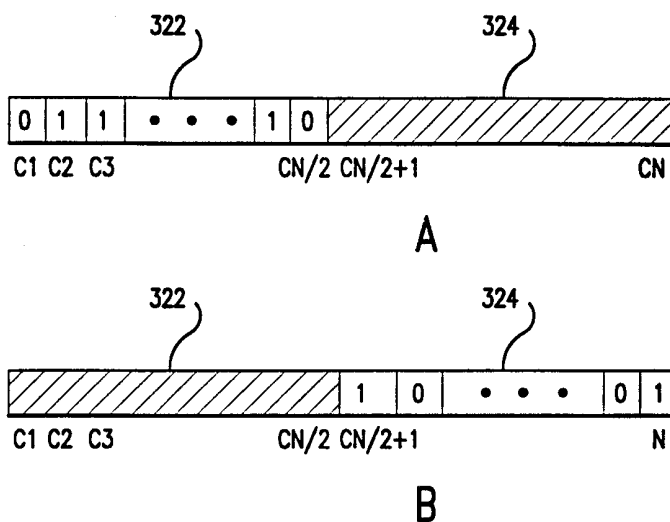


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04J 11/00	A3	(11) International Publication Number: WO 00/07319 (43) International Publication Date: 10 February 2000 (10.02.00)
(21) International Application Number: PCT/US99/17259 (22) International Filing Date: 29 July 1999 (29.07.99) (30) Priority Data: 09/126,217 30 July 1998 (30.07.98) US (71) Applicant: RDL COMMERCIAL TECHNOLOGIES CORPORATION [US/US]; 5800 Uplander Way, Culver City, CA 90230-6608 (US). (72) Inventors: DUTT, Birendra; 5800 Uplander Way, Culver City, CA 90230-6608 (US). NARAGHI, Manouher; 5800 Uplander Way, Culver City, CA 90230-6608 (US). CHAN, James, K.; 5800 Uplander Way, Culver City, CA 90230-6608 (US). (74) Agent: WRIGHT, William, H.; Loeb & Loeb LLP, Suite 2200, 10100 Santa Monica Boulevard, Los Angeles, CA 90067-4164 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, 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), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 30 March 2000 (30.03.00)

(54) Title: OPTICAL CDMA SYSTEM USING SUB-BAND CODING



(57) Abstract

An optical fiber communications system uses spread spectrum code division multiple access techniques to achieve better bandwidth utilization. A transmitting user in the system encodes the optical signal using a first coding mask, and a receiving user decodes the received signal using two decoding masks, all of the masks having lengths N . The first mask is divided into two sections of lengths $N/2$ each, one of the sections defining a first sub-code of length $N/2$, while the other section blocks light. Each of the second and third masks is also divided into two sections, which correspond to the two sections of the first mask. The section of the second mask corresponding to the coded section of the first mask has a second code that is identical to the first code, and the section of the second mask corresponding to the blocked section of the first mask is also blocked. The section of the third mask corresponding to coded section of the first mask has a third code that is complementary to the first code, and the section of the third mask corresponding to the blocked section of the first mask is also blocked. Some users on the system have masks in which the first of the two sections are blocked and the second of the two sections are coded, while other users have masks in which the second of the two sections are blocked and the first of the two sections are coded. The first codes used to code the encoding masks are selected from a set of unipolar codes that are derived from a set of balanced bipolar orthogonal codes.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon	KR	Republic of Korea	PL	Poland		
CN	China	KZ	Kazakstan	PT	Portugal		
CU	Cuba	LC	Saint Lucia	RO	Romania		
CZ	Czech Republic	LI	Liechtenstein	RU	Russian Federation		
DE	Germany	LK	Sri Lanka	SD	Sudan		
DK	Denmark	LR	Liberia	SE	Sweden		
EE	Estonia			SG	Singapore		

INTERNATIONAL SEARCH REPORT

International Application No.

PC1/US 99/17259

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04J11/00

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 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PARK S ET AL: "POLARITY-REVERSING TYPE PHOTONIC RECEIVING SCHEME FOR OPTICAL CDMA SIGNAL IN RADIO HIGHWAY" IEICE TRANSACTIONS ON ELECTRONICS, vol. E81-C, no. 3, 1 March 1998 (1998-03-01), pages 462-467, XP000778485 ISSN: 0916-8524 page 462 -page 463 --- -/--	1-3

☒ 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.

"&" document member of the same patent family

Date of the actual completion of the international search

18 November 1999

Date of mailing of the international search report

24/11/1999

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

Chauvet, C

INTERNATIONAL SEARCH REPORT

International Application No

PC/US 99/17259

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	NGUYEN L ET AL: "ALL-OPTICAL CDMA WITH BIPOLAR CODES" ELECTRONICS LETTERS, vol. 31, no. 6, 16 March 1995 (1995-03-16), page 469/470 XP000530325 ISSN: 0013-5194 cited in the application the whole document ---	1-3
A	KAVEHRAD M ET AL: "OPTICAL CODE-DIVISION-MULTIPLEXED SYSTEMS BASED ON SPECTRAL ENCODING OF NONCOHERENT SOURCES" JOURNAL OF LIGHTWAVE TECHNOLOGY, vol. 13, no. 3, 1 March 1995 (1995-03-01), pages 534-545, XP000509320 ISSN: 0733-8724 cited in the application page 534 -page 538, column 1, line 13 ---	1-3
A	WO 98 23057 A (RDL COMMERCIAL TECHNOLOGIES CO) 28 May 1998 (1998-05-28) cited in the application abstract page 4, line 6 -page 5, line 13 page 6, line 2 -page 10, line 24 ---	1-3
A	EP 0 782 288 A (YOZAN INC; SHARP KK (JP)) 2 July 1997 (1997-07-02) abstract ---	1-3
A	EP 0 157 692 A (SANGAMO WESTON) 9 October 1985 (1985-10-09) abstract -----	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/17259

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9823057 A	28-05-1998	US 5867290 A AU 4061997 A	02-02-1999 10-06-1998
EP 0782288 A	02-07-1997	JP 9181701 A JP 9200085 A JP 9284256 A DE 782288 T	11-07-1997 31-07-1997 31-10-1997 02-01-1998
EP 0157692 A	09-10-1985	US 4567588 A US 4653076 A US 4601047 A US 4561089 A US 4644523 A CA 1237205 A JP 61035035 A CA 1245781 A CA 1228436 A CA 1232380 A AU 588541 B AU 4644785 A CA 1246254 A	28-01-1986 24-03-1987 15-07-1986 24-12-1985 17-02-1987 24-05-1988 19-02-1986 29-11-1988 20-10-1987 02-02-1988 21-09-1989 26-02-1987 06-12-1988