaging protrusions engaged with the engaging recesses of the respective ferrule housings are formed at the tips of the pair of latch levers.

[0020] The lever coupler is configured in such a manner that a rear end side of the operating lever is fixed to a mounting base shaped of an approximately C-shaped frame and that engaging mechanisms are arranged at sides of left and right inner wall surfaces of the mounting base and sides of left and right outer wall surfaces of the holder so as to be mutually mountable or demountable.

[0021] The engaging mechanisms are formed by guide recess portions provided at the sides of left and right inner wall surfaces of the mounting base and by guide protrusions provided at the sides of left and right outer wall surfaces of the holder.

[0022] The engaging mechanisms are formed by guide protrusions provided at the sides of left and right inner wall surfaces of the mounting base and by engaging recesses provided at the sides of left and right outer wall surfaces of the holder.

[0023] The lever coupler is connected to present an approximate chevron shape when viewed from the side by the operating lever and the latch levers.

[0024] The lever coupler is connected to present an approximately flat shape when viewed from the side by the operating lever and the latch levers.

[0025] Tapered surfaces are formed on rear ends of the engaging protrusions provided at the tips of the latch levers.

Effect of the Invention

[0026] According to the invention, in the two core type optical connector plug that is used for two-way communication and has a pair of optical connectors of, for instance, an LC type, the holder itself is only vertically inverted with the optical connectors mounted on the holder, and positions of the pair of optical connectors disposed left and right can be simply interchanged relative to the lever coupler formed in one body by the latch levers and the operating lever.

[0027] That is, since the two core type optical connector plug of the invention includes: a holder configured to hold ferrule housings of a pair of optical connectors to become one body and to house core wires of a pair of optical fiber cables extending backward from the ferrule housings; a boot configured to simultaneously protect the pair of optical fiber cables extending backward from the holder; and a lever coupler provided to be mountable on or demountable from the

holder, wherein the lever coupler is formed such that a pair of latch levers are connected to a tip side of an operating lever mounted on a rear end of the lever coupler so as to correspond to the respective ferrule housings and provide elasticity, the two core type optical connector plug can be provided in which, when the position of the pair of optical connectors are interchanged, the lever coupler is removed from the holder, the holder is vertically inverted along with the pair of optical connectors, the lever coupler can be again installed on the inverted holder, and thereby the positions of the pair of optical connectors can be simply interchanged.

[0028] Since engaging recesses for detachably engaging engaging protrusions of tips of the pair of latch levers are formed in two upper and lower surfaces of each of the ferrule housings of the pair of optical connectors, holding performance caused by an elastic force of the lever coupler itself can be further enhanced by locking of the respective tips of the latch levers caused by the engaging recesses when the locking portions of the latch levers are engaged with engaging grooves provided for optical adaptors.

[0029] Since engaging protrusions engaged with the engaging recesses of the respective ferrule housings are formed at the tips of the pair of latch levers, the tips of the latch levers are firmly locked on the engaging recesses of respective ferrules.

[0030] Since the lever coupler is configured in such a manner that a rear end side of the operating lever is fixed to a mounting base shaped of an approximately C-shaped frame and that engaging mechanisms are arranged at sides of left and right inner wall surfaces of the mounting base and sides of left and right outer wall surfaces of the holder so as to be mutually mountable or demountable, the lever coupler is easily mounted on or demounted from the holder only by a simple operation of fingertips without using a tool such as a driver.

[0031] Since engaging mechanisms are formed by guide recess portions provided at the sides of left and right inner wall surfaces of the mounting base and by guide protrusions provided at the sides of left and right outer wall surfaces of the holder, the lever coupler is easily mounted on or demounted from the holder by a forward/backward sliding operation caused only by fingertips of the mounting base.

[0032] Since the engaging mechanisms are formed by guide protrusions provided at the sides of left and right inner wall surfaces of the mounting base and by engaging recesses provided at the sides of left and right outer wall surfaces of the holder, the lever coupler is easily mounted on or demounted from the holder by an upward/downward sliding operation caused only by fingertips of the mounting base.

[0033] Since the lever coupler is connected to present an approximate chevron shape when viewed from the side by the operating lever and the latch levers, the operating lever is pressed from above by hand. Thereby, the latch levers are stretched relative to the operating lever in an approximately flat shape, and a locking or unlocking process for the upper surfaces of the ferrule housings of the latch levers is easily performed.

[0034] Since the lever coupler is connected to present an approximately flat shape when viewed from the side by the operating lever and the latch levers, the lever coupler is fixed without being loosened from the holder, is rarely detached from the holder, and is suitable for low density mounting.

[0035] Since tapered surfaces are formed on rear ends of the engaging protrusions provided at the tips of the latch levers, the latch levers of the lever coupler can be easily removed from the ferrule housings.

BRIEF DESCRIPTION OF DRAWINGS

[0036] FIG. **1** is a side view illustrating a two core type optical connector plug according to an embodiment of the invention;

[0037] FIG. **2** is a perspective view illustrating the two core type optical connector plug according to the embodiment of the invention;

[0038] FIG. **3** is an exploded perspective view illustrating the same two core type optical connector plug;

[0039] FIG. **4** is a pre-assembled perspective view illustrating an operating state in which a lever coupler is removed from a holder of ferrule housings of a pair of optical connectors and the holder is vertically inverted;

[0040] FIG. **5** is a pre-assembled perspective view illustrating an operating state in which the lever coupler is mounted to the holder after the holder is vertically inverted;

[0041] FIG. **6** is a perspective view illustrating a state in which the lever coupler is mounted on the vertically inverted holder;

[0042] FIGS. **7**A-**7**E illustrate a form of the lever coupler, wherein FIG. **7**A is a plan view, FIG. **7**B is a side view, FIG. **7**C is a bottom view, FIG. **7**D is a front view, and FIG. **7**E is a rear view;

[0043] FIG. **8** is a partially enlarged cross-sectional view illustrating a state in which engaging protrusions of tips of latch levers are engaged with engaging recesses of ferrule housings;

[0044] FIG. **9** is an enlarged longitudinal sectional view illustrating a state in which guide recess portions formed inside a mounting base of the lever coupler and guide protrusions formed outside the holder are engaged;

[0045] FIG. **10** is a side view illustrating another example of the invention equipped with a lever coupler formed by connecting an operating lever and latch levers in a parallel state;

[0046] FIG. **11** is a perspective view illustrating another example of the invention equally equipped with the lever coupler formed by connecting the operating lever and the latch levers in a parallel state;

[0047] FIG. **12** is a pre-assembled perspective view illustrating an operating state in which the lever coupler formed by connecting the operating lever and the latch levers in a parallel state is removed from a holder and the holder is vertically inverted;

[0048] FIGS. **13**A-**13**E illustrate another embodiment of the lever coupler, wherein FIG. **13**A is a plan view, FIG. **13**B is a side view, FIG. **13**C is a bottom view, FIG. **13**D is a front view, and FIG. **13**E is a rear view;

[0049] FIG. **14** is an enlarged longitudinal sectional view illustrating a state in which guide protrusions formed inside a mounting base of the lever coupler and guide recess portions formed outside the holder are engaged;

[0050] FIGS. **15**A to **15**D are perspective views for sequentially illustrating an process of interchanging positions of a pair of optical connectors in the prior art; and

[0051] FIGS. **15**E to **15**G are perspective views for sequentially illustrating the process of interchanging the positions of the pair of optical connectors in the prior art.

MODE(S) FOR CARRYING OUT THE INVENTION

[0052] Hereinafter, an embodiment of a two core type optical connector plug according to the invention will be described in detail with reference to the drawings.

[0053] As illustrated in FIGS. **1**, **2** and **3**, a two core type optical connector plug according to the invention is equipped with a holder **1** that holds ferrule housings **10**A and **10**B of a pair of optical connectors A and B and houses core wires (not illustrated) of a pair of optical fiber cables extending backward from the ferrule housings **10**A and **10**B, a boot **2** that simultaneously protects the pair of optical fiber cables (not illustrated) extending backward from the holder **1**, and a lever coupler **20** that is mounted so as to be removable from the holder **1** in a forward/backward direction or in an upward/downward direction.

[0054] As illustrated in FIG. **3**, all the optical connectors A and B are LC type optical connectors based on the same structure, and are generally made up of ferrules F that have insertion holes into which respective optical fiber (not illustrated) are inserted so as to be mounted on tips of the optical fiber (core wires), the ferrule housings **10**A and **10**B that hold and houses tubes FH running backward via flanges F**1** of the ferrules F in inner circumferences thereof, coil springs S which are mounted in the ferrule housings **10**A and **10**B and whose one ends are locked on the flanges F**1**, and extender caps E that block rear opening sides of the ferrule housings **10**A and **10**B. The extender caps E draw the optical fiber cables via central holes in the backward direction, and function to lock the other ends of the coil springs S.

[0055] Further, the coil springs S are mounted between the flanges Fl and the extender caps E in a compressed state in an optical axis direction. Thereby, the ferrules F are biased to tip sides thereof by elastic forces of the coil springs S. Furthermore, the ferrule housings **10**A and **10**B themselves are held on a front side of the holder **1** (between upper and lower concave portions **13***a* and **13***a* to be described below) via tie portions **3** formed on rear outer circumferential surfaces of the extender caps E.

[0056] As illustrated in FIG. **3**, the holder **1** has an approximately square case shape in whole due to a vertically bisected structure of a halved lower holder **1***a* and a halved upper holder **1***b*. Locking claws (not illustrated) directed inward from lower ends of locking pieces **8***a* formed on left and right sidewalls of the halved upper holder **1***b* are engaged with locked portions **8***b* that are located inside recesses formed on left and right sidewalls of the halved lower holder **1***a*, and thereby the halved holders **1***a* and **1***b* are formed into one body.

[0057] Then, the concave portions **13***a* and **13***a* for engaging the tip portions **3** and **3** formed at the rear of the respective ferrule housings **10**A and **10**B of the optical connectors A and B are formed at front sides of the halved holders **1***a* and **1***b*. A flange **21***a* having a large diameter at a tip of a tubular fiber post **21** is fixed at a rear end of the holder **1** in a state in which it is sandwiched between the halved holders **1***a* and **1***b*. A side of a caulking ring **22***a* with which a heat shrinkable tube **22** is equipped at a tip thereof is fitted outside at a rear diameter reduction portion **21***b* of the fiber post **21**, and is caulked from an outer circumference of the rear diameter reduction portion **21***b*.

[0058] Further, as illustrated in FIG. **3**, the core wires (not illustrated) extending from the rears of the respective ferrule housings **10**A and **10**B are housed between the halved holders **1***a* and **11***b*, and a pair of optical fiber cable ends into which the core wires are inserted are inserted into the fiber post **21** in a lump. The pair of optical fiber cables extending backward through the fiber post **21** are held and fixed by heating shrinkage of the heat shrinkable tube **22**. Further, a tip opening side of the boot **2** is inserted and fixed around and to the caulking ring **22***a* so as to cover the heat shrinkable tube **22**.

[0059] As illustrated in FIGS. **1**, **2**, **3**, 7A, 7B, 7C, 7D and 7E, the lever coupler **20** is configured in such a manner that a rear end side of a wide sheet of flat operating lever **7** is fixed to an upper surface of a mounting base **9** shaped of an approximately C-shaped frame and that a pair of latch levers **5***a* and **5***a* are dichotomized and connected to a tip side of the operating lever **7** so as to correspond to the respective ferrule housings **10**A and **10**B and provide elasticity. That is, the lever coupler **20** is formed of a member having elasticity. Connected portions between the operating lever **7** and the latch levers **5***a* and **5***a* present an approximate chevron shape when viewed from the side. Thereby, by pressing the operating lever **7** from above by hand, the latch levers **5***a* and **5***a* are pushed down against elasticity along with locking portions **6***a* and **6***a*, which will be described later, and the connected portion between the operating lever **7** and each of the latch levers **5***a* and **5***a* is adapted to be able to be stretched to a nearly flat shape.

[0060] That is, as minutely illustrated in FIG. **8**, the locking portions **6***a* and **6***a* detachably engaged with a locking groove (not illustrated) provided for the optical adaptor are protuberantly provided at both left and right ends of an approximately middle portion of each of the latch levers **5***a* and **5***a*, and a pair of engaging protrusions **11***a* and **11***a* are formed on lower surfaces of tips of the respective latch levers **5***a* and **5***a*.

[0061] On the other hand, a pair of engaging recesses **12***a* and **12***a* for detachably engaging the engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a* are formed in two upper and lower surfaces of the respective ferrule housings **10**A and **10**B of the pair of optical connectors A and B.

[0062] Further, lower surfaces of the engaging protrusions **11***a* and **11***a* are formed on approximately arcuate concave surfaces when viewed from the front so as to correspond to each other, and inner bottom surfaces of the engaging recesses **12***a* and **12***a* are formed on convex surfaces so as to correspond to each other. Thereby, the engaging protrusions **11***a* and **11***a* and the engaging recesses **12***a* and **12***a* are adapted to maintain a close contact state to be engaged and connected at a given position without an offset in a transverse direction.

[0063] Furthermore, as illustrated in FIG. **8**, front sides of the engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a*, and front sides of the engaging recesses **12***a* and **12***a* of the ferrule housings **10**A and **10**B are formed on vertical surfaces **11***b* and **11***b* and **12***b* and **12***b*, respectively. Rear sides of the engaging protrusions **11***a* and **11***a* are formed on tapered surfaces **11***c* and **11***c*, and rear sides of the engaging recesses **12***a* and **12***a* are formed on vertical surfaces **12***c* and **12***c*. Thereby, the engaging recesses **12***a* and **12***a* of the ferrule housings **10**A and **10**B and the engaging protrusions **11***a* and **11***a* of the tips of the latch levers **5***a* and **5***a* engaged with the engaging recesses **12***a* and **12***a* with an elastic pressure are configured such that the vertical surfaces **12***b* and **12***b* and **11***b* and **11***b* collide with each other at front end sides thereof, and thus fear of separation of the latch levers **5***a* and **5***a* from the engaging recesses **12***a* and **12***a* of the ferrule housings **10**A and **10**B is reduced, whereas the separation of the latch levers

5*a* and **5***a* from the engaging recesses **12***a* and **12***a* of the ferrule housings **10**A and **10**B is smoothly carried out at rear end sides thereof by the tapered surfaces **11***c* and **11***c* provided at the rear sides of the engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a*.

[0064] Two guide recess portions **9***a* and **9***a* are formed up and down at sides of left and right inner wall surfaces **9***d* and **9***d* of the mounting base **9** in a forward/backward direction, and two guide protrusions **9***b* and **9***b* are formed up and down at sides of left and right outer wall surfaces **1***c* and **1***c* of the holder **1** (or the halved lower holder **1***a*) in a forward/backward direction so as to correspond to the guide recess portions **9***a* and **9***a*. Thus, the lever coupler **20** is slidably mounted on and demounted from the holder **1** (in a direction of an arrow C of FIG. **4** and a direction of an arrow D of FIG. **5**) by engagement between the guide recess portions **9***a* and **9***a* and the guide protrusions **9***b* and **9***b*. In the embodiment, the guide recess portions **9***a* and **9***a* are formed in the mounting base **9** of the lever coupler **20**, and the guide protrusions **9***b* and **9***b* are formed on the holder **1**. However, conversely the guide protrusions may be formed at the side of the mounting base **9**, and the guide recess portions may be formed at the side of the holder **1**.

[0065] Next, an example of a procedure of interchanging the positions of the pair of optical connectors A and B in the two core type optical connector plug regarding the form configured as described above will be described. In the following description, the same portions as in FIGS. **1**, **2**, and **3** are given the same symbols, and proper description thereof will be omitted or simplified.

[0066] When the positions of the pair of optical connectors A and B are interchanged, first, the lever coupler **20** are, as illustrated in FIG. **4**, removed from the holder **1** (in the direction of the arrow C of FIG. **4**). In this case, the guide recess portions **9***a* and **9***a* of the mounting base **9** is caused to slide along the guide protrusions **9***b* and **9***b* of the holder **1** (or the halved lower holder **1***a*) in a removal direction (or in the direction of the arrow C). Then, the engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a* are separated from the respective engaging recesses **12***a* and **12***a* formed on the upper surfaces of the ferrule housings **10**A and **10**B. However, at that time, the lever coupler **20** is smoothly removed from the holder **1** by the tapered surfaces **11***d* and **11***d* provided at the rear of the engaging protrusions **11***a* and **11***a* of the tips of the latch levers **5***a* and **5***a* and elasticity between the lever **7** and each of the latch levers **5***a* and **5***a*. Thus, as illustrated in FIG. **4**, the holder **1** is vertically inverted along with the pair of optical connectors A and B (in a direction of an arrow R of FIG. **4**).

[0067] Subsequently, as illustrated in FIG. **5**, the lever coupler **20** is again installed on the top of the inverted holder **1** (which is a portion that is the lower surface of the holder **1** before the inversion) (in a direction of an arrow D of FIG. **5**). In this case, the guide recess portions **9***a* and **9***a* of the mounting base **9** is caused to slide in an inserting direction (in the direction of the arrow D) while being engaged with the guide protrusions **9***b* and **9***b* of the holder **1** (or the halved lower holder **1***a*). Then, the engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a* are engaged with the respective engaging recesses **12***a* and **12***a* formed in the upper surfaces of the ferrule housings **10**A and **10**B by elasticity between the operating lever **7** and the latch levers **5***a* and **5***a*, and simultaneously the lever coupler **20** is inhibited from moving relative to the holder **1** in a drawing direction. Thereby, as illustrated in FIG. **6**, the positions of the pair of optical connectors A and B are interchanged left and right.

[0068] In using the two core type optical connector plug, the pair of optical connectors A and B are inserted into the respective insertion openings (not illustrated) of the optical adaptors. At this time, the locking portions **6***a* and **6***a* projected on both sides of the middle portion of each of the latch levers **5***a* and **5***a* are pushed down at an upper edge of each insertion opening once, and then the locking portions **6***a* and **6***a* are engaged with the locking groove (not illustrated) provided for the optical adaptor by the elasticity between the operating lever **7** and each of the latch levers **5***a* and **5***a*. Thereby, the optical connectors A and B are inhibited from being removed from the optical adaptors.

[0069] When the pair of optical connectors A and B are pulled out of the respective insertion openings of the optical adaptors, the operating lever **7** is pressed downward against the elasticity between the operating lever **7** and the latch levers **5***a* and **5***a* by hand. Then, the latch levers **5***a* and **5***a* are pushed down along with the locking portions **6***a* and **6***a* projected on both sides of the middle portions thereof at the same time, and the locking portions **6***a* and **6***a* are disengaged from the locking grooves (not illustrated) provided for the optical adaptors. Thereby, the pair of optical connectors A and B are smoothly removed from the respective insertion openings of the optical adaptors by the tapered surfaces **11***d* and **11***d* of the rear ends of the engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a* and by a function of the elasticity of the lever coupler **20**.

[0070] In FIGS. **10** to **14**, another example of the holder **1** and another example of the lever coupler **20** are illustrated. In the following description, the same portions as in FIGS. **1** and **2** are given the same symbols, and proper description thereof will be omitted or simplified.

