



US007221680B2

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

(10) **Patent No.:** **US 7,221,680 B2**
(45) **Date of Patent:** **May 22, 2007**

(54) **MULTIPLEXING AND TRANSMISSION OF MULTIPLE DATA STREAMS IN A WIRELESS MULTI-CARRIER COMMUNICATION SYSTEM**

(75) Inventors: **Rajiv Vijayan**, San Diego, CA (US); **Aamod Khandekar**, San Diego, CA (US); **Fuyun Ling**, San Diego, CA (US); **Gordon Kent Walker**, Poway, CA (US); **Ramaswamy Murali**, San Diego, CA (US)

(73) Assignee: **QUALCOMM Incorporated**, San Diego, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 61 days.

(21) Appl. No.: **10/932,586**

(22) Filed: **Sep. 1, 2004**

(65) **Prior Publication Data**

US 2005/0058089 A1 Mar. 17, 2005

Related U.S. Application Data

(60) Provisional application No. 60/499,741, filed on Sep. 2, 2003, provisional application No. 60/559,740, filed on Apr. 5, 2004.

(51) **Int. Cl.**
H04B 7/216 (2006.01)

(52) **U.S. Cl.** **370/441; 370/335; 370/342**

(58) **Field of Classification Search** **370/431, 370/310.2, 335, 342, 441, 330, 208**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,618,353 B2* 9/2003 Merrill et al. 370/225
2002/0085486 A1* 7/2002 Ehrmann-Patin et al. ... 370/210
2003/0086366 A1* 5/2003 Branlund et al. 370/208
2004/0266351 A1* 12/2004 Chuah et al. 455/62

* cited by examiner

Primary Examiner—Chi Pham

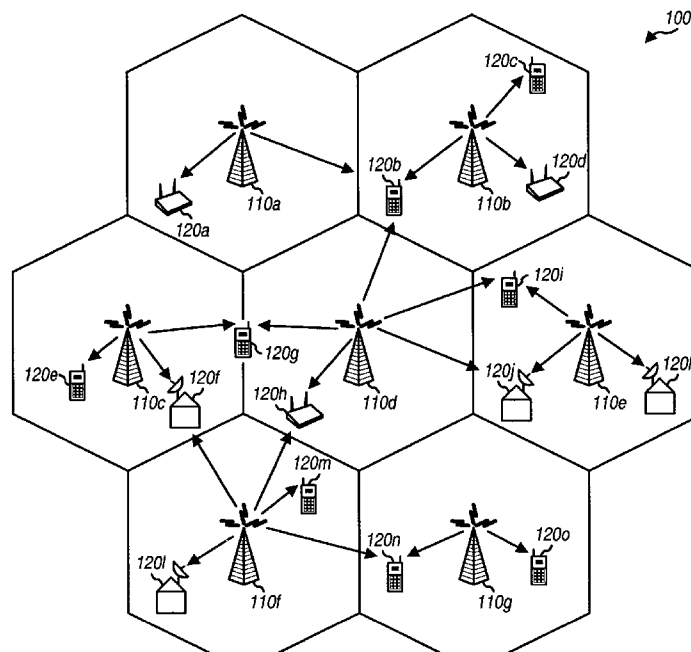
Assistant Examiner—Ronald Abelson

(74) *Attorney, Agent, or Firm*—Thomas R. Rouse; Sandip S. Minhas; Albert J. Harnois, Jr.

(57) **ABSTRACT**

Techniques for multiplexing and transmitting multiple data streams are described. Transmission of the multiple data streams occurs in “super-frames”. Each super-frame has a predetermined time duration and is further divided into multiple (e.g., four) frames. Each data block for each data stream is outer encoded to generate a corresponding code block. Each code block is partitioned into multiple sub-blocks, and each data packet in each code block is inner encoded and modulated to generate modulation symbols for the packet. The multiple subblocks for each code block are transmitted in the multiple frames of the same super-frame, one subblock per frame. Each data stream is allocated a number of transmission units in each super-frame and is assigned specific transmission units to achieve efficient packing. A wireless device can select and receive individual data streams.

