



(12) **United States Patent**  
**Gan et al.**

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(54) **APPROACH FOR SELECTING COMMUNICATIONS CHANNELS BASED ON PERFORMANCE**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 768 days.

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. ....	375/132
6,549,784 B1 *	4/2003	Kostic et al. ....	455/501
6,650,872 B1	11/2003	Karlsson	
6,687,239 B1 *	2/2004	Koprivica .....	370/341

(Continued)

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

(52) **U.S. Cl.** ..... **370/329**; 375/132; 455/450

(58) **Field of Classification Search** ..... 370/328-334, 370/431, 436, 437, 464, 465; 375/132-136; 450/450, 451, 452.1, 452.2

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,716,573 A	12/1987	Bergstrom et al.	
4,780,885 A *	10/1988	Paul et al. ....	375/267
5,323,447 A	6/1994	Gillis et al.	
5,394,433 A *	2/1995	Bantz et al. ....	375/132
5,418,839 A	5/1995	Knuth et al.	
5,541,954 A	7/1996	Emi	
5,574,979 A	11/1996	West	
5,649,291 A	7/1997	Taylor	

**OTHER PUBLICATIONS**

Johnsson, HiperLAN/2-The Broadband Radio Transmission Technology Operating in the 5 GHz Frequency Band, pp. 1-22, 1999.\*

(Continued)

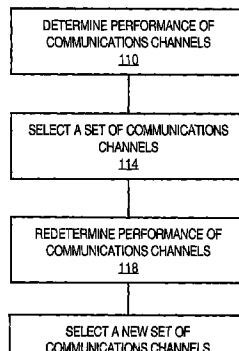
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(57) **ABSTRACT**

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.

**128 Claims, 11 Drawing Sheets**



Marvell Semiconductor, Inc.  
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MediaTek USA, Inc.

U.S. PATENT DOCUMENTS

6,694,147	B1 *	2/2004	Viswanath et al. ....	455/517
6,700,875	B1	3/2004	Schroeder et al.	
6,704,346	B1 *	3/2004	Mansfield .....	375/136
6,745,034	B1	6/2004	Wang et al.	
6,760,317	B1	7/2004	Honkanen et al.	
2002/0122462	A1 *	9/2002	Batra et al. ....	375/132

OTHER PUBLICATIONS

Zander, Adaptive Frequency Hopping in HF communications, IEEE, pp. 99-105, 1995.\*

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](http://grouper.ieee.org/groups/802/15/pub/2000/Nov00/00367r0P802-15_TG2-Adaptive-Frequency-Hopping.ppt).\*

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 002220853, 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. IEE Proc.-Commun., vol. 142, No. 2, Apr. 1995, entitled "Adaptive frequency hopping in HF communications", by J. Zander, PhD and G. Malmgren, MSc, (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).

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.