[0071] As illustrated in FIGS. **10**, **11**, **12**, **13**A, **13**B, **13**C, **13**D, **13**E and **14**, the lever coupler **20** in this example is configured such that connected portions between an operating lever **7** and a pair of latch levers **5***a* and **5***a* are mutually connected by an approximately flat (parallel) structure. At this time, as illustrated in FIG. **10**, a gap between an upper surface of a halved upper holder **1***b* of the holder **1** and a lower surface of the lever coupler **20** is formed, and thus the connected portions between the operating lever **7** and the pair of latch levers **5***a* and **5***a* are bent in an approximately inverted chevron shape when viewed from the side by downward pressing of the operating lever **7**, and the advantage that the engagement with the locking grooves (not illustrated) of the optical adaptors caused by the pair of latch levers **5***a* and **5***a* (locking portions **6***a* and **6***a*) is easily released even by a weak operating force of pressing the operating lever **7** by hand is obtained.

[0072] Further, locking protrusions **14***a* and **14***a* are formed at lower sides of left and right inner wall surfaces of a mounting base **9** so as to be opposite to each other, and locking recesses **14***b* and **14***b* are formed at upper and lower sides of left and right outer wall surfaces of the holder **1**(or the halved lower holder **1***a*) so as to correspond to the locking protrusions **14***a* and **14***a*. Thus, the lever coupler **20** is fixed to the holder **1** in a state in which upward pullout movement relative to the holder **1** is inhibited by engagement between any of the locking protrusions **14***a* and **14***a* and the locking recesses **14***b* and **14***b* (in a direction of an arrow M of FIG. **12**).

[0073] That is, when positions of a pair of optical connectors A and B are interchanged, first, as illustrated in FIG. **12**,

flanges **9***c* formed at both upper ends of the mounting base **9** of the lever coupler **20** are pulled upward by fingertips. Thereby, the lever coupler **20** is forcibly removed from the holder **1** (in a direction of an arrow N of FIG. **12**). Thus, the holder **1** is vertically inverted along with the pair of optical connectors A and B (in the direction of the arrow R of FIG. **12**), the lever coupler **20** is again installed on the top of the inverted holder **1** (which is a portion that is a lower surface of the holder **1** before the inversion) (in a direction of an arrow M of FIG. **12**). In this case, engaging protrusions **11***a* and **11***a* of the latch levers **5***a* and **5***a* are engaged with respective engaging recesses **12***a* and **12***a* formed in the ferrule housings **10**A and **10**B like the aforementioned first embodiment. Simultaneously, the locking protrusions **14***a* and **14***a* formed at the lower sides of the opposite inner wall surfaces of the mounting base **9** are engaged with the locking recesses **14***b* located below among the locking recesses **14***b* and **14***b* of the inverted holder **1**. Thereby, the positions of the pair of optical connectors A and B are interchanged left and right.

[0074] In the invention, the holder **1** and the lever coupler **20** are configured as described above, and can thus be mounted or demounted by a tough of fingertips alone in any case of the first embodiment and the second embodiment. Accordingly, when both are mounted or demounted, a mounting/demounting tool such as a driver is not required.

EXPLANATIONS OF LETTERS OR NUMERALS

[0075] A, B: optical connector
[0076] E: extender cap
[0077] F: ferrule
[0078] F**1**: flange
[0079] FH: tube
[0080] S: coil spring
[0081] **1**: holder
[0082] **1***a:* halved lower holder
[0083] **1***b:* halved upper holder
[0084] **1***c:* left and right outer wall surfaces
[0085] **2**: boot
[0086] **3**: tie portion
[0087] **5***a*, **5***a:* latch lever
[0088] **6***a*, **6***a:* locking portion
[0089] **7**: operating lever
[0090] **8***a:* locking piece
[0091] **8***b:* locked portion
[0092] **9**: mounting base
[0093] **9***a:* guide recess portion
[0094] **9***b:* guide protrusion
[0095] **9***c:* flange
[0096] **9***d:* left and right sidewall surface
[0097] **10**A, **10**B: ferrule housing
[0098] **11***a*, **11***a:* engaging protrusion
[0099] **11***b*, **11***b:* vertical surface
[0100] **11***c*, **11***c:* tapered surface
[0101] **12***a*, **12***a:* engaging recess
[0102] **12***b*, **12***b:* vertical surface
[0103] **12***c*, **12***c:* vertical surface
[0104] **13***a*, **13***a:* concave portion
[0105] **14***a:* locking protrusion
[0106] **14***b:* locking recess
[0107] **20**: lever coupler
[0108] **21**: fiber post
[0109] **21***a:* flange
[0110] **22**: heat shrinkable tube
[0111] **22***a:* caulking ring
[0112] **100***a*, **100***b:* ferrule housing
[0113] **101**: connector housing
[0114] **101***a:* lower connector housing halved body
[0115] **101***b:* upper connector housing halved body
[0116] **102**: boot
[0117] **103**: tie portion
[0118] **104**: concave portion
[0119] **105***a*, **105***b:* latch lever
[0120] **106***a*, **106***b:* locking protrusion
[0121] **107**: operating lever
[0122] **108**: locking claw
[0123] **109***a:* guide recess portion
[0124] **110**: elastic locking piece

1. A two core type optical connector plug comprising:
a holder configured to hold ferrule housings of a pair of optical connectors to become one body, and to house core wires of a pair of optical fiber cables extending backward from the ferrule housings;
a boot configured to simultaneously protect the pair of optical fiber cables extending backward from the holder; and
a lever coupler provided to be mountable on or demountable from the holder,
wherein the lever coupler is formed such that a pair of latch levers are connected to a tip side of an operating lever mounted on a rear end of the lever coupler so as to correspond to the respective ferrule housings and provide elasticity.

2. The two core type optical connector plug according to claim **1**, wherein engaging recesses for detachably engaging engaging protrusions of tips of the pair of latch levers are formed in two upper and lower surfaces of each of the ferrule housings of the pair of optical connectors.

3. The two core type optical connector plug according to claim **1**, wherein the engaging protrusions engaged with the engaging recesses of the respective ferrule housings are formed at the tips of the pair of latch levers.

4. The two core type optical connector plug according to claim **2**, wherein the engaging protrusions engaged with the engaging recesses of the respective ferrule housings are formed at the tips of the pair of latch levers.

5. The two core type optical connector plug according to claim **1**, wherein the lever coupler is configured in such a manner that a rear end side of the operating lever is fixed to a mounting base shaped of an approximately C-shaped frame and that engaging mechanisms are arranged at sides of left and right inner wall surfaces of the mounting base and sides of left and right outer wall surfaces of the holder so as to be mutually mountable or demountable.

6. The two core type optical connector plug according to claim **4**, wherein the engaging mechanisms are formed by guide recess portions provided at the sides of left and right inner wall surfaces of the mounting base and by guide protrusions provided at the sides of left and right outer wall surfaces of the holder.

7. The two core type optical connector plug according to claim **4**, wherein the engaging mechanisms are formed by guide protrusions provided at the sides of left and right inner wall surfaces of the mounting base and by engaging recesses provided at the sides of left and right outer wall surfaces of the holder.

8. The two core type optical connector plug according to claim **1**, wherein the lever coupler is connected to present an

approximate chevron shape when viewed from the side by the operating lever and the latch levers.

9. The two core type optical connector plug according to claim **1**, wherein the lever coupler is connected to present an approximately flat shape when viewed from the side by the operating lever and the latch levers.

10. The two core type optical connector plug according to claim **1**, wherein tapered surfaces are formed on rear ends of the engaging protrusions provided at the tips of the latch levers.

11. The two core type optical connector plug according to claim **2**, wherein tapered surfaces are formed on rear ends of the engaging protrusions provided at the tips of the latch levers.

12. The two core type optical connector plug according to claim **3**, wherein tapered surfaces are formed on rear ends of the engaging protrusions provided at the tips of the latch levers.

* * * * *

Litigation Search Report CRU 3999

Reexam Serial No. 90/014,456

TO: EXAMINER **Location: CRU** **Art Unit: 3999** **Date: 02/20/2020**	**From: Shanette Brown** **Location: CRU 3999** **REMSEN: 4D75** **Phone: (571) 272-6632** **Shanett.Brown@uspto.gov**

Search Notes

RE: 90/014,456– NO Litigation found for US Patent Number: **10,191,230**

Sources:

1) I performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.

2) I performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.

3) I performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.

4) I performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.

5) I performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.

Citing References (4)

Treatment	Title	Date	Type	Depth	Headnote(s)
—	**1. REVERSIBLE POLARITY FIBER OPTIC CONNECTOR FOR FIBER OPTIC OR ELECTRICAL SIGNAL TRANSMISSION, HAS REMOVABLE LATCH POSITIONED ON SECOND EXTERIOR WALL OF HOUSING YIELDS FIBER OPTIC CONNECTOR WITH SECOND POLARITY IS OPPOSITE TO FIRST POLARITY** Out Of Plan DWPI 2018-60297N ... and Opinion dated May 2014, PCT/ US2014/012137 International Preliminary Report on Patentability dated Sep. 2017 from US2015/059458, dated Nov. 6, 2015.Citing Patents: US 10191230 B2 2019-01-29 US 10444444 B2 2019-10-15 Patent Family Members Publication No. (Derwent):US 20180217340 A1 Original Title (English):OPTICAL CONNECTORS ...	Jan. 30, 2017	DWPI	—	—
—	**2. REVERSIBLE POLARITY FIBER OPTIC CONNECTOR FOR FIBER OPTIC TRANSMISSION IN COMMUNICATION NETWORK, HAS LATCH RECESS THAT IS POSITIONED ON FIRST EXTERIOR WALL OF CONNECTOR HOUSING YIELDS FIBER OPTIC CONNECTOR WITH FIRST POLARITY** Out Of Plan DWPI 2019-516599+ ... 457150P 2017-02-09 Application priority US 452147P 2017-01-30 Application priority Earliest Priority Date:2017-01-30 Related:Continuation of US patent number US 10191230 B Previously issued patent number US 2019187387 A Continuation of US patent number US 10191230 B No. of Countries:1 No. of Patents:2 ...	Jan. 30, 2017	DWPI	—	—
—	**3. OPTICAL CONNECTORS WITH REVERSIBLE POLARITY** Out Of Plan US PAT 10527802+ , U.S. PTO Utility Reversible polarity fiber optic connectors are provided having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules.... ... s):Jarmolowicz, Esq., Edward S.Examiner(s):Jordan, Andrew Priority Information Related Information:Continuation of application No. 15/884,327, filed on 2018/01/30, now Pat. No. 10,191,230 Provisional application No. 62/581,961, filed on 2017/11/06, provisional application No. 62/546,920, filed on 2017/08/17, provisional application No ...	Jan. 07, 2020	Patents	—	—

© 2020 Thomson Reuters. No claim to original U.S. Government Works.

Treatment	Title	Date	Type	Depth	Headnote(s)
—	**4. OPTICAL CONNECTORS WITH REVERSIBLE POLARITY** Out Of Plan US PAT APP 20190187387 , U.S. PTO Application Reversible polarity fiber optic connectors are provided having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules.... ... Southborough, MA MA, Siu Kei Hong Kong, Hong Kong Priority Information Related Information:Continuation of application No. 15/884,327, filed on 2018/01/30, now Pat. No. 10191230 Provisional application No. 62/581,961, filed on 2017/11/06, provisional application No. 62/546,920, filed on 2017/08/17, provisional application No ...	June 20, 2019	Patents	—	—

© 2020 Thomson Reuters. No claim to original U.S. Government Works.

Results for: US PAT 10191230 | Actions

Dockets 0

Narrow By

Open **or** Unknown **or** Closed

Clear

Filter Results

Dockets (0)

No documents found in **Dockets** filtered by **Open or Unknown or Closed.**

Try the following:

- Remove one or more filters: **Open or Unknown or Closed**
- Modify your search (edit or remove some search terms or add synonyms).
- Check for spelling errors.
- Use the options available from the **Actions** menu above to modify your search.
- Note: Some content may not be visible based on the restrictions of your subscription.

About LexisNexis® Privacy Policy Cookie Policy Terms & Conditions Sign Out

Copyright © 2020 LexisNexis. All rights reserved.

TotalPatent One®

US10191230B2 - Optical connectors with reversible polarity

Granted

Bibliographic information

Publication number and date
US10191230B2
01/29/2019

Granted

Application number and date
US15884327 01/30/2018

Priority number and date
US15884327 01/30/2018

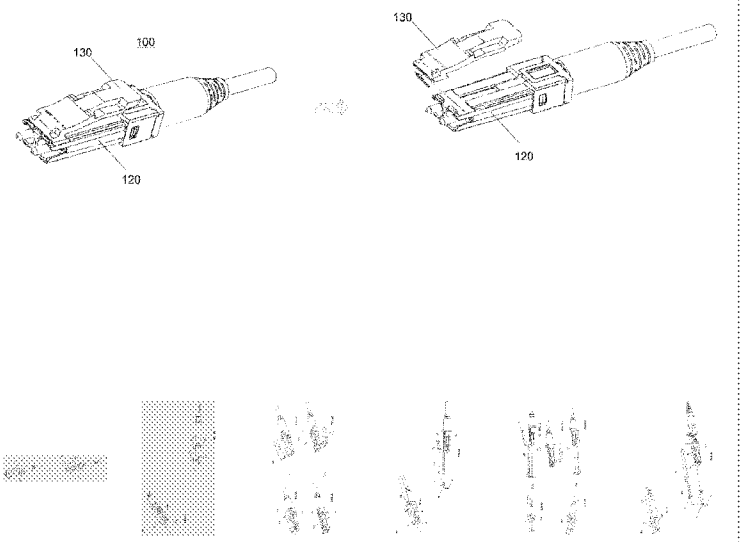
Original assignee
Senko Advanced Components, Inc.

Current assignee
SENKO ADVANCED COMPONENTS, INC

Inventor
Kimman Wong

Legal representative
Edward S. Jarmolowicz, Esq.

1/23 Clipped image



Abstract

Reversible polarity fiber optic connectors are provided having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules. Positioning removable elements such as latches, removable arms, or push-pull tabs on the first wall above the ferrules yields fiber optic connectors with a first polarity type, and positioning the removable elements on the second wall beneath the ferrules yields fiber optic connectors with a second, opposite polarity type. Various engagement mechanisms are provided on either the connector housing walls or on the removable elements, or both, to assist in affixing the removable element to the connector housing.

Description

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] The present application claims priorities to U.S. Provisional Patent Applications No. 62/452,147 filed Jan. 30, 2017, No. 62/457,150 filed Feb. 9, 2017, No. 62/463,898 filed Feb. 27, 2017, No. 62/463,901 filed Feb. 27, 2017, No. 62/485,042 filed Apr. 13, 2017, No. 62/546,920, filed Aug. 17, 2017, and No. 62/581,961 filed Nov. 6, 2017; the disclosures of which are incorporated herein by reference in their entireties.

FIELD OF THE INVENTION

[0002] The present disclosure relates generally optical connectors with reversible polarity.

BACKGROUND

[0003] The prevalence of the Internet has led to unprecedented growth in communication networks. Consumer demand for service and increased competition has caused network providers to continuously find ways to improve quality of service while reducing cost.

[0004] Certain solutions have included deployment of high-density interconnect panels. High-density interconnect panels may be designed to consolidate the increasing volume of interconnections necessary to support the fast-growing networks into a compacted form factor, thereby increasing quality of service and decreasing costs such as floor space and support overhead. However, room for improvement in the area of data centers, specifically as it relates to fiber optic connections, still exists. For example, manufacturers of connectors are always looking to reduce the size of the devices, while increasing ease of deployment, robustness, and modifiability after deployment. In particular, more optical connectors may need to be accommodated in the same footprint previously used for a smaller number of connectors in order

Total of 100% of description loaded.

Claims

1. A reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a latch coupling positioned on each of the first and second exterior walls of the housing; a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing; wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

2. The reversible polarity fiber optic connector of , wherein each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic connector is configured in the first

polarity or the angled walls of the recess on the second exterior wall when the fiber optic

connector is configured in the second polarity.

3. The reversible polarity fiber optic connector of , further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed.

4. The reversible polarity fiber optic connector of , wherein the pull tab comprises at least a first opening and a seconding opening for engaging the removable latch; wherein the first opening is configured to allow the connector housing and the removable latch to pass through; and the second opening is configured to allow the removable latch to partially pass through.

5. The reversible polarity fiber optic connector of , wherein the pull tab further comprises a first

Total of 100% of claims loaded.

Classifications

IPC

G02B6/38

CPC

G02B6/3821
G02B6/3879
G02B6/3893
G02B6/406
G02B6/3821
G02B6/3879
G02B6/3893

Families INPADOC (https://worldwide.espacenet.com/pu CC=US&NR=10191230B2&KC=B2&FT=

This section contains all family relations of this particular document. For more information about the different families please refer to the Manual (Glossary/Families).

(https://worldwide.espacenet.com/publicationDetails/inpadocPatentFamily?CC=US&NR=10191230B2&KC=B2&FT=D&ND=&date=20190129&DB=&locale=)

Extended (48)	Complete (2)	Main (2)	Domestic (2)	Application number	Pu
12/05/2016 Priority claims US15720980 US15881309 US15882343 US15884327 US15979596	07/16/2019 Priority claims US15882343 US16513281 US62452147	07/16/2019 Priority claims US15882343 US16513281 US62452147	07/16/2019	16513281 US16513281	US

Extended (48)	Complete (2)	Main (2)	Domestic (2)	Application number	Pu
US15981309 US16012674 US16123835 US16176661 US16182810 US16195513 US16257619 US16257672 US16297607 US16297614 US16387373 US16387427 US16513281 US62430067 US62430560 US62452147 US62457150 US62463898 US62463901 US62485042 US62546920 US62581961 US62658806 US62665217 US62675463 WO/US18/16049	04/17/2019 Priority claims US15881309 US15979596 US16387373 US16387427 US62452147 US62457150 US62546920 US62581961 US62658806 US62675463	04/17/2019 Priority claims US15881309 US15979596 US16387373 US16387427 US62452147 US62457150 US62546920 US62581961 US62658806 US62675463	04/17/2019	16387427 US16387427	US
	03/09/2019 Priority claims US15720980 US16297614 US62430067 US62430560 US62452147 US62457150 US62546920	03/09/2019 Priority claims US15720980 US16297614 US62430067 US62430560 US62452147 US62457150 US62546920	03/09/2019	16297614 US16297614	US
	03/09/2019	03/09/2019	03/09/2019		

Citations

Citation	Authority	Normalized number	Application date	Publication number	Publicati date
backward	US	3721945	09/09/1971	US3721945A	03/20/19
backward	US	4327964	12/20/1979	US4327964A	05/04/19
backward	US	4478473	09/30/1982	US4478473A	10/23/19
backward	US	4762388	03/15/1985	US4762388A	08/09/19
backward	US	4764129	10/08/1985	US4764129A	08/16/19

Page: ...

