

UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/816,084	05/17/2011	RE42368	C2393-1106RE1	2616

48789 7590 04/27/2011 LAW OFFICES OF BARRY N. YOUNG 200 PAGE MILL ROAD SUITE 102 PALO ALTO, CA 94306

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

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

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

Tai Chen, San Jose, CA; Jeffrey P. Wilde, Morgan Hill, CA; Joseph E. Davis, Morgan Hill, CA;

Receipt date: 06/15/2010

12816084 - GAU: 2883

				Application N	lumber	Filed Here	with
				Filling Date		Filed Here	with
INFOR	MAT	ION DISCLOS	URE	First Named	Inventor T	ai Chen et.	al
STATE	MEN	II BY APPLIC	ANI	Art Unit	••••••••••••••••••••••••••••••••••••••	Ünknown	
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/B.H./	9	6028689		2-22-2000	Michalicek et. a	1	alt
/B.H.	/ 10	5414540		1995-05-09	Patel et. al		all
/B.H./	11	5629790	A	1997-05-01	Neukermans e	t al	al
/B.H./	12	5745271		1998-04-28	Ford et. al		ali
/B.H./	13	5835458	A	1998-11-01	Bischel et. al		all
/B.H./	14	5960133	٨	1999-09-01	Tomlinson		all
/B.H./	15	5974207	A	1999-10-01	Aksyuk et. al		all
/B.H./	16	6204946	81	2001-03-01	Aksyuk et al		31
/B.H./	17	6205269	B1	2001-03-01	Morton		all
/B.H./	18	6222954	B1	2001-04-01	Riza		all
/B.H./	19	6253135	B1	2001-07-01	Wade		all

EFS Web 2.1.17

/Brian Healy/

02/10/2011

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u> Mail Stop ISSUE' FEE Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 or <u>Fax</u> (571)-273-2885

appropriate. All further correspondence including indicated unless corrected below or directed othe maintenance fee notifications.	the Patent, advance o wise in Block 1, by (rders and notification of r s) specifying a new corres	naintenance fees pondence addres	will be mailed s; and/or (b) i	I to the current of dicating a separa	uld be completed where strespondence address as te "FEE ADDRESS" for
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	×		Barry N.	Young //	• /	(Depositur's came)
			Mug	140	my	(Signature)
			March 28,	2011	0	{Date}
APPLICATION NO. FILING DATE	1	FIRST NAMED INVENTOR		ATTORNEY	DOCKET NO.	CONFIRMATION NO.
12/816,084 06/15/2010		Tai Chen		C2393-	1106RE1	2616
POWER MANAGEMENT CAPABILITIES						
AFFEN. TIPE SMALL ENTIT	1550E FEE DUE	PUBLICATION HEE DUE	FREY, PAIDISS		TAL FEE(S) DUR	BATEDUE
nonprovisional • NO	\$1510	50	\$0		\$1510	06/24/2011
EXAMINER	ART UNIT	CLASS-SUBCLASS				
HEALY, BRIAN	2883	385-024000				
Change of correspondence address or indication FR 1.363). Change of correspondence address (or Change Address form PTO/SB/122) attached. Free Address" indication (or "Fee Address" PTO/SB/47; Rev 03-02 or more recent) attached	of "Fee Address" (37 ge of Correspondence Indication form 1. Use of a Customer	 For printing on the p the names of up to or agents OR, alternati the name of a sing presistered attorney or 2 registered patent attor 	ratent front page, 3 registered patrively, le firm (having as agent) and the na rneys or agents. I	list ant allorneys a member a mes of up to f no name is	1 <u>Barry N</u> 2 3	. Young
ASSIGNEE NAME AND RESIDENCE DATA PLEASE NOTE: Unless an assignce is identif recordation as set forth in 37 CFR 3.11. Comple (A) NAME OF ASSIGNEE Capella Photonics, In- desse check the appropriate assignce category or c	TO BE PRINTED ON ied below, no assignee ction of this form is NC C , ategories (will not be p	THE PATENT (print or ty data will appear on the p IT a substitute for filing an (B) RESIDENCE: (CIT' San Jo rinted on the patent):	pe) atent. If an assignment. (and STATE OR se, Calif Individual 🖾	nce is identifi COUNTRY) ornia Conporation or	ed below, the doc	ument has been filed for p entity
a. The following fee(s) are submitted:	4	b. Payment of Fee(s): (Ple	use first reapply	any previous!	y paid issue fee st	iown above)
XX Issue Fee		A check is enclosed.				
Publication Fee (No small entity discount pe Advance Order - # of Copies	mitted)	Payment by credit card. Form PTO-2038 is stiached. (EFS-Web) The Director is hereby authorized to charge the required foc(s), any deficiency, or credit any overpayment, to Deposit Account Number (enclose an extra copy of this form)				
Change in Entity Status (from status indicated a. Applicant claims SMALL ENTITY status	above) . See 37 CFR 1.27.	🛛 b. Applicant is no los	iger claiming SM	ALL ENTITY	status. Sec 37 CF	R 1.27(g)(2).
NOTE: The Issue Fee and Publication Fee (if requinterest as shown by the records of the United State	red) will not be accept rs Patent and Trademar	ed from anyone other than k Office	the applicant; a re	gistered attorn	ey or agent; or the	assignce or other party in
Authorized Signature Such	young		Date Ma	rch 28,	2011	
Typed or printed name Barry N. Yo	ung (Registration	No. 27,	744	
This collection of information is required by 37 Cf an application. Confidentiality is governed by 35 submitting the completed application form to the this form and/or suggestions for reducing this bur for 1430, Alexandra, Virginia 22313-1430. DO Alexandria, Virginia 22313-1450.	R 1.311. The informat U.S.C. 122 and 37 CFF USPTO. Time will var ten, should be sent to 1 NOT SEND FEES OR	ion is required to obtain or 1.14. This collection is a y depending upon the indi- the Chief folormation Offic COMPLETED FORMS T report to a collection of in-	retain a benefit b timated to take 1 vidual case. Any ser, U.S. Patent an O THIS ADDRE formation unless	y the public with 2 minutes to constraints on a Tredemark with SS. SEND TO it displays a ve	hich is to file (and emplete, including the amount of tim Office, U.S. Depai Commissioner fo did OMB control of	by the USPTO to process) gathering, preparing, and e you require to complete ument of Commerce, P.O. pr Patents, P.O. Box 1450, number.

PTOL-85 (Rev. 02/11) Approved for use through 08/31/2013.

OMB 0651-0033

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

Electronic Patent Application Fee Transmittal					
Application Number:	12	816084			
Filing Date:	15	Jun-2010			
Title of Invention:	RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXERS WITH SERVO CONTROL AND DYNAMIC SPECTRAL POWER MANAGEMENT CAPABILITIES				
First Named Inventor/Applicant Name:	Tai Chen				
Filer:	Barry N. Young				
Attorney Docket Number:	C2	393-1106RE1			
Filed as Large Entity					
Utility under 35 USC 111(a) Filing Fees					
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:					
Pages:					
Claims:					
Miscellaneous-Filing:					
Petition:					
Patent-Appeals-and-Interference:					
Post-Allowance-and-Post-Issuance:					
Utility Appl issue fee		1501	1	1510	1510
Extension-of-Time:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
	Tot	al in USD	(\$)	1510

Electronic Acknowledgement Receipt				
EFS ID:	9756232			
Application Number:	12816084			
International Application Number:				
Confirmation Number:	2616			
Title of Invention:	RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXERS WITH SERVO CONTROL AND DYNAMIC SPECTRAL POWER MANAGEMENT CAPABILITIES			
First Named Inventor/Applicant Name:	Tai Chen			
Customer Number:	48789			
Filer:	Barry N. Young			
Filer Authorized By:				
Attorney Docket Number:	C2393-1106RE1			
Receipt Date:	28-MAR-2011			
Filing Date:	15-JUN-2010			
Time Stamp:	17:59:07			
Application Type:	Utility under 35 USC 111(a)			

Payment information:

Submitted with Payment		yes						
Payment Type		Credit Card						
Payment was suc	ccessfully received in RAM	\$1510	\$1510					
RAM confirmatio	n Number	5714	5714					
Deposit Account								
Authorized User	ġ.							
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Information:					
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New Applications Under 35 U.S.C. 111

Post Card, as described in MPEP 503.

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

NOTICE OF ALLOWANCE AND FEE(S) BUE

48789 7590 03/24/2011 LAW OFFICES OF BARRY N. YOUNG 200 PAGE MILL ROAD SUITE 102 PALO ALTO, CA 94306

EXAMINER	
HEALY, BRIAN	

PAPER NUMBER

ART UNIT

2883 DATE MAILED: 03/24/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/816,084	06/15/2010	Tai Chen	C2393-1106RE1	2616

TITLE OF INVENTION: RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXERS WITH SERVO CONTROL AND DYNAMIC SPECTRAL POWER MANAGEMENT CAPABILITIES

APPLN, TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$0	\$0	\$1510	06/24/2011

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

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

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:	If the SMALL ENTITY is shown as NO:
A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.	A. Pay TOTAL FEE(S) DUE shown above, or
B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or	B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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

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

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

Page 1 of 3

PART B - FEE(S) TRANSMITTAL

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INSTRUCTIONS: This appropriate. All further indicated unless correct maintenance fee notifica	form should be used f correspondence includin ed below or directed oth tions.	for transmitting the ISSU og the Patent, advance on herwise in Block 1, by (a	JE FEE and PUBLICATI rders and notification of n a) specifying a new corres	ON FEE (if requir naintenance fees wi pondence address;	red). Blo ill be ma and/or (b	cks 1 through 5 s iled to the current) indicating a sep	should be completed where t correspondence address as parate "FEE ADDRESS" for	
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							(Depositor's name)	
							(Signature)	
							(Date)	
APPLICATION NO.	FILING DATE		FIRST NAMED INVENTOR		ATTORN	EY DOCKET NO.	CONFIRMATION NO.	
12/816,084	06/15/2010		Tai Chen		C23	93-1106RE1	2616	
TITLE OF INVENTION POWER MANAGEMEN	N: RECONFIGURABLE	E OPTICAL ADD-DRO	P MULTIPLEXERS WIT	'H SERVO CONT	ROL AN	D DYNAMIC SI	PECTRAL	
APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE	FEE	FOTAL FEE(S) DUE	E DATE DUE	
nonprovisional	· NO	\$1510	\$0	\$0		\$1510	06/24/2011	
EXAM	IINER	ART UNIT	CLASS-SUBCLASS					
HEALY	BRIAN	2883	385-024000					
 Change of correspond CFR 1.363). Change of corresp Address form PTO/SI "Fee Address" ind PTO/SB/47; Rev 03-0 Number is required. 	ence address or indication ondence address (or Cha 3/122) attached. ieation (or "Fee Address' 2 or more recent) attached	n of "Fee Address" (37 nge of Correspondence " Indication form cd. Use of a Customer	2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 3					
 ASSIGNEE NAME A PLEASE NOTE: Un recordation as set fort (A) NAME OF ASSIGNATION (A) NAME OF ASSIGNATION (A) (A) (A) (A) (A) (A) (A) (A) (A) (A)	ND RESIDENCE DATA less an assignce is identi h in 37 CFR 3.11. Comp GNEE	A TO BE PRINTED ON ified below, no assignee oletion of this form is NO	THE PATENT (print or typ data will appear on the pa T a substitute for filing an (B) RESIDENCE: (CITY	ic) atent. If an assigne assignment. and STATE OR CO	e is iden OUNTRY	tified below, the o	document has been filed for	
Please check the appropr	fate assignce category or	categories (will not be pr	nited on the patent):		rporation	or other private gr	roup entry Government	
4a. The following fee(s)	are submitted:	41	D. Payment of Fee(s): (Plea	se first reapply an	y previou	asly paid issue fee	e shown above)	
Issue Fee Publication Fee (N	lo small entity discount r	permitted)	Payment by credit car	d Form PTO-2038	is attache	d		
Advance Order - #	f of Copies		The Director is hereby overpayment, to Depos	authorized to charg sit Account Number	ge the req	uired fcc(s), any d (cnclose a	eficiency, or credit any an extra copy of this form).	
5. Change in Entity Sta	tus (from status indicated s SMALL ENTITY statu	d above) 15. See 37 CFR 1.27.	b. Applicant is no long	ger claiming SMAL	L ENTIT	Y status. See 37 C	CFR 1.27(g)(2).	
NOTE: The Issue Fee an interest as shown by the	d Publication Fee (if requ records of the United Sta	uired) will not be accepte tes Patent and Trademark	d from anyone other than the office.	ne applicant; a regis	tered atto	orney or agent; or t	the assignce or other party in	
Authorized Signature				Date				
Typed or printed nam	e			Registration No	0			
This collection of inform an application. Confiden submitting the complete this form and/or suggest Box 1450, Alexandria, V Alexandria, Virginia 223 Under the Paperwork Re	ation is required by 37 C tiality is governed by 35 d application form to the ions for reducing this bu irginia 22313-1450. DO 13-1450. duction Act of 1995, no p	FR 1.311. The informatic U.S.C. 122 and 37 CFR USPTO. Time will vary rden, should be sent to th NOT SEND FEES OR (persons are required to response to	on is required to obtain or r 1.14. This collection is est depending upon the indiv e Chief Information Office COMPLETED FORMS TO spond to a collection of info	etain a benefit by th imated to take 12 m idual case. Any cor r, U.S. Patent and 7 0 THIS ADDRESS. ormation unless it d	e public inutes to meents o Frademari SEND T isplays a	which is to file (an complete, includi n the amount of ti k Office, U.S. Dep O: Commissioner valid OMB contro	Id by the USPTO to process) ing gathering, preparing, and ime you require to complete partment of Commerce, P.O. for Patents, P.O. Box 1450, ol number.	

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE OMB 0651-0033

			UNITED STATES DEPART United States Patent and T Address: COMMISSIONER F(P.O. Box 1450 Alexandria, Virginia 223) www.uspto.gov	MENT OF COMMERCE Frademark Office DR PATENTS 13-1450		
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.		
. 12/816,084	06/15/2010	Tai Chen	C2393-1106RE1	2616		
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LAW OFFICES (OF BARRY N. YOUNG		HEALY, BRIAN			
SUITE 102	OAD		ART UNIT	PAPER NUMBER		
PALO ALTO, CA	94306		2883			
			DATE MAILED: 03/24/201	i l		

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

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

Page 3 of 3

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:

- 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.

