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Gan et al.

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(45) **Date of Patent:** ***Jan. 13, 2009**

(54) **APPROACH FOR MANAGING THE USE OF COMMUNICATIONS CHANNELS BASED ON PERFORMANCE**

4,780,885 A 10/1988 Paul et al.
5,317,568 A 5/1994 Bixby et al.
5,323,447 A 6/1994 Gillis et al.
5,394,433 A 2/1995 Bantz et al.
5,418,839 A 5/1995 Knuth et al.
5,541,954 A 7/1996 Emi

(75) Inventors: **Hongbing Gan**, Carlton North (AU);
Bijan Treister, Kew (AU); **Efstratios Skafidas**, Coburg (AU)

(Continued)

(73) Assignee: **Bandspeed, Inc.**, Austin, TX (US)

FOREIGN PATENT DOCUMENTS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 189 days.

GB 2 401 512 A1 11/2004

(Continued)

This patent is subject to a terminal disclaimer.

OTHER PUBLICATIONS

Lawrey et al., Adaptive Frequency Hopping for Multiuser OFDM, pp. 1-5, ICICS'99.*

(Continued)

(21) Appl. No.: **11/397,443**

Primary Examiner—Frank Duong

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(74) *Attorney, Agent, or Firm*—Hickman Palermo Truong & Becker LLP

(65) **Prior Publication Data**

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(57) **ABSTRACT**

Related U.S. Application Data

An approach for selecting sets of communications channels involves determining the performance of communications channels. A set of channels is selected based on the results of performance testing and specified criteria. The participant generates data that identifies the selected set of channels and provides that data to other participants of the communications network. The participants communicate over the set of channels, such as by using a frequency hopping protocol. When a specified time expires or monitoring of the performance of the channel set identifies poor performance of the set of channels, the participant selects another set of channels for use in communications based on additional performance testing. By selecting channels based on the initial performance testing and performance monitoring, the communications network adaptively avoids channels with poor performance.

(63) Continuation of application No. 09/948,488, filed on Sep. 6, 2001, now Pat. No. 7,027,418.

(60) Provisional application No. 60/264,594, filed on Jan. 25, 2001.

(51) **Int. Cl.**
H04Q 7/00 (2006.01)

(52) **U.S. Cl.** **370/329**

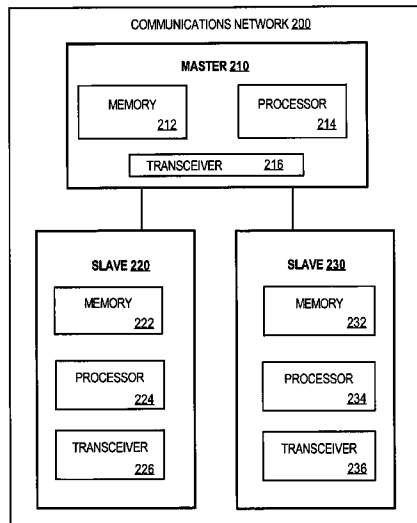
(58) **Field of Classification Search** 370/328–339
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,716,573 A 12/1987 Bergstrom et al.

29 Claims, 11 Drawing Sheets



U.S. PATENT DOCUMENTS

5,574,979 A 11/1996 West
 5,649,291 A 7/1997 Tayloe
 5,726,978 A * 3/1998 Frodigh et al. 370/252
 5,774,808 A 6/1998 Särkioja et al.
 5,781,861 A 7/1998 Kang et al.
 5,844,522 A 12/1998 Sheffer et al.
 5,873,036 A 2/1999 Vucetic
 5,898,928 A 4/1999 Karlsson et al.
 5,956,642 A 9/1999 Larsson et al.
 6,009,332 A 12/1999 Haartsen
 6,169,761 B1 1/2001 Marcoccia et al.
 6,240,126 B1 5/2001 Ohashi et al.
 6,549,784 B1 4/2003 Kostic et al.
 6,601,101 B1 7/2003 Lee et al.
 6,633,761 B1 10/2003 Singhal et al.
 6,650,872 B1 11/2003 Karlsson
 6,687,239 B1 2/2004 Koprivica
 6,694,147 B1 2/2004 Viswanath et al.
 6,700,875 B1 3/2004 Schroeder et al.
 6,704,346 B1 3/2004 Mansfield
 6,745,034 B2 6/2004 Wang et al.
 6,751,249 B1 6/2004 Cannon et al.
 6,760,317 B1 7/2004 Honkanen et al.
 7,027,418 B2 * 4/2006 Gan et al. 370/329
 2002/0122462 A1 9/2002 Batra et al.
 2005/0020271 A1 1/2005 Fukuda et al.
 2005/0223115 A1 10/2005 Hanson et al.