Non-patent literature

EP Search Report and Opinion dated Mar. 2015 EP 14187661.
EP Search Report and Opinion dated Feb. 2015 EP 14168005.
Fiber Optic Connectors and Assemblies Catalog 2009 Huber&Suhner.
Fiber Optic Interconnect Solutions Tactical Fiber Optic Connectors, Cables and Termini Glenair, 2006.
Fiber Optic Products Catalog Nov. 2007 Tyco Electronics.
ISR and Opinion dated Apr. 2012, PCT/US2012/058799.
ISR and Opinion dated Aug. 2012, PCT/US2012/039126.
ISR and Opinion dated Jan. 2016, PCT/US2013/54784.
ISR and Opinion dated Aug. 2014, PCT/US2014/041500.
ISR and Opinion dated May 2014, PCT/US2014/012137.
ISR and Opinion dated Aug. 2008, PCT/US2008/057023.
International Preliminary Report on Patentability dated Sep. 2017 from US2015/059458, dated Nov. 6, 2015.
ISR and Opinion dated Apr. 13, 2018 PCT/US2018/016049.
ISR and Opinion dated Feb. 2017, PCT/US2017/13286.
ISR and Opinion dated Aug. 2017, PCT/US2017/40178.
AFOP to introduce LC Slimpac(TM) Uniboot Connectors as high density connector solutions Aug.

Persons

Original Assignees

Original	Standardized	Normalized
Senko Advanced Components, Inc. Marlborough, Massachusetts, United States of America, US	SENKO ADVANCED COMPONENTS	

Current Assignees

Original	Standardized	Normalized
SENKO ADVANCED COMPONENTS, INC 450 DONALD LYNCH BLVD LEGAL 01701 MARLBOROUGH UNITED STATES	SENKO ADVANCED COMPONENTS	

Inventor(s)

Original
Kimman Wong Hong Kong, Hong Kong, HK
Jeffrey Gniadek Northbridge, Massachusetts, United States of America, US
Kazuyoshi Takano Southborough, Massachusetts, United States of America, US

Original

Siu Kei Ma

Hong Kong, Hong Kong, HK

Legal representative(s)

Original	Standardized	Normalized
Edward S. Jarmolowicz, Esq.		

Legal information

Status

Event	Date
Granted	01/29/2019
Filed	01/30/2018

Ownership

Date from	Date to	Name	Standardized	Normalized
01/31/2018		SENKO ADVANCED COMPONENTS, INC	SENKO ADVANCED COMPONENTS	
01/30/2018	01/31/2018	GNIADEK, JEFFERY	GNIADEK JEFFERY	
01/30/2018	01/31/2018	TAKANO, KAZUYOSHI	TAKANO KAZUYOSHI	
01/30/2018	02/01/2018	WONG, KIMMAN	WONG KIMMAN	
01/30/2018	02/02/2018	MA, SIU KEI	MA SIU KEI	

Payment status

Date	Payment status	Description

Litigation

Date	Docket number	Comments	Judgement

Similar documents

The similarity check is done by matching this document to all documents in the database. Only the title and abstract text are matched, resulting in a score.

Lexis Advance®
Research

Results for: 10191230 OR 10,191,230

News (8) Sort by: Relevance

1. US Patent Issued to Senko Advanced Components on Jan. 29 for "Optical connectors with reversible polarity" (Massachusetts Inventor)

US Fed News | Jan 29, 2019 | 256 words
ALEXANDRIA , Va. , Jan. 29 -- United States Patent no. 10,191,230, issued on Jan. 29, was assigned to Senko Advanced Components Inc. (Marlborough , Mass.). "Optical connectors with reversible polarity" was invented by SENKO Advanced Components, Inc. (Marlborough , Mass.). According to the abstract* released by the U.S. Patent & Trademark Office: "Reversible polarity fiber optic connectors are provided having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules. Positioning removable elements such as latches, removable arms, or ...

2. No Headline In Original

Plus Patent News | Jan 30, 2019 | 212 words
ALEXANDRIA , Va : United States Patent and Trademark Office has granted patent no. 10,191,230 on January 29, 2019, to Senko Advanced Components, Inc. (Massachusetts) titled as "Optical connectors with reversible polarity"Inventors: Wong; Kimman (Hong Kong , HK), Gniadek; Jeffrey (Northbridge , MA), Takano; Kazuyoshi (Southborough , MA), Ma; Siu Kei (Hong Kong , HK)Assignee: Senko Advanced Components, Inc. (Marlborough, MA) (Massachusetts)According to the abstract released by the U.S. Patent & Trademark Office : "Reversible polarity fiber optic connectors are provided having ...

3. Regulatory update: Minnesota Public Utilities Commission: CLEAN ENERGY ORGANIZATIONS, has issued (17-184) TESTIMONY--TESTIMONY AND SCHEDULES OF MICHAEL GOGGIN

US Official News | Sep 07, 2018 | 10200 words
Saint Paul: Minnesota Public Utilities Commission has issued the following document (docket): Clean Energy Organizations Exhibit _____ STATE OF MINNESOTA OFFICE OF ADMINISTRATIVE HEARINGS FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION IN THE MATTER OF THE APPLICATION OF XCEL ENERGY AND ITC MIDWEST LLC FOR A CERTIFICATE OF NEED FOR THE HUNTLEY - WILMARTH 345 KV TRANSMISSION PROJECT DOCKET NO. E-002, ET-6675/CN-17-184 OAH DOCKET NO. 82-2500-35157 DIRECT TESTIMONY AND SCHEDULES OF MICHAEL GOGGIN SUBMITTED ON BEHALF OF WIND ON THE WIRES MINNESOTA CENTER FOR ENVIRONMENTAL ...

4. Pedestal Cap for Wdg2 Locos

Tenders Monitor Africa-Asia | Jul 06, 2018 | 98 words
Company : NORTHEAST FRONTIER RAILWAY Address : Headquarter Office . Maligaon, Guwahati-781011, Assam, Attn: Divisional Railway Manager Website : http://www.nfr.indianrailways.gov.in / Country : India Location : India Tender_No : 10181007 Dead line : 2018-07-13 Local International : International Funding Agency : No Description : Tenders are invited for Pedestal Cap for Wdg2 Locos Description: Pedestal Cap for Wdg2 Locos as Per Diw Drg No. Tpl-5398, Alt-C and Pt No. 11089910. Tender Closing Date Time: 13/07/2018 11:30 Document : http://www.bidsinfo.com /adminexe/documents/-IN2~20180706-10191230.html ...

5. Govett Enhanced Inc Final Results.

London Stock Exchange Aggregated Regulatory News Service (ARNS) | Jul 23, 2001 | 2018 words
Govett Enhanced Income Inv TrustPLC 27 February 2001 Govett Enhanced Income Investment Trust PLC Preliminary Announcement for the year ended 31st December 2000 This is my second annual report to shareholders of Govett Enhanced Income Investment Trust PLC, following the successful launch of your Company in March 1999. The objective of the Trust remains to maximise the income of and return on capital to the Ordinary shares having achieved a capital return sufficient to repay the final redemption entitlement of the Zero Dividend Preference Shares. The flexibility of the Investment Trust structure enables ...

6. Alfredo Di Stefano has died - Real Madrid legend passes away after suffering heart attack, aged 88

MailOnline | Jul 07, 2014 | FOOTBALL | 1663 words | ADAM CRAFTON
Di Stefano suffered cardiac arrest on Saturday Former forward represented Spain , Colombia and Argentina Born in Buenos Aires, he was Real Madrid's second highest scorer Member of Real Madrid side that won five consecutive European Cups between 1956 and 1960 Scored opening goal in iconic European Cup final of 1960 when Real beat Eintract Frankfurt 7-3 at Hampden Park FAREWELL ALFREDO ...

7. Alfredo Di Stefano has died - Real Madrid legend passes away after suffering heart attack, aged 88

MailOnline | Jul 07, 2014 | FOOTBALL | 1378 words | ADAM CRAFTON
Di Stefano suffered cardiac arrest on Saturday Former forward represented Spain , Colombia and Argentina Born in Buenos Aires, he was Real Madrid 's second highest scorer Member of Real Madrid side that won five consecutive European Cups between 1956 and 1960 Scored opening goal in iconic European Cup final of 1960 when Real beat Eintract Frankfurt 7-3 at Hampden Park The world of football is in mourning after the death of legendary Real Madrid forward Alfredo Di Stefano at the age of 88. The former Argentina , Spain ...

8. Alfredo Di Stefano has died - Real Madrid legend passes away after suffering heart attack, aged 88

MailOnline | Jul 08, 2014 | FOOTBALL | 1677 words | ADAM CRAFTON
Di Stefano suffered cardiac arrest on Saturday Former forward represented Spain , Colombia and Argentina Born in Buenos Aires, he was Real Madrid's second highest scorer Member of Real Madrid side that won five consecutive European Cups between 1956 and 1960 Scored opening goal in iconic European Cup final of 1960 when Real beat Eintract Frankfurt 7-3 at Hampden Park FAREWELL ALFREDO ...

Content type: News
Terms: 10191230 OR 10,191,230
Search Type: Boolean - Fewer Results
Narrow By: Sources: News
Date and Time: Feb 20, 2020 05:31:30 a.m. EST

LexisNexis About LexisNexis® Privacy Policy Cookie Policy Terms & Conditions Sign Out Copyright © 2020 LexisNexis. All rights reserved. RELX Group™ Print

Patent Assignment Abstract of Title

Total Assignments: 1

Application #: 15884327 **Filing Dt:** 01/30/2018 **Patent #:** 10191230 **Issue Dt:** 01/29/2019
PCT #: NONE **Intl Reg #:** **Publication #:** US20180217340 **Pub Dt:** 08/02/2018
Inventors: Kimman WONG, Jeffrey GNIADEK, Kazuyoshi TAKANO, Siu Kei MA
Title: OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

Assignment: 1

Reel/Frame: 044982 / 0186 **Received:** 02/20/2018 **Recorded:** 02/20/2018 **Mailed:** 02/22/2018 **Pages:** 6
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignors:

GNIADEK, JEFFERY	**Exec Dt:** 01/31/2018
TAKANO, KAZUYOSHI	**Exec Dt:** 01/31/2018
WONG, KIMMAN	**Exec Dt:** 02/01/2018
MA, SIU KEI	**Exec Dt:** 02/02/2018

Assignee: SENKO ADVANCED COMPONENTS, INC
450 DONALD LYNCH BLVD
LEGAL
MARLBOROUGH, UNITED STATES 01701

Correspondent: SENKO ADVANCED COMPONENTS, INC.
450 DONALD LYNCH BLVD
LEGAL
MARLBOROUGH, MA 01752

Search Results as of: 02/21/2020 09:02 AM

If you have any comments or questions concerning the data displayed, contact PRD / Assignments at 571-272-3350. v.2.6
Web interface last modified: Jun 26, 2017 v.2.6

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

BIB DATA SHEET

CONFIRMATION NO. 3026

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
90/014,456	02/19/2020 RULE	385	3993	902/9 REX

APPLICANTS

INVENTORS

10191230, Residence Not Provided;
SENKO ADVANCED COMPONENTS, INC (Assignee), MARLBOROUGH, MA;
Theodosios Thomas NK Patent Law (3RD PTY REQ), Raleigh, NC;
NK PATENT LAW, RALEIGH, NC

**** CONTINUING DATA ***************************

This application is a REX of 15/884,327 01/30/2018 PAT 10191230 *
which claims benefit of 62/452,147 01/30/2017
and claims benefit of 62/457,150 02/09/2017
and claims benefit of 62/463,898 02/27/2017
and claims benefit of 62/463,901 02/27/2017
and claims benefit of 62/485,042 04/13/2017
and claims benefit of 62/546,920 08/17/2017
and claims benefit of 62/581,961 11/06/2017
(*)Data provided by applicant is not consistent with PTO records.

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

Foreign Priority claimed ☐ Yes ☐ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged _____ Examiner's Signature	☐ Met after Allowance _____ Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
				25	5

ADDRESS

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752
UNITED STATES

TITLE

Optical Connectors with Reversible Polarity

FILING FEE RECEIVED		
6000	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

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

REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,456	02/19/2020	10191230

CONFIRMATION NO. 3026

REEXAM ASSIGNMENT NOTICE

152878
Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

OC000000114904834

Date Mailed: 02/24/2020

NOTICE OF ASSIGNMENT OF REEXAMINATION REQUEST

The above-identified request for reexamination has been assigned to Art Unit 3993. All future correspondence to the proceeding should be identified by the control number listed above and directed to the assigned Art Unit.

A copy of this Notice is being sent to the latest attorney or agent of record in the patent file or to all owners of record. (See 37 CFR 1.33(c)). If the addressee is not, or does not represent, the current owner, he or she is required to forward all communications regarding this proceeding to the current owner(s). An attorney or agent receiving this communication who does not represent the current owner(s) may wish to seek to withdraw pursuant to 37 CFR 1.36 in order to avoid receiving future communications. If the address of the current owner(s) is unknown, this communication should be returned within the request to withdraw pursuant to Section 1.36.

NOTICE OF USPTO EX PARTE REEXAMINATION PATENT OWNER STATEMENT WAIVER PROGRAM

The USPTO has implemented a pilot program where, after a reexamination proceeding has been granted a filing date and before the examiner begins his or her review, the patent owner may orally waive the right to file a patent owner's statement. See *"Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings,"* 75 FR 47269 (August 5, 2010). One goal of the pilot program is to reduce the pendency of reexamination proceedings and improve the efficiency of the reexamination process.

Ordinarily when ex parte reexamination is ordered, the USPTO must wait until after the receipt of the patent owner's statement and the third party requester's reply, or after the expiration of the time period for filing the statement and reply (a period that can be as long as 5 to 6 months), before mailing a first determination of patentability. The USPTO's first determination of patentability is usually a first Office action on the merits or a Notice of Intent to Issue Reexamination Certificate (NIRC).

Under the pilot program, the patent owner's oral waiver allows the USPTO to act on the first determination of patentability immediately after determining that reexamination will be ordered, and in a suitable case issue the reexamination order and the first determination of patentability (which could be a NIRC if the claims under reexamination are confirmed) at the same time.

Benefits to the Patent Owner for participating in this pilot program include reduction in pendency.

To participate in this pilot program, Patent Owners may contact the USPTO's Central Reexamination Unit (CRU) at 571-272-7705. The USPTO will make the oral waiver of record in the reexamination file in an interview summary and a copy will be mailed to the patent owner and any third party requester.

cc: Third Party Requester(if any)
NK PATENT LAW
4917 WATERS EDGE DRIVE
SUITE 275
RALEIGH, NC 27606

/tplovelace/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

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

REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,456	02/19/2020	10191230

CONFIRMATION NO. 3026

NK PATENT LAW
4917 WATERS EDGE DRIVE
SUITE 275
RALEIGH, NC 27606

REEXAMINATION REQUEST NOTICE

OC000000114904832

Date Mailed: 02/24/2020

NOTICE OF STREAMLINED REEXAMINATION REQUEST FILING DATE

(Third Party Requester)

Requester is hereby notified that the filing date of the request for reexamination is 02/19/2020, the date that the filing requirements of 37 CFR § 1.510 were received.

A decision on the request for reexamination will be mailed within three months from the filing date of the request for reexamination. (See 37 CFR 1.515(a)).

A copy of the Notice is being sent to the person identified by the requester as the patent owner. Further patent owner correspondence will be the latest attorney or agent of record in the patent file. (See 37 CFR 1.33). Any paper filed should include a reference to the present request for reexamination (by Reexamination Control Number).

cc: Patent Owner
152878
Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

/tplovelace/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,456	02/19/2020	10191230	902/9 REX	3026

152878 7590 02/27/2020

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER
DOERRLER, WILLIAM CHARLES

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
02/27/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

NK PATENT LAW
4917 WATERS EDGE DRIVE
SUITE 275
RALEIGH, NC 27606

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,456* .

PATENT UNDER REEXAMINATION *10191230* .

ART UNIT *3993* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Ex Parte Reexamination Interview Summary – Pilot Program for Waiver of Patent Owner's Statement	Control No. 90/014,456	Patent Under Reexamination is Requested 10191230	
	Examiner WILLIAM DOERRLER	Art Unit 3993	AIA (FITF) Status Yes

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

All participants (USPTO official and patent owner):

(1) SHANETTE BROWN (3) _____

(2) _____ (4) _____

Date of Telephonic Interview: 25 February 2020.

A. The USPTO official requested waiver of the patent owner's statement pursuant to the pilot program for waiver of patent owner's statement in *ex parte* reexamination proceedings.*

☐ The patent owner **agreed** to waive its right to file a patent owner's statement under 35 U.S.C. 304 in the event reexamination is ordered for the above-identified patent.

☐ The patent owner **did not agree** to waive its right to file a patent owner's statement under 35 U.S.C. 304 at this time.

☑ USPTO personnel were unable to reach the patent owner.**

B. The Patent Owner of record telephoned the Office and indicated they would like to participate in the pilot program for waiver of patent owner's statement in *ex parte* reexamination proceedings.*

☐ The Patent owner of record telephoned the Office and **agreed** to waive its right to file a patent owner's statement under 35 U.S.C. 304 in the event reexamination is ordered for the above-identified patent.

The patent owner is not required to file a written statement of this telephone communication under 37 CFR 1.560(b) or otherwise. However, any disagreement as to this interview summary must be brought to the immediate attention of the USPTO, and no later than one month from the mailing date of this interview summary. Extensions of time are governed by 37 CFR 1.550(c).

*For more information regarding this pilot program, see *Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings, 75 Fed. Reg.* 47269 (August 5, 2010), available on the USPTO Web site at http://www.uspto.gov/patents/law/notices/2010.jsp.

**The patent owner may contact the USPTO personnel at (571) 272-7705 or at the telephone number provided below if the patent owner decides to waive the right to file a patent owner's statement under 35 U.S.C. 304.

/SHANETTE BROWN/ (571)272-6632

Signature and telephone number of the USPTO official, who contacted, was contacted by, or attempted to contact the patent owner.

cc: Requester (if third party requester)

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,456	02/19/2020	10191230	902/9 REX	3026

152878 7590 03/17/2020

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER
DOERRLER, WILLIAM CHARLES

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
03/17/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

NK Patent Law
4917 Waters Edge Drive
Suite 475
Raleigh, NC 27606

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,456* .

PATENT UNDER REEXAMINATION *10191230* .

ART UNIT *3993* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Order Granting Request For Ex Parte Reexamination	Control No. 90/014,456	Patent Under Reexamination 10191230	
	Examiner WILLIAM C DOERRLER	Art Unit 3993	AIA (FITF) Status Yes

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

The request for *ex parte* reexamination filed 02/19/2020 has been considered and a determination has been made. An identification of the claims, the references relied upon, and the rationale supporting the determination are attached.

Attachments: a)☐ PTO-892, b)☑ PTO/SB/08, c)☐ Other: ____

1. ☑ The request for *ex parte* reexamination is GRANTED.

RESPONSE TIMES ARE SET AS FOLLOWS:

For Patent Owner's Statement (Optional): TWO MONTHS from the mailing date of this communication (37 CFR 1.530 (b)). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).**

For Requester's Reply (optional): TWO MONTHS from the **date of service** of any timely filed Patent Owner's Statement (37 CFR 1.535). **NO EXTENSION OF THIS TIME PERIOD IS PERMITTED.** If Patent Owner does not file a timely statement under 37 CFR 1.530(b), then no reply by requester is permitted.