	Application No.	Applicant(s)
Notice - 6 All	12/816,084	CHEN ET AL.
Notice of Allowability	Examiner	Art Unit
	BRIAN M. HEALY	2883
The MAILING DATE of this communication appeal All claims being allowable, PROSECUTION ON THE MERITS IS (0 herewith (or previously mailed), a Notice of Allowance (PTOL-85) on NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIG of the Office or upon petition by the applicant. See 37 CFR 1.313 a	rs on the cover sheet with the DR REMAINS) CLOSED in this or other appropriate communicat CHTS. This application is subject and MPEP 1308.	e correspondence address application. If not included tion will be mailed in due course. THIS ct to withdrawal from issue at the initiati
1. X This communication is responsive to the response filed 03/0	<u>2/2011</u> .	
2. 🛛 The allowed claim(s) is/are <u>1-22</u> .		
 Acknowledgment is made of a claim for foreign priority und a) All b) Some* c) None of the: Certified copies of the priority documents have to Certified copies of the priority documents have to Copies of the certified copies of the priority documents have to Copies of the certified copies of the priority documents have to Copies of the certified copies of the priority documents have to Copies of the certified copies of the priority documents have to 	ler 35 U.S.C. § 119(a)-(d) or (f). been received. been received in Application No uments have been received in th	 his national stage application from the
Applicant has THREE MONTHS FROM THE "MAILING DATE" of noted below. Failure to timely comply will result in ABANDONME THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.	f this communication to file a rep NT of this application.	ply complying with the requirements
 A SUBSTITUTE OATH OR DECLARATION must be submitt INFORMAL PATENT APPLICATION (PTO-152) which gives 	ed. Note the attached EXAMIN reason(s) why the oath or decl	ER'S AMENDMENT or NOTICE OF aration is deficient.
5. CORRECTED DRAWINGS (as "replacement sheets") must	be submitted.	
(a) [] including changes required by the Notice of Draftsperso	n's Patent Drawing Review (PT	O-948) attached
1) 🗌 hereto or 2) 🗌 to Paper No./Mail Date		
(b) including changes required by the attached Examiner's Paper No./Mail Date	Amendment / Comment or in th	e Office action of
Identifying indicia such as the application number (see 37 CFR 1.8 each sheet. Replacement sheet(s) should be labeled as such in the	4(c)) should be written on the dra e header according to 37 CFR 1.1	awings in the front (not the back) of 21(d).
6. DEPOSIT OF and/or INFORMATION about the deposi attached Examiner's comment regarding REQUIREMENT For attached Examiner's comment regarding REQUIREMENT For	t of BIOLOGICAL MATERIA OR THE DEPOSIT OF BIOLOG	L must be submitted. Note the SICAL MATERIAL.
Attachment(s)		
I. X Notice of References Cited (PTO-892)	5. 🗌 Notice of Informa	al Patent Application
2. Notice of Draftperson's Patent Drawing Review (PTO-948)	6. Interview Summa	ary (PTO-413),
3. Information Disclosure Statements (PTO/SB/08),	Paper No./Mail 7. 🗌 Examiner's Ame	Date ndment/Comment
A Depart No./Mail Date Examiner's Comment Regarding Requirement for Deposit of Biological Material	8. 🛛 Examiner's State	ement of Reasons for Allowance
	9. 🗌 Other	
	/BRIAN M. HEALY/	
	PRIMARY EXAMINE	ER
	ART UNIT: 2883	

DETAILED ACTION

Allowable Subject Matter

1. The following is an <u>examiner's statement of reasons for allowance</u>: The closet references of record are (Note these references were made of record on PTOL-1449) Bouevitch et. al., U.S.P. No. 6,498,872 which teaches (Figs.1-12) an optical device which is used in conjunction with configurable optical add/drop multiplexers (COADM) which includes optical fiber input/output ports 80a,80b,99a,99b which sends wavelength of light which are collimated through lens 90 to spherical reflector 10 which is incident of diffraction grating 20 to MEMS reflector(s) 51,52.which are movable in either the horizontal or vertical directions to return specific wavelengths lambda 1, lambda2 to the output ports 3. Bouevitch et. al., U.S.P. No. 6,498,872 does not teach or suggest using channel micromirrors which are both individually and continuously controllable to reflect received spectral channels to any one of the output ports and to control the power of the received spectral channels coupled to the output ports.

2. Additional secondary references Wagener et. al., U.S.P. No. 6,631,222 (Figs.1-4), Jin et. al., U.S.P. No. 6,256,430 (Figs.1-7) and Ma et. al., U.S.P. No. 6,567,574 (Figs.1-12) all teach that at the time the invention was made it was know that pivotable micro mirrors or MEMS can be used with wavelength multiplexers to switch or select wavelengths between input and output ports.

3. None of the aforementioned references, either taken alone or in combination with each other, teach or suggest the claimed optical add-drop device which includes an input port for an input multi-wavelength optical signal having first spectral channels; one or more ports for second spectral channels, an output port for an output multi-wavelength optical signal ; a wavelength-

Page 2

selective device for spatially separating the spectral channels, a spatial array of beam deflecting elements such that each element receives a corresponding one of the spectral channels and each of the elements are <u>individually and continuously controllable in two dimensions</u> to reflect it's corresponding spectral channel to a selected one of the output ports and <u>to control the</u> <u>power of the received spectral channels reflected to the selected ports</u>. These limitations are recited in amended claim 1. Therefore the patentability of amended claim 1 is confirmed.

4. Dependent claims 2-14 are inclusive of the limitations of amended claim 1, as well as other additionally recited limitations. Please see the dependent claims for the specifics of these additionally recited limitations. The patentability of dependent claims 2-14 is confirmed.

5. In addition, none of the aforementioned references, either taken alone or in combination with each other, teach or suggest the claimed optical add-drop device which includes an input port for an input multi-wavelength optical signal having multiple spectral channels; an output port for an output multi-wavelength optical signal, one or more drop ports for selected spectral channels dropped from the multi-wavelength optical signal ; a wavelength-selective device for spatially separating the spectral channels, a spatial array of beam deflecting elements such that each element receives a corresponding one of the spectral channels and each of the elements are **individually and continuously controllable in two dimensions** to reflect it's corresponding spectral channel to a selected one of the output ports and <u>to control the power of the received spectral channels reflected to the selected ports, whereby a subset of the spectral channels is directed to the drop ports .</u> These limitations are recited in amended claim 15.

6. These limitations are recited in original claim 21. <u>Therefore the patentability of</u> <u>amended claim 15 is confirmed.</u>

7. None of the aforementioned references, either taken alone or in combination with each other, teach or suggest the claimed optical add-drop device which includes an input port for an input multi-wavelength optical signal having multiple spectral channels, an output port for an output multi-wavelength optical signal, one or more add ports for selected specral channels to be added to the output multi-wavelength optical signal; a wavelength-selective device for reflecting the multiple and selected spectral channels and a spatial array of beam deflecting elements such that each element receives a corresponding one of the spectral channels and each of the elements are **individually and continuously controllable in two dimensions** to reflect it's corresponding spectral channel to a selected one of the output ports and **to control the power of the received spectral channels reflected to the selected port**. These limitations are recited in amended claim 16. Therefore the patentability of amended claim 16 is confirmed.

8. Finally, none of the aforementioned references, either taken alone or in combination with each other, teach or suggest the claimed method of performing dynamic add and drop in a WDM optical network comprising the steps of separating an input multi-wavelength optical signal into spectral channels; imaging each of the spectral channels in a beam deflecting element and controlling both <u>dynamically and continuously the beam deflecting elements in two</u> <u>dimensions</u> so as to combine the selected ones of the spectral channels into an output multi-wavelength optical signal and <u>to control the power of the spectral channels which are</u> <u>combined into the output multi-wavelength optical signal</u>. These limitations are recited in amended claim 17. <u>Therefore the patentability of amended claim 17 is confirmed.</u>

9. Dependent claims 18-22 are inclusive of the limitations of original claim 17, as well as other additionally recited limitations. Please see the dependent claims for the specifics of these additionally recited limitations. The patentability of dependent claims 18-22 is confirmed.

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."

The reissue oath or declaration, filed 03/02/2011 is sufficient to overcome the rejection of claims based on 35 U.S.C. 251. See previous office action.

This reissue application is a reissue of U.S. Patent Application 10/745,364, filed 12/22/2003, now PAT 6,879,750, which is a CON of U.S. Patent Application 10/005,714, filed 11/07/2001, now U.S.P. No. 6,687,431 which is a CON of U.S. Patent Application No. 09/938,426, filed 08/23/2001 now, U.S.P. No. 6,625,346 which claims the benefit of 60/277,217, filed 03/19/2001.

The references which were made of record in USP No. 6,879,750, No. 6,625,346 and No. 6,687,431 will also be made of record in the present Application.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIAN M. HEALY whose telephone number is (571)272-2347. The examiner can normally be reached on M-F 6AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Robinson can be reached on (571)272-2319. 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.

> /BRIAN M. HEALY/ Primary Examiner Art Unit 2883

Notice of Peferences Cited	Application/Control No. 12/816,084	Applicant(s)/Patent Under Reexamination CHEN ET AL.			
Notice of References Cited	Examiner	Art Unit			
	BRIAN M. HEALY	2883	Page 1 of 1		

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,687,431	02-2004	Chen et al.	385/24
*	в	US-6,879,750	04-2005	Chen et al.	385/24
	С	US-			
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FOREIGN PATENT DOCUMENTS

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NON-PATENT DOCUMENTS

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

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

Notice of References Cited

Part of Paper No. 20110308

A li di No k	Application No.	Applicant(s)								
Application Number	12816084	CHEN ET AL.								
	Notice of Reissue Publishee	d in OG on 08/03/2010								
Original Patent Number of Patent To	Be Reissued is 6,879,750	The Maintenance fee status is: ⊠ up to date. ☐ not required.								
This reissue patent is subject to A Terminal Disclaimer that: was filed during the prosecution of the reissue application. was of record prior to the filing of the reissue application.										
Physical surrender of the letters pate	ent									
☐ was made.☐ was not made, but☑ is not required	 ☐ was made. ☐ was not made, but a statement of loss/inaccessibility was provided. ☑ is not required 									
	Final SPRE Review									
	3/21/11 (DATE)	x								

U.S. Patent and Trademark Office-

Page 1 of 1



UNITED STATES PATENT AND TRADEMARK OFFICE

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

BIB DATA SHEET

CONFIRMATION NO. 2616

SERIAL NUME 12/816,084	BER 4	FILING or DATE 06/15/2	371(c)		CLASS 385	GRO	ROUP ART UNIT		ATTO C2	RNEY DOCKET NO. 393-1106RE1
APPLICANTS Tai Chen, San Jose, CA; Jeffrey P. Wilde, Morgan Hill, CA; Joseph E. Davis, Morgan Hill, CA;										
** CONTINUING DATA **********************************										
** FOREIGN APPLICATIONS ************************************										
Foreign Priority claimed Yes No 35 USC 119(a-d) conditions met Yes No Verified and /BRIAN HEALY/ Verified and /BRIAN HEALY/ Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indicess Indi Indicess Indi Indicess Indicess Indicess								INDEPENDENT CLAIMS 4		
ADDRESS LAW OFF 200 PAGE SUITE 10 PALO AL UNITED S	ADDRESS LAW OFFICES OF BARRY N. YOUNG 200 PAGE MILL ROAD SUITE 102 PALO ALTO, CA 94306									
TITLE Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities										
FILING FEE FEES: Authority has been given in Paper No								ing Ext. of time)		

BIB (Rev. 05/07).

Issue Classific	ation

	Application/Control No.	Applicant(s)/Patent Under Reexamination
1	12816084	CHEN ET AL.
	Examiner	Art Unit
	BRIAN M HEALY	2883

ORIGINAL CLASS SUBCLASS						INTERNATIONAL CLASSIFICATION							
						CLAIMED					NON-CLAIMED		
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NONE		is Allowed:		
(Assistant Examiner)	(Date)	22		
/BRIAN M HEALY/ Primary Examiner.Art Unit 2883	3082011	O.G. Print Claim(s)	O.G. Print Figure	
(Primary Examiner)	(Date)	1 and 17	1A	

U.S. Patent and Trademark Office

Part of Paper No. 20110308

0	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	12816084	CHEN ET AL.
	BRIAN M HEALY	2883 .

SEARCHED								
Class	Subclass	Date	Examiner					
385	24,11,10,37,34,33	3/8/2011	/BH/					
398	79,82,83,84,88,87	3/8/2011	/BH/					

SEARCH NOTES							
Search Notes	Date	Examiner					
SEARCHED "EAST"(prior art and interference)(SEARCH TERMS, CLASS/SUBCLASSES AND DATABASES USED ARE LISTED ON PRINTOUT.)	3/8/2011	/BH/					
PALM INVENTOR SEARCH	3/8/2011	/BH/					
STIC LITIGATION SEARCH (NO LITIGATION FOUND)	3/9/2011	/BH/					
CONSULTED PARENT CASES CORRESPONDING TO USP No.6,879,750; 6,687,431, 6,625,346.	3/8/2011	/BH/					

INTERFERENCE SEARCH							
Class	Subclass	Date	Examiner				
385	24,11,10,37,34,33	3/8/2011	/BH/				
398	79,82,83,84,88,87	3/8/2011	/BH/				



U.S. Patent and Trademark Office

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Part of Paper No.: 20110308

Index of Claims			Application/Control No. 12816084 Examiner BRIAN M HEALY			Applica Reexar CHEN Art Uni 2883	Applicant(s)/Patent Under Reexamination CHEN ET AL. Art Unit 2883						
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Part of Paper No. : 20110308



EIC 2800 SEARCH REPORT



STIC Database Tracking Number: 358320

To: BRIAN HEALY Location: JEF-4D05 Art Unit: 2883 Wednesday, March 09, 2011 From: DIANE JACKSON Location: EIC2800 JEF-4B68 Phone: (571)272-3260

Case Serial Number: 12/816084

diane.jackson@uspto.gov

Search Notes

Hi,

Attached are litigation search results in Lexis Nexis, and CourtLink and Q-Pat/Orbit.

No Litigation was found for Serial Number 12/816084 and Patent Numbers 6879750, 6687431 and 6625346.

If you have any questions, please feel free to contact me.

