



US006167031A

United States Patent [19]

[11] Patent Number: **6,167,031**

Olofsson et al.

[45] Date of Patent: **Dec. 26, 2000**

- [54] **METHOD FOR SELECTING A COMBINATION OF MODULATION AND CHANNEL CODING SCHEMES IN A DIGITAL COMMUNICATION SYSTEM**
- [75] Inventors: **Håkan Gunnar Olofsson**, Stockholm, Sweden; **Jörn Thielecke**, Erlangen, Germany
- [73] Assignee: **Telefonaktiebolaget LM Ericsson (publ)**, Stockholm, Sweden
- [21] Appl. No.: **08/921,321**
- [22] Filed: **Aug. 29, 1997**
- [51] **Int. Cl.⁷** **H04Q 7/34**
- [52] **U.S. Cl.** **370/252; 370/345; 455/67.3**
- [58] **Field of Search** **370/252, 345; 455/63, 67.3, 226.3, 228, 522**

Matsuoka, H. et al., 'Adaptive Modulation System with Variable Coding Rate Concatenated Code for High Quality Multi-Media Communication Systems', Vehicular Technology Conference, Apr. 1996, IEEE 46th, pp. 487-491.

Pearce, D.A.J. et al., 'Comparison of Counter-Measures Against Slow Rayleigh Fading for TDMA Systems', Advanced TDMA Techniques and Applications (Digest No. 1996/234), IEE Colloquium, pp. 9/1-9/6, Oct. 1996.

Naijoh, M. et al., 'ARQ Schemes With Adaptive Modulation/TDMA/TDD Systems for Wireless Multimedia Communication Services', Personal, Indoor and Mobile Radio Communications, Sep. 1997, PIMRC'97, 8th IEEE International Symposium, pp. 709-713.

Biglieri, E. et al., 'Coding and Modulation Under Power Constraints', IEEE Personal Communications, pp. 32-39, Jun. 1998.

European Search Report dated May 12, 1998.

J.E. Kleider et al., "An Adaptive-Rate Digital Communication System for Speech", 1997 IEEE International Conference on Acoustics, Speech and Signal Processing, vol. 3, Apr. 21-24, 1997, Los Alamitos, CA.

[56] References Cited

U.S. PATENT DOCUMENTS

5,909,469 6/1999 Frodigh et al. 375/302

FOREIGN PATENT DOCUMENTS

0 137695 A2 4/1985 European Pat. Off. H04N 1/00
 0 154565 A2 9/1995 European Pat. Off. H04L 27/00
 0 731573 A1 9/1996 European Pat. Off. H04B 17/00
 WO 93/00751 1/1993 WIPO H04B 1/10
 WO 97/13388 4/1997 WIPO H04Q 7/38

OTHER PUBLICATIONS

Sampei, S. et al, 'Adaptive Modulation/TDMA Scheme for Personal Multi-Media Communication Systems', Global Telecommunications Conference, 1994, GLOBECOM'94, Communications: The Global Bridge, IEEE, pp. 989-993, Nov. 1994.

UE, T. et al., 'Symbol Rate and Modulation Level Controlled Adaptive Modulation/TDMA/TDD for Personal Communication Systems', Vehicular Technology Conference, 1995 IEEE 45th, pp. 306-310, Jul. 1995.

Primary Examiner—Melvin Marcelo
Attorney, Agent, or Firm—Burns, Doane, Swecker & Mathis, L.L.P.

[57] ABSTRACT

A communication system that supports multiple modulation and channel coding schemes selects an optimum RF link by measuring link quality parameters, such as C/I ratio. All of the available RF links are characterized based on the measured link quality parameters by calculating mean values and variances of the parameters. Based on the characterization of the RF link, user quality values, such as user data throughput and speech quality values, are estimated. The communication system selects the RF link that provides the best user quality value.