/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993		

cc:Requester (if third party requester)

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.

DECISION ON REQUEST FOR REEXAMINATION

A substantial new question of patentability affecting claims 1-25 of United States Patent Number 10,191,230 is raised by the request for *ex parte* reexamination.

Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 305 requires that *ex parte* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extensions of time in *ex parte* reexamination proceedings are provided for in 37 CFR 1.550(c).

Service of Papers

After the filing of a request for reexamination by a third party requester, any document filed by either the patent owner or the third party requester must be served on the other party (or parties where two or more third party requester proceedings are merged) in the reexamination proceeding in the manner provided in 37 C.F.R. 1.248. See 37 C.F.R. 1.550(f).

Amendment in Reexamination Proceedings

Patent owner is notified that any proposed amendment to the specification and/or claims in this reexamination proceeding must comply with 37 C.F.R. 1.530(d)-(j), must be formally presented pursuant to 37 C.F.R. 1.52(a) and (b), and must contain any fees required by 37 C.F.R. 1.20(c). See MPEP §2250(IV) for examples to assist in the preparation of proper proposed amendments in reexamination proceedings.

Submissions

In order to ensure full consideration of any amendments, affidavits or declarations or other documents as evidence of patentability, such documents must be submitted in response to the first Office action on the merits (which does not result in a close of prosecution). Submissions after the second Office action on the merits, which is intended to be a final action, will be governed by the requirements of 37 C.F.R. 1.116, after final rejection and by 37 C.F.R. 41.33 after appeal, which will be strictly enforced.

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a) to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving Patent No. 10,191,230 throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282 and 2286.

In order to ensure full consideration of any amendments, affidavits or declarations, or other documents as evidence of patentability, such documents must be submitted in response to this Office action. Submissions after the next Office action, which is intended to be a final action, will be governed by the requirements of 37 CFR 1.116, after final rejection and 37 CFR 41.33 after appeal, which will be strictly enforced.

Notification of Current Assignment of the Patent

The patent owner is requested to provide the current assignment information for the patent for which reexamination is requested. An assignment can be made of record in the file of a patent application, patent, or other patent proceeding (e.g., reexamination proceeding). This step is necessary to permit the assignee to "take action" in the application, patent, or other

patent proceeding under the conditions set forth in 37 CFR 3.73 and MPEP § 324. Recordation of an assignment in the assignment records of the Office, however, does not, by itself, permit the assignee to take action in the application, patent, or other patent proceeding.

Brief Summary of the Previous Examination

The '230 patent issued with 25 claims on January 29, 2019. The patent issued from application 15/884,327, which was filed January 30, 2018 and claimed priority based on provisional applications 62/581,961 (filed November 6, 2017), 62/546,920 (filed August 17, 2017), 62/485,042 (filed April 13, 2017), 62/463,901 (filed February 27, 2017), 62/463,898 (filed February 27, 2017), 62/457,150 (filed February 9, 2017) and 62/452,147 (filed January 30, 2017).

The '327 application was filed with 25 claims. The first Office action was a notice of allowance mailed September 6, 2018. The reasons for allowance stated: "The prior art does not teach or suggest a removable latching system, removable arm system, or removable push-pull tab as set forth in the claimed combination of independent claim(s) 1,9, and 15, 19, and 23, respectively.

The following references are seen as pertinent to the present application:

U.S. Patent Application Publication No. 2016/0349458 of Murray et al. (Murray);

U.S. Patent Application Publication No. 2015/0378113 of Good et al. (Good); and

U.S. Patent Application Publication No. 2016/0116685 of Wong et al. (Wong).

While the (apparently) corresponding international application PCT/US2018/016049 indicates that the Good reference may be more pertinent, the examiner sees the alignment mechanism in Good as not providing a latch that holds the connection sufficiently in place. The Murray reference relies on a boot, and not a housing to provide connection for a latching mechanism."

Substantial New Question

The Third Party Requester (TPR) requested reexamination of claims 1-25 of U.S. Patent No. 10,191,230 (hereinafter "the '230 patent") based upon the following proposed rejections:

1. Claims 1, 2, 6 and 9 of the '230 patent are unpatentable under 35 USC 102(a)(2)) as anticipated by US Patent No. 8,834,038 to Limbert et al. (hereinafter "Limbert").

2. Claims 3-5,7,8,10,12-16,19,20 and 22-25 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Limbert in view of US Patent No. 8,641,293 to Lin (hereinafter "Lin").

3. Claims 17,18 and 21 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Limbert in view of Lin and further in view of US Patent No. 9,028,270 to Vanderwoud (hereinafter "Vanderwoud").

4. Claims 1 and 2 of the '230 patent are unpatentable under 35 USC 102(a)(2) as anticipated by US Pre-Grant Publication No. 2016/0047993 to Hioki et al. (hereinafter "Hioki").

5. Claims 3-16,19 and 22-25 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Hioki in view of Lin.

6. Claims 17,18 and 21 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Hioki in view of Lin and further in view of Vanderwoud.

A discussion of the availability of the prior art references now follows:

Limbert is a US patent that published September 16, 2014. As this is more than one year prior to the January 30, 2017 priority date of the '230 patent, Limbert is available as prior art

under 35 U.S.C. 102(a)(1). Limbert was not cited during the original prosecution of the '230 patent.

Lin is a US patent that published February 4, 2014. As this is more than one year prior to the January 30, 2017 earliest priority date of the '230 patent, Lin is available as prior art under 35 U.S.C. 102(a)(1). This Lin reference was not cited or relied upon for a rejection in the original prosecution.

Vanderwoud is a US patent that was published May 12, 2015. As this is more than one year prior to the January 30, 2017 priority date of the '230 patent, Vanderwoud is available as prior art under 35 U.S.C. 102(a)(1). Vanderwoud was not cited or relied upon for a rejection in the original prosecution of the '230 patent.

Hioki is a US Pre-Grant Publication that published February 18, 2016. As this is prior to the January 30, 2017 priority date of the '230 patent, Hioki is available as prior art under 35 U.S.C. 102(a)(2). Hioki was not cited during the original prosecution of the '230 patent.

Discussion of the SNQs

The request presents 2 SNQs and 6 proposed rejections (relying on the same references). The proposed rejections are discussed here as SNQs.

SNQ 1: Claims 1,2,6 and 9 anticipated by Limbert.

Limbert appears to show a reversible polarity fiber optic connector (title or abstract) comprising first and second ferrules (line 17 of column 6 states that a fiber with a ferrule can be slotted into the adaptor-the reference shows two fibers entering the adaptor), and a connector

housing (112) surrounding the first and second ferrules with the housing having an upper and lower wall. Figure 4 shows a latch mounting aperture. The paragraph beginning on line 25 of column 5 describes how the latch mechanism 114 is configured to be releasably mounted mountable to each of the opposing faces of the connector body (using shaped apertures on each of the top and bottom surface). This is done to "accommodate the desire to alter the polarity of the patch cord connection."

In regard to claim 2, figures 4a and 4c show the latch coupling as a recess with slanted walls and figure 4c shows 9a protrusion 132 with slanted edges to prevent rotation of the latch. In regard to claim 6, Limbert shows extensions 133 which couple with appropriately shaped grooves which are part of the latch's anti-rotation fixings. In regard to claim 9, post 131 of the latch mechanism is seen as an arm that is removably connected with the aperture in either face of the connector body.

As Limbert appears to disclose all of the structure of claims 1,2,6 and 9 the '230 patent, an examiner would consider the reference important in the patentability determination thereof. As the reference has not been cited in an earlier proceeding, the reference is seen to provide a SNQ for claims 1,2,6 and 9 of the '230 patent.

SNQ 2 and 3: Claims 3-5,7,8,10,12-16,19,20 and 22-25 obvious over Limbert in view of Lin.

As discussed above, Limbert is seen to present a SNQ for claims 1,2,6 and 9. Claim 3 depends from claim 1, claim 7 depends from claim 6 and claim 12 depends from claim 9 and add the feature of a pull tab for engaging the removable latch, wherein pulling the tab away from the ferrules depresses the latch. Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. In regard to claims 4 and 8, Lin shows multiple openings that the latch can pass through. In regard to claim 5,

deformable portions 315 and 327 of Lin cooperate to depress the removable latch. In regard to claim 10, Limbert shows a removable connector and both latch type connectors and recess type connectors are known in the art. In regard to claim 14, Lin shows the latch (320, fig 4) and the arm (310, fig 3) as separate components. In regard to claim 15, Lin teaches an optical connector with a pull tab 310 which connects to housing (clip member 320) which has a plurality of apertures with the tab having protrusions cooperating with the apertures for connection. In regard to claim 16, the housing of Limbert has apertures on first and second walls of the housing to permit the reversal of polarity. In regard to claims 19 and 23, Limbert shows a fiber optic connector with regions (retainers in the language of claim 23) for connecting a latch to opposite sides to change the polarity of the connector and Lin describes, in the paragraph beginning on line 30 of column 4, connecting the pull tab handle member 310 to the clip 320 by deforming opening 312 to insert tab 327. Ring 315 of the handle member is then forced to enclose tab 126 of the connector. In regard to claim 20, Limbert states in lines 56-61 of column 5 that a screw driver can be used to remove the latch. In regard to claim 22, Limberg teaches apertures on first and second surfaces of the housing to enable moving the latch to the opposite side to reverse polarity of the connector. In regard to claims 24 and 25, Lin's pull tab 310 includes multiple projections to fit in various openings. These include opening 312 as well as the opening inside U-shaped member 315 and projections 325 and 327 on the housing to be received by the openings.

As Limbert in combination with Lin appears to disclose all of the structure of claims 3-5,7,8,10,12-16,19,20 and 22-25 of the '230 patent, an examiner would consider this combination of references important in the patentability determination thereof. As these references have not been cited in an earlier proceeding, the references are seen to provide a SNQ for claims 3-5,7,8,10,12-16,19,20 and 22-25 of the '230 patent.

SNQ 3: Claims 17,18 and 21 obvious over Limbert in view of Lin and further in view of Vanderwoud.

As discussed above in regard to proposed rejections 1 and 2, Limbert or Limbert in combination with Lin are seen to provide a SNQ for claims 1-16,19,20 and 22-25. Claim 17 depends from claim 15 and adds the feature of a spring to urge the push-pull tab forward. While the latching mechanism of Lin's pull tab actuator requires resilience, a spring is not explicitly described. Vanderwoud discloses a pull tab actuator for connectors with latch 114 "spring-biased to the latched position (line 45 of column3). This is also seen as the housing latch being urged forward by a spring of claim 18 and claim 21. As such Limbert in view of Lin and Vanderwoud is seen to provide a new technical teaching and the combination of the references is seen to provide a SNQ for claims 17,18 and 21 of the '230 patent.

SNQ 4: Claims 1 and 2 anticipated by Hioki.

Hioki discloses an optical connector plug (title) which is capable of simply interchanging positions of a pair of optical connectors disposed left and right (abstract). Ferrule housings 10A and 10B are surrounded by a holder 1 which surrounds the ferrules and has a top and bottom wall, each with a recess 12a. The recesses are designed to removably engage protrusions 11a to form a removable latch. Figures 4 and 5 of Hioki show the ferrules in opposite positions (opposite polarity) by changing the position of the latch. In regard to claim 2, paragraph 62 of Hioki states that the recesses 12a have convex surfaces to correspond with the arcuate concave surfaces of the protrusions 11a. As such Hioki is seen to provide a new technical teaching and therefore the reference is seen to provide a SNQ for the claims 1 and 2 of the '230 patent.

SNQ 5: Claims 3-16,19 and 22-25 obvious over Hioki in view of Lin.

As discussed above, Hioki is seen to present a SNQ for claims 1 and 2. Claim 3 depends from claim 1 and adds the feature of a pull tab for engaging the removable latch, wherein pulling the tab away from the ferrules depresses the latch. Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. In regard to claims 4 and 8, Lin shows multiple openings that the latch can pass through. In regard to claim 5, deformable portions 315 and 327 of Lin cooperate to depress the removable latch. In regard to claim 6, Hioki shows recesses 12a and protrusions 11a which are seen as grooves and projections. In regard to claim 7, Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. In regard to claim 9, the holder 1 of Hioki is seen as a common housing for both ferrules with a top surface 1b and a bottom surface 1a. In regard to claim 10, Limbert shows a removable connector and both latch type connectors and recess type connectors are known in the art. In regard to claim 11, Hioki discloses tabs 9a and grooves 9a for guiding the tabs. The placement of the grooves and tabs is reversed as claimed in claim 11, but the components are shown in the environment, so the teaching is still seen to provide a significant technical teaching that was not presented during the original prosecution. In regard to claims 12 and 13, Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. In regard to claim 14, Lin shows the latch (320, fig 4) and the arm (310, fig 3) as separate components. In regard to claim 15, Lin teaches an optical connector with a pull tab 310 which connects to housing (clip member 320) which has a plurality of apertures with the tab having protrusions cooperating with the apertures for connection. In regard to claim 16, the housing of Hioki has apertures (recesses 12a) on first and second walls of the housing to permit the reversal of polarity. In regard to claims 19 and 23, Hioki shows a

fiber optic connector with regions (retainers in the language of claim 23) for connecting a latch to opposite sides to change the polarity of the connector and Lin describes, in the paragraph beginning on line 30 of column 4, connecting the pull tab handle member 310 to the clip 320 by deforming opening 312 to insert tab 327. Ring 315 of the handle member is then forced to enclose tab 126 of the connector. In regard to claim 22, Hioki teaches apertures (recesses) on first and second surfaces of the housing to enable moving the latch to the opposite side to reverse polarity of the connector. In regard to claims 24 and 25, Lin's pull tab 310 includes multiple projections to fit in various openings. These include opening 312 as well as the opening inside U-shaped member 315 and projections 325 and 327 on the housing to be received by the openings.

As Hioki in combination with Lin appears to disclose all of the structure of claims 3-16,19 and 22-25 of the '230 patent, an examiner would consider this combination of references important in the patentability determination thereof. As these references have not been cited in an earlier proceeding, the references are seen to provide a SNQ for claims 3-16,19 and 22-25 of the '230 patent.

SNQ 6: Claims 17,18 and 21 obvious over Hioki in view of Lin and further in view of Vanderwoud.

As discussed above in regard to proposed rejections 5 and 6, Hioki or Hioki in combination with Lin are seen to provide a SNQ for claims 1-16,19,20 and 22-25. Claim 17 depends from claim 15 and adds the feature of a spring to urge the push-pull tab forward. While the latching mechanism of Lin's pull tab actuator requires resilience, a spring is not explicitly described. Vanderwoud discloses a pull tab actuator for connectors with latch 114 "spring-biased to the latched position (line 45 of column3). This is also seen as the housing latch being urged forward by a spring of claim 18 and claim 21. As such Hioki in view of Lin and

Vanderwoud is seen to provide a new technical teaching and the combination of the references is seen to provide a SNQ for claims 17,18 and 21 of the '230 patent.

Conclusion

As the request provided a SNQ for claims 1-25, these claims will be reexamined.

All correspondence relating to this ex parte reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered.

By Mail to: Mail Stop Ex Parte Reexam
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i) (C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely filed if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning the status of this proceeding should be directed to the Central Reexamination Unit at telephone number (571) 272-7705. Any inquiry concerning this communication should be directed to William C. Doerrler at telephone number (571) 272-4807.

Signed:

/WILLIAM C DOERRLER/
Primary Examiner, Art Unit 3993

Conferees: /JLG/ /E.D.L/
SPRS, Art Unit 3993

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
NK Patent Law 4917 Waters Edge Drive Suite 275 Raleigh, NC 27606

LITIGATION REVIEW ☑	/WCD/ (examiner initials)	10 March 2020 (date)
Case Name		Director Initials
None		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
None	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Examiner	Art Unit
	WILLIAM C DOERRLER	3993

CPC - Searched*		
Symbol	Date	Examiner
None		

CPC Combination Sets - Searched*		
Symbol	Date	Examiner
None		

US Classification - Searched*			
Class	Subclass	Date	Examiner
None			

* 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
15/884,327 case file reviewed	03/06/2020	

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993	

Receipt date: 02/19/2020

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
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	10191230
Filing Date	2018-01-30
First Named Inventor	Kimman Wong
Art Unit	-
Examiner Name	- Doerrler
Attorney Docket Number	902/9 REX

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	10191230	B2	2019-01-29	Wong, et al.	
	2	8834038	B2	2014-09-16	Limbert, et al.	
	3	8641293	B2	2014-02-04	Lin, et al.	
	4	9028270	B1	2015-05-12	Vanderwoud	

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

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20160047993	A1	2016-02-18	Hioki, et al.	

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

FOREIGN PATENT DOCUMENTS

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]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /W.C.D/

Receipt date: 02/19/2020

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	10191230
	Filing Date	2018-01-30
	First Named Inventor	Kimman Wong
	Art Unit	-
	Examiner Name	-
	Attorney Docket Number	902/9 REX

	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

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	USPTO, Notice of Allowance for Application No. 15884,327 dated August 30, 2018	☐

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

EXAMINER SIGNATURE

Examiner Signature	/WILLIAM C DOERRLER/	Date Considered	03/05/2020

*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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /W.C.D/

Receipt date: 02/19/2020

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10191230
Filing Date	2018-01-30
First Named Inventor	Kimman Wong
Art Unit	-
Examiner Name	-
Attorney Docket Number	902/9 REX

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	/Theodosios Thomas/	Date (YYYY-MM-DD)	2019-02-19
Name/Print	Theodosios Thomas	Registration Number	45159

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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /W.C.D/

Receipt date: 02/19/2020

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 record s.

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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /W.C.D/

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,456	02/19/2020	10191230	902/9 REX	3026

152878 7590 06/15/2020

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER
DOERRLER, WILLIAM CHARLES

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
06/15/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

NK Patent Law
4917 Waters Edge Drive
Suite 275
Raleigh, NC 27606

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,456* .

PATENT UNDER REEXAMINATION *10191230* .

ART UNIT *3993* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Office Action in Ex Parte Reexamination	**Control No.** 90/014,456	**Patent Under Reexamination** 10191230	
	Examiner WILLIAM C DOERRLER	**Art Unit** 3993	**AIA (FITF) Status** Yes

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

a. ☐ Responsive to the communication(s) filed on _____.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

b. ☐ This action is made FINAL.

c. ☑ A statement under 37 CFR 1.530 has not been received from the patent owner.

A shortened statutory period for response to this action is set to expire _____ month(s) from the mailing date of this letter. Failure to respond within the period for response will result in termination of the proceeding and issuance of an *ex parte* reexamination certificate in accordance with this action. 37 CFR 1.550(d). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).** If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☐ Information Disclosure Statement, PTO/SB/08.
3. ☐ Interview Summary, PTO-474.
4. ☐ _____.