Thanks,

Diane

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Page 1 of 1

From: Healy, Brian

Sent: Tuesday, March 08, 2011 8:51 AM

To: STIC-EIC2800

Subject: I need a litigation search for reissue case 12/816,084

Dear Sir or Madam, My name is Brian Healy (employee No 62975) and I am a Primary Examiner working on a reissue. I Need a litigation search for reissue 12/816,084 corresponding to 10/745,364, now, PAT 6,879,750 which is a CON of 10/005,714, now USP 6,687,431 which is a CON of 09/938,426, now USP No. 6,625,346 which claims benefit of 60/277,217. Thanks, Brian Healy, Primary Examiner, Art Unit: 2883 (571)272-2347

6,02 5,31

3/8/2011

Application Number Information			Page 1 of 1
Application Number Information	а. С		
Application Number: 12/816084 Assignments	Examiner Number: 62975 / HEALY, BRIAN		
Filing or 371(c) Date: 06/15/2010 <u>eDan</u>	Group Art Unit: 2883	IFW_Madras	
Effective Date: 06/15/2010	Class/Subclass: 385/024.000		
Application Received: 06/15/2010	Lost Case: NO		
Patent Number:	Interference Number:		
Issue Date: 00/00/0000	Unmatched Petition: NO		
Date of Abandonment: 00/00/0000	L&R Code: Secrecy Code:1		
Attorney Docket Number: C2393-1106RE1	Third Level Review: NO	Secrecy Order: NO	
Status: 71 /RESPONSE TO NON-FINAL OFFICE ACTION ENTERED AND	FORWARDED TO EXAMINER	Status Date: 03/03/2011	
Confirmation Number: 2616	Oral Hearing: NO		
Title of Invention: RECONFIGURABLE OPTICAL ADD-DROP MULTIPLE? CAPABILITIES	KERS WITH SERVO CONTROL AND DYNAMIC S	PECTRAL POWER MANAGE	MENT

Bar Code	PALM Location	Location Date	Charge to Loc	Charge to Name	Employee Name	Location
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/	Attorney Docket #	Search	Search			

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14. J.) - M(37) Continuity/Reexam Information

Continuity/Reexam Information for 12/816084

Parent Data

 Parent Data

 12816084, filed 06/15/2010 is a reissue of 10745364, filed 12/22/2003, now U.S. Patent #6879750 and having 1 RCE-type filing therein 10745364 is a continuation of 10005714, filed 11/07/2001, now U.S. Patent #6687431

 10005714 is a continuation of 09938426, filed 08/23/2001, now U.S. Patent #6625346 and having 1 RCE-type filing therein 09938426

 09938426
 Claims Priority from Provisional Application 60277217, filed 03/19/2001

Child Data

Appln Info Contents Petition Info Atty/Agent Info Continuity/Reexam Foreign/Data	Inventors Address Fees Post Info Pre Gra
Search Another: Application # Search or Patent# Search	
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Application Number Information			Page 1 of 1
Application Number Information			
Application Number: 10/745364 Assignments	Examiner Number: 65907 / PALMER, PH	IAN	
Filing or 371(c) Date: 12/22/2003 eDan	Group Art Unit: 2874	IFW Madras	
Effective Date: 12/22/2003	Class/Subclass: 385/024.000		
Application Received: 12/24/2003	Lost Case: NO		
Pat. Num./Pub. Num: 6879750/20040136648	Interference Number:		19 (B)
Issue Date: 04/12/2005	Unmatched Petition: NO		
Date of Abandonment: 00/00/0000	L&R Code: Secrecy Code:1		
Attorney Docket Number: 351909-991106	Third Level Review: NO	Secrecy Order: NO	
Status: 150 /PATENTED CASE		Status Date: 03/23/2005	
Confirmation Number: 1514	Oral Hearing: NO		
Title of Invention: RECONFIGURABLE OPTICAL ADD-DRO	P MILLTIPLEXERS WITH SERVO CONTROL AND D	YNAMIC SPECTRAL POWER MANAG	EMENT

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Application Number Information			Page 1 of 1
Application Number Information	* 20		
Application Number: 10/005714 Order This File Assignments	Examiner Number: 65417 / NGO, HUNG		
Filing or 371(c) Date: 11/07/2001 eDan	Group Art Unit: 2633		÷.
Effective Date: 11/07/2001	Class/Subclass: 385/024.000		
Application Received: 12/07/2001	Lost Case: NO		
Pat. Num./Pub. Num: 6687431/20020131688	Interference Number:		
Issue Date: 02/03/2004	Unmatched Petition: NO		
Date of Abandonment: 00/00/0000	L&R Code: Secrecy Code:1		
Attorney Docket Number: 2102393-991102	Third Level Review: NO	Secrecy Order: NO	
Status: 150 /PATENTED CASE		Status Date: 01/15/2004	
Confirmation Number: 8631	Oral Hearing: NO		
Title of Invention: RECONFIGURABLE OPTICAL ADD-DROP MUI	TIPLEXERS WITH SERVO CONTROL AND DYNAM	IC SPECTRAL POWER MANA	GEMENT

CAPABILITIES

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Bar Code	PALM Location	Location Date	Charge to Loc	Charge to Name	Employee Name	Location
10005714	<u>9200</u>	03/22/2010	No Charge to Location	No Charge to Name	BAIG,ABDUL	
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Conten	ts Petition Info	Atty/Agent Info	Continuity/Reexam For	elgn Data Inventors Ad	Idress Fees Post In	fo Pre
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3/9/2011

Page 3 of 3

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Page 1 of 1

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Page 1 of 13

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LEGAL-REP: Young, Barry N. -

PUB-TYPE: April 12, 2005 - Utility Patent having a previously published pre-grant publication (B2)

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Table Of Contents

Page 1 of 2

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Table Of Contents	Page 2 of 2
Image: Title 41. public contracts Image: Title 42. The public health and welfare Image: Title 43. public lands Image: Title 44. public printing and documents Image: Title 45. Railroads Image: Title 45. Railroads Image: Title 46. Shipping Image: Title 48. Territories and insular possessions Image: Title 49. Transportation Image: Title 50. War and National defense Image: Title 51. National and commercial space programs	
⟨ 1 - 51 of 51	
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Page 1 of 1



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Page 1 of 1

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Page 1 of 1

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Page 1 of 16

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Page 1 of 1

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Page 1 of 2

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ble Of Cor	tents	Page 2 of 2
	TITLE 41. PUBLIC CONTRACTS TITLE 42. THE PUBLIC HEALTH AND WELFARE TITLE 43. PUBLIC LANDS TITLE 44. PUBLIC PRINTING AND DOCUMENTS TITLE 45. RAILROADS TITLE 46. SHIPPING TITLE 47. TELEGRAPHS, TELEPHONES, AND RADIOTELEGRAPHS TITLE 48. TEREPTOPIES AND INSULAB DOSSESSIONS	
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	<□ 1 - 51 of 51 ⇒	
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Page 1 of 1

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Page 1 of 19

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REISSUE December November	: 31, 2004 - 14, 2006 -	Reissue Application file This patent was reissu	ed Ex. Gp.: 2874; ed as Reissue Pa	Re. S.N. 11/027,5 cent RE 39,397 (O	586 , (O.G. March 15, 2 G. November 14, 2006	005)),
INVENTO	R: Wilde, Je	effrey P Los Gatos, C	ALIFORNIA			

APPL-NO: 938426 (09)

FILED-DATE: August 23, 2001

GRANTED-DATE: September 23, 2003

PRIORITY: August 23; 2001 - 10938426, United States of America (US)

ASSIGNEE-PRE-ISSUE:

August 23, 2001 - ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS)., CAPELLA PHOTONICS, INC. 19 GREAT OAKS BLVD., SUITE 20SAN JOSE, CALIFORNIA, 95119, Reel and Frame Number: 012118/0994

ASSIGNEE-AT-ISSUE:

Capella Photonics, Inc., San Jose, CALIFORNIA, United States company or corporation (02)

ASSIGNEE-AFTER-ISSUE:

May 5, 2009 - SECURITY AGREEMENT, ZACCARIA, BERT L., 475 SANSOME STREET, SUITE 1850, SANTA CLARA, CALIFORNIA, UNITED STATES OF AMERICA (US), 95054, Reel and Frame Number: 022641/0593 July 9, 2009 - SECURITY AGREEMENT, TEATON CAPITAL COMPANY, 3000 SAND HILL ROAD, SUITE 3-210, MENLO PARK, CALIFORNIA, UNITED STATES OF AMERICA (US), 94025, Reel and Frame Number: 022932/0669

LEGAL-REP: Gray Cary Ware & Freidenrich LLP

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Page 1 of 1

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Patent	Law Digest						
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Page 1 of 1

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Page 1 of 1

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Page 1 of 1

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Page 1 of 1



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Table Of Contents

Page 1 of 2

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	TITLE 1. GENERAL PROVISIONS	
	TITLE 2. THE CONGRESS	1
및 브	TITLE 3. THE PRESIDENT	
	TITLE 4. FLAG AND SEAL, SEAT OF GOVERNMENT, AND THE STATES	1
	TITLE 5. GOVERNMENT ORGANIZATION AND EMPLOYEES	
	TITLE 6. DOMESTIC SECURITY	
	TITLE 7. AGRICULTURE	
	TITLE 8. ALIENS AND NATIONALITY	
	TITLE 9. ARBITRATION	
픱닏	TITLE 10. ARMED FORCES	
	TITLE 11. BANKRUPTCY	
	TITLE 12. BANKS AND BANKING	
	TITLE 13. CENSUS	
	TITLE 14. COAST GUARD	
	TITLE 15. COMMERCE AND TRADE	
	TITLE 16. CONSERVATION	1
	TITLE 17. COPYRIGHTS	1
	TITLE 18. CRIMES AND CRIMINAL PROCEDURE	
븱닏	TITLE 19. CUSTOMS DUTIES	
빛 닏	TITLE 20. EDUCATION	1
# 드	TITLE 21. FOOD AND DRUGS	
팔님	TITLE 22. FOREIGN RELATIONS AND INTERCOURSE	
	TITLE 23. HIGHWAYS	
	TITLE 24. HOSPITALS AND ASYLUMS	1
	TITLE 25. INDIANS	1
	TITLE 26. INTERNAL REVENUE CODE	
		1
	TITLE 28. JUDICIART AND JUDICIAL PROCEDURE	1
	TTLE 29, LABOR	1
H	TITLE 31, MONEY AND FINANCE	i
	TITLE 32 NATIONAL GUARD	1
Ŧ	TITLE 33. NAVIGATION AND NAVIGABLE WATERS	
e r	TITLE 34. [NAVY]	1
Ξ C	TITLE 35. PATENTS	
FI D	TITLE 36, PATRIOTIC AND NATIONAL OBSERVANCES, CEREMONIES, AND ORGANIZATIONS	
E F	TITLE 37, PAY AND ALLOWANCES OF THE UNIFORMED SERVICES	1
÷ F	TITLE 38. VETERANS' BENEFITS	
E F	TITLE 39. POSTAL SERVICE	
Ē	TITLE 40. PUBLIC BUILDINGS, PROPERTY, AND WORKS	

Table Of Co	ntents	Page 2 of 2
	TITLE 41. PUBLIC CONTRACTS TITLE 42. THE PUBLIC HEALTH AND WELFARE TITLE 43. PUBLIC LANDS TITLE 44. PUBLIC PRINTING AND DOCUMENTS TITLE 45. RAILROADS TITLE 45. SHIPPING TITLE 46. SHIPPING TITLE 47. TELEGRAPHS, TELEPHONES, AND RADIOTELEGRAPHS TITLE 48. TERRITORIES AND INSULAR POSSESSIONS TITLE 49. TRANSPORTATION TITLE 50. WAR AND NATIONAL DEFENSE TITLE 51. NATIONAL AND COMMERCIAL SPACE PROGRAMS	
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L17	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (alignment near5 mirrors)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:41
L18	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (telecentric near5 arrangement)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:41
L19	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and collimators	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:41

EAST Search History (Prior Art)

L20	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (beam near5 focuser)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:42
L21	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (micromachined nera5 mirrors)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:42
L22	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (diffraction near5 grating near5 (ruled or holographic or echelle or curved))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:43
L23	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (dispersing near5 prisms)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:43
L24	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (reflective near5 membranes)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:44
L25	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop near5 dynamic near5 method) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/03/08 09:45

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Defa ult Oper ator	Plurals	Time Stamp
L26	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop near5 dynamic near5 method) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions)	USPAT; UPAD	OR	OFF	2011/03/08 09:45
L27	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (reflective near5 membranes)	USPAT; UPAD	OR	OFF	2011/03/08 09:45
L28	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (dispersing near5 prisms)	USPAT; UPAD	OR	OFF	2011/03/08 09:45
L29	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and (diffraction near5 grating near5 (ruled or holographic or echelle or curved))	USPAT; UPAD	OR	OFF	2011/03/08 09:45
L30	0	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 selected near5 port) and (spatial near5 array near5 beam near5 deflecting) and (continuously near5 controllable near5 two near5 dimensions) and collimators	USPAT; UPAD	OR	OFF	2011/03/08 09:45
L31	3	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 channels) and (spatial near5 array near5 beam near5 deflecting) and (continuously nera5 controllable near5 2D)	USPAT; UPAD	OR	OFF	2011/03/08 09:46

Page 5

EAST Search History (Interference)

L32	3	(wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (control near5 power near5 channels) and (spatial near5 array near5 beam near5 deflecting)	USPAT; UPAD	OR	OFF	2011/03/08 09:46
L33	0	(398/79,82,83,84,88,87.ccls.) and (wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (spectral near5 channels) and (spatial near5 array near5 beam near5 deflecting)	USPAT; UPAD	OR	OFF	2011/03/08 09:46
L34	3	(385/24,11,37,34.ccls.) and (wdm or (wavelength near5 multiplexing)) and (add near5 drop) and (spectral near5 channels) and (spatial near5 array near5 beam near5 deflecting)	USPAT; UPAD	OR	OFF	2011/03/08 09:46

3/8/2011 9:47:33 AM C:\Documents and Settings\bhealy\My Documents\EAST\Workspaces\12816084.wsp Page 6

JDS UNIPHASE CORPORATION Exhibit 1002, Page 76

Attorney Docket No. C2393-1106RE1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reissue Appln. No.: 12/816,084

Group Art Unit: 2883

Filed: 06/15/2010

Examiner: Healy, Brian

(Reissue of U.S. Patent No. 6,879,750, Issued April 12, 2005, Patentee: Tai Chen et. al)

Title: Reconfigurable Optical Add-Drop Multiplexers With Servo Control and Dynamic Spectral Power Management Capabilities

RESPONSE

Mail Stop REISSUE

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

Dear Sir:

In response to the Office Action of February 15, 2011, rejecting the claims under 35 U.S.C. §251 as being based upon a defective reissue oath or declaration, enclosed is a Replacement Reissue Application Declaration by Assignee that corrects the defects in the original Declaration filed with this application. Please replace the originally filed Declaration with the enclosed Replacement Reissue Application Declaration.

Remarks

Applicant thanks the Examiner for his helpful suggestions as to changes to the reissue declaration to overcome the rejection of the claims under 35 U.S.C. §251. The enclosed Declaration adopts the Examiner's suggestions.

It is submitted that enclosed Replacement Reissue Application Declaration overcomes the rejection under 35 U.S.C. §251, and that this application is in condition for examination on its merits and for allowance. Accordingly, favorable reconsideration of this and early allowance of all claims are solicited.

Date: March 2, 2011

Respectfully Submitted,

/Barry N. Young/

Barry N. Young Attorney for Assignee Reg. No. 27,744

Customer No. 48789 Law Offices of Barry N. Young 200 Page Mill Road, Suite 102 Palo Alto, CA 94306-2061 Phone: (650) 326-2701 Fax: (650) 326-2799 byoung@young-iplaw.com

Attorney Docket No. C2393-1106RE1

Attorney Docket No. C2393-1106RE1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reissue Appln. No.: 12/816,084

Group Art Unit: 2883

Filed: 06/15/2010 Examiner: Healy, Brian

(Reissue of U.S. Patent No. 6,879,750, Issued April 12, 2005, Patentee: Tai Chen et. al)

Title: Reconfigurable Optical Add-Drop Multiplexers With Servo Control and Dynamic Spectral Power Management Capabilities

REPLACEMENT REISSUE APPLICATION DECLARATION BY ASSIGNEE

I, Larry Schwerin, hereby declare that:

The residence, mailing address and citizenship of the Inventors of the aboveidentified patent for which reissue is sought are as stated below.

I am authorized to act on behalf of the following Assignee: CAPELLA PHOTONICS, INC., A DELAWARE CORPORATION, and my title with said assignee is President and Chief Executive Officer. The entire title and interest in said Patent is vested in said Assignee, and I consent on behalf of said Assignee to the filing of this Reissue Application for the above Patent.

Inventor's Full Name:	Tai Chen
Residence/Mailing Address:	3173 Linkfield Way San Jose, CA 95135
Citizenship:	US

Inventor's Full Name:	Jeffrey P. Wilde
Residence/Mailing Address:	2310 Rockwood Ranch Road Morgan Hill, CA 95037
Citizenship:	US

Inventor's Full Name:	Joseph E. Davis
Residence/Mailing Address:	18765 St. Marks Avenue Morgan Hill, CA 95037
Citizenship:	US

I believe said above named Inventors to be the original and first inventors of the subject matter which is described and claimed in said above identified Patent for which a reissue patent is sought, the specification of which:

was filed as Reissue Application No. 12/816,084 on 06/15/2010;

and was amended by Preliminary Amendment filed on 06/15/2010.