35 Claims, 15 Drawing Sheets



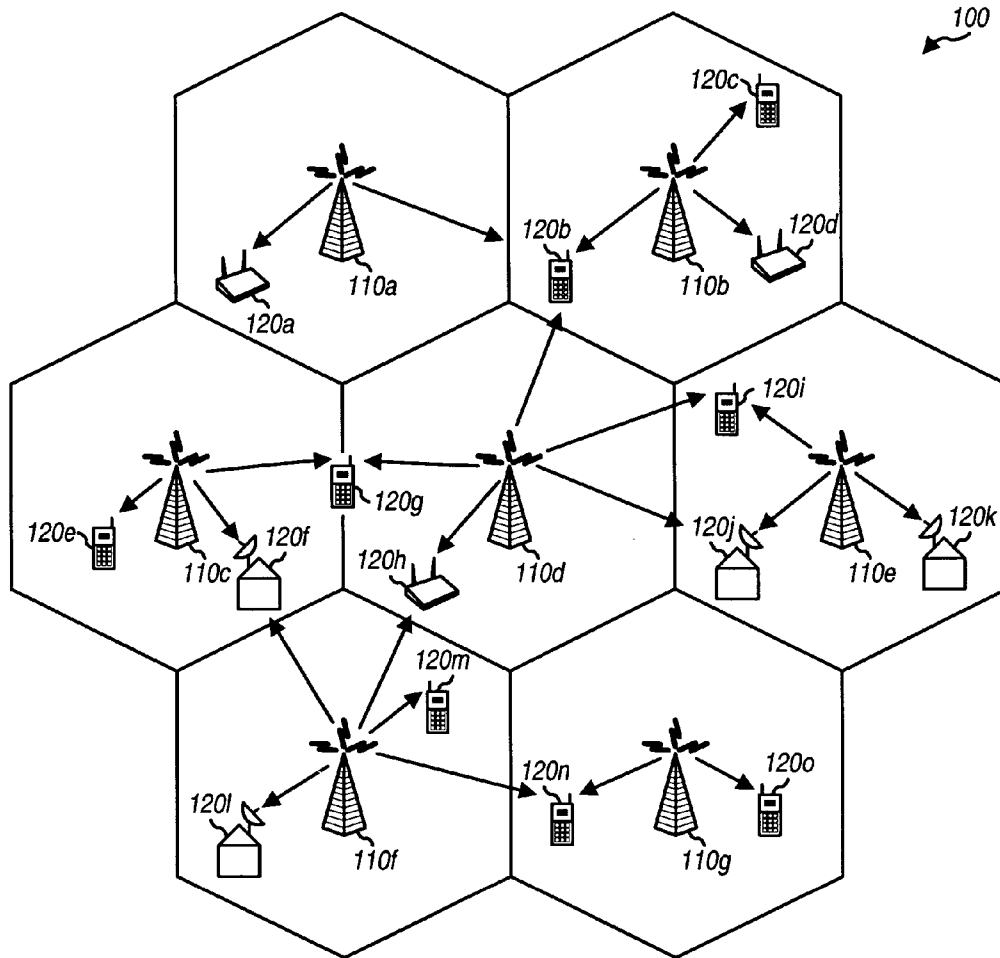


FIG. 1

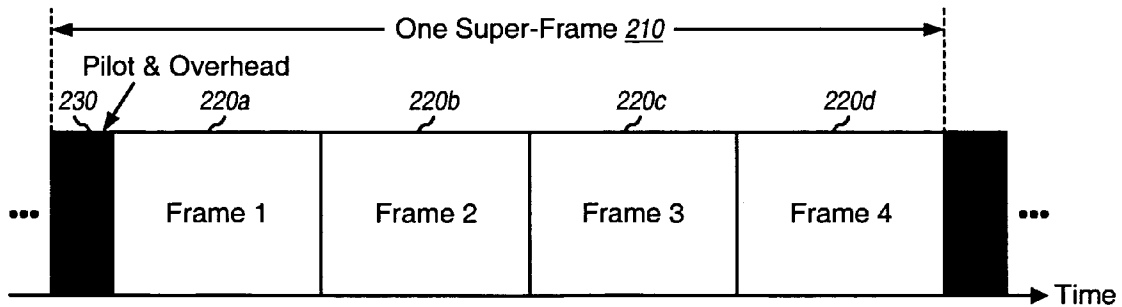


FIG. 2