Part II SUMMARY OF ACTION

1a. ☑ Claims 1-25 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been canceled in the present reexamination proceeding.
3. ☐ Claims _____ are patentable and/or confirmed.
4. ☑ Claims 1-25 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ The drawings, filed on _____ are acceptable.
7. ☐ The proposed drawing correction, filed on _____ has been (7a) ☐ approved (7b) ☐ disapproved.
8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the certified copies have
   1 ☐ been received.
   2 ☐ not been received.
   3 ☐ been filed in Application No. _____.
   4 ☐ been filed in reexamination Control No. _____.
   5 ☐ been received by the International Bureau in PCT application No. _____.
   * See the attached detailed Office action for a list of the certified copies not received.
9. ☐ Since the proceeding appears to be in condition for issuance of an *ex parte* reexamination certificate except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte* Quayle, 1935 C.D. 11, 453 O.G. 213.
10. ☐ Other: _____

cc: Requester (if third party requester)

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.

Reexamination

After the filing of a request for reexamination by a third party requester, any document filed by either the patent owner or the third party requester must be served on the other party (or parties where two or more third party requester proceedings are merged) in the reexamination proceeding in the manner provided in 37 C.F.R. 1.248. See 37 C.F.R. 1.550(f).

In order to ensure full consideration of any amendments, affidavits or declarations, or other documents as evidence of patentability, such documents must be submitted in response to this Office action. Submissions after the next Office action, which is intended to be a final action, will be governed by the requirements of 37 CFR 1.116, after final rejection and 37 CFR 41.33 after appeal, which will be strictly enforced.

Patent owner is notified that any proposed amendment to the specification and/or claims in this reexamination proceeding must comply with 37 C.F.R. 1.530(d)-(j), must be formally presented pursuant to 37 C.F.R. 1.52(a) and (b), and must contain any fees required by 37 C.F.R. 1.20(c). See MPEP §2250(IV) for examples to assist in the preparation of proper proposed amendments in reexamination proceedings.

The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a), to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving Patent No. 10,191,230 throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282 and 2286.

Brief Description of Proceedings

The Third Party Requester (TPR) requested reexamination of claims 1-25 of U.S. Patent No. 10,191,230 (hereinafter "the '230 patent") based upon the following proposed rejections:

1. Claims 1, 2, 6 and 9 of the '230 patent are unpatentable under 35 USC 102(a)(2)) as anticipated by US Patent No. 8,834,038 to Limbert et al. (hereinafter "Limbert").

2. Claims 3-5,7,8,10,12-16,19,20 and 22-25 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Limbert in view of US Patent No. 8,641,293 to Lin (hereinafter "Lin").

3. Claims 17,18 and 21 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Limbert in view of Lin and further in view of US Patent No. 9,028,270 to Vanderwoud (hereinafter "Vanderwoud").

4. Claims 1 and 2 of the '230 patent are unpatentable under 35 USC 102(a)(2) as anticipated by US Pre-Grant Publication No. 2016/0047993 to Hioki et al. (hereinafter "Hioki").

5. Claims 3-16,19 and 22-25 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Hioki in view of Lin.

6. Claims 17,18 and 21 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Hioki in view of Lin and further in view of Vanderwoud.

An Order mailed March 17, 2020 found a SNQ for claims 1-25 was provided by the request for the above proposed rejections. Patent owner has not filed a statement under 35 U.S.C. 304 and the period to do so has expired.

Claim Rejections - 35 USC § 102

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.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

Claim(s) 1,2,6 and 9 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Limbert.

Limbert discloses a reversible polarity fiber optic connector (title or abstract) comprising first and second ferrules (line 17 of column 6 states that a fiber with a ferrule can be slotted into the adaptor-the reference shows two fibers entering the adaptor), and a connector housing (112) surrounding the first and second ferrules with the housing having an upper and lower wall. Figure 4 shows a latch mounting aperture. The paragraph beginning on line 25 of column 5 describes how the latch mechanism 114 is configured to be releasably mounted moun table to each of the opposing faces of the connector body (using shaped apertures on each of the top and bottom surface). This is done to "accommodate the desire to alter the polarity of the patch cord connection." (column 5, lines 26-28)

In regard to claim 2, figures 4a and 4c show the latch coupling as a recess with slanted walls and figure 4c shows 9a protrusion 132 with slanted edges to prevent rotation of the latch. In regard to claim 6, Limbert shows extensions 133 which couple with appropriately shaped grooves which are part of the latch's anti-rotation fixings. In regard to claim 9, post 131 of the latch mechanism is seen as an arm that is removably connected with the aperture in either face of the connector body.

Claim(s) 1 and 2 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Hioki.

Hioki discloses an optical connector plug (title) which is capable of simply interchanging positions of a pair of optical connectors disposed left and right (abstract). Ferrule housings 10A and 10B are surrounded by a holder 1 which surrounds the ferrules and has a top and bottom wall, each with a recess 12a. The recesses are designed to removably engage protrusions 11a to form a removable latch. Figures 4 and 5 of Hioki show the ferrules in opposite positions (opposite polarity) by changing the position of the latch. In regard to claim 2, paragraph 62 of Hioki states that the recesses 12a have convex surfaces to correspond with the arcuate concave surfaces of the protrusions 11a.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-5,7,8,10,12-16,19,20 and 22-25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Limbert in view of Lin.

As discussed above, Limbert discloses the reversible fiber optic connector of claims 1,2,6 and 9. Claim 3 depends from claim 1, claim 7 depends from claim 6 and claim 12 depends from claim 9 and add the feature of a pull tab for engaging the removable latch, wherein pulling the tab away from the ferrules depresses the latch. Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. It

would have been obvious to one of ordinary skill in the art at the time of applicant's invention from the teaching of Lin to modify the reversible fiber optic connector of Limbert by adding a pull tab to make the latch easier to depress. In regard to claims 4 and 8, Lin shows multiple openings that the latch can pass through. Lin's protrusion 327 serves to push the latch 126 down when the pull tab 310 is pulled away from the latch. In regard to claim 5, deformable portions 315 and 327 of Lin cooperate to depress the removable latch. In regard to claim 10, Limbert shows a removable connector and both latch type connectors and recess type connectors are known in the art. In regard to claim 14, Limbert shows an arm 116 and Lin shows a connector with pull tab 310 with aperture 312, with the pull tab able to be integrated with arm 328. In regard to claim 15, Lin teaches an optical connector with a pull tab 310 which connects to housing (clip member 320) which has a plurality of apertures with the tab having protrusions cooperating with the apertures for connection. The clip member 320 is seen as part of the connector, so the apertures therein are apertures in the connector. In regard to claim 16, the housing of Limbert has apertures on first and second walls of the housing to permit the reversal of polarity. In regard to claims 19 and 23, Limbert shows a fiber optic connector with regions (retainers in the language of claim 23) for connecting a latch to opposite sides to change the polarity of the connector and Lin describes, in the paragraph beginning on line 30 of column 4, connecting the pull tab handle member 310 to the clip 320 by deforming opening 312 to insert tab 327. Ring 315 of the handle member is then forced to enclose tab 126 of the connector. It would have been obvious to an ordinary practitioner in the art at the time of applicant's invention to use the pull tab connector shown by Lin in a convertible system, such as that shown in Limbert to enable reversibility of the fiber optic cable. The walls of Limbert are seen as deformable to enable the connection (such as splines 138) to form a connection to keep the parts together once connected. In regard to claim 20, Limbert states in lines 56-61 of column 5 that a screw driver can be used to remove the latch. In regard to claim 22, Limberg teaches apertures on first and second surfaces of the housing to enable moving the latch to the

opposite side to reverse polarity of the connector. The apertures are seen as formed from a deformable wall to ensure a tight grip with splines 138. In regard to claims 24 and 25, Lin's pull tab 310 includes multiple projections to fit in various openings. These include opening 312 as well as the opening inside U-shaped member 315 and projections 325 and 327 on the housing to be received by the openings.

Claims 17,18 and 21 is/are rejected under 35 U.S.C. 103 as being unpatentable over Limbert in view of Lin as applied to claims 3-5,7,8,10,12-16,19,20 and 22-25 above, and further in view of Vanderwoud.

As discussed above, Limbert in combination with Lin are seen to render claims 3-5,7,8,10,12-16,19,20 and 22-25 obvious. Claim 17 depends from claim 15 and adds the feature of a spring to urge the push-pull tab forward. While the latching mechanism of Lin's pull tab actuator requires resilience, a spring is not explicitly described. Vanderwoud discloses a pull tab actuator for connectors with latch 114 "spring-biased to the latched position (line 45 of column3). This is also seen as the housing latch being urged forward by a spring of claim 18 and claim 21. It would have been obvious to one of ordinary skill in the art at the time of applicant's invention from the teaching of Vanderwoud to modify the fiber optic connector with removable latch by adding a spring to the pull tab to bias the pull tab for a more secure connection.

Claims 3-16,19 and 22-25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Hioki in view of Lin.

As discussed above, Hioki is seen to disclose all of the claimed structure of claims 1 and 2. Claim 3 depends from claim 1 and adds the feature of a pull tab for engaging the removable latch, wherein pulling the tab away from the ferrules depresses the latch. Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4

shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. It would have been obvious to one of ordinary skill in the art at the time of applicant's invention from the teaching of Lin to modify the convertible fiber optic cable connector of Hioki by adding a tab associated with the latch to make it easier to change the connection of the fiber optic cable. In regard to claims 4 and 8, Lin shows multiple openings that the latch can pass through. Lin's protrusion 327 serves to push the latch 126 down when the pull tab 310 is pulled away from the latch. In regard to claim 5, first and second deformable portions 315 and 327 of Lin cooperate to depress the removable latch. In regard to claim 6, Hioki shows recesses 12a and protrusions 11a which are seen as grooves and projections. In regard to claim 7, Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. In regard to claim 9, the holder 1 of Hioki is seen as a common housing for both ferrules with a top surface 1b and a bottom surface 1a. In regard to claim 10, Limbert shows a removable connector and both latch type connectors and recess type connectors are known in the art. The arm 7 of Hioki is removable to permit it to be positioned on the opposite side of the connector. In regard to claim 11, Hioki discloses tabs 9a and grooves 9a for guiding the tabs. The placement of the grooves and tabs is reversed as claimed in claim 11, but the components are shown in the environment, so the teaching is seen to make such a modification obvious to an ordinary practitioner in the art. In regard to claims 12 and 13, Lin shows a connector for optical fibers and in figure 6 and the associated discussion beginning on line 66 of column 4 shows handle 311 and states that pulling the handle will cause tab 126 to move vertically to control the latch. In regard to claim 14, Lin shows the latch (320, fig 4) and the arm (310, fig 3) as separate components which are integrated during use. Figures 15A-15D of Hioki show an embodiment with recesses on the removable arm to mate with latches which are part of the ferrules. In regard to claim 15, Lin teaches an optical connector with a pull tab 310 which connects to housing (clip member 320)

which has a plurality of apertures with the tab having protrusions cooperating with the apertures for connection. In regard to claim 16, the housing of Hioki has apertures (recesses 12a) on first and second walls of the housing to permit the reversal of polarity. In regard to claims 19 and 23, Hioki shows a fiber optic connector with regions (retainers in the language of claim 23) for connecting a latch to opposite sides to change the polarity of the connector and Lin describes, in the paragraph beginning on line 30 of column 4, connecting the pull tab handle member 310 to the clip 320 by deforming opening 312 to insert tab 327. Ring 315 of the handle member is then forced to enclose tab 126 of the connector. In regard to claim 22, Hioki teaches apertures (recesses) on first and second surfaces of the housing to enable moving the latch to the opposite side to reverse polarity of the connector. In regard to claims 24 and 25, Lin's pull tab 310 includes multiple projections to fit in various openings. These include opening 312 as well as the opening inside U-shaped member 315 and projections 325 and 327 on the housing to be received by the openings.

Claims 17,18 and 21 is/are rejected under 35 U.S.C. 103 as being unpatentable over Hioki in view of Lin as applied to claims 3-16,19 and 22-25 above, and further in view of Vanderwoud.

As discussed above, Hioki in combination with Lin are seen to render claims 3-16,19 and 22-25 obvious. Claim 17 depends from claim 15 and adds the feature of a spring to urge the push-pull tab forward. While the latching mechanism of Lin's pull tab actuator requires resilience, a spring is not explicitly described. Vanderwoud discloses a pull tab actuator for connectors with latch 114 "spring-biased to the latched position (line 45 of column3). This is also seen as the housing latch being urged forward by a spring of claim 18 and claim 21. It would have been obvious to one of ordinary skill in the art at the time of applicant's invention from the teaching of Vanderwoud to modify the fiber optic connector with removable latch by adding a spring to the pull tab to bias the pull tab for a more secure connection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM C DOERRLER whose telephone number is (571)272-4807. The examiner can normally be reached on M-F, 7-5.

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, Eileen Lillis can be reached on 571-272-6928. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (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.

/WILLIAM C DOERRLER/
Primary Examiner, Art Unit 3993

Conferees: /ple/ /E.D.L/
SPRS, Art Unit 3993

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
NK Patent Law 4917 Waters Edge Drive Suite 275 Raleigh, NC 27606

LITIGATION REVIEW ☑	/WCD/ (examiner initials)	10 March 2020 (date)
Case Name		Director Initials
None		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
None	

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,456	02/19/2020	10191230	902/9 REX	3026

152878 7590 07/23/2020

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER
DOERRLER, WILLIAM CHARLES

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
07/23/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

NK Patent Law
4917 Waters Edge Drive
Suite 275
Raleigh, NC 27606

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,456* .

PATENT UNDER REEXAMINATION *10191230* .

ART UNIT *3993* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Ex Parte Reexamination Interview Summary	Control No. 90/014,456	Patent Under Reexamination 10191230	
	Examiner WILLIAM C DOERRLER	Art Unit 3993	AIA (FITF) Status Yes

All participants (USPTO personnel, patent owner, patent owner's representative):

(1) WILLIAM DOERRLER	(3) ____
(2) Kurt James, PO rep	(4) ____

Date of Interview: 15 July 2020

Type: a) ☑ Telephonic b) ☐ Video Conference
c) ☐ Personal (copy given to: 1) ☐ patent owner 2) ☐ patent owners representative)

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☑ No.
If Yes, brief description: ____

Agreement with respect to the claims f) ☐ was reached. g) ☑ was not reached. h) ☐ N/A.
Any other agreement(s) are set forth below under "Description of the general nature of what was agreed to..."

Claim(s) discussed: None .

Identification of prior art discussed: None .

Description of the general nature of what was agreed to if an agreement was reached, or any other comments:
See Continuation Sheet .

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims patentable, if available, must be attached. Also, where no copy of the amendments that would render the claims patentable is available, a summary thereof must be attached.)

A FORMAL WRITTEN RESPONSE TO THE LAST OFFICE ACTION MUST INCLUDE PATENT OWNER'S STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. (See MPEP § 2281). IF A RESPONSE TO THE LAST OFFICE ACTION HAS ALREADY BEEN FILED, THEN PATENT OWNER IS GIVEN **ONE MONTH** FROM THIS INTERVIEW DATE TO PROVIDE THE MANDATORY STATEMENT OF THE SUBSTANCE OF THE INTERVIEW
(37 CFR 1.560(b)). THE REQUIREMENT FOR PATENT OWNERS STATEMENT CAN NOT BE WAIVED.
EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).

/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993		

cc: Requester (if third party requester)

Continuation of Description of the general nature of what was agreed to if an agreement was reached, or any other comments: The shortened statutory period was omitted from the Office action mailed June 15, 2020. The shortened statutory period is 2 months (in accordance with MPEP 2263). Applicant was reminded that extensions of time in reexaminations must be filed prior to the expiration of the shortened stautory period.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: 10191230 Art Unit: 3993
Serial No: 90/014,456
Filed: February 19, 2020
Confirmation No: 3026
For: Optical Connectors with Reversible Polarity
Examiner: William Charles Doerrler

August 17, 2020

Amendment A

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

COMMISSIONER:

In response to the Office action dated May 15, 2020, please enter the following amendments and consider the following remarks.

Amendments to the claims begins on page 2 of this paper.

Applicant's Remarks begin on page 10 of this paper.

Electronic Patent Application Fee Transmittal

Application Number:	90014456
Filing Date:	19-Feb-2020
Title of Invention:	Optical Connectors with Reversible Polarity
First Named Inventor/Applicant Name:	10191230
Filer:	Kurt F. James/Debra Staas
Attorney Docket Number:	902/9 REX

Filed as Large Entity

Filing Fees for ex parte reexam

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
REEXAMINATION CLAIMS IN EXCESS OF 20	1822	9	100	900
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**900**

Electronic Acknowledgement Receipt

EFS ID:	40307959
Application Number:	90014456
International Application Number:	
Confirmation Number:	3026
Title of Invention:	Optical Connectors with Reversible Polarity
First Named Inventor/Applicant Name:	10191230
Customer Number:	152878
Filer:	Kurt F. James/Debra Staas
Filer Authorized By:	Kurt F. James
Attorney Docket Number:	902/9 REX
Receipt Date:	17-AUG-2020
Filing Date:	19-FEB-2020
Time Stamp:	19:35:16
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$900
RAM confirmation Number	E20208GJ35441404
Deposit Account	194409
Authorized User	Debra Staas

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

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Amendment.PDF	333821 f6ba681a71612ea35409ec54fedb8be238ecb03e	yes	16

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Applicant Arguments/Remarks Made in an Amendment	10	16
Claims	2	9
Response after Ex Parte Quayle Action	1	1

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30410 c0741cd8e6e481ab7753ffe2a32935737b20a897	no	2

Warnings:

Information:

Total Files Size (in bytes):	364231

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

REMARKS

By this amendment, claims 1, 9, 11, 15, 19, and 23 are amended and claims 26-34 are newly added. No new matter is added by the amendments. Claims 1-34 are pending in the application.

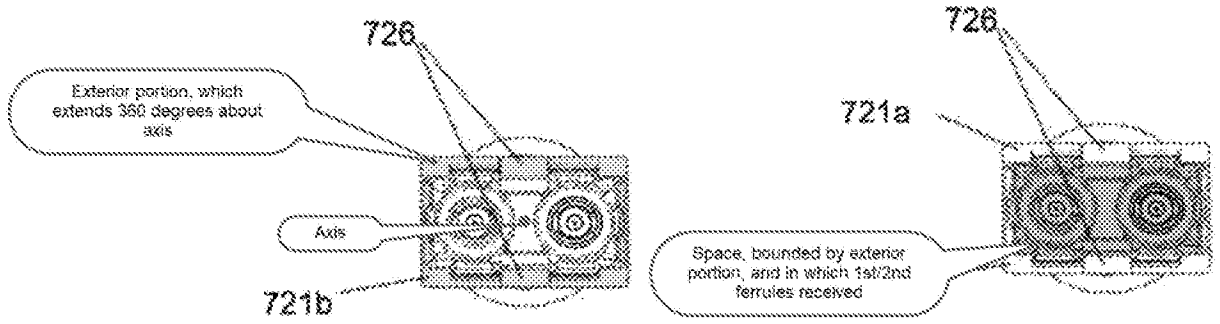
Status and Support for Claim Changes under 37 CFR 1.530(e)

Applicant hereby amends each of independent claims 1, 9, 15, 19, and 23 to recite:

> "a [common][1] connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules."