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I verily believe the original Patent to be wholly or partially inoperative or invalid for the reason that the patentee claimed more than he had a right to claim in the Patent.

At least one error upon which reissue is based is described as follows: Claim 1 is deemed to be too broad and invalid in view of U.S. Patent No. 6,498,872 to Bouevitch and further in view of one or more of U.S. Patent No. 6,567,574 to Ma, U.S. Patent No. 6,256,430 to Jin, or U.S. Patent No. 6,631,222 to Wagener by failing to include limitations regarding the spatial array of beam deflecting elements being individually and continuously controllable in two dimensions to control the

- 2 -

JDS UNIPHASE CORPORATION Exhibit 1002, Page 81 power of the spectral channels reflected to selected output ports, as indicated by the amendments to Claim 1 in the Preliminary Amendment referred to above.

All errors corrected in this Reissue Application arose without deceptive intent on the part of the Applicant.

I hereby appoint the practitioners associated with **Customer No. 48489** as our attorneys or agents to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

Please direct all communications to: Barry N. Young Reg. No. 27,744 200 Page Mill Road, Suite 102 Palo Alto, CA 94306 (650) 326-2701 Byoung@young-iplaw.com

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this Declaration is directed.

Dated: _____, 2011

Bv: home

Larry Schwerin President and Chief Executive Officer Capella Photonics, Inc. 5390 Hellyer Avenue San Jose, CA 95138

Electronic Acl	knowledgement Receipt
EFS ID:	9573533
Application Number:	12816084
International Application Number:	
Confirmation Number:	2616
Title of Invention:	Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities
First Named Inventor/Applicant Name:	Tai Chen
Customer Number:	48789
Filer:	Barry N. Young
Filer Authorized By:	
Attorney Docket Number:	C2393-1106RE1
Receipt Date:	02-MAR-2011
Filing Date:	15-JUN-2010
Time Stamp:	18:27:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted wi	th Payment	no			
File Listin	g:				
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After	Perp 3-2-11 pdf	9373		з
	Non-Final Reject	hesp_9 2 11.pdf	f5e28a6bd4f90393999796e65e960dcd730 bf700	110	5
Warnings:					
Information:					

2 Warnings:	Reissue dec filed in accordance with	Repl Re Declr-3-2-11.pdf	1659075 no		3
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Information	:				
		Total Files Size (in bytes): 166	8448	
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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 DEPAR United States Patent and Adress: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 223 www.uspto.gov	TMENT OF COMMERC Trademark Office OR PATENTS \$13-1450
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/816,084	06/15/2010	Tai Chen	C2393-1106RE1	2616
48789	7590 02/15/2011 S OF PARRY N. VOUN(2	EXAM	INER
200 PAGE MII	L ROAD	J	HEALY,	BRIAN
SUITE 102	CA 94306		ART UNIT	PAPER NUMBER
TALO ALTO,	CA 94500		2883	
			NOTIFICATION DATE	DELIVERY MODE
			02/15/2011	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

BYOUNG@YOUNG-IPLAW.COM BNYOUNG7@GMAIL.COM

PTOL-90A (Rev. 04/07)

	Арр	lication No.	Applicant(s)	
	12/8	816,084	CHEN ET AL.	
Office Action Summa	ry Exa	miner	Art Unit	
	BRI	AN M. HEALY	2883	
The MAILING DATE of this co	mmunication appears o	on the cover sheet	with the correspondence addres	s
Period for Reply				
 A SHORTENED STATUTORY PER WHICHEVER IS LONGER, FROM T Extensions of time may be available under the pr after SIX (6) MONTHS from the mailing date of tt If NO period for reply is specified above, the max Failure to reply within the set or extended period Any reply received by the Office later than three earned patent term adjustment. See 37 CFR 1.7 	IOD FOR REPLY IS S THE MAILING DATE C ovisions of 37 CFR 1.136(a). In its communication, imum statutory period will apply for reply will, by statute, cause in nonths after the mailing date of 04(b).	ET TO EXPIRE 3 DF THIS COMMUN n no event, however, may a y and will expire SIX (6) MC the application to become a t this communication, even	MONTH(S) OR THIRTY (30) D. ICATION. a reply be timely filed DNTHS from the mailing date of this commun BANDONED (35 U.S.C. § 133). if timely filed, may reduce any	AYS,
Status				
1) Responsive to communication	(s) filed on			
2a) This action is FINAL .	2b) This actio	n is non-final.		
3) Since this application is in con	dition for allowance ex	cept for formal ma	tters, prosecution as to the me	rits is
closed in accordance with the	practice under Ex par	te Quayle, 1935 C.	D. 11, 453 O.G. 213.	
Disposition of Claims				
4) Claim(s) 1-22 is/are pending in	the application			
4a) Of the above claim(s)	is/are withdrawn fro	m consideration		
5) Claim(s) is/are allowed				
6) Claim(s) 1-22 is/are rejected.				
7) Claim(s) is/are objected	to.			
8) Claim(s) are subject to	restriction and/or elec	tion requirement.		
Application Papers				
9 The specification is objected to	by the Examiner			
10) The drawing(s) filed on $15 Jun$	e 2010 is/are∵a)⊠ ac	cepted or b) 🗌 obi	ected to by the Examiner	
Applicant may not request that an	v objection to the drawin	ng(s) be held in abev	ance. See 37 CFB 1.85(a).	
Replacement drawing sheet(s) in	cluding the correction is	required if the drawin	a(s) is objected to. See 37 CFR 1.	121(d).
11) The oath or declaration is obje	cted to by the Examine	er. Note the attache	ed Office Action or form PTO-1	52.
10) Acknowledgment is made of a	alaim for foreign priori	tu under DE LL C.C.	S 110(a) (d) at (5)	
	claim for foreign priori	ty under 35 0.5.C.	§ 119(a)-(d) of (f).	
	e or. riority documents have	a boon received		
2 Certified copies of the p	riority documents have	e been received in	Application No	
3 Copies of the certified c	onies of the priority do	e been received in	n received in this National Star	10
application from the Inte	ernational Bureau (PC	T Rule 17 2(a))	n received in this National Otag	10
* See the attached detailed Office	action for a list of the	certified copies no	t received	
Attachment(s)				
1) DNotice of References Cited (PTO-892)		4) 🗌 Interview	Summary (PTO-413)	
2) Notice of Draftsperson's Patent Drawing Re	view (PTO-948)	5) Notice of	o(s)/Mail Date	
Paper No(s)/Mail Date <u>20100615</u> .	(60,06)	6) 🛛 Other: <u>at</u>	tached office action.	
5. Patent and Trademark Office	041			

JDS UNIPHASE CORPORATION Exhibit 1002, Page 86 Application/Control Number: 12/816,084 Art Unit: 2883

DETAILED ACTION

Reissue Applications

 Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which Patent No. RE39,397 and USP No. 6,625,346 is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely appraise the Office of any information which is material to patentability of the claims under consideration in this reissue application.

These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

2. The reissue oath/declaration filed with this application is defective because it fails to identify at least one error which is relied upon to support the reissue application. See 37 CFR 1.175(a)(1) and MPEP § 1414.

3. The reissue oath or declaration filed June 15, 2010 (6/15/2010), asserts that the patent was wholly or partially inoperative or invalid because the patentee claims more than he had a right to claim and identified the error that serves as basis for reissue being :

4. "Claims 1,15,16 and 17 may have claimed more than there was a right to claim in view of the cited prior art." The oath or declaration, as filed, lacks specificity because it merely states, "Claims 1,15,16 and 17 <u>may have claimed more</u> than there was a right to in view of <u>the cited</u> <u>prior art</u>.." This recitation does not include any specific language pointed out in at least one of the independent claims which provides the basis for reissue. The phrase "may have claimed

Application/Control Number: 12/816,084 Art Unit: 2883

more" also lacks sufficient specificity because it is left to the reader to determine if the claimed subject matter "may have claimed more" in view of the cited art, which is also not identified, which is a task which lends itself to guessing or trail and error as to what claim language is too broad. Applicant must identify at least one specific piece of prior art (or combination of references) in order to specifically state at least one error.

5. In addition, the oath or declaration, as filed, was printed on paper which needed toner and as a result the oath or declaration is faded and partially illegible.

6. The current text of 37 CFR 1.175(a)(1) reads as follows: "The applicant believes the original patent to be wholly or partly inoperative or invalid by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than the patentee had the right to claim in the patent, stating at least one error being relied upon as the basis for reissue."

7. The Examiner takes note of the fact that the word "state" (used as a verb) is defined by the current Merriam-Webster dictionary (current online edition) as "to express the particulars of especially in words." Thus it can be seem that to "state at least one error" would include "the particulars of (or specificity of) at least one error." While a dictionary definition is somewhat anecdotal the need for specificity of at least one error has been expanded upon in MPEP 1414 (c) which states : "It is not sufficient for an oath/declaration to merely state "this application is being filed to correct errors in the patent which may be noted from the changes made in the disclosure." Rather, the oath/declaration must specifically identify an error. In addition, it is not sufficient to merely reproduce the claims with brackets and underlining and state that such will identify the error. See In re Constant, 827 F.2d 728,729, 3 USPQ 2d 1479 (Fed Cir.), cert.

Denied, **484 U.S. 894** (**1987**). Any error in the claims must be identified by reference <u>to the</u> **specific claim**(s) and the specific claim language wherein lies the error."

8. The reissue oath or declaration also states the original patent to be wholly or partly inoperative or invalid by reasons of the patentee claiming more or less than he had a right to claim in the patent. The MPEP states in 1414 and 37 CFR 1.175; "A statement that the original patent is "wholly or partly inoperative or invalid" by reason of the patentee claiming more or less than the patentee had a right to <u>claim is improper, a claim cannot claim "more or less" at the</u> same time."

9. The Examiner would like to suggest some language which would be acceptable in the oath or declaration. This is not a requirement but a suggestion designed to advance the prosecution of the present application.

10. "<u>Claim 1 is</u> deemed to be too broad and invalid in view of [include at least one specific example of prior art], <u>by not including limitations regarding the spatial array of beam-deflecting elements being individually and continuously controllable in two dimensions to control of power of received spectral channels at selected ports, as indicated by the amendments to <u>Claim 1</u> in the Preliminary Amendment referred to above and filed with this application. "</u>

 For further guidance regarding acceptable declaration language Applicant is referred to MPEP 1414 (II) (c).

 Claims 1-22 are rejected as being based upon a defective reissue oath or declaration under 35 U.S.C. 251 as set forth above. See 37 CFR 1.175.

Application/Control Number: 12/816,084 Art Unit: 2883

The nature of the defect(s) in the oath or declaration is set forth in the discussion above in this Office action (see above discussion).

A copy of PTO-1449 will be included in this office action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIAN M. HEALY whose telephone number is (571)272-2347. The examiner can normally be reached on M-F 6AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Robinson can be reached on (571)272-2319. 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.

> /BRIAN M. HEALY/ Primary Examiner Art Unit 2883

Application/Control Number: 12/816,084 Art Unit: 2883 Page 6

	ndex of (Claims	Application/C 12816084 Examiner BRIAN M HEA	LY	0.	Applica Reexan CHEN E Art Uni 2883	ant(s nina ET A t)/Pat tion L.	tent Unde	r
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=	Allowed	÷	Restricted	1	Interfer	ence		0	Obje	cted
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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. 2616

SERIAL NUM	BER	FILING or DATE	371(c)		CLASS	GR	OUP ART	UNIT	ATTO	RNEY DOCKET NO.
12/816,08	4	06/15/20	10		385		2883		C2	393-1106RE1
	-	RULE								
APPLICANT Tai Chen Jeffrey P. Joseph E	s , San Jo . Wilde, . Davis,	ose, CA; Morgan Hill, C , Morgan Hill, C	CA; CA;							
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BIB (Rev. 05/07).

Receipt date: 06/15/2010

12816084 - GAU: 2883

Doc code: IDS

P10/33/084 (01-10) mation Disclosure Statement (IDS) Filed U.S. Paten and Trademark Office. U.S. DEPARTMENT OF COSMERCE Under the Paperwork Reduction Act of 1985, no persons are required to respond to a collection of information unless it contains a valid OMB control number Doc description: Information Disclosure Statement (IDS) Filed

	Application Number	Filed Herewith
NEADWATION DIAAL AAUDE	Filing Date	Filed Herewith
INFORMATION DISCLOSURE	First Named Inventor	Tai Chen et. al
(Not for submission under 37 CFR 1 99)	Arl Unit	Unknown
	Examiner Name	Unknown
	Attorney Docket Numbe	C2393~1106RE1

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Examiner Initial*	Cite No	Patent Number	Kind Code1	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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/Brian Healy/

02/10/2011

EFS Web 2.1.17

Receipt date: 06/15/2010

12816084 - GAU: 2883

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INFORMATION DISCLOSURE	Filing Date	Filed Herewith
STATEMENT BY ADDI ICANT	First Named Inventor	Tai Chen et. al
(Not for submission under 37 CER 1 99)	Art Unit	Unknown
	Examiner Name	Unknown
	Attorney Docket Number	C2393-1106RE1

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Exhibit 1002, Page 96

EFS Web 2 1 17

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02/10/2011

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Examiner Initial*	Cite No	Publication Number	Kind Code1	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/B.H./	1	20020131691	Ai	2002-09-01	Garrett et al.	ali
/B.H./	2	20030043471	A1	2003-03-01	Belser et. al	ail
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NEODMATION DISCLOSUDE	Filing Date	Filed Herewith
STATEMENT BY ADDI ICANT	First Named Inventor	ai Chen et. al
(Not for submission under 37 CFR 1.99)	Art Unit	Unknown
·	Examiner Name	Unknown
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12816084 - GAU: 2883



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Applicant(s)

Tai Chen, San Jose, CA; Jeffrey P. Wilde, Morgan Hill, CA; Joseph E. Davis, Morgan Hill, CA;

Assignment For Published Patent Application

Capella Photonics, Inc, San Jose, CA

Power of Attorney: The patent practitioners associated with Customer Number 48789

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If Required, Foreign Filing License Granted: 07/02/2010

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Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

page 1 of 3

Title

Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities

Preliminary Class

385

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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

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page 3 of 3



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Applicant(s)

Tai Chen, San Jose, CA; Jeffrey P. Wilde, Morgan Hill, CA; Assignment For Published Patent Application

Capella Photonics, Inc, San Jose, CA Power of Attorney: The patent practitioners associated with Customer Number <u>48789</u>

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Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

page 1 of 3

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page 3 of 3

Attorney Docket No. C2393-1106RE1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reissue Appln. No.: 12/816,084

Group Art Unit: 2883

Filed: 06/15/2010 Examiner:

(Reissue of U.S. Patent No. 6,879,750, Issued April 12, 2005, Patentee: Tai Chen et. al)

Title: Reconfigurable Optical Add-Drop Multiplexers With Servo Control and Dynamic Spectral Power Management Capabilities

REQUEST FOR CORRECTED FILING RECEIPT

Mail Stop REISSUE

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

Dear Sir:

The Official Filing Receipt issued in this case fails to list all of the inventors of

U.S. 6,879,750 of which this application is a reissue application. Attached is a copy

of the incorrect Filing Receipt showing the missing inventor: The missing is inventor

is:

Inventor's Full Name:	Joseph E. Davis
Residence/Mailing Address:	18765 St. Marks Avenue Morgan Hill, CA 95037
Citizenship:	US

The PDF copy of the Reissue Application Declaration By Assignee (PTO/SB/52) filed upon filing this application was incomplete in that it inadvertently failed to include the additional separately numbered sheet listing the above missing inventor, Joseph E. Davis, although the block indicating that additional inventors were listed on the separately numbered sheet on the original Declaration form was checked.