FOREIGN PATENT DOCUMENTS

WO WO 96/34468 A1 10/1996
 WO WO 00/60896 10/2000

WO WO 01/03379 A1 1/2001

OTHER PUBLICATIONS

Zander, J. PhD and G. Malmgren MSc, IEEE Proc.-Commun., vol. 142, No. 2, Apr. 1995, entitled "Adaptive frequency hopping in HF communications", (pp. 99-105).
 Fifth International Symposium on Signal Processing and its Applications, ISSPA '99 Brisbane, Australia, Aug. 22-25, 1999, entitled "Multiuser OFDM", by E. Lawrey, (pp. 761-764).
 Walter L. Davis, "A MAC Layer submission for the High Rate 802.15.3 Standard," Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs), Sep. 2000, XP 00220853, pp. 1-57.
 Jeyhan Karaoguz "Multi-Rate QAM Physical Layer (8-40 Mbps) Proposal for High Rate WPAN," Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs), Oct. 20, 2000 XP002220854, pp. 1-39.
 Johnsson, HiperLAN/2-The Broadband Radio Transmission Technology Operating in the 5 GHz Frequency Band, pp. 1-22 1999.
 European Patent Office, "Communication pursuant to Article 96(2) EPC," Jun. 22, 2004, 5 pages.
 "Clean Version of Amended Claims for Response to Official Comm. From Patent Examiner," EPO Patent Application No. 02709170.1, pp. 1-15, 2004.
 Lawrey et al. n Adaptive Frequency Hopping for Multiuser OFDM, pp. 1-5, ICICS '99.
 Gan et al, Adaptive Frequency Hopping Implementation Proposals for IEEE 802.15 1/2 WPAN, pp. 1-28, Nov. 2000, downloaded at http://grouper.ieee.org/groups/802/15/pub/2000/Nov00/00367r0P802-15_TG2-Adaptive-Frequency-Hopping.ppt.
 The International Bureau of WIPO, "Notification Concerning Transmittal of Copy of International Preliminary Report on Patentability (Chapter 1 of the Patent Cooperation Treaty)" International application No. PCT/US2006/027206, received Jan. 31, 2008, 7 pages.
 Claims, International application No. PCT/US2006/027206, 6 pages.