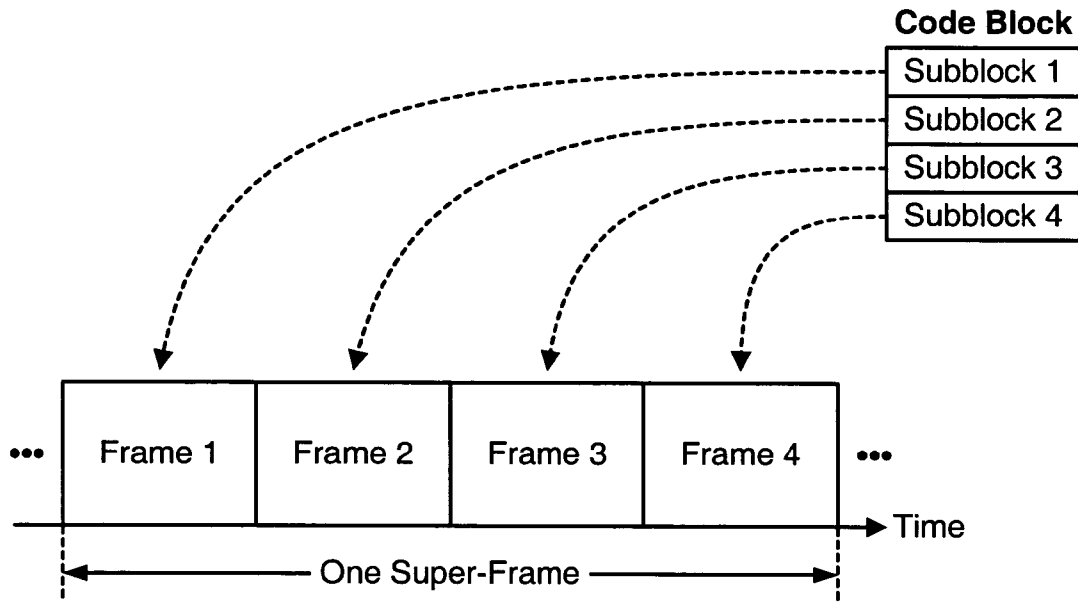


FIG. 3A

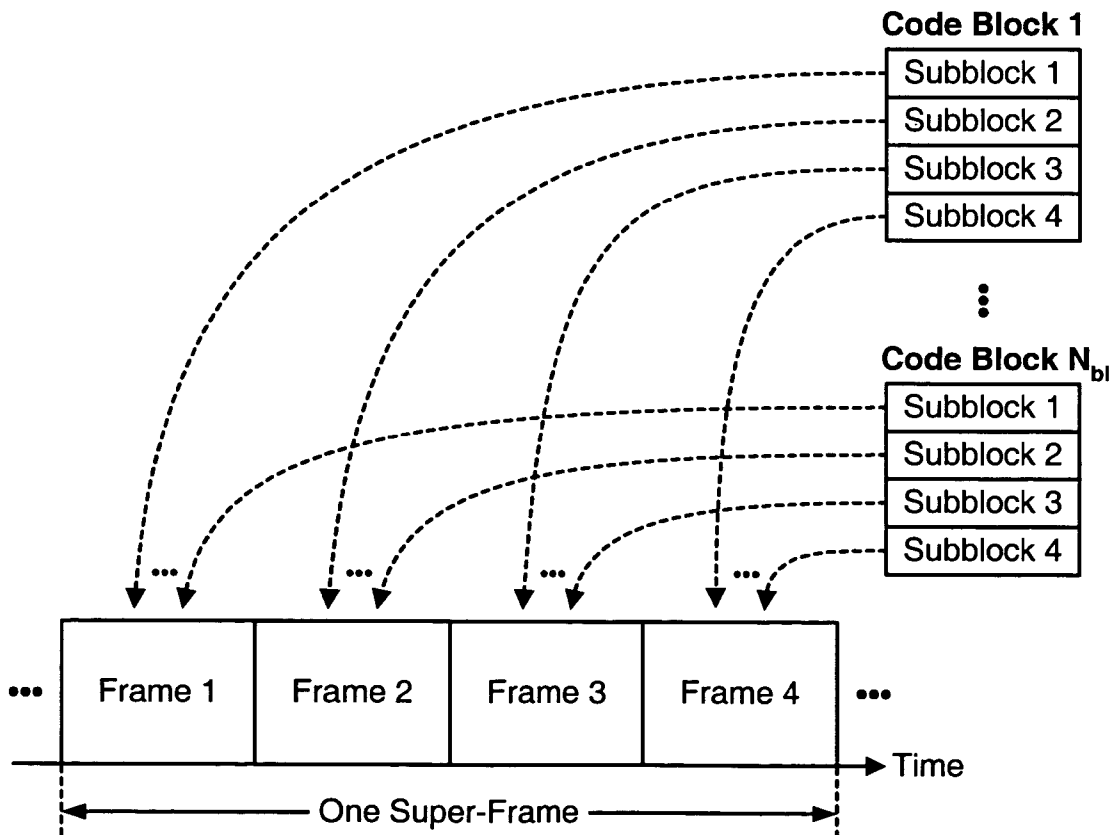


FIG. 3B

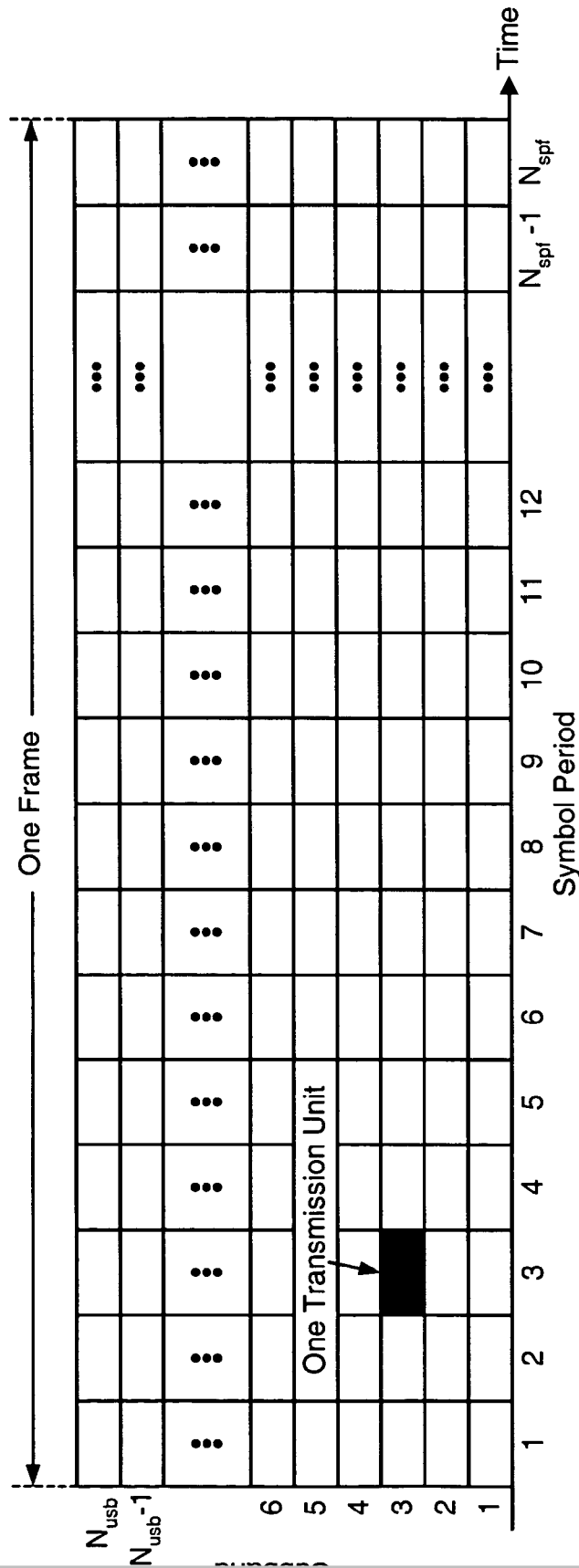