Attached is a complete copy of the originally signed Declaration form that includes the omitted sheet listing the additional inventor Joseph E. Davis.

Please issue a corrected filing receipt that includes the missing inventor, Joseph E. Davis.

Date: July 6, 2010

Respectfully Submitted,

/Barry N. Young/

Barry N. Young Attorney for Assignee Reg. No. 27,744

Customer No. 48789 Law Offices of Barry N. Young 200 Page Mill Road, Suite 102 Palo Alto, CA 94306-2061 Phone: (650) 326-2701 Fax: (650) 326-2799 byoung@young-iplaw.com



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NOT GRANTED

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page 3 of 3

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[Page 1 of 2] Feig cated of elements in a request by thr CFK 1 12: The members a required to obtain or result a secret by the active when is to be random the CFK 11: The members are applicated to obtain a request by the active when is to be random to extended by the active when it is to be random to extended by the active when it is to be random to extended by the active when it is to be random to extended by the active active when it is to be random to extended by the active when it is to be random to extended by the active ac

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Page 2 of 21

Reissue of U.S. Pat. No. 6,879,750 Title: Reconfigurable Optical Add-Drop Multiplexers With Servo Control and Dynamic Spectral Power management Capabilities

Continuation Sheet of PTO/SB/52 - Reissue Declaration By The Assignee

Additional Inventors:

Inventor Joseph E. Davis Citizenship: US

Residence/Mailing Address: 18765 St. Marks Avenue: Morgan Hill, CA 95037

Page 3 of 3

Electronic Acknowledgement Receipt						
EFS ID:	7955858					
Application Number:	12816084					
International Application Number:						
Confirmation Number:	2616					
Title of Invention:	Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities					
First Named Inventor/Applicant Name:	Tai Chen					
Customer Number:	48789					
Filer:	Barry N. Young					
Filer Authorized By:						
Attorney Docket Number:	C2393-1106RE1					
Receipt Date:	06-JUL-2010					
Filing Date:	15-JUN-2010					
Time Stamp:	13:51:09					
Application Type:	Utility under 35 USC 111(a)					

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New Applications Under 35 U.S.C. 111

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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.

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City	Palo Alto	State CA			Zip Code	9430	6
Country	US	Telephone (650) 3	326-2701		Email	Byoun	g@young-iplaw.com
Signature	/Barry N. Young/				Date	June 14	, 2010
Name (Print	/Type) Barry N. Young		Re	egistration N	NO. (Attorne	y/Agent)	27,744
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to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Reissue, 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.

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(12) United States Patent Chen et al.

(54) RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXERS WITH SERVO CONTROL AND DYNAMIC SPECTRAL POWER MANAGEMENT CAPABILITIES

- (75) Inventors: Tai Chen, San Jose, CA (US); Jeffrey P. Wilde, Morgan Hill, CA (US); Joseph E. Davis, Morgan Hill, CA (US)
- (73) Assignee: Capella Photonics, Inc., San Jose, 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.

This patent is subject to a terminal disclaimer.

- (21) Appl. No.: 10/745,364
- (22) Filed: Dec. 22, 2003

(65) Prior Publication Data

US 2004/0136648 A1 Jul. 15, 2004

Related U.S. Application Data

- (63) Continuation of application No. 10/005,714, filed on Nov. 7, 2001, now Pat. No. 6,687,431, which is a continuation of application No. 09/938,426, filed on Aug. 23, 2001, now Pat. No. 6,625,346.
- (60) Provisional application No. 60/277,217, filed on Mar. 19, 2001.
- (51) Int. Cl.⁷ G02B 6/28

- (10) Patent No.:
 US
 6,879,750 B2

 (45) Date of Patent:
 *Apr. 12, 2005

(56) References Cited

U.S. PATENT DOCUMENTS

6,625,346	B2 *	9/2003	Wilde	385/24
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* cited by examiner

Primary Examiner—Phan T. H. Palmer (74) Attorney, Agent, or Firm—Barry N. Young

(57) ABSTRACT

This invention provides a novel wavelength-separatingrouting (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors. The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports. As such, the inventive WSR apparatus is capable of routing the spectral channels on a channel-bychannel basis and coupling any spectral channel into any one of the output ports. The WSR apparatus of the present invention may be further equipped with servo-control and spectral power-management capabilities, thereby maintaining the coupling efficiencies of the spectral channels into the output ports at desired values. The WSR apparatus of the present invention can be used to construct a novel class of dynamically reconfigurable optical add-drop multiplexers (OADMs) for WDM optical networking applications.

22 Claims, 12 Drawing Sheets





US 6,879,750 B2

Sheet 2 of 12

U.S. Patent



JDS UNIPHASE CORPORATION Exhibit 1002, Page 117

Apr. 12, 2005



U.S. Patent

Apr. 12, 2005

Sheet 3 of 12

Fig. 1D



U.S. Patent



Sheet 5 of 12

US 6,879,750 B2







Fig. 2C







Sheet 8 of 12

US 6,879,750 B2



Fig. 3



Fig. 4A



Fig. 4B











1

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. application Ser. No. 10/005,714, filed Nov. 7, 2001 now U.S. Pat. No. 6,687,431, which is a continuation of U.S. application Ser. No. 09/938,426, filed Aug. 23, 2001, now U.S. Pat No. 6,625,346 which claims the benefit of U.S. application Ser. No. 60/277,217, filed Mar. 19, 2001.

FIELD OF THE INVENTION

This invention relates generally to optical communication systems. More specifically, it relates to a novel class of dynamically reconfigurable optical add-drop multiplexers (OADMs) for wavelength division multiplexed optical net-20 working applications.

BACKGROUND

As fiber-optic communication networks rapidly spread into every walk of modern life, there is a growing demand for optical components and subsystems that enable the fiber-optic communications networks to be increasingly scalable, versatile, robust, and cost-effective.

Contemporary fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information bandwidth of the fiber. The 35 prevalence of WDM technology has made optical add-drop multiplexers indispensable building blocks of modern fiberoptic communication networks. An optical add-drop multiplexer (OADM) serves to selectively remove (or drop) one or more wavelengths from a multiplicity of wavelengths on an optical fiber, hence taking away one or more data channels from the traffic stream on the fiber. It further adds one or more wavelengths back onto the fiber, thereby inserting new data channels in the same stream of traffic. As such, an OADM makes it possible to launch and retrieve 45 multiple data channels (each characterized by a distinct wavelength) onto and from an optical fiber respectively, without disrupting the overall traffic flow along the fiber. Indeed, careful placement of the OADMs can dramatically improve an optical communication network's flexibility and 50 robustness, while providing significant cost advantages.

Conventional OADMs in the art typically employ multiplexers/demultiplexers (e.g, waveguide grating routers or arrayed-waveguide gratings), tunable filters, optical switches, and optical circulators in a parallel or serial 55 architecture to accomplish the add and drop functions. In the parallel architecture, as exemplified in U.S. Pat. No. 5,974, 207, a demultiplexer (e.g., a waveguide grating router) first separates a multi-wavelength signal into its constituent spectral components. A wavelength switching/routing 60 means (e.g., a combination of optical switches and optical circulators) then serves to drop selective wavelengths and add others. Finally, a multiplexer combines the remaining (i.e., the pass-through) wavelengths into an output multiwavelength optical signal. In the serial architecture, as 65 exemplified in U.S. Pat. No. 6,205,269, tunable filters (e.g., Bragg fiber gratings) in combination with optical circulators

2

are used to separate the drop wavelengths from the passthrough wavelengths and subsequently launch the add channels into the pass-through path. And if multiple wavelengths are to be added and dropped, additional multiplexers and demultiplexers are required to demultiplex the drop wavelengths and multiplex the add wavelengths, respectively. Irrespective of the underlying architecture, the OADMs currently in the art are characteristically high in cost, and prone to significant optical loss accumulation. Moreover, the designs of these OADMs are such that it is inherently difficult to reconfigure them in a dynamic fashion.

U.S. Pat. No. 6,204,946 to Askyuk et al. discloses an OADM that makes use of free-space optics in a parallel construction. In this case, a multi-wavelength optical signal 15 emerging from an input port is incident onto a ruled diffraction grating. The constituent spectral channels thus separated are then focused by a focusing lens onto a linear array of binary micromachined mirrors. Each micromirror is configured to operate between two discrete states, such that it either retroreflects its corresponding spectral channel back into the input port as a pass-through channel, or directs its spectral channel to an output port as a drop channel. As such, the pass-through signal (i.e., the combined pass-through channels) shares the same input port as the input signal. An optical circulator is therefore coupled to the input port, to provide necessary routing of these two signals. Likewise, the drop channels share the output port with the add channels. An additional optical circulator is thereby coupled to the output port, from which the drop channels exit and the add channels are introduced into the output port. The add channels are subsequently combined with the pass-through signal by way of the diffraction grating and the binary micromirrors.

Although the aforementioned OADM disclosed by Askyuk et al. has the advantage of performing wavelength separating and routing in free space and thereby incurring less optical loss, it suffers a number of limitations. First, it requires that the pass-through signal share the same port/ fiber as the input signal. An optical circulator therefore has to be implemented, to provide necessary routing of these two signals. Likewise, all the add and drop channels enter and leave the OADM through the same output port, hence the need for another optical circulator. Moreover, additional means must be provided to multiplex the add channels before entering the system and to demultiplex the drop channels after exiting the system. This additional multiplexing/demultiplexing requirement adds more cost and complexity that can restrict the versatility of the OADM thus-constructed. Second, the optical circulators implemented in this OADM for various routing purposes introduce additional optical losses, which can accumulate to a substantial amount. Third, the constituent optical components must be in a precise alignment, in order for the system to achieve its intended purpose. There are, however, no provisions provided for maintaining the requisite alignment; and no mechanisms implemented for overcoming degradation in the alignment owing to environmental effects such as thermal and mechanical disturbances over the course of operation.

U.S. Pat. No. 5,906,133 to Tomlinson discloses an OADM that makes use of a design similar to that of Aksyuk et al. There are input, output, drop and add ports implemented in this case. By positioning the four ports in a specific arrangement, each micromirror, notwithstanding switchable between two discrete positions, either reflects its corresponding channel (coming from the input port) to the output port, or concomitantly reflects its channel to the drop

port and an incident add channel to the output port. As such, this OADM is able to perform both the add and drop functions without involving additional optical components (such as optical circulators used in the system of Aksyuk et al.). However, because a single drop port is designated for all the drop channels and a single add port is designated for all the add channels, the add channels would have to be multiplexed before entering the add port and the drop channels likewise need to be demutiplexed upon exiting from the drop port. Moreover, as in the case of Askyuk et al., there are no provisions provided for maintaining requisite optical alignment in the system, and no mechanisms implemented for combating degradation in the alignment due to environmental effects over the course of operation.

As such, the prevailing drawbacks suffered by the OADMs currently in the art are summarized as follows: 1) The wavelength routing is intrinsically static, rendering it

- difficult to dynamically reconfigure these OADMs.
- 2) Add and/or drop channels often need to be multiplexed and/or demultiplexed, thereby imposing additional complexity and cost.
- 3) Stringent fabrication tolerance and painstaking optical alignment are required. Moreover, the optical alignment is not actively maintained, rendering it susceptible to environmental effects such as thermal and mechanical disturbances over the course of operation.
- 4) In an optical communication network, OADMs are typically in a ring or cascaded configuration. In order to mitigate the interference amongst OADMs, which often adversely affects the overall performance of the network, it is essential that the power levels of spectral channels 30 entering and exiting each OADM be managed in a systematic way, for instance, by introducing power (or gain) equalization at each stage. Such a power equalization capability is also needed for compensating for nonuniform gain caused by optical amplifiers (e.g., erbium 35 doped fiber amplifiers) in the network. There lacks, however, a systematic and dynamic management of the power levels of various spectral channels in these OADMs.
- 5) The inherent high cost and heavy optical loss further 40 impede the wide application of these OADMs.

In view of the foregoing, there is an urgent need in the art for optical add-drop multiplexers that overcome the aforementioned shortcomings in a simple, effective, and economical construction.

SUMMARY

The present invention provides a wavelength-separatingrouting (WSR) apparatus and method which employ an array of fiber collimators serving as an input port and a 50 plurality of output ports; a wavelength-separator; a beamfocuser; and an array of channel micromirrors.

In operation, a multi-wavelength optical signal emerges from the input port. The wavelength-separator separates the multi-wavelength optical signal into multiple spectral 55 channels, each characterized by a distinct center wavelength and associated bandwidth. The beam-focuser focuses the spectral channels into corresponding spectral spots. The channel micromirrors are positioned such that each channel micromirror receives one of the spectral channels. The 60 channel micromirrors are individually controllable and movable, e.g., continuously pivotable (or rotatable), so as to reflect the spectral channels into selected ones of the output ports. As such, each channel micromirror is assigned to a specific spectral channel, hence the name "channel micro- 65 mirror". And each output port may receive any number of the reflected spectral channels.

4

A distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion, e.g., pivoting (or rotation), of each channel micromirror is under analog control such that its pivoting angle can be continuously adjusted. This enables each channel micromirror to scan its corresponding spectral channel across all possible output ports and thereby direct the spectral channel to any desired output port.

In the WSR apparatus of the present invention, the wavelength-separator may be provided by a ruled diffraction grating, a holographic diffraction grating, an echelle grating, a curved diffraction grating, a dispersing prism, or other wavelength-separating means known in the art. The beamfocuser may be a single lens, an assembly of lenses, or other beam-focusing means known in the art. The channel micromirrors may be provided by silicon micromachined mirrors, reflective ribbons (or membranes), or other types of beamdeflecting means known in the art. And each channel micromirror may be pivotable about one or two axes. The fiber collimators serving as the input and output ports may be arranged in a one-dimensional or two-dimensional array. In the latter case, the channel micromirrors must be pivotable biaxially.

The WSR apparatus of the present invention may further comprise an array of collimator-alignment mirrors, in optical communication with the wavelength-separator and the fiber collimators, for adjusting the alignment of the input multi-wavelength signal and directing the spectral channels into the selected output ports by way of angular control of the collimated beams. Each collimator-alignment mirror may be rotatable about one or two axes. The collimatoralignment mirrors may be arranged in a one-dimensional or two-dimensional array. First and second arrays of imaging lenses may additionally be optically interposed between the collimator-alignment mirrors and the fiber collimators in a telecentric arrangement, thereby "imaging" the collimatoralignment mirrors onto the corresponding fiber collimators to ensure an optimal alignment.

The WSR apparatus of the present invention may further include a servo-control assembly, in communication with the channel micromirrors and the output ports. The servocontrol assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports. (If the WSR apparatus includes an array of collimator-alignment mirrors as described above, the servo-control assembly may additionally provide dynamic control of the collimator-alignment mirrors.) Moreover, the utilization of such a servo-control assembly effectively relaxes the requisite fabrication tolerances and the precision of optical alignment during assembly of a WSR apparatus of the present invention, and further enables the system to correct for shift in optical alignment over the course of operation. A WSR apparatus incorporating a servo-control assembly thus described is termed a WSR-S apparatus, thereinafter in the present invention.

