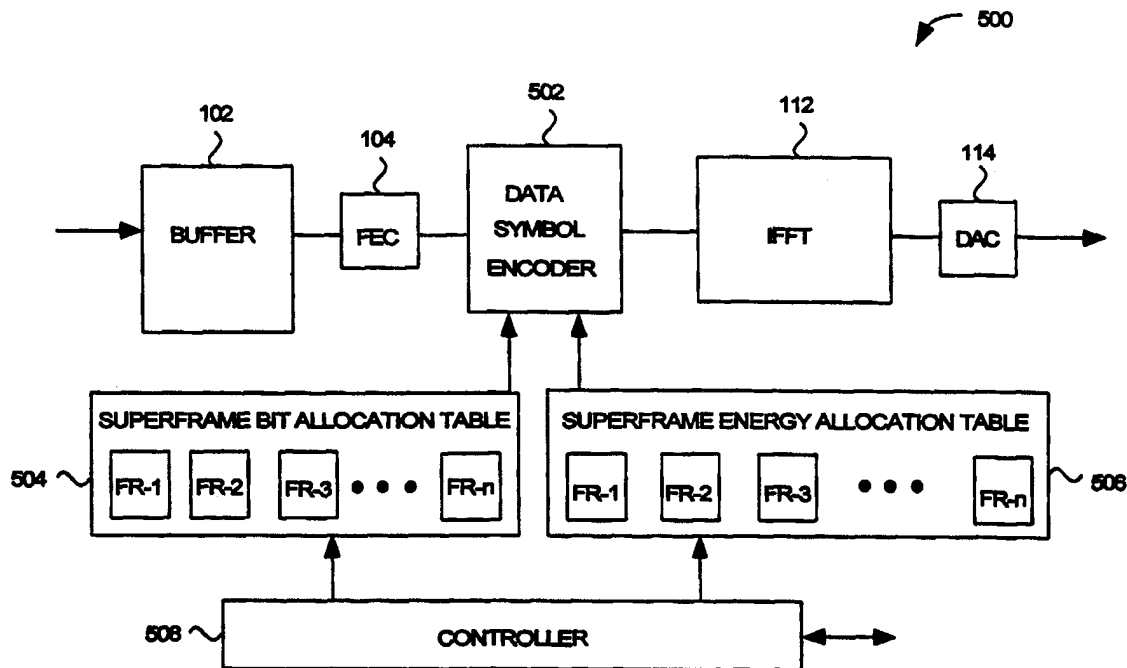




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|  |  |   |
|--|--|---|
| <p>(51) International Patent Classification <sup>6</sup> :<br/><b>H04L 27/26, 5/02</b></p>   | <p><b>A3</b></p>   | <p>(11) International Publication Number: <b>WO 98/52312</b><br/>(43) International Publication Date: 19 November 1998 (19.11.98)</p> |
| <p>(21) International Application Number: PCT/US98/09489<br/>(22) International Filing Date: 8 May 1998 (08.05.98)<br/>(30) Priority Data:<br/>08/855,881 12 May 1997 (12.05.97) US<br/>60/062,679 22 October 1997 (22.10.97) US<br/>(71) Applicant (for all designated States except US): AMATI COMMUNICATIONS CORPORATION [US/US]; 243 Samaritan Drive, San Jose, CA 95124 (US).<br/>(72) Inventors; and<br/>(75) Inventors/Applicants (for US only): CHOW, Jacky, S. [-/US]; 880 Babb's Creek Road, Gilroy, CA 95020 (US). BINGHAM, John, A., C. [US/US]; 2353 Webster Street, Palo Alto, CA 94301 (US).<br/>(74) Agent: DOUGLASS, Thomas, C.; Beyer &amp; Weaver, LLP, P.O. Box 61059, Palo Alto, CA 94304 (US).</p> | <p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, 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, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, 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, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b><br/><i>With international search report.</i></p> <p>(88) Date of publication of the international search report:<br/>11 February 1999 (11.02.99)</p> |   |

(54) Title: METHOD AND APPARATUS FOR SUPERFRAME BIT ALLOCATION IN A DISCRETE MULTITONE (DMT) SYSTEM



(57) Abstract

A method and apparatus for supporting multiple bit allocations in a multicarrier modulation system are disclosed. Hence, symbols being transmitted or received can make use of different bit allocations. By supporting the multiple bit allocations, the multicarrier modulation system is able to support bit allocation on a superframe basis. Also disclosed are techniques for selection and alignment of superframe formats to improve system performance. In the case of data transmission systems involving different transmission schemes, different bit allocations can be used to reduce undesired crosstalk interference.