\* cited by examiner

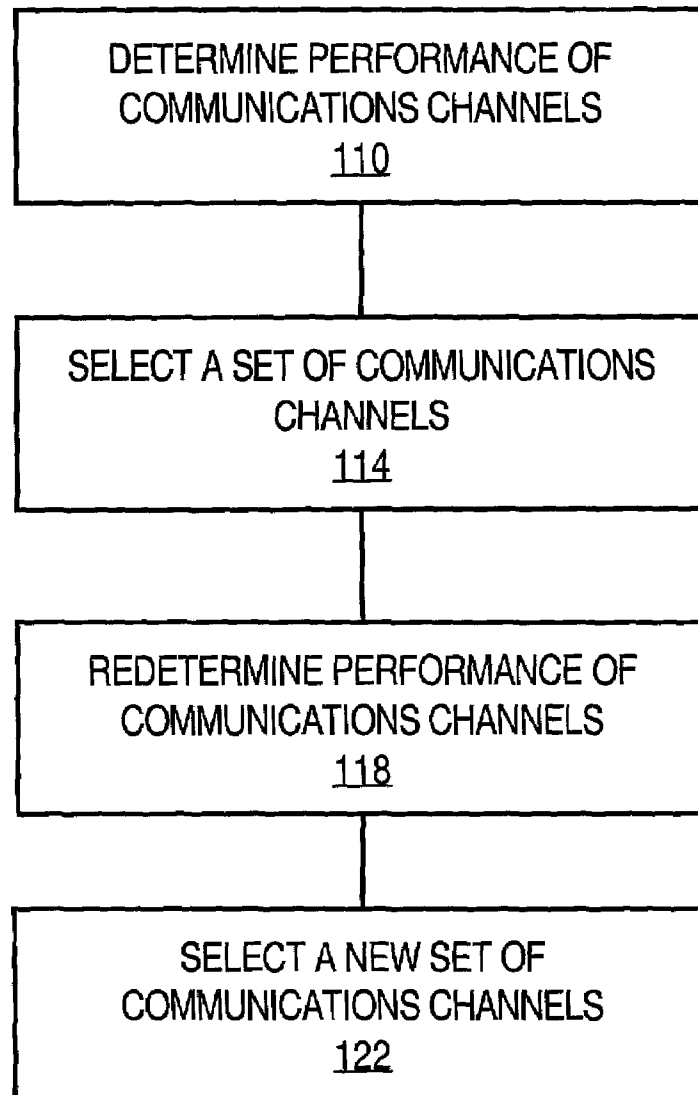


FIG. 1A

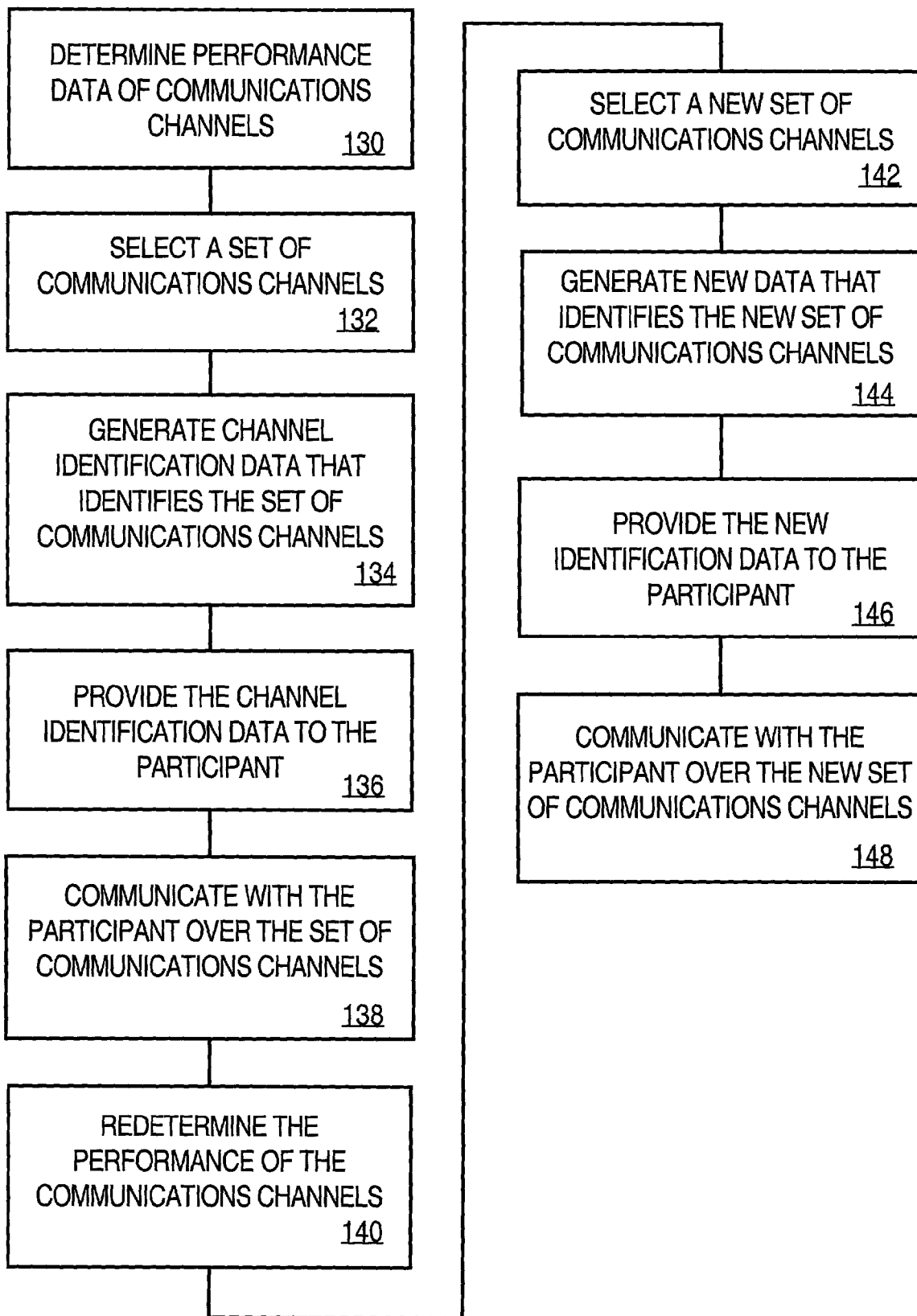