Accordingly, the WSR-S (or WSR) apparatus of the present invention may be used to construct a variety of optical devices, including a novel class of dynamically reconfigurable optical add-drop multiplexers (OADMs), as exemplified in the following embodiments.

One embodiment of an OADM of the present invention comprises an aforementioned WSR-S (or WSR) apparatus

and an optical combiner. The output ports of the WSR-S apparatus include a pass-through port and one or more drop ports, each carrying any number of the spectral channels. The optical combiner is coupled to the pass-through port, serving to combine the pass-through channels with one or more add spectral channels. The combined optical signal constitutes an output signal of the system. The optical combiner may be an N×1 (N≥2) broadband fiber-optic coupler, for instance, which also serves the purpose of multiplexing a multiplicity of add spectral channels to be 10 coupled into the system.

In another embodiment of an OADM of the present invention, a first WSR-S (or WSR) apparatus is cascaded with a second WSR-S (or WSR) apparatus. The output ports of the first WSR-S (or WSR) apparatus include a pass- 15 through port and one or more drop ports. The second WSR-S (or WSR) apparatus includes a plurality of input ports and an exiting port. The configuration is such that the pass-through channels from the first WSR-S apparatus and one or more add channels are directed into the input ports of the second 20 WSR-S apparatus, and consequently multiplexed into an output multi-wavelength optical signal directed into the exiting port of the second WSR-S apparatus. That is to say that in this embodiment, one WSR-S apparatus (e.g., the first one) effectively performs a dynamic drop function, whereas 25 the other WSR-S apparatus (e.g., the second one) carries out a dynamic add function. And there are essentially no fundamental restrictions on the wavelengths that can be added or dropped, other than those imposed by the overall communication system. Moreover, the underlying OADM archi-30 tecture thus presented is intrinsically scalable and can be readily extended to any number of the WSR-S (or WSR) systems, if so desired for performing intricate add and drop functions in a network environment.

Those skilled in the art will recognize that the aforemen- 35 tioned embodiments provide only two of many embodiments of a dynamically reconfigurable OADM according to the present invention. Various changes, substitutions, and alternations can be made herein, without departing from the principles and the scope of the invention. Accordingly, a 40 skilled artisan can design an OADM in accordance with the present invention, to best suit a given application.

All in all, the OADMs of the present invention provide many advantages over the prior art devices, notably:

- 1) By advantageously employing an array of channel micro- 45 mirrors that are individually and continuously controllable, an OADM of the present invention is capable of routing the spectral channels on a channel-bychannel basis and directing any spectral channel into any one of the output ports. As such, its underlying operation 50 is dynamically reconfigurable, and its underlying architecture is intrinsically scalable to a large number of channel counts.
- 2) The add and drop spectral channels need not be multiplexed and demultiplexed before entering and after leav- 55 ing the OADM respectively. And there are not fundamental restrictions on the wavelengths to be added or dropped.
- 3) The coupling of the spectral channels into the output ports is dynamically controlled by a servo-control assembly, effects (such as thermal and mechanical disturbances) and therefore more robust in performance. By maintaining an optimal optical alignment, the optical losses incurred by the spectral channels are also significantly reduced.
- 4) The power levels of the spectral channels coupled into the 65 output ports can be dynamically managed according to demand, or maintained at desired values (e.g., equalized

6

at a predetermined value) by way of the servo-control assembly. This spectral power-management capability as an integral part of the OADM will be particularly desirable in WDM optical networking applications.

- 5) The use of free-space optics provides a simple, low loss, and cost-effective construction. Moreover, the utilization of the servo-control assembly effectively relaxes the requisite fabrication tolerances and the precision of optical alignment during initial assembly, enabling the OADM to be simpler and more adaptable in structure, lower in cost and optical loss.
- 6) The underlying OADM architecture allows a multiplicity of the OADMs according to the present invention to be readily assembled (e.g., cascaded) for WDM optical networking applications.

The novel features of this invention, as well as the invention itself, will be best understood from the following drawings and detailed description.

BRIEF DESCRIPTION OF THE FIGURES

FIGS. 1A-1D show a first embodiment of a wavelengthseparating-routing (WSR) apparatus according to the present invention, and the modeling results demonstrating the performance of the WSR apparatus;

FIGS. 2A-2C depict second and third embodiments of a WSR apparatus according to the present invention;

FIG. 3 shows a fourth embodiment of a WSR apparatus according to the present invention;

FIGS. 4A-4B show schematic illustrations of two embodiments of a WSR-S apparatus comprising a WSR apparatus and a servo-control assembly, according to the present invention:

FIG. 5 depicts an exemplary embodiment of an optical add-drop multiplexer (OADM) according to the present invention; and

FIG. 6 shows an alternative embodiment of an OADM according to the present invention.

DETAILED DESCRIPTION

In this specification and appending claims, a "spectral channel" is characterized by a distinct center wavelength and associated bandwidth. Each spectral channel may carry a unique information signal, as in WDM optical networking applications.

FIG. 1A depicts a first embodiment of a wavelengthseparating-routing (WSR) apparatus according to the present invention. By way of example to illustrate the general principles and the topological structure of a wavelength-separating-routing (WSR) apparatus of the present invention, the WSR apparatus 100 comprises multiple input/output ports which may be in the form of an array of fiber collimators 110, providing an input port 110-1 and a plurality of output ports 110-2 through 110-N (N≥3); a wavelength-separator which in one form may be a diffraction grating 101; a beam-focuser in the form of a focusing lens 102; and an array of channel micromirrors 103

In operation, a multi-wavelength optical signal emerges rendering the OADM less susceptible to environmental 60 from the input port 110-1. The diffraction grating 101 angularly separates the multi-wavelength optical signal into multiple spectral channels, which are in turn focused by the focusing lens 102 into a spatial array of distinct spectral spots (not shown in FIG. 1A) in a one-to-one correspondence. The channel micromirrors 103 are positioned in accordance with the spatial array formed by the spectral spots, such that each channel micromirror receives one of

the spectral channels. The channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed into selected ones of the output ports 110-2 through 110-N by way of the focusing lens 102 and the diffraction grating 101. As such, each channel micromirror is assigned to a specific spectral channel, hence the name "channel micromirror" Each output port may receive any number of the reflected spectral channels.

For purposes of illustration and clarity, only a selective few (e.g., three) of the spectral channels, along with the input multi-wavelength optical signal, are graphically illustrated in FIG. 1A and the following figures. It should be noted, however, that there can be any number of the spectral channels in a WSR apparatus of the present invention (so long as the number of spectral channels does not exceed the number of channel mirrors employed in the system). It should also be noted that the optical beams representing the spectral channels shown in FIG. 1A and the following 20 figures are provided for illustrative purpose only. That is, their sizes and shapes may not be drawn according to scale. For instance, the input beam and the corresponding diffracted beams generally have different cross-sectional shapes, so long as the angle of incidence upon the diffraction 25 grating is not equal to the angle of diffraction, as is known to those skilled in the art.

In the embodiment of FIG. 1A, it is preferable that the diffraction grating 101 and the channel micromirrors 103 are placed respectively at the first and second (i.e., the front and back) focal points (on the opposing sides) of the focusing lens 102. Such a telecentric arrangement allows the chief rays of the focused beams to be parallel to each other and generally parallel to the optical axis. In this application, the telecentric configuration further allows the reflected spectral 35 channels to be efficiently coupled into the respective output ports, thereby minimizing various translational walk-off effects that may otherwise arise. Moreover, the input multiwavelength optical signal is preferably collimated and circular in cross-section. The corresponding spectral channels 4 diffracted from the diffraction grating 101 are generally elliptical in cross-section; they may be of the same size as the input beam in one dimension and elongated in the other dimension.

It is known that the diffraction efficiency of a diffraction 45 grating is generally polarization-dependent. That is, the diffraction efficiency of a grating in a standard mounting configuration may be considerably higher for P-polarization that is perpendicular to the groove lines on the grating than for S-polarization that is orthogonal to P-polarization, espe- 50 cially as the number of groove lines (per unit length) increases. To mitigate such polarization-sensitive effects, a quarter-wave plate 104 may be optically interposed between the diffraction grating 101 and the channel micromirrors 103, and preferably placed between the diffraction grating 55 101 and the focusing lens 102 as is shown in FIG. 1A. In this way, each spectral channel experiences a total of approximately 90-degree rotation in polarization upon traversing the quarter-wave plate 104 twice. (That is, if a beam of light has P-polarization when first encountering the diffraction 60 grating, it would have predominantly (if not all) S-polarization upon the second encountering, and vice versa.) This ensures that all the spectral channels incur nearly the same amount of round-trip polarization dependent loss.

In the WSR apparatus 100 of FIG. 1A, the diffraction grating 101, by way of example, is oriented such that the

8

focused spots of the spectral channels fall onto the channel micromirrors 103 in a horizontal array, as illustrated in FIG. 1B.

Depicted in FIG. 1B is a close-up view of the channel micromirrors 103 shown in the embodiment of FIG. 1A. By way of example, the channel micromirrors 103 are arranged in a one-dimensional array along the x-axis (i.e., the horizontal direction in the figure), so as to receive the focused spots of the spatially separated spectral channels in a oneto-one correspondence. (As in the case of FIG. 1A, only three spectral channels are illustrated, each represented by a converging beam.) Let the reflective surface of each channel micromirror lie in the x-y plane as defined in the figure and be movable, e.g., pivotable (or deflectable) about the x-axis in an analog (or continuous) manner. Each spectral channel, upon reflection, is deflected in the y-direction (e.g., downward) relative to its incident direction, so to be directed into one of the output ports 110-2 through 110-N shown in FIG. 1A.

As described above, a unique feature of the present invention is that the motion of each channel micromirror is individually and continuously controllable, such that its position, e.g., pivoting angle, can be continuously adjusted. This enables each channel micromirror to scan its corresponding spectral channel across all possible output ports and thereby direct the spectral channel to any desired output port. To illustrate this capability, FIG. 1C shows a plot of coupling efficiency as a function of a channel micromirror's pivoting angle 0, provided by a ray-tracing model of a WSR apparatus in the embodiment of FIG. 1A. As used herein, the coupling efficiency for a spectral channel is defined as the ratio of the amount of optical power coupled into the fiber core in an output port to the total amount of optical power incident upon the entrance surface of the fiber (associated with the fiber collimator serving as the output port). In the ray-tracing model, the input optical signal is incident upon a diffraction grating with 700 lines per millimeter at a grazing angle of 85 degrees, where the grating is blazed to optimize the diffraction efficiency for the "-1" order. The focusing lens has a focal length of 100 mm. Each output port is provided by a quarter-pitch GRIN lens (2 mm in diameter) coupled to an optical fiber (see FIG. 1D). As displayed in FIG. 1C, the coupling efficiency varies with the pivoting angle θ , and it requires about a 0.2-degree change in θ for the coupling efficiency to become practically negligible in this exemplary case. As such, each spectral channel may practically acquire any coupling efficiency value by way of controlling the pivoting angle of its corresponding channel micromirror. This is also to say that variable optical attenuation at the granularity of a single wavelength can be obtained in a WSR apparatus of the present invention. FIG. 1D provides ray-tracing illustrations of two extreme points on the coupling efficiency vs. 0 curve of FIG. 1C: on-axis coupling corresponding to $\theta=0$, where the coupling efficiency is maximum; and off-axis coupling corresponding to θ =0.2 degrees, where the representative collimated beam (representing an exemplary spectral channel) undergoes a significant translational walk-off and renders the coupling efficiency practically negligible. All in all, the exemplary modeling results thus described demonstrate the unique capabilities of the WSR apparatus of the present invention.

FIG. 1A provides one of many embodiments of a WSR apparatus according to the present invention. In general, the wavelength-separator is a wavelength-separating means that 65 may be a ruled diffraction grating, a holographic diffraction grating, an echelle grating, a dispersing prism, or other types of spectral-separating means known in the art. The beam-

focuser may be a focusing lens, an assembly of lenses, or other beam-focusing means known in the art. The focusing function may also be accomplished by using a curved diffraction grating as the wavelength-separator. The channel micromirrors may be provided by silicon micromachined mirrors, reflective ribbons (or membranes), or other types of beam-deflecting elements known in the art. And each micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports. The underlying fabrication techniques for micromachined mirrors and associated actuation mechanisms are well documented in the art, see U.S. Pat. No. 5,629,790 for example. Moreover, a fiber collimator is typically in the form of a collimating lens (such as a GRIN lens) and a ferrule-mounted fiber packaged together in a mechanically rigid stainless steel (or glass) tube. The fiber collimators serving as the input and output ports may be arranged in a one-dimensional array, a twodimensional array, or other desired spatial pattern. For instance, they may be conveniently mounted in a linear array along a V-groove fabricated on a substrate made of silicon, plastic, or ceramic, as commonly practiced in the art. It 25 should be noted, however, that the input port and the output ports need not necessarily be in close spatial proximity with each other, such as in an array configuration (although a close packing would reduce the rotational range required for each channel micromirror). Those skilled in the art will know how to design a WSR apparatus according to the present invention, to best suit a given application.

A WSR apparatus of the present invention may further comprise an array of collimator-alignment mirrors, for adjusting the alignment of the input multi-wavelength optical signal and facilitating the coupling of the spectral channels into the respective output ports, as shown in FIGS. 2A–2B and 3.

Depicted in FIG. 2A is a second embodiment of a WSR apparatus according to the present invention. By way of 40 example, WSR apparatus 200 is built upon and hence shares a number of the elements used in the embodiment of FIG. 1A, as identified by those labeled with identical numerals. Moreover, a one-dimensional array 220 of collimatoralignment mirrors 220-1 through 220-N is optically inter- 45 posed between the diffraction grating 101 and the fiber collimator array 110. The collimator-alignment mirror 220-1 is designated to correspond with the input port 110-1, for adjusting the alignment of the input multi-wavelength optical signal and therefore ensuring that the spectral channels 50 impinge onto the corresponding channel micromirrors. The collimator-alignment mirrors 220-2 through 220-N are designated to the output ports 110-2 through 110-N in a oneto-one correspondence, serving to provide angular control of the collimated beams of the reflected spectral channels and 55 thereby facilitating the coupling of the spectral channels into the respective output ports according to desired coupling efficiencies. Each collimator-alignment mirror may be rotatable about one axis, or two axes.

The embodiment of FIG. 2A is attractive in applications 60 where the fiber collimators (serving as the input and output ports) are desired to be placed in close proximity to the collimator-alignment mirror array 220. To best facilitate the coupling of the spectral channels into the output ports, arrays of imaging lenses may be implemented between the 65 collimator-alignment mirror array 220 and the fiber collimator array 110, as depicted in FIG. 2B. By way of example,

10

WSR apparatus 250 of FIG. 2B is built upon and hence shares many of the elements used in the embodiment of FIG. 2A, as identified by those labeled with identical numerals. Additionally, first and second arrays 260, 270 of imaging lenses are placed in a 4-f telecentric arrangement with respect to the collimator-alignment mirror array 220 and the fiber collimator array 110. The dashed box 280 shown in FIG. 2C provides a top view of such a telecentric arrangement. In this case, the imaging lenses in the first and second arrays 260, 270 all have the same focal length f. The collimator-alignment mirrors 220-1 through 220-N are placed at the respective first (or front) focal points of the imaging lenses in the first array 260. Likewise, the fiber collimators 110-1 through 110-N are placed at the respective second (or back) focal points of the imaging lenses in the second array 270. And the separation between the first and second arrays 260, 270 of imaging lenses is 2f. In this way, the collimator-alignment mirrors 220-1 through 220-N are effectively imaged onto the respective entrance surfaces (i.e., the front focal planes) of the GRIN lenses in the corresponding fiber collimators 110-1 through 110-N. Such a telecentric imaging system substantially eliminates translational walk-off of the collimated beams at the output ports that may otherwise occur as the mirror angles change.