Support for the amendment is found throughout the drawings of the '230 patent. Every drawing depicts a single housing comprising an exterior extending 360° with respect to an axis around a space in which two ferrules are received. This feature is shown particularly clearly in FIG. 7B, two copies of which are reproduced below. As highlighted in the left drawing, the connector housing 720 comprises an exterior portion that extends 360° about an axis. As highlighted in the right drawing, the exterior portion defines an interior space in which first and second optical fiber ferrules are received. Support for the amendment is further found at 5:50-51, which describes a "combined unit" duplex connector. In context (i.e., contrasting the "combined unit" from a more conventional duplex connector comprising separate plug frames separated by an air gap), this passage is understood by those skilled in the art to refer to a combined plug frame or connector housing that receives two ferrules in the same space. Elimination of the plug frames allows the connector to be substantially more compact and have a smaller footprint.

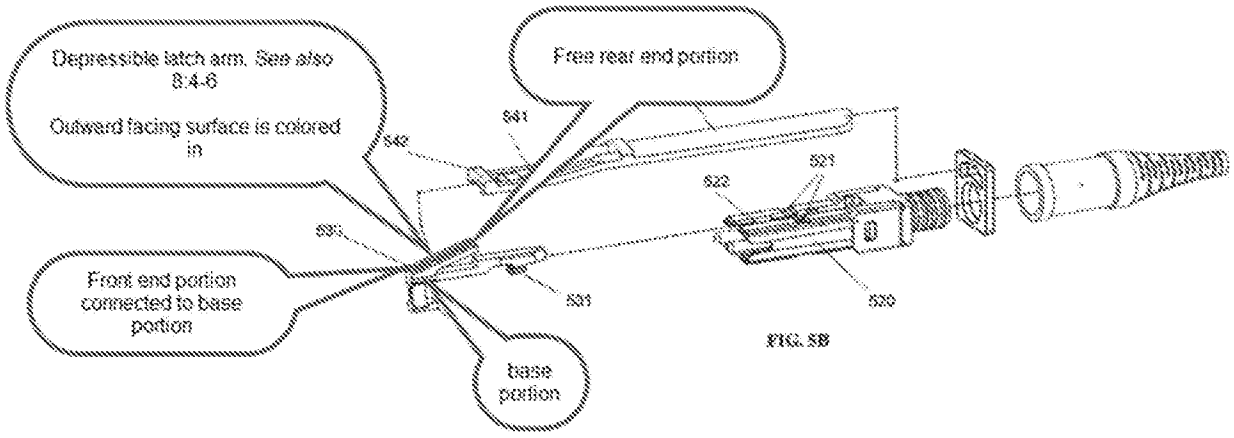
[1] Appears in claim 9 only.



The amendment to claim 11 makes the terminology consistent with claim 9. Support for the amendment is found in the '230 patent, among other places, at 2:34-37, 8:29-51.

Support for new claim 26 is found in the '230 patent, among other places, at 8:42-45, 8:53-56 and FIGS. 8.A.2, 9B, and 9C, which disclose a projection 735 on a latch arm 730 having a dovetail shape (seen in the drawings) and configured to be received in a receiving track 726 of a connector housing 720.

Support for new claim 27 is found in the '230 patent, among other places, at FIG. 5B as indicated below.



Additional support for new claim 27 is found in U.S. Provisional Patent Application No. 62/485,042, which the '230 patent expressly incorporates by reference at 1:10-14. FIG. 1 of the '042 application, reproduced at left below, illustrates a latch element 110 that is substantially identical to the latch element 530 of the '042 application. Figure 6 of the '042 application, reproduced at right below, depicts the latch arm 11 being bent so that the free rear end portion is depressed toward the base portion to remove the free rear end portion from an adapter opening and unlatch the reversible polarity fiber optic connector from the adapter.

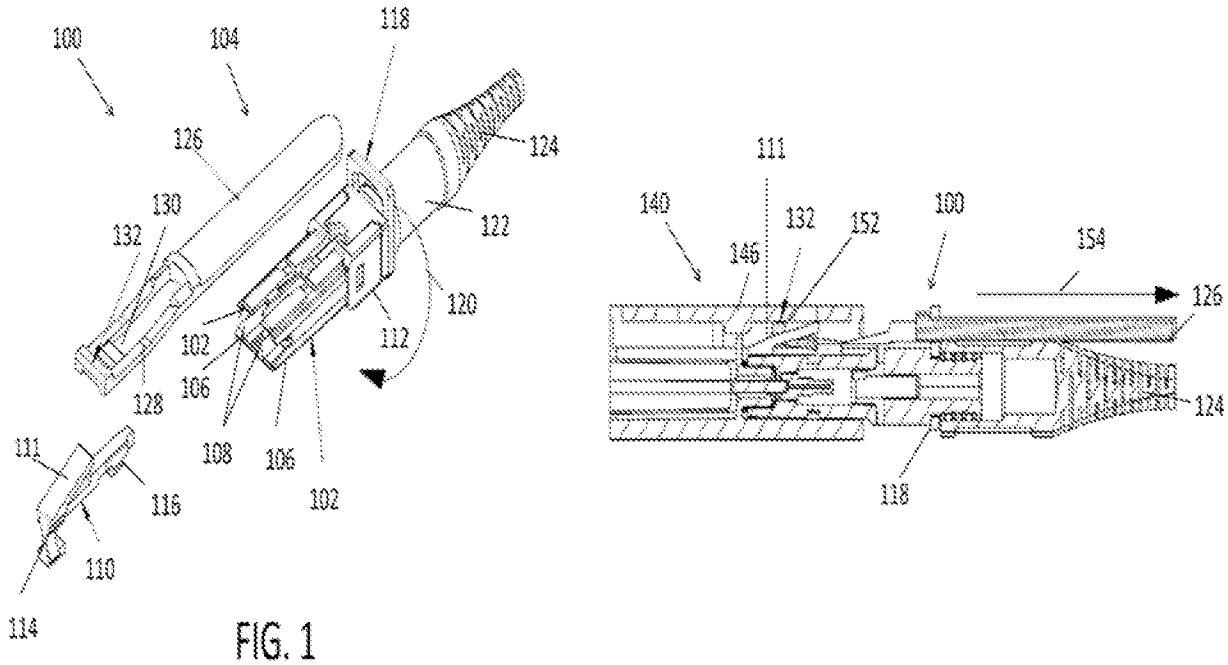


FIG. 1

Support for new claim 28 is found at 5:34-39, which describes how the embodiments of the '830 patent comprises remote release mechanisms for removing the connectors from receptacles. Column 8, lines 2-6 of the '230 patent disclose a particular embodiment encompassed in the scope of claim 8 in which the remote release comprises a pull tab 530. As shown in FIG. 5A the pull tab includes an elongate front section that extends along the housing and a rear section that extends rearward from the front section. Still further support is found in FIG. 6 and paragraphs [0039] and [0043] of the '042 application, which describe how the remote release is used by pulling the pull tab rearward relative to the depressible latch.

Support for new claim 29 is found, among other places, at 8:2-6 of the '230 patent, Support for new claim 29 is also found in FIG. 5A of the '230 patent, which depicts an edge of a front end portion of the pull tab 540 against the outward facing surface of the depressible latch arm received in the opening. FIG. 6 and paragraphs [0039] and [0043] of the '042 application further disclose how the same remote release is used by pulling the pull tab rearward so that the edge of the front end portion of the pull tab slides along the outward facing surface of the latch arm to depress the latch arm.

Support for new claim 30 is found in the '230 patent, among other places, at 7:66-67 and FIGS. 5B and 6A. Colum 7, line 66-67 describes a groove 522 on the connector housing 520 and a protrusion 531 on the latch 530 configured to be received in the housing. FIG. 5B shows that the groove 522 has an open end, and FIG. 6A illustrates how the protrusion 531 can be inserted into the groove 522 by movement relative to the housing 520 along the axis.

New claim 31 finds support in FIGS. 17A-C and 21A-C and 10:57-60 and 11:22-25. Additional support is found in FIGS. 16B, 38A and 40A of U.S. Provisional Patent Application No. 62/546,920, which was expressly incorporated by reference into the '230 patent. These citations show that connectors of the type disclosed in the '230 patent each include a single back body that attaches to single front body to simultaneously compress first and second ferrule springs that are disposed on a pair of ferrules.

Direct support for claim 32 is found at 5:48-64 of the '230 patent.

Direct support for claim 33 is found at 5:50-51.

Support for claim 34 is found throughout the drawings of the '230 patent, which show various connector housings that radially overlap a longitudinal segment of each of two ferrules received in the housing.

35 U.S.C. § 102, 103

The issued claims stand rejected under 35 U.S.C. §§ 102, 103 as allegedly being anticipated or rendered obvious by either Limbert (US 8,834,038) or Hioki (US 2016/0047993). Without conceding the propriety of the rejections, Applicant has amended each of the independent claims to further distinguish the applied references.

As amended, each of claims 1, 9, 15, 19 and 23 recites, among other elements, a "connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received." Each independent claim further specifies that the exterior portion has first and second walls above and below the first and second ferrules, and on each of the first and second walls is positioned either a latch coupling for engaging a removable latch (claim 1), a coupling surface for engaging a removable arm (claim 9), an aperture for

receiving a removable push-pull tab (claim 15), a deformable region for receiving a push-pull tab (claim 19), or a push-pull tab retainer (claim 23).

The amendments to the independent claims clarify that the claimed reversible polarity connector comprises a single duplex housing for two optical ferrules. More particularly, the amendments specify that the housing has an axis and an exterior portion that extends 360° about the housing axis to define an internal space. Each independent claim further recites that both of the first and second optical ferrules are received in the interior space defined by the 360° span of the exterior portion of the housing. Furthermore, as previously recited in the independent claims of the '230 patent, the housing comprises first and second walls that define respective connection elements for connecting a respective removable part to a selected one of the walls and thereby defining a chosen polarity of the connector.

Each of claims 1, 9, 15, 19, and 23 is submitted to be novel and nonobvious over the cited references because none of the cited references discloses or suggests a connector housing with an exterior portion extending 360° about a space in which first and second optical ferrules are received.

As to the rejections based on Limbert, the Office opines that the claimed housing is met by the body 112. However, the body 112 does not comprise "an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received." On the contrary, as shown in each of FIGS. 6 and 8, ***no portion of the optical ferrules is received the body 112***. Instead, the entirety of each ferrule is received in an individual simplex plug frame such that the ferrules are located in front of the back body 112 and not in a space defined by the back body. It is only a portion of the plug frame that is received in the back body 112. Thus, the back body 112 does not define a space in which first and second optical ferrules are received as set forth in the independent claims. Moreover, neither plug frame meets the claimed housing because the exterior portion of each plug frame extends 360° about only one optical ferrule. Finally, it is noted that the brace member 213 depicted in FIGS. 9a and 9b does not meet the claimed housing because it does not extend 360° about an axis. Rather, it necessarily includes gaps in the perimeter of the exterior portion into which the simplex plug frames 211 can pass to mount the brace member on the plug frames. Furthermore, there is no disclosure of the brace comprising connection points on first and second

walls to which a removable part can be releasably attached to select the polarity of the connector as set forth in each of claims 1, 9, 15, 19, and 23.

As to the rejections based on Hioki, the Office finds that the claimed housing is met by the individual simplex ferrule housings 10A, 10B. However, neither ferrule housing 10A, 10B comprises an exterior portion that extends 360° about a space in which first ***and second*** optical ferrules are received. Instead, each ferrule housing 10A, 10B is a conventional plug frame that receives only one individual ferrule F. Furthermore, the holder 1 also fails to meet the requirements of the claimed connector housing for at least the same reasons as the back body 112 of Limbert. That is, neither of the ferrules F is received in a space defined by the holder 1. Accordingly, like Limbert, Hioki fails to disclose or suggest a housing comprising an exterior portion that extends 360° about a space in which first and second optical ferrules are received.

Moreover, the rejections rely exclusively on Limbert and Hioki for the claimed connector housing. No showing has been made that any other reference cures the deficiencies of Limbert and Hioki noted above.

For at least these reasons, each of claims 1, 9, 15, 19, and 23 is submitted to be novel and nonobvious over the applied references. Withdrawal of the rejections and allowance of claims 1, 9, 15, 19, and 23 are therefore respectfully requested.

Claims 2-8 depend from claim 1, claims 10-14 depend from claim 9, claims 16-18 depend from claim 15, claims 20-22 depend from claim 19, and claims 24-25 depend from claim 23. Each of claims 2-8, 10-14, 16-18, 20-22, and 24-25 is submitted to be patentable over the cited references for at least the same reasons as the independent claim from which it depends. Accordingly, withdrawal of the rejections and allowance of claims 2-8, 10-14, 16-18, 20-22, and 24-25 are respectfully requested.

New Claims

New claims 26-34 depend directly or indirectly from claim 1 and are submitted to be patentable over the cited references for at least the same reasons as claim 1. Favorable consideration and allowance of claims 26-34 are therefore respectfully requested.

Conclusion

Applicant believes that claims 1-34 are in condition for allowance. Favorable consideration and allowance are therefore respectfully requested.

Should any other fee be required, the Commissioner is hereby authorized to charge the necessary fee to Deposit Account No. 19-4409.

Respectfully submitted,

/Kurt F. James/

Kurt F. James, Reg. No. 33,716
Stinson LLP
7700 Forsyth Blvd., Suite 1100
St. Louis, Missouri 63105
(314) 863-0800

JGP/dss

Amendments to the Claims

This listing of claims will replace all prior versions of claims in the application:

LISTING OF CLAIMS:

Claim 1. (Currently amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a latch coupling positioned on each of the first and second exterior walls of the connector housing;

a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;

wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 2. (Original) The reversible polarity fiber optic connector of claim 1, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and

the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic connector is configured in the first polarity or the angled walls of the recess on the second exterior wall when the fiber optic connector is configured in the second polarity.

Claim 3. (Original) The reversible polarity fiber optic connector of claim 1, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed.

Claim 4. (Original) The reversible polarity fiber optic connector of claim 3, wherein the pull tab comprises at least a first opening and a seconding opening for engaging the removable latch;

wherein the first opening is configured to allow the connector housing and the removable latch to pass through; and

the second opening is configured to allow the removable latch to partially pass through.

Claim 5. (Original) The reversible polarity fiber optic connector of claim 3, wherein the pull tab further comprises a first deformable portion and a second deformable portion;

wherein the first deformable portion is configured to cooperate with the second deformable portion to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

Claim 6. (Currently amended) The reversible polarity fiber optic connector of claim 1, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes a groove; and

at least a projection for coupling with the groove on the first exterior wall when the fiber optic connector is configured in the first polarity or the groove on the second exterior wall when the fiber optic connector is configured in the second polarity.

Claim 7. (Original) The reversible polarity fiber optic connector of claim 6, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the reversible polarity fiber optic connector depresses the removable latch.

Claim 8. (Original) The reversible polarity fiber optic connector of claim 7, wherein the pull tab comprises:

an opening for engaging the removable latch; and

a front protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

Claim 9. (Currently amended) A reversible polarity fiber optic connector with exchangeable arms for changing connector type comprising:

at least first and second optical ferrules;

a common connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a coupling surface positioned on each of the first and second exterior walls of the common connector housing;

a removable arm for engaging either of the first and second exterior wall coupling surfaces on the common connector housing, the removable arm including either a latch or a latch recess;

wherein positioning the removable arm on the first exterior wall of the common connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the common connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 10. (Original) The reversible polarity fiber optic connector of claim 9 wherein positioning a removable arm with a latch on the coupling surface creates a latch-type connector and positioning a removable arm with a recess creates a recess-type connector.

Claim 11. (Original) The reversible polarity fiber optic connector of claim 9 wherein the common connector housing includes a receiving track in the coupling surface and the removable arm includes a projection for engaging in the receiving track in the coupling surface.

Claim 12. (Original) The reversible polarity fiber optic connector of claim 9 further comprising a pull tab.

Claim 13. (Original) The reversible polarity fiber optic connector of claim 12 wherein the removable arm includes a latch and the pull tab is a separate element from the removable arm.

Claim 14. (Original) The reversible fiber optic connector of claim 12 wherein removable arm includes a recess and the pull tab is integrated with the removable arm.

Claim 15. (Currently amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first aperture in the first exterior wall of the connector housing and a second aperture in the second exterior wall of the connector housing;

a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 16. (Original) The reversible polarity fiber optic connector of claim 15 further comprising first and second apertures respectively beneath the first and second exterior walls of the connector housing for receiving the protrusion.

Claim 17. (Original) The reversible polarity fiber optic connector of claim 15, further comprising a spring to urge the push-pull tab forward.

Claim 18. (Original) The reversible polarity fiber optic connector of claim 15, wherein the push-pull tab protrusion is retained by a housing latch, the connector housing latch being urged forward by a spring.

Claim 19. (Currently amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first deformable region in the first exterior wall of the connector housing and a second deformable region in the second exterior wall of the connector housing;

a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 20. (Original) The combination of the reversible polarity fiber optic connector of claim 19 and a tool for deforming the deformable region of either the first exterior wall of the connector housing or the second exterior wall of the connector housing.

Claim 21. (Original) The reversible polarity fiber optic connector of claim 19, further comprising a spring to urge the push-pull tab forward.

Claim 22. (Original) The reversible polarity fiber optic connector of claim 19 further comprising first and second apertures respectively beneath the first and second exterior walls of the connector housing for receiving the protrusion from the deformable region.

Claim 23. (Currently amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a removable push-pull tab;

a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall;

wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 24. (Original) The reversible polarity fiber optic connector of claim 23 wherein the first and second push-pull tab retainers each include a projection.

Claim 25. (Original) The reversible polarity fiber optic connector of claim 23 wherein each projection is a clip for receiving a portion of the push-pull tab.

Claim 26. (New) The reversible polarity fiber optic connector of claim 1, wherein latch coupling includes a receiving track, wherein the removable latch comprises a projection for engaging each receiving track, and wherein the projection has a dovetail shape.

Claim 27. (New) The reversible polarity fiber optic connector of claim 1, wherein the removable latch comprises a base portion and a depressible latch having a front end portion connected to the base portion, a free rear end portion spaced apart from the front end portion along the axis and being raised relative to the front end portion, and an outward facing longitudinal surface extending along the axis from the front end portion to the free rear end portion, the removable latch being bendable such that the free rear end portion can be depressed toward the base portion.

Claim 28. (New) The reversible polarity fiber optic connector of claim 27, further comprising a remote release including an elongate front section configured to extend longitudinally along the connector housing and engage the depressible latch arm and an elongate rear section extending rearward from the elongate front section, the elongate front section of the remote release being slidably connected to the removable latch such that the elongate front section can move rearward relative to removable latch.

Claim 29. (New) The reversible polarity fiber optic connector of claim 35, wherein the elongate front section comprises an opening configured to receive the depressible latch arm and a front end portion defining a front end of the opening, the front end portion of the front elongate section being configured to slide rearward along the outward facing surface of the depressible latch arm when the elongate front section moves rearward to depress the depressible latch arm.

Claim 30 (New) The reversible polarity fiber optic connector of claim 34, wherein each latch coupling includes a groove having an open axial end and the removable latch comprises a protrusion on the base portion configured to be inserted into the groove through the open axial end.

Claim 31. (New) The reversible polarity fiber optic connector as set forth in claim 1, further comprising first and second ferrule springs received on the first and second ferrules, respectively, wherein the connector housing comprises a single front body and a single back

body configured to attach to the single front body such that the first and second ferrule springs are compressed simultaneously between the single back body and the single front body.