FIG. 4

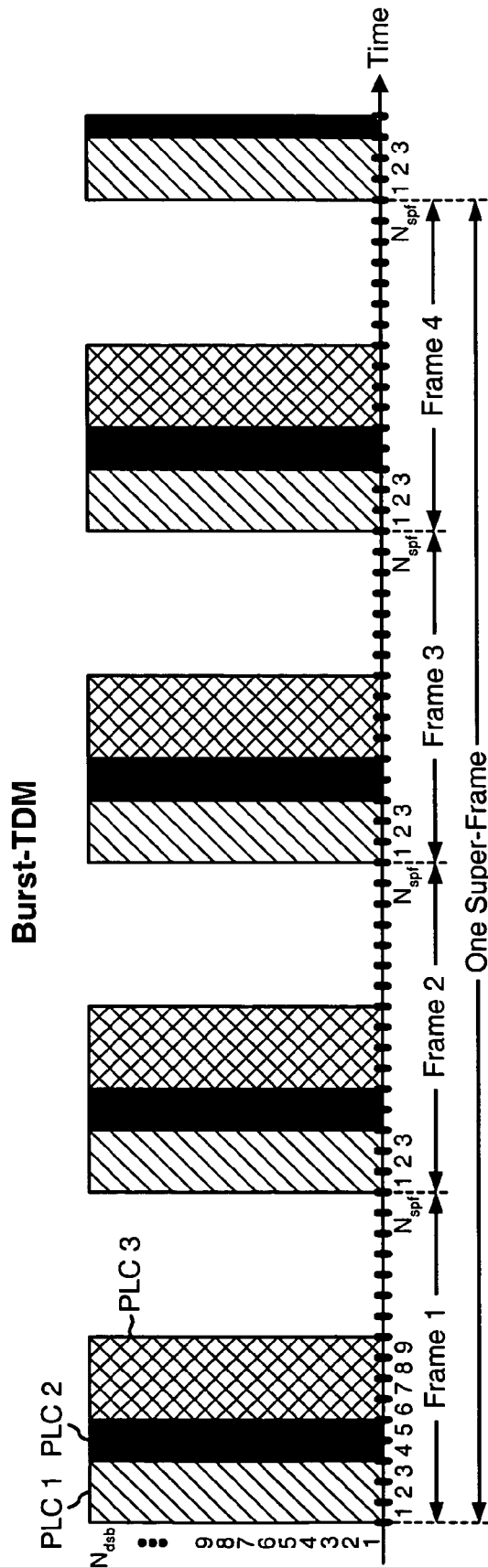


FIG. 5A

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.