FIG. 1B

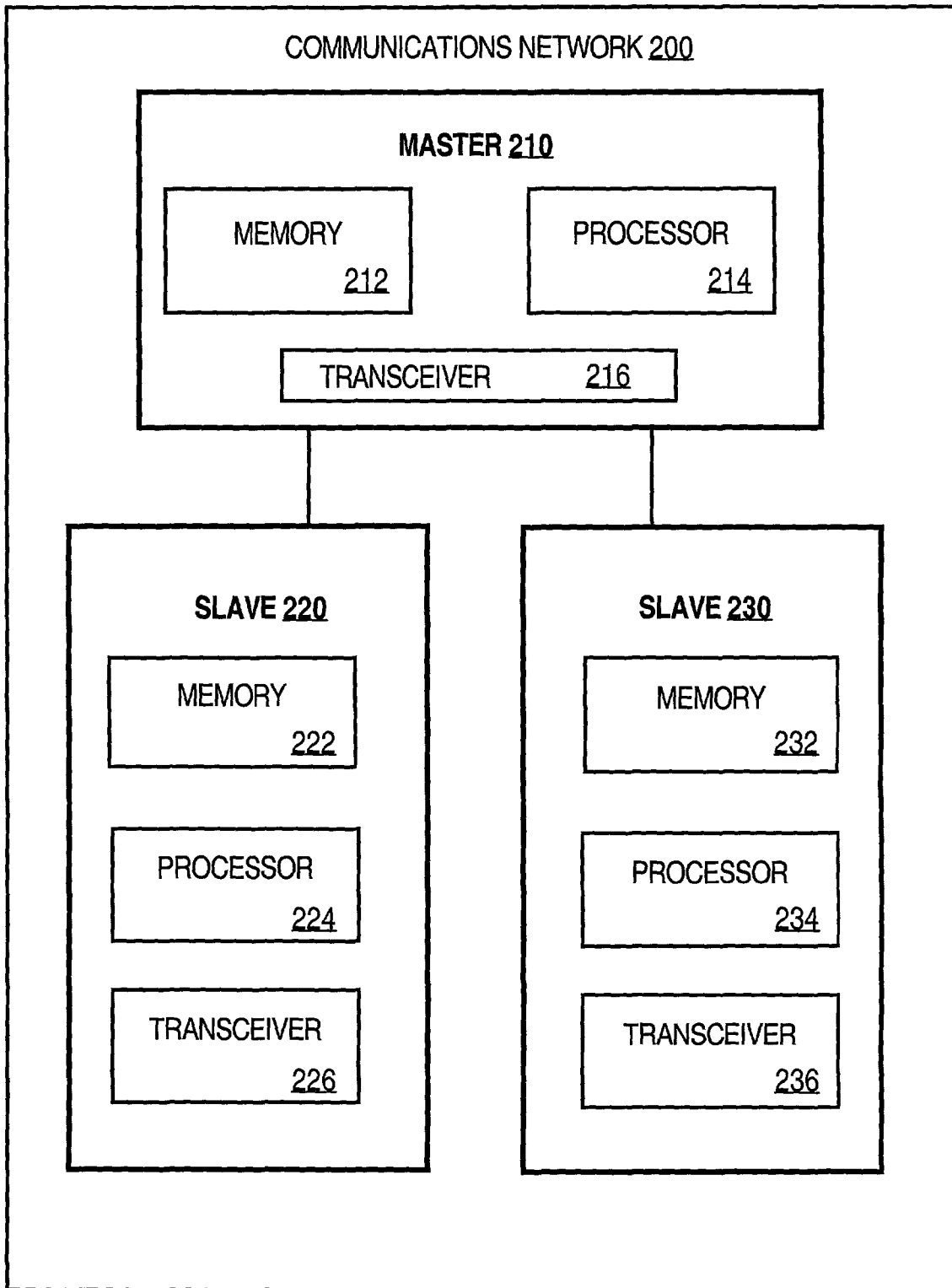


FIG. 2

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