Claim 32. (New) The reversible polarity fiber optic connector as set forth in claim 1, wherein the first and second optical ferrules have a pitch of about 4.8 mm or less.

Claim 33. (New) The reversible polarity fiber optic connector as set forth in claim 1, wherein the connector housing is a single combined housing for each of the first and second optical ferrules.

Claim 34 (New) The reversible polarity fiber optic connector as set forth in claim 1, wherein the exterior portion of the housing radially overlaps a longitudinal segment of each of the first and second optical ferrules with respect to the axis.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 90/014,456	Filing Date 02/19/2020	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	08/17/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 25	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 5	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TYWANA P LOVELACE/
*** 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 number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. 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 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Number: 10,191,230 Art Unit: 3993
Serial No: 90/014,456
Filed: February 18, 2020
Confirmation No: 3026
For: Optical connectors with reversible polarity
Examiner: William Charles Doerrler

August 17, 2020

Certificate of Service

In accordance with 37 CFR 1.550, the undersigned attorney hereby certifies that on August 17, 2020, a copy the response to the June 15, 2020 Non-Final Office Action was served via U.S. first class mail, postage prepaid, to the third party requester listed on the Control No. 90/014,456, reproduced below:

Theodosios Thomas, Reg. No. 45,159
NK Patent Law
4917 Waters Edge Drive, Suite 275
Raleigh, NC 27606

Respectfully submitted,

/Kurt F. James/

Kurt F. James, Reg. No. 33,716
Stinson LLP
7700 Forsyth Blvd., Suite 1100
St. Louis, Missouri 63105
(314) 863-0800

JGP/dss

Electronic Acknowledgement Receipt

EFS ID:	40308356
Application Number:	90014456
International Application Number:	
Confirmation Number:	3026
Title of Invention:	Optical Connectors with Reversible Polarity
First Named Inventor/Applicant Name:	10191230
Customer Number:	152878
Filer:	Jonathan G. Pollmann
Filer Authorized By:	
Attorney Docket Number:	902/9 REX
Receipt Date:	17-AUG-2020
Filing Date:	19-FEB-2020
Time Stamp:	20:37:07
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	certofservice.pdf	93398 21c822318cf6643f7978c7882203cfd22d123dce	no	1
Warnings:					

Information:	
Total Files Size (in bytes):	93398

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,456	02/19/2020	10191230	902/9 REX	3026

152878 7590 09/03/2020

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER
DOERRLER, WILLIAM CHARLES

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
09/03/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

NK Patent Law
4917 Waters Edge Drive
Suite 275
Raleigh, NC 27606

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,456* .

PATENT UNDER REEXAMINATION *10191230* .

ART UNIT *3993* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

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.

Reexamination

After the filing of a request for reexamination by a third party requester, any document filed by either the patent owner or the third party requester must be served on the other party (or parties where two or more third party requester proceedings are merged) in the reexamination proceeding in the manner provided in 37 C.F.R. 1.248. See 37 C.F.R. 1.550(f).

In order to ensure full consideration of any amendments, affidavits or declarations, or other documents as evidence of patentability, such documents must be submitted in response to this Office action. Submissions after the next Office action, which is intended to be a final action, will be governed by the requirements of 37 CFR 1.116, after final rejection and 37 CFR 41.33 after appeal, which will be strictly enforced.

Patent owner is notified that any proposed amendment to the specification and/or claims in this reexamination proceeding must comply with 37 C.F.R. 1.530(d)-(j), must be formally presented pursuant to 37 C.F.R. 1.52(a) and (b), and must contain any fees required by 37 C.F.R. 1.20(c). See MPEP §2250(IV) for examples to assist in the preparation of proper proposed amendments in reexamination proceedings.

The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a), to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving Patent No. 10,191,230 throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282 and 2286.

Brief Description of Proceedings

The Third Party Requester (TPR) requested reexamination of claims 1-25 of U.S. Patent No. 10,191,230 (hereinafter "the '230 patent") based upon the following proposed rejections:

1. Claims 1, 2, 6 and 9 of the '230 patent are unpatentable under 35 USC 102(a)(2)) as anticipated by US Patent No. 8,834,038 to Limbert et al. (hereinafter "Limbert").

2. Claims 3-5,7,8,10,12-16,19,20 and 22-25 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Limbert in view of US Patent No. 8,641,293 to Lin (hereinafter "Lin").

3. Claims 17,18 and 21 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Limbert in view of Lin and further in view of US Patent No. 9,028,270 to Vanderwoud (hereinafter "Vanderwoud").

4. Claims 1 and 2 of the '230 patent are unpatentable under 35 USC 102(a)(2) as anticipated by US Pre-Grant Publication No. 2016/0047993 to Hioki et al. (hereinafter "Hioki").

5. Claims 3-16,19 and 22-25 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Hioki in view of Lin.

6. Claims 17,18 and 21 of the '230 patent are unpatentable under 35 USC 103(a) as obvious over Hioki in view of Lin and further in view of Vanderwoud.

An Order mailed March 17, 2020 found a SNQ for claims 1-25 was provided by the request for the above proposed rejections. Patent owner did not filed a statement under 35 U.S.C. 304 and the period to do so expired. This led to the June 15, 2020 non-final Office action which rejected claims 1,2,6 and 9 as anticipated by Limbert, claims 1 and 2 as anticipated by Hioki, claims 3-5,7,8,10,12-16,19,20 and 22-25 as obvious over Limbert in view of Lin, claims 17,18 and 21 as obvious over Limbert in view of Lin and Vanderwoud, claims 3-16,19 and 22-25 as obvious over Hioki in view of Lin and claims 17,18 and 21 as obvious over Hioki in view of Lin

and Vanderwoud. Patent Owner (PO) responded on August 17 by amending the independent claims to include the connector has a longitudinal axis and an exterior portion and the exterior portion extends 360 degrees circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received. New dependent claims 26-34 were also included, as well as remarks.

Claim Rejections - 35 USC § 112

> The following is a quotation of 35 U.S.C. 112(b):
> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.
>
> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 29 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 29 depends from claim 35, which does not exist. It is further noted that in the August 17, 2020 amendment that status indicator for claim 6 is “currently amended”, but the claim does not appear to have been amended. Claim 30 depends from claim 34, it is unclear if this was intentional (depending on a higher number claim in a newly presented claim) or if this is a typographical error.

Allowable Subject Matter

Claims 1-28 and 30-34 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to show or fairly teach a reversible fiber optic connector with a connector

housing having a longitudinal axis and an exterior portion that surrounds first and second optical ferrules such that the exterior portion of the housing extends 360 degrees circumferentially with respect to the longitudinal axis about a space in which the first and second optical ferrules are received with means removably mounted on either a first exterior wall of the housing or a second exterior wall of the housing so that the polarity of the connector is reversed depending on whether the means is mounted on the first exterior wall or the second exterior wall. Both Hioki and Limbert show fiber optic connectors which can be connected with different polarity based on the position of a removable latch means, but neither reference shows a housing that extends entirely around both the first and second ferrules. Both show separate housings for each ferrule. The other applied references cannot remedy this deficiency.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM C DOERRLER whose telephone number is (571)272-4807. The examiner can normally be reached on M-F, 7-5.

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, Eileen Lillis can be reached on 571-272-6928. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (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.

/WILLIAM C DOERRLER/
Primary Examiner, Art Unit 3993

Conferees: /ple/ /E.D.L/
SPRS, Art Unit 3993

Office Action in Ex Parte Reexamination	Control No. 90/014,456	Patent Under Reexamination	
	Examiner WILLIAM C DOERRLER	Art Unit 3993	AIA (FITF) Status Yes

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

a. ☑ Responsive to the communication(s) filed on 17 August 2020.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

b. ☑ This action is made FINAL.

c. ☐ A statement under 37 CFR 1.530 has not been received from the patent owner.

A shortened statutory period for response to this action is set to expire two month(s) from the mailing date of this letter. Failure to respond within the period for response will result in termination of the proceeding and issuance of an *ex parte* reexamination certificate in accordance with this action. 37 CFR 1.550(d). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).** If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☐ Information Disclosure Statement, PTO/SB/08.
3. ☐ Interview Summary, PTO-474.
4. ☐ _____.

Part II SUMMARY OF ACTION

1a. ☑ Claims 1-34 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been canceled in the present reexamination proceeding.
3. ☑ Claims 1-28 and 30-34 are patentable and/or confirmed.
4. ☑ Claims 29 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ The drawings, filed on _____ are acceptable.
7. ☐ The proposed drawing correction, filed on _____ has been (7a) ☐ approved (7b) ☐ disapproved.
8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the certified copies have
   1 ☐ been received.
   2 ☐ not been received.
   3 ☐ been filed in Application No. _____.
   4 ☐ been filed in reexamination Control No. _____.
   5 ☐ been received by the International Bureau in PCT application No. _____.
   * See the attached detailed Office action for a list of the certified copies not received.
9. ☐ Since the proceeding appears to be in condition for issuance of an *ex parte* reexamination certificate except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte* Quayle, 1935 C.D. 11, 453 O.G. 213.
10. ☐ Other: _____

cc: Requester (if third party requester)

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 90/014,456	Filing Date 02/19/2020	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	10/02/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 34	Minus	** 34	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 5	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TYWANA P LOVELACE/
*** 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 number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. 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 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Number: 10,191,230 Art Unit: 3993
Serial No: 90/014,456
Filed: February 19, 2020
Confirmation No: 3026
For: Optical connectors with reversible polarity
Examiner: William Charles Doerrler

Certificate of Service

In accordance with 37 CFR 1.550, the undersigned attorney hereby certifies that on October 2, 2020, a copy of the response to the September 3, 2020 Final Office Action was served via U.S. first class mail, postage prepaid, to the third party requester listed on the Control No. 90/014,456, reproduced below:

Theodosios Thomas, Reg. No. 45,159
NK Patent Law
4917 Waters Edge Drive, Suite 275
Raleigh, NC 27606

Respectfully submitted,

/Kurt F. James/

Kurt F. James, Reg. No. 33,716
Stinson LLP
7700 Forsyth Blvd., Suite 1100
St. Louis, Missouri 63105
(314) 863-0800

JGP/dss

Electronic Acknowledgement Receipt

EFS ID:	40745826
Application Number:	90014456
International Application Number:	
Confirmation Number:	3026
Title of Invention:	Optical Connectors with Reversible Polarity
First Named Inventor/Applicant Name:	10191230
Customer Number:	152878
Filer:	Jonathan G. Pollmann/Meagan Fitzpatrick
Filer Authorized By:	Jonathan G. Pollmann
Attorney Docket Number:	902/9 REX
Receipt Date:	02-OCT-2020
Filing Date:	19-FEB-2020
Time Stamp:	12:59:37
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	Amendment.pdf	145823 4c3a224850e902e7938521081e89d1a561a9ba01	no	11

Warnings:

Information:					
2	Reexam Certificate of Service	COS.pdf	94939 d7fc4293c2279a481491f2e4d7d119f24f97f4c7	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	240762	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: 10191230 Art Unit: 3993
Serial No: 90/014,456
Filed: February 19, 2020
Confirmation No: 3026
For: Optical Connectors with Reversible Polarity
Examiner: William Charles Doerrler

October 2, 2020

Amendment B

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

COMMISSIONER:

In response to the Office action dated September 3, 2020, please enter the following amendments and consider the following remarks.

Amendments to the claims begins on page 2 of this paper.

Applicant's Remarks begin on page 10 of this paper.

Amendments to the Claims

This listing of claims will replace all prior versions of claims in the application:

LISTING OF CLAIMS:

Claim 1. (Amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a latch coupling positioned on each of the first and second exterior walls of the connector housing;

a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;

wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 2. (Original) The reversible polarity fiber optic connector of claim 1, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and

the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic connector is configured in the first polarity or the angled walls of the recess on the second exterior wall when the fiber optic connector is configured in the second polarity.

Claim 3. (Original) The reversible polarity fiber optic connector of claim 1, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed.

Claim 4. (Original) The reversible polarity fiber optic connector of claim 3, wherein the pull tab comprises at least a first opening and a seconding opening for engaging the removable latch;

wherein the first opening is configured to allow the connector housing and the removable latch to pass through; and

the second opening is configured to allow the removable latch to partially pass through.

Claim 5. (Original) The reversible polarity fiber optic connector of claim 3, wherein the pull tab further comprises a first deformable portion and a second deformable portion;

wherein the first deformable portion is configured to cooperate with the second deformable portion to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

Claim 6. (Original) The reversible polarity fiber optic connector of claim 1, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes a groove; and

at least a projection for coupling with the groove on the first exterior wall when the fiber optic connector is configured in the first polarity or the groove on the second exterior wall when the fiber optic connector is configured in the second polarity.

Claim 7. (Original) The reversible polarity fiber optic connector of claim 6, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the reversible polarity fiber optic connector depresses the removable latch.

Claim 8. (Original) The reversible polarity fiber optic connector of claim 7, wherein the pull tab comprises:

an opening for engaging the removable latch; and

a front protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

Claim 9. (Amended) A reversible polarity fiber optic connector with exchangeable arms for changing connector type comprising:

at least first and second optical ferrules;

a common connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a coupling surface positioned on each of the first and second exterior walls of the common connector housing;

a removable arm for engaging either of the first and second exterior wall coupling surfaces on the common connector housing, the removable arm including either a latch or a latch recess;

wherein positioning the removable arm on the first exterior wall of the common connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the common connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 10. (Original) The reversible polarity fiber optic connector of claim 9 wherein positioning a removable arm with a latch on the coupling surface creates a latch-type connector and positioning a removable arm with a recess creates a recess-type connector.

Claim 11. (Original) The reversible polarity fiber optic connector of claim 9 wherein the common connector housing includes a receiving track in the coupling surface and the removable arm includes a projection for engaging in the receiving track in the coupling surface.

Claim 12. (Original) The reversible polarity fiber optic connector of claim 9 further comprising a pull tab.

Claim 13. (Original) The reversible polarity fiber optic connector of claim 12 wherein the removable arm includes a latch and the pull tab is a separate element from the removable arm.

Claim 14. (Original) The reversible fiber optic connector of claim 12 wherein removable arm includes a recess and the pull tab is integrated with the removable arm.

Claim 15. (Amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first aperture in the first exterior wall of the connector housing and a second aperture in the second exterior wall of the connector housing;

a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 16. (Original) The reversible polarity fiber optic connector of claim 15 further comprising first and second apertures respectively beneath the first and second exterior walls of the connector housing for receiving the protrusion.

Claim 17. (Original) The reversible polarity fiber optic connector of claim 15, further comprising a spring to urge the push-pull tab forward.

Claim 18. (Original) The reversible polarity fiber optic connector of claim 15, wherein the push-pull tab protrusion is retained by a housing latch, the connector housing latch being urged forward by a spring.

Claim 19. (Amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first deformable region in the first exterior wall of the connector housing and a second deformable region in the second exterior wall of the connector housing;

a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 20. (Original) The combination of the reversible polarity fiber optic connector of claim 19 and a tool for deforming the deformable region of either the first exterior wall of the connector housing or the second exterior wall of the connector housing.

Claim 21. (Original) The reversible polarity fiber optic connector of claim 19, further comprising a spring to urge the push-pull tab forward.

Claim 22. (Original) The reversible polarity fiber optic connector of claim 19 further comprising first and second apertures respectively beneath the first and second exterior walls of the connector housing for receiving the protrusion from the deformable region.

Claim 23. (Amended) A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing having a longitudinal axis and comprising an exterior portion at least partially surrounding the first and second optical ferrules such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising [and having] a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a removable push-pull tab;

a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall;

wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claim 24. (Original) The reversible polarity fiber optic connector of claim 23 wherein the first and second push-pull tab retainers each include a projection.

Claim 25. (Original) The reversible polarity fiber optic connector of claim 23 wherein each projection is a clip for receiving a portion of the push-pull tab.

Claim 26. (New) The reversible polarity fiber optic connector of claim 1, wherein latch coupling includes a receiving track, wherein the removable latch comprises a projection for engaging each receiving track, and wherein the projection has a dovetail shape.

Claim 27. (New) The reversible polarity fiber optic connector of claim 1, wherein the removable latch comprises a base portion and a depressible latch having a front end portion connected to the base portion, a free rear end portion spaced apart from the front end portion along the axis and being raised relative to the front end portion, and an outward facing longitudinal surface extending along the axis from the front end portion to the free rear end portion, the removable latch being bendable such that the free rear end portion can be depressed toward the base portion.

Claim 28. (New) The reversible polarity fiber optic connector of claim 27, further comprising a remote release including an elongate front section configured to extend longitudinally along the connector housing and engage the depressible latch arm and an elongate rear section extending rearward from the elongate front section, the elongate front section of the remote release being slidably connected to the removable latch such that the elongate front section can move rearward relative to removable latch.

Claim 29. (New) The reversible polarity fiber optic connector of claim 28, wherein the elongate front section comprises an opening configured to receive the depressible latch arm and a front end portion defining a front end of the opening, the front end portion of the front elongate section being configured to slide rearward along the outward facing surface of the depressible latch arm when the elongate front section moves rearward to depress the depressible latch arm.

Claim 30 (New) The reversible polarity fiber optic connector of claim 27, wherein each latch coupling includes a groove having an open axial end and the removable latch comprises a protrusion on the base portion configured to be inserted into the groove through the open axial end.

Claim 31. (New) The reversible polarity fiber optic connector as set forth in claim 1, further comprising first and second ferrule springs received on the first and second ferrules, respectively, wherein the connector housing comprises a single front body and a single back

body configured to attach to the single front body such that the first and second ferrule springs are compressed simultaneously between the single back body and the single front body.

Claim 32. (New) The reversible polarity fiber optic connector as set forth in claim 1, wherein the first and second optical ferrules have a pitch of about 4.8 mm or less.

Claim 33. (New) The reversible polarity fiber optic connector as set forth in claim 1, wherein the connector housing is a single combined housing for each of the first and second optical ferrules.

Claim 34 (New) The reversible polarity fiber optic connector as set forth in claim 1, wherein the exterior portion of the housing radially overlaps a longitudinal segment of each of the first and second optical ferrules with respect to the axis.

REMARKS

Status and Support for Claim Changes under 37 CFR 1.530(e)

Pursuant to 37 CFR 1.530(e), Applicant provides the following statement of the status of all patent claims:

- Claims 1, 9, 15, 19, and 23 were amended in the paper filed August 17, 2020, and are not further amended by this paper.
- Claims 2-8, 10-14, 16-18, and 24-25 are as originally presented in U.S. Patent No. 10,191,230 ("the '230 patent").
- Claims 26-28 and 31-34 are new with respect to the '230 patent but are not changed by this amendment paper.
- Claims 29 and 30 are new with respect to the '230 patent and are changed in this amendment paper relative to the paper filed August 17, 2020.

Pursuant to 37 CFR 1.530(e), Applicant provides the following statement explaining the changes made by this amendment paper. In this paper, the status indicator for claim 6 is changed to "Original." Additionally, new claim 29 is changed relative to the version presented on August 17, 2020, to depend from claim 28 instead of claim 35. Finally, new claim 30 is changed relative to the version presented on August 17, 2020, to depend from claim 27 instead of claim 34.