* cited by examiner

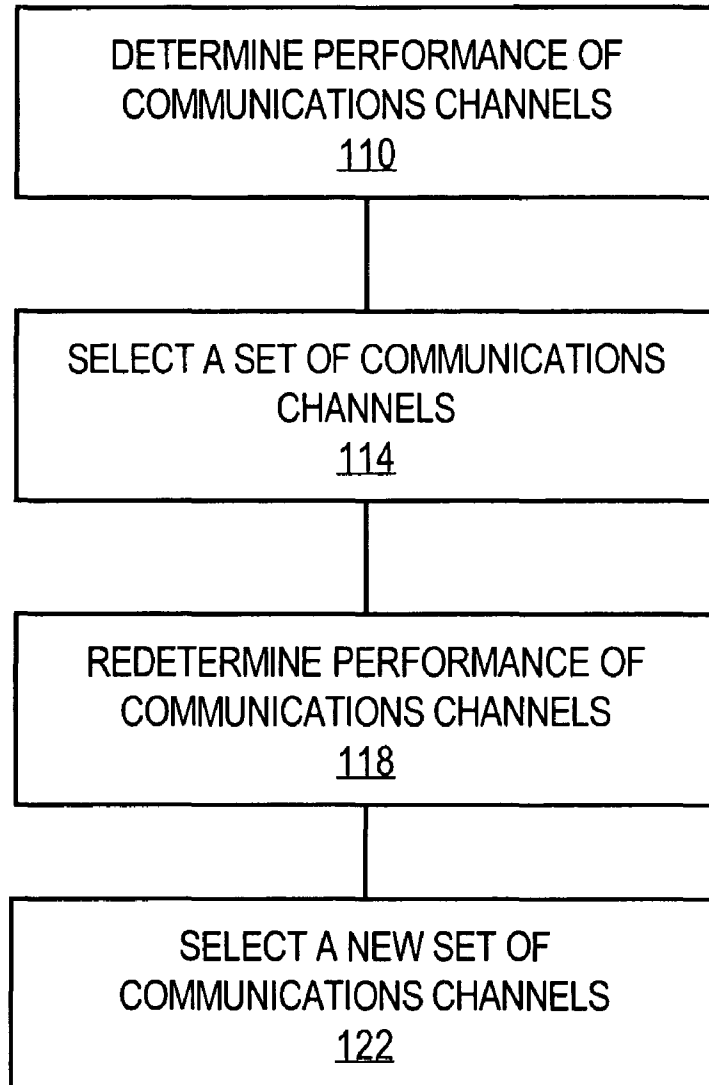


FIG. 1A

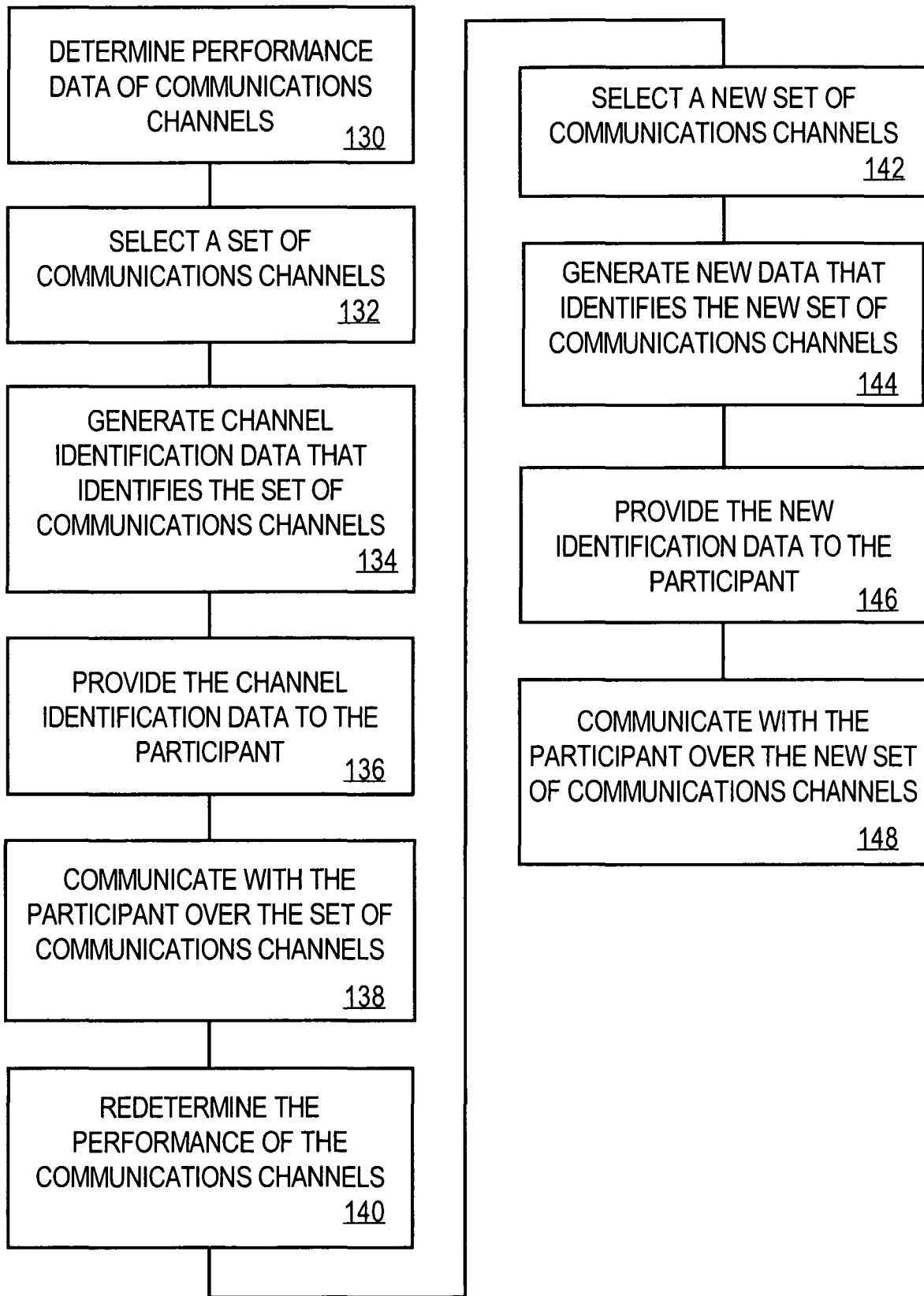