FIG. 3 shows a fourth embodiment of a WSR apparatus according to the present invention. By way of example, WSR apparatus 300 is built upon and hence shares a number of the elements used in the embodiment of FIG. 2B, as identified by those labeled with identical numerals. In this case, the one-dimensional fiber collimator array 110 of FIG. 2B is replaced by a two-dimensional array 350 of fiber collimators, providing for an input-port and a plurality of output ports. Accordingly, the one-dimensional collimatoralignment mirror array 220 of FIG. 2B is replaced by a two-dimensional array 320 of collimator-alignment mirrors, and first and second one-dimensional arrays 260, 270 of imaging lenses of FIG. 2B are likewise replaced by first and second two-dimensional arrays 360, 370 of imagining lenses respectively. As in the case of the embodiment of FIG. 2B, the first and second two-dimensional arrays 360, 370 of imaging lenses are placed in a 4-f telecentric arrangement with respect to the two-dimensional collimator-alignment mirror array 320 and the two-dimensional fiber collimator array 350. The channel micromirrors 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to any one of the output ports). As such, the WSR apparatus 300 is equipped to support a greater number of the output ports.

In addition to facilitating the coupling of the spectral channels into the respective output ports as described above, the collimator-alignment mirrors in the above embodiments also serve to compensate for misalignment (e.g., due to fabrication and assembly errors) in the fiber collimators that provide for the input and output ports. For instance, relative misalignment between the fiber cores and their respective collimating lenses in the fiber collimators can lead to pointing errors in the collimated beams, which may be corrected for by the collimator-alignment mirrors. For these reasons, the collimator-alignment mirrors are preferably rotatable about two axes. They may be silicon micromachined mirrors, for fast rotational speeds. They may also be other types of mirrors or beam-deflecting elements known in the art.

To optimize the coupling of the spectral channels into the output ports and further maintain the optimal optical alignment against environmental effects such as temperature variations and mechanical instabilities over the course of operation, a WSR apparatus of the present invention may incorporate a servo-control assembly, for providing dynamic control of the coupling of the spectral channels into the respective output ports on a channel-by-channel basis. A WSR apparatus incorporating a servo-control assembly is termed a WSR-S apparatus, thereinafter in this specification.

FIG. 4A depicts a schematic illustration of a first embodiment of a WSR-S apparatus according to the present invention. The WSR-S apparatus 400 comprises a WSR apparatus 410 and a servo-control assembly 440. The WSR 410 may be in the embodiment of FIG. 1A, or any other embodiment in accordance with the present invention. The servo-control assembly 440 includes a spectral monitor 460, for monitoring the power levels of the spectral channels coupled into the output ports 420-1 through 420-N of the WSR apparatus 15 410. By way of example, the spectral monitor 460 is coupled to the output ports 420-1 through 420-N by way of fiberoptic couplers 420-1-C through 420-N-C, wherein each fiber-optic coupler serves to tap off a predetermined fraction of the optical signal in the corresponding output port. The 20 servo-control assembly 440 further includes a processing unit 470, in communication with the spectral monitor 460 and the channel micromirrors 430 of the WSR apparatus 410. The processing unit 470 uses the power measurements from the spectral monitor 460 to provide feedback control of 25 the channel micromirrors 430 on an individual basis, so as to maintain a desired coupling efficiency for each spectral channel into a selected output port. As such, the servocontrol assembly 440 provides dynamic control of the coupling of the spectral channels into the respective output 30 ports on a channel-by-channel basis and thereby manages the power levels of the spectral channels coupled into the output ports. The power levels of the spectral channels in the output ports may be dynamically managed according to demand, or maintained at desired values (e.g., equalized at 35 a predetermined value) in the present invention. Such a spectral power-management capability is essential in WDM optical networking applications, as discussed above.

FIG. 4B depicts a schematic illustration of a second embodiment of a WSR-S apparatus according to the present invention. The WSR-S apparatus 450 comprises a WSR apparatus 480 and a servo-control assembly 490. In addition to the channel micromirrors 430 (and other elements identified by the same numerals as those used in FIG. 4A), the WSR apparatus 480 further includes a plurality of 45 collimator-alignment mirrors 485, and may be configured according to the embodiment of FIGS. 2A, 2B, 3, or any other embodiment in accordance with the present invention. By way of example, the servo-control assembly 490 includes the spectral monitor 460 as described in the 50 embodiment of FIG. 4A, and a processing unit 495. In this case, the processing unit 495 is in communication with the channel micromirrors 430 and the collimator-alignment mirrors 485 of the WSR apparatus 480, as well as the spectral monitor 460. The processing unit 495 uses the power 55 measurements from the spectral monitor 460 to provide dynamic control of the channel micromirrors 430 along with the collimator-alignment mirrors 485, so to maintain the coupling efficiencies of the spectral channels into the output ports at desired values.

In the embodiment of FIG. 4A or 4B, the spectral monitor 460 may be one of spectral power monitoring devices known in the art that is capable of detecting the power levels of spectral components in a multi-wavelength optical signal. Such devices are typically in the form of a wavelength- 65 separating means (e.g., a diffraction grating) that spatially separates a multi-wavelength optical signal by wavelength

12

into constituent spectral components, and one or more optical sensors (e.g., an array of photodiodes) that are configured such to detect the power levels of these spectral components. The processing unit 470 in FIG. 4A (or the processing unit 495 in FIG. 4B) typically includes electrical circuits and signal processing programs for processing the power measurements received from the spectral monitor 460 and generating appropriate control signals to be applied to the channel micromirrors 430 (and the collimator-alignment mirrors 485 in the case of FIG. 4B), so to maintain the coupling efficiencies of the spectral channels into the output ports at desired values. The electronic circuitry and the associated signal processing algorithm/software for such processing unit in a servo-control system are known in the art. A skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application.

The incorporation of a servo-control assembly provides additional advantages of effectively relaxing the requisite fabrication tolerances and the precision of optical alignment during initial assembly of a WSR apparatus of the present invention, and further enabling the system to correct for shift in the alignment over the course of operation. By maintaining an optimal optical alignment, the optical losses incurred by the spectral channels are also significantly reduced. As such, the WSR-S apparatus thus constructed is simpler and more adaptable in structure, more robust in performance, and lower in cost and optical loss. Accordingly, the WSR-S (or WSR) apparatus of the present invention may be used to construct a variety of optical devices and utilized in many applications.

For instance, by directing the spectral channels into the output ports in a one-channel-per-port fashion and coupling the output ports of a WSR-S (or WSR) apparatus to an array of optical sensors (e.g., photodiodes), or a single optical sensor that is capable of scanning across the output ports, a dynamic and versatile spectral power monitor (or channel analyzer) is provided, which would be highly desired in WDM optical networking applications. Moreover, a novel class of optical add-drop multiplexers (OADMs) may be built upon the WSR-S (or WSR) apparatus of the present invention, as exemplified in the following embodiments.

FIG. 5 depicts an exemplary embodiment of an optical add-drop multiplexer (OADM) according to the present invention. By way of example, OADM 500 comprises a WSR-S (or WSR) apparatus 510 and an optical combiner 550. An input port 520 of the WSR-S apparatus 510 transmits a multi-wavelength optical signal. The constituent spectral channels are subsequently separated and routed into a plurality of output ports, including a pass-through port 530 and one or more drop ports 540-1 through 540-N (N≥1). The pass-through port 530 may receive any number of the spectral channels (i.e., the pass-through spectral channels). Each drop port may also receive any number of the spectral channels (i.e., the drop spectral channels). The pass-through port 530 is optically coupled to the optical combiner 550, which serves to combine the pass-through spectral channels with one or more add spectral channels provided by one or 60 more add ports 560-1 through 560-M (M≥1). The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal.

In the above embodiment, the optical combiner 550 may be a K×1 (K≥2) broadband fiber-optic coupler, wherein there are K input-ends and one output-end. The pass-through spectral channels and the add spectral channels are fed into the K input-ends (e.g., in a one-to-one correspondence) and

the combined optical signal exits from the output-end of the K×1 fiber-optic coupler as the output multi-wavelength optical signal of the system. Such a multiple-input coupler also serves the purpose of multiplexing a multiplicity of add spectral channels to be coupled into the OADM 500. If the power levels of the spectral channels in the output multi-wavelength optical signal are desired to be actively managed, such as being equalized at a predetermined value, two spectral monitors may be utilized. As a way of example, the first spectral monitor may receive optical signals tapped off from the pass-through port 530 and the drop ports 540-1 through 540-N (e.g., by way of fiber-optic couplers as depicted in FIG. 4A or 4B). The second spectral monitor receives optical signals tapped off from the exiting port 570. A servo-control system may be constructed accordingly for monitoring and controlling the pass-through, drop and add 15 spectral channels. As such, the embodiment of FIG. 5 provides a versatile optical add-drop multiplexer in a simple and low-cost assembly, while providing multiple physically separate drop/add ports in a dynamically reconfigurable fashion.

FIG. 6 depicts an alternative embodiment of an optical add-drop multiplexer (OADM) according to the present invention. By way of example, OADM 600 comprises a first WSR-S apparatus 610 optically coupled to a second WSR-S apparatus 650. Each WSR-S apparatus may be in the 25 embodiment of FIG. 4A or 4B. (A WSR apparatus of the embodiment of FIG. 1A, 2A, 2B, or 3 may be alternatively implemented.) The first WSR-S apparatus 610 includes an input port 620, a pass-through port 630, and one or more drop ports 640-1 through 640-N (N≥1). The pass-through 30 spectral channels from the pass-through port 630 are further coupled to the second WSR-S apparatus 650, along with one or more add spectral channels emerging from add ports 660-1 through 660-M (M≥1). In this exemplary case, the pass-through port 630 and the add ports 660-1 through 35 660-M constitute the input ports for the second WSR-S apparatus 650. By way of its constituent wavelengthseparator (e.g., a diffraction grating) and channel micromirrors (not shown in FIG. 6), the second WSR-S apparatus 650 serves to multiplex the pass-through spectral channels and 40 the add spectral channels, and route the multiplexed optical signal into an exiting port 770 to provide an output signal of the system.

In the embodiment of FIG. 6, one WSR-S apparatus (e.g., the first WSR-S apparatus 610) effectively performs 45 dynamic drop function, whereas the other WSR-S apparatus (e.g., the second WSR-S apparatus 650) carries out dynamic add function. And there are essentially no fundamental restrictions on the wavelengths that can be added or dropped (other than those imposed by the overall communication 50 system). Moreover, the underlying OADM architecture thus presented is intrinsically scalable and can be readily extended to any number of cascaded WSR-S (or WSR) systems, if so desired for performing intricate add and drop functions. Additionally, the OADM of FIG. 6 may be 55 operated in reverse direction, by using the input ports as the output ports, the drop ports as the add ports, and vice versa.

Those skilled in the art will recognize that the aforementioned embodiments provide only two of many embodiments of a dynamically reconfigurable OADM according to 60 the present invention. Those skilled in the art will also appreciate that various changes, substitutions, and alternations can be made herein without departing from the principles and the scope of the invention as defined in the appended claims. Accordingly, a skilled artisan can design 65 an OADM in accordance with the principles of the present invention, to best suit a given application.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions, and alternations can be made herein without departing from the principles and the scope of the invention. Accordingly, the scope of the present invention should be determined by the following claims and their legal equivalents.

What is claimed is:

1. An optical add-drop apparatus comprising an input port for an input multi-wavelength optical signal having first spectral channels; one or more other ports for second spectral channels; an output port for an output multiwavelength optical signal; a wavelength-selective device for spatially separating said spectral channels; and a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable to reflect its corresponding spectral channel to a selected one of said ports.

 The optical add-drop apparatus of claim 1 further comprising a control unit for controlling each of said beamdeflecting elements.

3. The optical add-drop apparatus of claim 2, wherein the control unit further comprises a servo-control assembly, including a spectral monitor for monitoring power levels of selected ones of said spectral channels, and a processing unit responsive to said power levels for controlling said beam-deflecting elements.

 The optical add-drop apparatus of claim 3, wherein said servo-control assembly maintains said power levels at predetermined values.

5. The optical add-drop apparatus of claim 2, wherein the control unit controls said beam-deflecting elements to direct selected ones of said first spectral channels to one or more of said second ports to be dropped as second spectral channels from said output multi-wavelength optical signal.

6. The optical add-drop apparatus of claim 2, wherein the control unit controls said beam-deflecting elements to direct selected ones of said second spectral channels to said output port to be added to said output multi-wavelength optical signal.

7. The optical add-drop apparatus of claim 1 further comprising alignment mirrors for adjusting alignment of said input and output multi-wavelength optical signals and said second spectral channels with said wavelength-selective device.

8. The optical add-drop apparatus of claim 7 further comprising collimators associated with said alignment mirrors, and imaging lenses in a telecentric arrangement with said alignment mirrors and said collimators.

9. The optical add-drop apparatus of claim 1, wherein said wavelength selective device further combines selected ones of said spectral channels reflected from said beam-deflecting elements to form said output multi-wavelength optical signal.

10. The optical add-drop apparatus of claim 1, wherein said one or more other ports comprise an add port and a drop port for respectively adding second and dropping first spectral channels.

11. The optical add-drop apparatus of claim 1 further comprising a beam-focuser for focusing said separated spectral channels onto said beam deflecting elements.

12. The optical add-drop apparatus of claim 1, wherein said wavelength-selective device comprises a device selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

13. The optical add-drop apparatus of claim 1, wherein said beam-deflecting elements comprise micromachined mirrors.

 The optical add-drop apparatus of claim 1, wherein said beam-deflecting elements comprise reflective membranes.

15. An optical add-drop apparatus, comprising an input port for an input multi-wavelength optical signal having multiple spectral channels; an output port for an output multi-wavelength optical signal; one or more drop ports for 10 selected spectral channels dropped from said multiwavelength optical signal; a wavelength-selective device for spatially separating said multiple spectral channels; and a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said 15 spectral channels, each of said elements being individually and continuously controllable to reflect its corresponding spectral channel to a selected one of said ports, whereby a subset of said spectral channels is directed to said drop ports.

16. An optical add-drop apparatus, comprising an input 20 port for an input multi-wavelength optical signal having multiple spectral channels; an output port for an output multi-wavelength optical signal; one or more add ports for selected spectral channels to be added to said output multi-wavelength optical signal; a wavelength-selective device for 25 reflecting said multiple and said selected spectral channels; and a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable to reflect its corresponding 30 spectral channel to a selected one of said ports, whereby said spectral channels from said add ports are selectively provided to said output port.

17. A method of performing dynamic add and drop in a WDM optical network, comprising separating an input multi-wavelength optical signal into spectral channels; imaging each of said spectral channels onto a corresponding beam-deflecting element; and controlling dynamically and continuously said beam-deflecting elements so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal.

18. The method of claim 17, wherein said selected ones of said spectral channels comprises a subset of said spectral channels, such that other non-selected ones of said spectral channels are dropped from said output multi-wavelength optical signal.