Support for new claim 29 as presented here is found, among other places, at 8:2-6 of the '230 patent. Support for new claim 29 is also found in FIG. 5A of the '230 patent, which depicts an edge of a front end portion of the pull tab 540 against the outward facing surface of the depressible latch arm received in the opening. FIG. 6 and paragraphs [0039] and [0043] of the '042 application further disclose how the same remote release is used by pulling the pull tab rearward so that the edge of the front end portion of the pull tab slides along the outward facing surface of the latch arm to depress the latch arm.

Support for new claim 30 as presented here is found in the '230 patent, among other places, at 7:66-67 and FIGS. 5B and 6A. Colum 7, line 66-67 describes a groove 522 on the connector housing 520 and a protrusion 531 on the latch 530 configured to be received in the housing. FIG. 5B shows that the groove 522 has an open end, and FIG. 6A illustrates how the

protrusion 531 can be inserted into the groove 522 by movement relative to the housing 520 along the axis.

35 U.S.C.§ 112

In response to the rejection under 35 U.S.C. § 112, Applicant has amended claim 29 to depend from claim 28. Accordingly, withdrawal of the rejection and allowance of claim 29 are respectfully requested.

Allowable Subject Matter

Applicant gratefully acknowledges the indication that claims 1-28 and 30-34 are allowable.

Conclusion

Applicant believes that claims 1-34 are in condition for allowance. Favorable consideration and allowance are therefore respectfully requested.

Should any other fee be required, the Commissioner is hereby authorized to charge the necessary fee to Deposit Account No. 19-4409.

Respectfully submitted,

/Kurt F. James/

Kurt F. James, Reg. No. 33,716
Stinson LLP
7700 Forsyth Blvd., Suite 1100
St. Louis, Missouri 63105
(314) 863-0800

JGP/dss

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,456	02/19/2020	10191230	902/9 REX	3026

152878 7590 10/26/2020

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER
DOERRLER, WILLIAM CHARLES

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
10/26/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

NK Patent Law
4917 Waters Edge Drive
Suite 275
Raleigh, NC 27606

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,456* .

PATENT UNDER REEXAMINATION *10191230* .

ART UNIT *3993* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Notice of Intent to Issue Ex Parte Reexamination Certificate	**Control No.** 90/014,456	**Patent Under Reexamination** 10191230	
	Examiner WILLIAM C DOERRLER	**Art Unit** 3993	**AIA Status** Yes

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

1. ☑ Prosecution on the merits is (or remains) closed in this *ex parte* reexamination proceeding. This proceeding is subject to reopening at the initiative of the Office or upon petition. *Cf.* 37 CFR 1.313(a). A Certificate will be issued in view of
   (a) ☑ Patent owner's communication(s) filed: 10-2-2020.
   (b) ☐ Patent owner's failure to file an appropriate timely response to the Office action mailed: _____.
   (c) ☐ Patent owner's failure to timely file an Appeal Brief (37 CFR 41.31).
   (d) ☐ The decision on appeal by the ☐ Board of Patent Appeals and Interferences ☐ Court dated _____
   (e) ☐ Other: _____.
2. The Reexamination Certificate will indicate the following:
   (a) Change in the Specification: ☐ Yes ☑ No
   (b) Change in the Drawing(s): ☐ Yes ☑ No
   (c) Status of the Claim(s):
      (1) Patent claim(s) confirmed: _____.
      (2) Patent claim(s) amended (including dependent on amended claim(s)): 1-25
      (3) Patent claim(s) canceled: _____.
      (4) Newly presented claim(s) patentable: 26-34.
      (5) Newly presented canceled claims: _____.
      (6) Patent claim(s) ☐ previously ☐ currently disclaimed: _____
      (7) Patent claim(s) not subject to reexamination: _____.
3. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
4. ☑ Note the attached statement of reasons for patentability and/or confirmation. Any comments considered necessary by patent owner regarding reasons for patentability and/or confirmation must be submitted promptly to avoid processing delays. Such submission(s) should be labeled: "Comments On Statement of Reasons for Patentability and/or Confirmation."
5. ☐ Note attached NOTICE OF REFERENCES CITED (PTO-892).
6. ☐ Note attached LIST OF REFERENCES CITED (PTO/SB/08 or PTO/SB/08 substitute).
7. ☐ The drawing correction request filed on _____ is: ☐approved ☐disapproved.
8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐None of the certified copies have
   ☐been received.
   ☐not been received.
   ☐been filed in Application No. _____.
   ☐been filed in reexamination Control No. _____.
   ☐been received by the International Bureau in PCT Application No. _____.

   * Certified copies not received: _____.
9. ☐ Note attached Examiner's Amendment.
10. ☐ Note attached Interview Summary (PTO-474).
11. ☐ Other: _____.

All correspondence relating to this reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993	

cc: Requester (if third party requester)

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.

STATEMENT OF REASONS FOR PATENTABILITY AND/OR CONFIRMATION

The following is an examiner's statement of reasons for patentability and/or confirmation of the claims found patentable in this reexamination proceeding: The prior art fails to show or fairly teach a reversible fiber optic connector with a connector housing having a longitudinal axis and an exterior portion that surrounds first and second optical ferrules such that the exterior portion of the housing extends 360 degrees circumferentially with respect to the longitudinal axis about a space in which the first and second optical ferrules are received with means removably mounted on either a first exterior wall of the housing or a second exterior wall of the housing so that the polarity of the connector is reversed depending on whether the means is mounted on the first exterior wall or the second exterior wall. Both Hioki and Limbert show fiber optic connectors which can be connected with different polarity based on the position of a removable latch means, but neither reference shows a housing that extends entirely around both the first and second ferrules. Both show separate housings for each ferrule. The other applied references cannot remedy this deficiency.

Any comments considered necessary by PATENT OWNER regarding the above statement must be submitted promptly to avoid processing delays. Such submission by the patent owner should be labeled: "Comments on Statement of Reasons for Patentability and/or Confirmation" and will be placed in the reexamination file.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM C DOERRLER whose telephone number is (571)272-4807. The examiner can normally be reached on M-F, 7-5.

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, Eileen Lillis can be reached on 571-272-6928. 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.

/WILLIAM C DOERRLER/
Primary Examiner, Art Unit 3993

Conferees: /ple/ /E.D.L/
SPRS, Art Unit 3993

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Certificate Date	Certificate Number
		C1

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
NK Patent Law 4917 Waters Edge Drive Suite 275 Raleigh, NC 27606

LITIGATION REVIEW ☑	/WCD/ (examiner initials)	10 March 2020 (date)
Case Name		Director Initials
None		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
None	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Examiner	Art Unit
	WILLIAM C DOERRLER	3993

CPC - Searched*		
Symbol	Date	Examiner
None		

CPC Combination Sets - Searched*		
Symbol	Date	Examiner
None		

US Classification - Searched*			
Class	Subclass	Date	Examiner
None			

* 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
15/884,327 case file reviewed	03/06/2020	

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Examiner	**Art Unit**
	WILLIAM C DOERRLER	3993

CPC								
Symbol							**Type**	**Version**
G02B	/	6	/	3893			F	2013-01-01
G02B	/	6	/	3821			I	2013-01-01
G02B	/	6	/	3879			I	2013-01-01
G02B	/	6	/	406			A	2013-01-01

CPC Combination Sets									
Symbol							**Type**	**Set**	**Ranking**	**Version**
	/		/							

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	34	
/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993	08 October 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2A

U.S. Patent and Trademark Office — Part of Paper No.: 20201007

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Examiner	Art Unit
	WILLIAM C DOERRLER	3993

INTERNATIONAL CLASSIFICATION				
CLAIMED				
G02B6/38	/	6	/	38
G02B6/40	/	6	/	40

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	34	
/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993	08 October 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2A

U.S. Patent and Trademark Office

Part of Paper No.: 20201007

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,456	10191230
	Examiner	Art Unit
	WILLIAM C DOERRLER	3993

☑ 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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	34	
/WILLIAM C DOERRLER/ Primary Examiner, Art Unit 3993	08 October 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2A

U.S. Patent and Trademark Office Part of Paper No.: 20201007

Bibliographic Data

Application No: 90/014,456

Foreign Priority claimed: ○ Yes ◉ No

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

Verified and Acknowledged: /WILLIAM C DOERRLER/ (Examiner's Signature) | (Initials)

Title: Optical Connectors with Reversible Polarity

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/19/2020	385	3993	902/9 REX
RULE			

APPLICANTS

INVENTORS

10191230,

SENKO ADVANCED COMPONENTS, INC (Assignee), MARLBOROUGH, MA, UNITED STATES

Theodosios Thomas NK Patent Law (3RD PTY REQ), Raleigh, NC, UNITED STATES

CONTINUING DATA

This application is a REX of 15884327 01/30/2018 PAT 10191230

15884327 has PRO of 62581961 11/06/2017

15884327 has PRO of 62546920 08/17/2017

15884327 has PRO of 62485042 04/13/2017

15884327 has PRO of 62463901 02/27/2017

15884327 has PRO of 62463898 02/27/2017

15884327 has PRO of 62457150 02/09/2017

15884327 has PRO of 62452147 01/30/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

STATE OR COUNTRY

ADDRESS

Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752
UNITED STATES

FILING FEE RECEIVED

$6,000

OK TO ENTER: /W.C.D/

181207-01USREX
SENKO 8655.US2RE (3514234.000908)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: 10191230 Art Unit: 3993
Serial No: 90/014,456
Filed: February 19, 2020
Confirmation No: 3026
For: Optical Connectors with Reversible Polarity
Examiner: William Charles Doerrler

October 2, 2020

Amendment B

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

COMMISSIONER:

In response to the Office action dated September 3, 2020, please enter the following amendments and consider the following remarks.

Amendments to the claims begins on page 2 of this paper.

Applicant's Remarks begin on page 10 of this paper.

US010191230C1

(12) EX PARTE REEXAMINATION CERTIFICATE (11755th)

United States Patent

Wong et al.

(10) Number: US 10,191,230 C1

(45) Certificate Issued: Nov. 16, 2020

(54) **OPTICAL CONNECTORS WITH REVERSIBLE POLARITY**

(71) Applicant: **SENKO Advanced Components, Inc.**, Marlborough, MA (US)

(72) Inventors: **Kimman Wong**, Hong Kong (HK); **Jeffrey Gniadek**, Northbridge, MA (US); **Kazuyoshi Takano**, Southborough, MA (US); **Siu Kei Ma**, Hong Kong (HK)

(73) Assignee: **SENKO ADVANCED COMPONENTS, INC**, Marlborough, MA (US)

Reexamination Request:
No. 90/014,456, Feb. 19, 2020

Reexamination Certificate for:

Patent No.:	**10,191,230**
Issued:	**Jan. 29, 2019**
Appl. No.:	**15/884,327**
Filed:	**Jan. 30, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/581,961, filed on Nov. 6, 2017, provisional application No. 62/546,920, filed on Aug. 17, 2017, provisional application No. 62/485,042, filed on Apr. 13, 2017, provisional application No. 62/463,901, filed on Feb. 27, 2017, provisional application No. 62/463,898, filed on Feb. 27, 2017, provisional application No. 62/457,150, filed on Feb. 9, 2017, provisional application No. 62/452,147, filed on Jan. 30, 2017.

(51) **Int. Cl.**
G02B 6/38 (2006.01)
G02B 6/40 (2006.01)

(52) **U.S. Cl.**
CPC ***G02B 6/3893*** (2013.01); ***G02B 6/3821*** (2013.01); ***G02B 6/3879*** (2013.01); *G02B 6/406* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

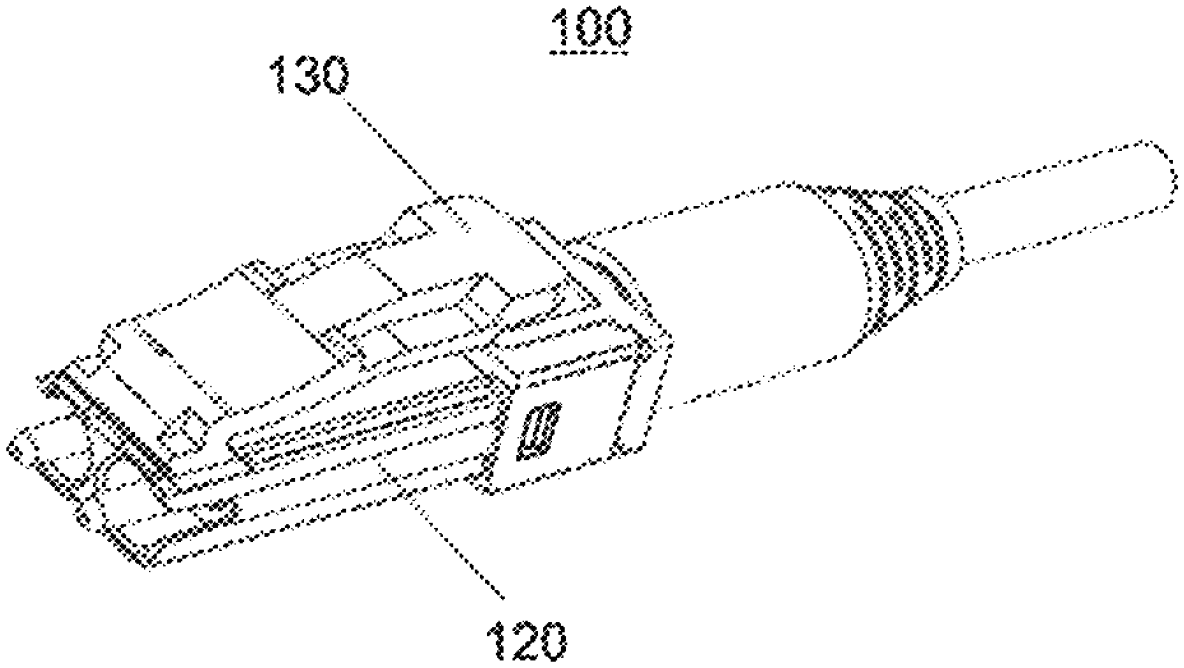
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,456, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — William C Doerrler

(57) **ABSTRACT**

Reversible polarity fiber optic connectors are provided having housings at least partially surrounding first and second optical ferrules with walls above and beneath the ferrules. Positioning removable elements such as latches, removable arms, or push-pull tabs on the first wall above the ferrules yields fiber optic connectors with a first polarity type, and positioning the removable elements on the second wall beneath the ferrules yields fiber optic connectors with a second, opposite polarity type. Various engagement mechanisms are provided on either the connector housing walls or on the removable elements, or both, to assist in affixing the removable element to the connector housing.



EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims **1**, **9**, **15**, **19** and **23** are determined to be patentable as amended.

Claims **2-8**, **10-14**, **16-18**, **20-22**, **24** and **25**, dependent on an amended claim, are determined to be patentable.

New claims **26-34** are added and determined to be patentable.

1. A reversible polarity fiber optic connector comprising:
at least first and second optical ferrules;
a connector housing *having a longitudinal axis and comprising an exterior portion* at least partially surrounding the first and second optical ferrules [and having] *such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising* a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;
a latch coupling positioned on each of the first and second exterior walls of the connector housing;
a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;
wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

9. A reversible polarity fiber optic connector with exchangeable arms for changing connector type comprising:
at least first and second optical ferrules;
a common connector housing *having a longitudinal axis and comprising an exterior portion* at least partially surrounding the first and second optical ferrules [and having] *such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising* a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;
a coupling surface positioned on each of the first and second exterior walls of the common connector housing;
a removable arm for engaging either of the first and second exterior wall coupling surfaces on the common connector housing, the removable arm including either a latch or a latch recess;
wherein positioning the removable arm on the first exterior wall of the *common* connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the *common connector* housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

15. A reversible polarity fiber optic connector comprising:
at least first and second optical ferrules;
a connector housing *having a longitudinal axis and comprising an exterior portion* at least partially surrounding the first and second optical ferrules [and having] *such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising* a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;
a first aperture in the first exterior wall of the connector housing and a second aperture in the second exterior wall of the connector housing;
a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing;
wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

19. A reversible polarity fiber optic connector comprising:
at least first and second optical ferrules;
a connector housing *having a longitudinal axis and comprising an exterior portion* at least partially surrounding the first and second optical ferrules [and having] *such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a space in which each of the first and second optical ferrules are received, the exterior portion comprising* a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;
a first deformable region in the first exterior wall of the connector housing and a second deformable region in the second exterior wall of the connector housing;
a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing;
wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the *connector* housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

23. A reversible polarity fiber optic connector comprising:
at least first and second optical ferrules;
a connector housing *having a longitudinal axis and comprising an exterior portion* at least partially surrounding the first and second optical ferrules [and having] *such that the exterior portion extends 360° circumferentially with respect to the longitudinal axis about a*

space in which each of the first and second optical ferrules are received, the exterior portion comprising a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a removable push-pull tab;

a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall;

wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the connector housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

26. The reversible polarity fiber optic connector of claim 1, wherein latch coupling includes a receiving track, wherein the removable latch comprises a projection for engaging each receiving track, and wherein the projection has a dovetail shape.

27. The reversible polarity fiber optic connector of claim 1, wherein the removable latch comprises a base portion and a depressible latch having a front end portion connected to the base portion, a free rear end portion spaced apart from the front end portion along the axis and being raised relative to the front end portion, and an outward facing longitudinal surface extending along the axis from the front end portion to the free rear end portion, the removable latch being bendable such that the free rear end portion can be depressed toward the base portion.

28. The reversible polarity fiber optic connector of claim 27, further comprising a remote release including an elongate front section configured to extend longitudinally along the connector housing and engage the depressible latch arm and an elongate rear section extending rearward from the elongate front section, the elongate front section of the remote release being slidably connected to the removable latch such that the elongate front section can move rearward relative to removable latch.

29. The reversible polarity fiber optic connector of claim 28, wherein the elongate front section comprises an opening configured to receive the depressible latch arm and a front end portion defining a front end of the opening, the front end portion of the front elongate section being configured to slide rearward along the outward facing surface of the depressible latch arm when the elongate front section moves rearward to depress the depressible latch arm.

30. The reversible polarity fiber optic connector of claim 27, wherein each latch coupling includes a groove having an open axial end and the removable latch comprises a protrusion on the base portion configured to be inserted into the groove through the open axial end.

31. The reversible polarity fiber optic connector as set forth in claim 1, further comprising first and second ferrule springs received on the first and second ferrules, respectively, wherein the connector housing comprises a single front body and a single back body configured to attach to the single front body such that the first and second ferrule springs are compressed simultaneously between the single back body and the single front body.

32. The reversible polarity fiber optic connector as set forth in claim 1, wherein the first and second optical ferrules have a pitch of about 4.8 mm or less.

33. The reversible polarity fiber optic connector as set forth in claim 1, wherein the connector housing is a single combined housing for each of the first and second optical ferrules.

34. The reversible polarity fiber optic connector as set forth in claim 1, wherein the exterior portion of the housing radially overlaps a longitudinal segment of each of the first and second optical ferrules with respect to the axis.

* * * * *