FIG. 1B

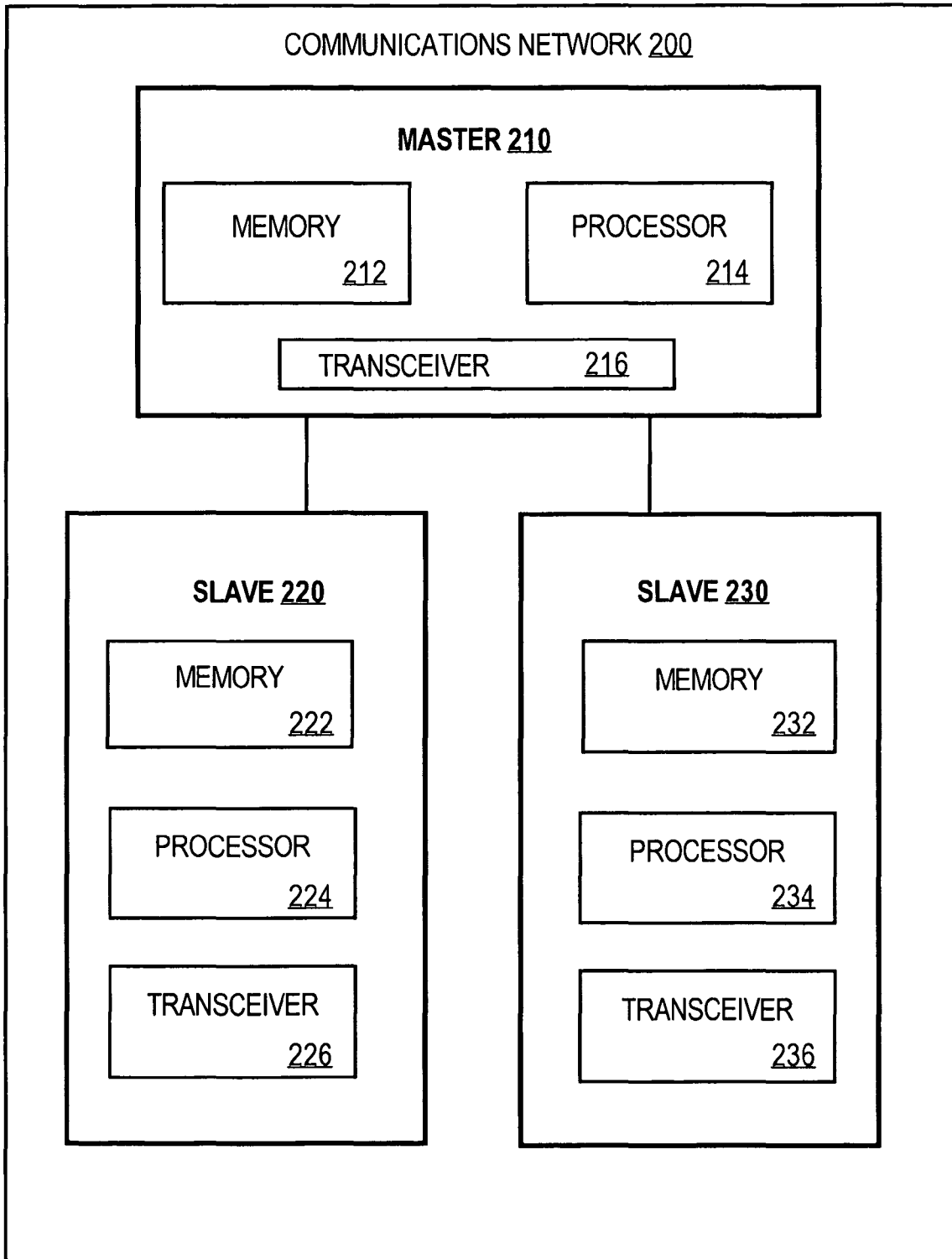


FIG. 2

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