

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
7 March 2002 (07.03.2002)

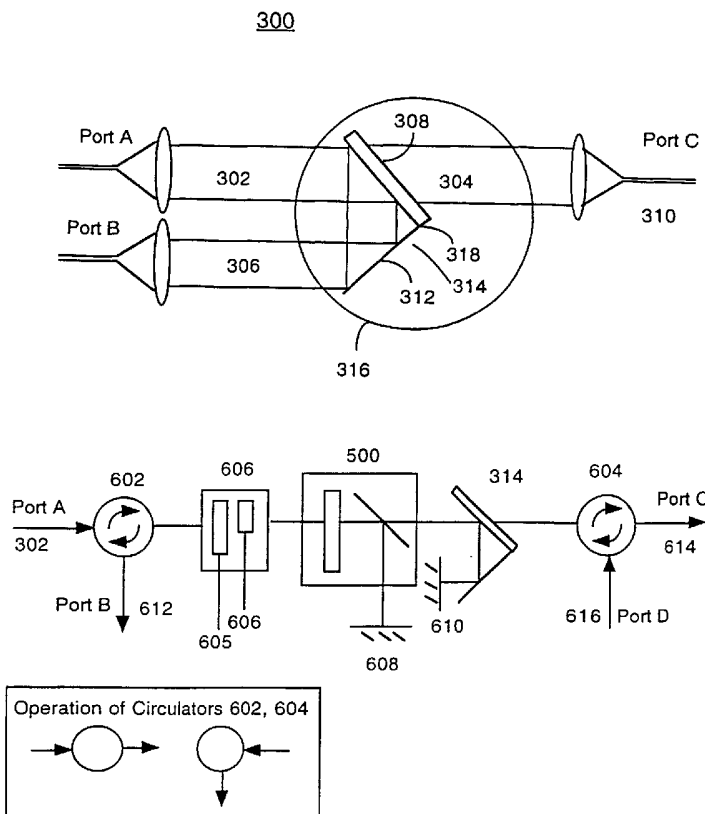
PCT

(10) International Publication Number
WO 02/018993 A3

- (51) International Patent Classification⁷: **G02B 6/293**, H04J 14/02
- (74) Agents: **BALES, Jennifer, L.** et al.; Macheledt Bales & Johnson LLP, Montain View Plaza, 1520 Euclid Circle, Lafayette, CO 80026-1250 (US).
- (21) International Application Number: PCT/US01/42017
- (22) International Filing Date: 30 August 2001 (30.08.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/230,180 1 September 2000 (01.09.2000) US
60/231,109 8 September 2000 (08.09.2000) US
09/716,882 20 November 2000 (20.11.2000) US
- (71) Applicant and
(72) Inventor: **CORMACK, Robert, H.** [US/US]; 5305 Holmes Place, Boulder, CO 80303 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: TUNABLE OPTICAL FILTER WITH RETAINED COMPLEMENTARY OUTPUT



(57) Abstract: A tunable interference add/drop filter system combines an interference filter (308) or the like with a mirror (312) attached adjacent to the filter at an angle under 180° to form a reflector assembly (314). The reflector assembly is rotated to tune the filter system. The dropped output (304) passes through the filter, while the passed output (306) reflects off of the filter and the mirror. The direction of the passed output beam is a fixed angle from the input beam, and the beam is translated sideways by a fixed amount, no matter how much the reflector assembly is rotated. Thus the dropped output (or complementary output) can be retained. A null state switch (500) prevents light from reaching the filter while the filter system is tuning.



WO 02/018993 A3



Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

6 February 2003

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/42017

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G02B/293 H04J14/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G02B H04J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 600 093 A (MCMAHON DONALD H) 17 August 1971 (1971-08-17) the whole document ---	1,7,13
A	US 6 008 920 A (HENDRIX KAREN DENISE) 28 December 1999 (1999-12-28) figures 1,3,5,8 column 11, line 41 -column 14, line 65 ---	1,13
A	US 5 481 402 A (CHENG YIHAO ET AL) 2 January 1996 (1996-01-02) the whole document ---	1,4
A	US 4 671 603 A (MCQUOID JAMES A ET AL) 9 June 1987 (1987-06-09) figures column 6, line 24 - line 65 column 7, line 18 -column 8, line 2 --- -/--	1

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

24 September 2002

Date of mailing of the international search report

01/10/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Mathyssek, K

INTERNATIONAL SEARCH REPORT

 International Application No
 PCT/US 01/42017

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 638 837 A (CSELT CENTRO STUDI LAB TELECOM) 15 February 1995 (1995-02-15) figures column 3, line 29 -column 5, line 31 ---	7
A	WO 99 35522 A (CORNING INC) 15 July 1999 (1999-07-15) claims; figures 1,3A,3B,4 ---	7
A	EP 0 378 442 A (BRITISH TELECOMM) 18 July 1990 (1990-07-18) figures column 1, line 5 -column 4, line 51 ---	1
A	US 6 075 647 A (BAGWELL TIMOTHY L ET AL) 13 June 2000 (2000-06-13) figures 1,3-5 column 1, line 4 - line 47 column 2, line 8 - line 67 column 3, line 1 -column 4, line 3 column 5, line 18 -column 6, line 62 -----	1,4,13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/42017

Patent document cited in search report		Publication date	Patent family member(s)	Publication date			
US 3600093	A	17-08-1971	DE 2055026 A1	19-05-1971			
			GB 1327435 A	22-08-1973			
US 6008920	A	28-12-1999	EP 1066697 A1	10-01-2001			
			WO 9946879 A1	16-09-1999			
US 5481402	A	02-01-1996	NONE				
US 4671603	A	09-06-1987	DE 3441689 A1	30-05-1985			
			FR 2555324 A1	24-05-1985			
			GB 2151036 A , B	10-07-1985			
			JP 60119507 A	27-06-1985			
EP 0638837	A	15-02-1995	IT 1265018 B1	17-10-1996			
			CA 2129779 A1	11-02-1995			
			DE 69410187 D1	18-06-1998			
			DE 69410187 T2	08-10-1998			
			DE 638837 T1	03-08-1995			
			EP 0638837 A1	15-02-1995			
			JP 2545047 B2	16-10-1996			
			JP 7154372 A	16-06-1995			
			US 5479082 A	26-12-1995			
			WO 9935522	A	15-07-1999	AU 744431 B2	21-02-2002
						AU 1908299 A	26-07-1999
BR 9813239 A	10-10-2000						
CA 2310586 A1	15-07-1999						
CN 1285048 T	21-02-2001						
EP 1046070 A1	25-10-2000						
JP 2002501212 T	15-01-2002						
WO 9935522 A1	15-07-1999						
US 6198857 B1	06-03-2001						
EP 0378442	A	18-07-1990				AT 101925 T	15-03-1994
			AU 621985 B2	26-03-1992			
			AU 4969190 A	13-08-1990			
			CA 2047710 A1	14-07-1990			
			DE 69006748 D1	31-03-1994			
			DE 69006748 T2	26-05-1994			
			EP 0378442 A1	18-07-1990			
			ES 2049412 T3	16-04-1994			
			WO 9008335 A1	26-07-1990			
			HK 136396 A	02-08-1996			
			IE 900130 L	13-07-1990			
			JP 2801394 B2	21-09-1998			
			JP 4504176 T	23-07-1992			
			KR 9703765 B1	21-03-1997			
US 5193027 A	09-03-1993						
US 6075647	A	13-06-2000	DE 19846255 A1	12-08-1999			
			GB 2333857 A , B	04-08-1999			
			JP 11271679 A	08-10-1999			