19. The method of claim 18, wherein said controlling comprises reflecting said non-selected ones of said spectral channels to one or more drop ports.

20. The method of claim 17 further comprising imaging other spectral channels onto other corresponding beamdeflecting elements, and controlling dynamically and continuously said other beam-deflecting elements so as to combine said other spectral channels with said selected ones of said spectral channels into said output multi-wavelength optical signal.

21. The method of claim 17, wherein said imaging comprises focusing said spectral channels onto said beamdeflecting elements.

22. The method of claim 17 further comprising monitoring a power level in one or more of said selected ones of said spectral channels, and controlling an alignment between said input multi-wavelength optical signal and corresponding beam-deflecting elements in response to said monitoring.

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Jeffrey P. Wilde			US-
Residence/Mailing Address 2310 Rockwood Ranch Read; Mo	rgan Hill. CA 95037		
Additional Inventors a	are named on separately numbered	i sheets att	ached hereto.
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Name of Patentee(s)		
Tai Chen, et. al		
Patent Number 6,879.750	D A	ate Patent issued pril 12, 2005
Title of Invention		
Reconfigurable Optical Add-Drop Multiplex	ers with Servo Control and	Dynamic Spectral Power Management Cap
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Applicatio	on No./Patent No.: 6,879,750	Filed/Issue Date: April 12, 2005
Titled:	Reconfigurable Optical Add-Drop Mul Capabilities	Itiplexers with Servo Control and Dynamic Spectral Power Management
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Attorney Docket No. C2393-1106RE1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue of:

Patent No.: 6,879,750

Issued: April 12, 2005

Patentee: Tai Chen, et. al

Reissue Appln. No.:

Group Art Unit:

Filed: herewith Examiner:

Title: Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities

PRELIMINARY AMENDMENT

<u>and</u>

STATEMENT OF STATUS AND SUPPORT FOR ALL CHANGES TO CLAIMS

Mail Stop REISSUE

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

Dear Sir:

Please amend this application as follows:

Amendments to Claims

1. (Amended) An optical add-drop apparatus comprising

an input port for an input multi-wavelength optical signal having first spectral channels;

one or more other ports for second spectral channels; an output port for an output multi-wavelength optical signal;

a wavelength-selective device for spatially separating said spectral channels; and

a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable <u>in two dimensions</u> to reflect its corresponding spectral channel to a selected one of said ports <u>and to</u> <u>control the power of the spectral channel reflected to said selected port</u>.

2. (Original) The optical add-drop apparatus of claim 1 further comprising a control unit for controlling each of said beam-deflecting elements.

3. (Original) The optical add-drop apparatus of claim 2, wherein the control unit further comprises a servo-control assembly, including a spectral monitor for monitoring power levels of selected ones of said spectral channels, and a processing unit responsive to said power levels for controlling said beam-deflecting elements.

- 2 -

4. (Original) The optical add-drop apparatus of claim 3, wherein said servocontrol assembly maintains said power levels at predetermined values.

5. (Original) The optical add-drop apparatus of claim 2, wherein the control unit controls said beam-deflecting elements to direct selected ones of said first spectral channels to one or more of said second ports to be dropped as second spectral channels from said output multi-wavelength optical signal.

6. (Original) The optical add-drop apparatus of claim 2, wherein the control unit controls said beam-deflecting elements to direct selected ones of said second spectral channels to said output port to be added to said output multi-wavelength optical signal.

7. (Original) The optical add-drop apparatus of claim 1 further comprising alignment mirrors for adjusting alignment of said input and output multi-wavelength optical signals and said second spectral channels with said wavelength-selective device.

8. (Original) The optical add-drop apparatus of claim 7 further comprising collimators associated with said alignment mirrors, and imaging lenses in a telecentric arrangement with said alignment mirrors and said collimators.

- 3 -

9. (Original) The optical add-drop apparatus of claim 1, wherein said wavelength selective device further combines selected ones of said spectral channels reflected from said beam-deflecting elements to form said output multiwavelength optical signal.

10. (Original) The optical add-drop apparatus of claim 1, wherein said one or more other ports comprise an add port and a drop port for respectively adding second and dropping first spectral channels.

11. (Original) The optical add-drop apparatus of claim 1 further comprising a beam-focuser for focusing said separated spectral channels onto said beam deflecting elements.

12. (Original) The optical add-drop apparatus of claim 1, wherein said wavelength-selective device comprises a device selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms.

13. (Original) The optical add-drop apparatus of claim 1, wherein said beamdeflecting elements comprise micromachined mirrors.

14. (Original) The optical add-drop apparatus of claim 1, wherein said beamdeflecting elements comprise reflective membranes.

- 4 -

15. (Amended) An optical add-drop apparatus, comprising

an input port for an input multi-wavelength optical signal having multiple spectral channels;

an output port for an output multi-wavelength optical signal;

one or more drop ports for selected spectral channels dropped from said multi-wavelength optical signal;

a wavelength-selective device for spatially separating said multiple spectral channels; and

a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable <u>in two dimensions</u> to reflect its corresponding spectral channel to a selected one of said ports<u>and to</u> <u>control the power of the spectral channel reflected to said selected port</u>, whereby a subset of said spectral channels is directed to said drop ports.

16. (Amended) An optical add-drop apparatus, comprising

an input port for an input multi-wavelength optical signal having multiple spectral channels;

an output port for an output multi-wavelength optical signal; one or more add ports for selected spectral channels to be added to said output multi-wavelength optical signal;

- 5 -
a wavelength-selective device for reflecting said multiple and said selected spectral channels; and

a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable <u>in two dimensions</u> to reflect its corresponding spectral channel to a selected one of said ports<u>and to</u> <u>control the power of the spectral channel reflected to said selected port</u>, whereby said spectral channels from said add ports are selectively provided to said output port.

17. (Amended) A method of performing dynamic add and drop in a WDM optical network, comprising

separating an input multi-wavelength optical signal into spectral channels; imaging each of said spectral channels onto a corresponding beamdeflecting element; and

controlling dynamically and continuously said beam-deflecting elements in two dimensions so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal and to control the power of the spectral channels combined into said output multi-wavelength optical signal.

18. (Original) The method of claim 17, wherein said selected ones of said spectral channels comprises a subset of said spectral channels, such that other non-selected ones of said spectral channels are dropped from said output multi-

- 6 -

wavelength optical signal.

19. (Original) The method of claim 18, wherein said controlling comprises reflecting said non-selected ones of said spectral channels to one or more drop ports.

20. (Original) The method of claim 17 further comprising imaging other spectral channels onto other corresponding beam-deflecting elements, and controlling dynamically and continuously said other beam-deflecting elements so as to combine said other spectral channels with said selected ones of said spectral channels into said output multi-wavelength optical signal.

21. (Original) The method of claim 17, wherein said imaging comprises focusing said spectral channels onto said beam-deflecting elements.

22. (Original) The method of claim 17 further comprising monitoring a power level in one or more of said selected ones of said spectral channels, and controlling an alignment between said input multi-wavelength optical signal and corresponding beam-deflecting elements in response to said monitoring.

- 7 -

Remarks

Independent apparatus Claims 1, 15 and 16 have been amended similarly to recite that the beam deflecting elements are individually and continuously controllable "<u>in two dimensions</u> to reflect its corresponding spectral channel to a selected one of said ports <u>and to control the power of the spectral channel reflected</u> <u>to said selected port</u>". (These amended Claims 1, 15 and 16 have also been written with sub-paragraphing to improve their readability.)

Independent method Claim 17 has been amended somewhat similarly to the apparatus claims to recite "controlling dynamically and continuously said beam-deflecting elements in two dimensions so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal and to control the power of the spectral channels combined into said output multi-wavelength optical signal signal". (Claim 17 has also been written with sub-paragraphing to improve its readability.)

The basis for these amendments is in the specification at Col. 3, line 58 – Col. 4, line 22; Col. 6, line 65 – Col. 7, line 6; Col. 8, lines 20-36; Col. 9, lines 4-13 and Col. 10, lines 44-48.

The amendments correct errors and ensure that the amended claims distinguish over the prior art.

- 8 -

Date: June 11, 2010

Respectfully Submitted,

/Barry N. Young/

Barry N. Young Attorney for Assignee Reg. No. 27,744

Customer No. 48789 Law Offices of Barry N. Young 200 Page Mill Road, Suite 102 Palo Alto, CA 94306-2061 Phone: (650) 326-2701 Fax: (650) 326-2799 byoung@young-iplaw.com Doc code: IDS

P10/33/084 (01-10) mation Disclosure Statement (IDS) Filed U.S. Patern and Trademark Office: U.S. DEPARTMENT OF COMMERCE Under the Paperwork Reduction Act of 1985, no persons are required to respond to a collection of information unless it contains a valid OMB control number Doc description: Information Disclosure Statement (IDS) Filed

	Application Number	Filed Herewith
NEADWATION DIAAL AAUDE	Filing Date	Filed Herewith
INFORMATION DISCLOSURE	First Named Inventor	Tai Chen et. al
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Arl Unit	Unknown
	Examiner Name	Unknown
	Attorney Docket Number	C2393-1106RE1

	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	7183633	82	2007-02-27	Daneman et. al	ail			
	2	6989921	82	2006-01-24	Bernstein ef al	all			
	3	6810169	B2	2004-10-26	Bouevilch et al	all			
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	8	6256430	B1	2001-07-03	Jin ét. al	ali			

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NEODMATION DIAGLOGUDE	Filing Date	Filed Herewith	
INFORMATION DISCLOSURE	First Named Inventor	Tai Chen et. al	
STATEMENT BY APPLICANT	Art Unit	Unknown	
	Examiner Name	Unknown	
	Attorney Docket Number	C2393-1106RE1	

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 10	5414540		1995-05-09	Patel et. al	ลม
11	5629790	A	1997-05-01	Neukermans et al	all
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18	6222954	B1	2001-04-01	Riza	ali
19	6253135	B1	2001-07-01	Wade	all

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	Application Number	Filed Herewith	
NEODMATION DISCLOSUDE	Filing Date	Filed Herewith	
STATEMENT BY APPLICANT	First Named Inventor	ai Chen et. al	
	Art Unit	Unknown	
	Examiner Name	Unknown	
	Attorney Docket Number	C2393-1106RE1	

	20 6289155		81	2001-09-01	Wade	9:1
	21	6307657	B1	2001-10-23	Ford	all
	22	6416250	BI	2002-07-01	Corbosiero et al	ali
	23	6625346		2003-09-23	Wilde et. al	
	24	6634810	B1	2003-10-21	Ford et. al	all
	25	6898348	82	2005-05-24	Morozov et. al	થા
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	1	20020131691	A1	2002-09-01	Garrett et al.	ali
	2	20030043471	A1	2003-03-01	Belser et. al	ail
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INFORMATION DISCLOSURE	First Named Inventor	ai Chen et. al	
Not for submission under 37 CER 1 99)	Art Unit	Unknown	
	Examiner Name	Unknown	
	Attorney Docket Number	C2393-1106RE1	

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	Filing Date	Filed Herewith
	First Named Inventor T	'ai Chen et. al
STATEMENT BY APPLICANT	Art Unit	Unknown
(NOTION SUBMISSION UNDER 37 CFR 1.33)	Examiner Name	Unknown
	Attorney Docket Number	C2393-1106RE1

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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.

Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

information disclosure statement. See 37 CFR 1.97(e)(1).

XX None

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	/Barry N. Young/	Date (YYYY-MM-DD)	2010-06-14
Name/Print	Barry N. Young	Registration Number	27,744

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Application Number:					
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Title of Invention:	Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities Tai Chen				vo Control and
First Named Inventor/Applicant Name:	Tai Chen				
Filer:	Barry N. Young				
Attorney Docket Number:	C2393-1106RE1				
Filed as Large Entity					
Reissue (Utility) Filing Fees					
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:					
Utility Reissue Basic		1014	1	330	330
Design and utility Reissue Basic		1114	1	540	540
Design and utility Reissue Basic		1314	1	650	650
Pages:	1				
Claims:					
Reissue claims in excess of 20 for large		1205	2	52	104
Independent claims reissue large		1204	1	220	220
Miscellaneous-Filing:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:		R1 5.0		
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
	Tot	al in USD	(\$)	1844

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EFS ID:	7819473		
Application Number:	12816084		
International Application Number:			
Confirmation Number:	2616		
Title of Invention:	Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities		
First Named Inventor/Applicant Name:	Tai Chen		
Customer Number:	48789		
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Attorney Docket Number:	C2393-1106RE1		
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1	Transmittal Reissue Application	SB-50_Re_Trnsmtl.pdf	63609 67fa5719572364c4cba9a3a6e7c2a97a2596	no	1
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Information	1				
			52750	no	1
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	Abstract		1	1	
	Drawings-only black and white line drawings		2	13	
	Specification		14	19	
	Claims		20	21	
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6	Assignee showing of ownership per 37 CFR 3.73(b).	SB-96_Stmt_373b.pdf	213777 42efc196a5e1536b4c3616050437f1a4dede	no	1
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	Claims		2	7	
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Approved for use through 1/31/2007. 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 Application or Docket Number PATENT APPLICATION FEE DETERMINATION RECORD Filing Date 06/15/2010 To be Mailed 12/816,084 Substitute for Form PTO-875 APPLICATION AS FILED - PART I OTHER THAN (Column 1) (Column 2) SMALL ENTITY OR SMALL ENTITY FOR NUMBER FILED NUMBER EXTRA RATE (\$) FEE (\$) RATE (\$) FEE (\$) BASIC FEE N/A N/A N/A N/A (37 CFR 1.16(a), (b). SEARCH FEE N/A N/A N/A N/A 37 CER 1 16(k) EXAMINATION FEE N/A N/A N/A N/A 37 CFR 1.16(o) (p), or (q TOTAL CLAIMS minus 20 = XS OR X \$ (37 CFR 1.16) INDEPENDENT CLAIMS XS = XS = minus 3 (37 CFR 1.16(h) If the specification and drawings exceed 100 sheets of paper, the application size fee due APPLICATION SIZE FEE is \$250 (\$125 for small entity) for each (37 CFR 1.16(s)) 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 TOTAL APPLICATION AS AMENDED - PART II OTHER THAN SMALL ENTITY OR SMALL ENTITY (Column 1) (Column 2) (Column 3) CLAIMS HIGHEST REMAINING NUMBER PRESENT ADDITIONAL ADDITIONAL 06/15/2010 RATE (\$) RATE (\$) AFTER PREVIOUSI Y **EXTRA** FEE (\$) FEE (\$) AMENDMEN' AMENDMENT PAID FOR Total (37 CFR 0 OR 0 · 22 Minus . 22 X \$ X \$52= = . 4 Minus ***4 = 0 X \$ OR X \$220 0 -Application Size Fee (37 CFR 1.16(s)) FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) OR TOTAL TOTAL 0 ADD'L OR ADD'L FEE FEE (Column 1) (Column 2) (Column 3) CLAIMS HIGHEST REMAINING ADDITIONAL NUMBER PRESENT ADDITIONAL RATE (\$) RATE (\$) PREVIOUSLY FEE (\$) AFTER **EXTRA** FEE (\$) AMENDMENT PAID FOR Total (37 CFR Minus OR XS XS = AMENDME Inde ndent *** Minus OR XS XS = = Application Size Fee (37 CFR 1.16(s)) FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) OR TOTAL TOTAL OR ADD'L ADD'L FEE FEE * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. Legal Instrument Examiner: ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". /DEBORAH NASH/ *** 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

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