**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<br>Republic of Macedonia | TM | Turkmenistan             |
| BF | Burkina Faso             | GR | Greece                                   | ML | Mali   | TR | Turkey                   |
| BG | Bulgaria                 | HU | Hungary                                  | MN | Mongolia                                     | TT | Trinidad and Tobago      |
| BJ | Benin                    | IE | Ireland                                  | MR | Mauritania                                   | UA | Ukraine                  |
| BR | Brazil                   | IL | Israel                                   | MW | Malawi                                       | UG | Uganda                   |
| BY | Belarus                  | IS | Iceland                                  | MX | Mexico                                       | US | United States of America |
| CA | Canada                   | IT | Italy                                    | NE | Niger  | UZ | Uzbekistan               |
| CF | Central African Republic | JP | Japan                                    | NL | Netherlands                                  | VN | Viet Nam                 |
| CG | Congo                    | KE | Kenya                                    | NO | Norway                                       | YU | Yugoslavia               |
| CH | Switzerland              | KG | Kyrgyzstan                               | NZ | New Zealand                                  | ZW | Zimbabwe                 |
| CI | Côte d'Ivoire            | KP | Democratic People's<br>Republic of Korea | PL | Poland                                       |    |                          |
| CM | Cameroon                 | KR | Republic of Korea                        | PT | Portugal                                     |    |                          |
| CN | China                    | KZ | Kazakstan                                | RO | Romania                                      |    |                          |
| CU | Cuba                     | LC | Saint Lucia                              | RU | Russian Federation                           |    |                          |
| CZ | Czech Republic           | LI | Liechtenstein                            | SD | Sudan  |    |                          |
| DE | Germany                  | LK | Sri Lanka                                | SE | Sweden                                       |    |                          |
| DK | Denmark                  | LR | Liberia                                  | SG | Singapore                                    |    |                          |
| EE | Estonia                  |    |  |    |  |    |                          |

**INTERNATIONAL SEARCH REPORT**

International Application No

PCT/US 98/09489

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 6 H04L27/26 H04L5/02

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 6 H04L

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

Electronic data base consulted during the international search (name of data base and, where 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.             |
|------------|--|-----------------------------------|
| X          | US 5 495 483 A (PENDLETON MATTHEW A ET AL) 27 February 1996<br><br>see column 2, line 48 - column 3, line 10<br>see column 3, line 35 - line 53<br>see column 7, line 13 - column 8, line 14<br>see column 10, line 6 - line 16<br>see column 10, line 54 - column 11, line 12<br>see column 13, line 45 - line 61<br>see column 24, line 55 - column 25, line 60<br>see column 26, line 53 - column 27, line 35<br>see column 30, line 43 - column 34, line 52<br>see figures 6,7 | 1-9,<br>12-16,<br>19-33,<br>47-50 |
| A          | -/--   | 11,18,                            |

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<br><br>23 October 1998 | Date of mailing of the international search report<br><br>11/11/1998 |
|--|--|

|  |   |
|--|---|
| Name and mailing address of the ISA<br>European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Authorized officer<br><br>Koukourlis, S |
|--|---|

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/09489

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |  |  |
|--|--|--|
| Category °   | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                              |
|  |  | 34, 35, - -<br>41,<br>44-46,<br>52-55              |
| A  | <p>-----</p> <p>WO 97 03506 A (AMATI COMMUNICATIONS CORP<br/>;BINGHAM JOHN A C (US); TONG (US))<br/>30 January 1997</p> <p>see abstract</p>  | 10, 11,<br>17, 18,<br>34-42,<br>46, 51,<br>54, 55  |
| A  | <p>-----</p> <p>GB 2 303 032 A (SAMSUNG ELECTRONICS CO<br/>LTD) 5 February 1997</p> <p>see abstract<br/>see page 1, line 1 - page 6, line 5<br/>see page 7, line 26 - page 8, line 19<br/>see figure 4</p> | 1, 12,<br>22-24,<br>34-36,<br>41, 47               |
| A  | <p>-----</p> <p>US 5 479 447 A (CIOFFI JOHN M ET AL)<br/>26 December 1995</p> <p>see abstract<br/>see column 5, line 26 - column 6, line 19</p>  | 23, 24,<br>27, 28,<br>32, 33,<br>35, 36,<br>41, 45 |
| A  | <p>-----</p> <p>EP 0 653 859 A (PLESSEY TELECOMM)<br/>17 May 1995<br/>see the whole document</p>   | 34-46  |
| A  | <p>-----</p> <p>GB 2 300 546 A (SAMSUNG ELECTRONICS CO<br/>LTD) 6 November 1996</p> <p>see page 4, line 1 - line 11</p> <p>-----</p>   | 10, 11,<br>17, 18,<br>54, 55                       |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/09489

| Patent document cited in search report | Publication date | Patent family member(s)  | Publication date   |
|--|------------------|--|--|
| US 5495483 A                           | 27-02-1996       | NONE   |  |
| WO 9703506 A                           | 30-01-1997       | US 5680394 A<br>AU 6478296 A<br>EP 0838109 A   | 21-10-1997<br>10-02-1997<br>29-04-1998   |
| GB 2303032 A                           | 05-02-1997       | FR 2736229 A<br>JP 9051328 A   | 03-01-1997<br>18-02-1997   |
| US 5479447 A                           | 26-12-1995       | NONE   |  |
| EP 0653859 A                           | 17-05-1995       | AU 688814 B<br>AU 8149494 A<br>CA 2174864 A<br>WO 9513674 A<br>GB 2283879 A, B<br>JP 9505185 T<br>US 5668802 A<br>ZA 9408935 A | 19-03-1998<br>29-05-1995<br>18-05-1995<br>18-05-1995<br>17-05-1995<br>20-05-1997<br>16-09-1997<br>18-07-1995 |
| GB 2300546 A                           | 06-11-1996       | JP 8307385 A   | 22-11-1996   |