41 Claims, 10 Drawing Sheets

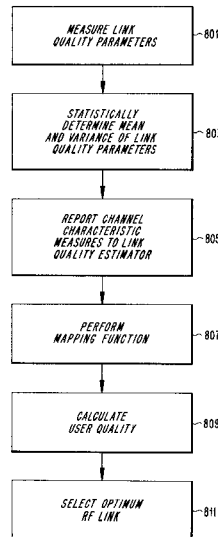


FIG. 1

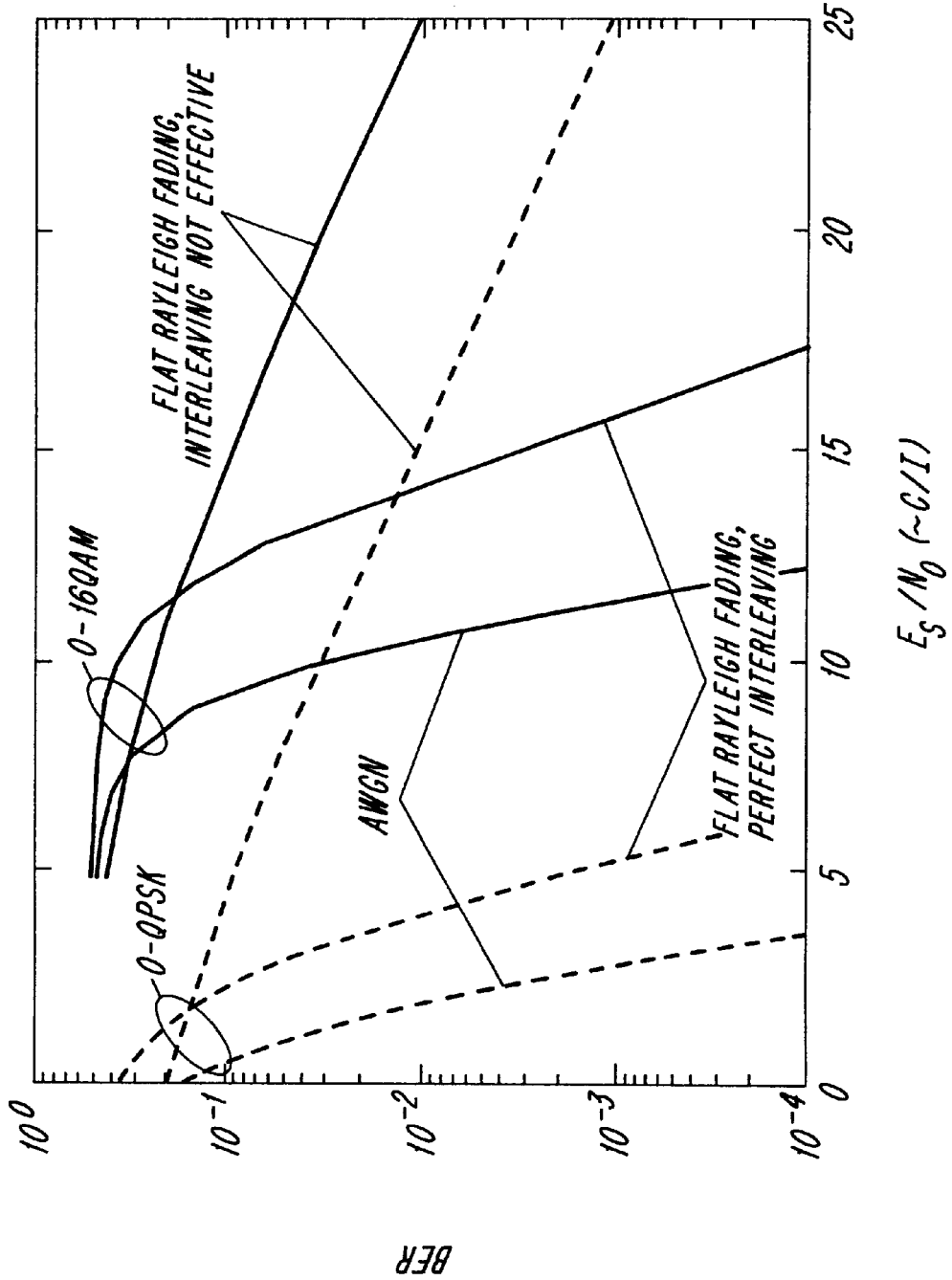
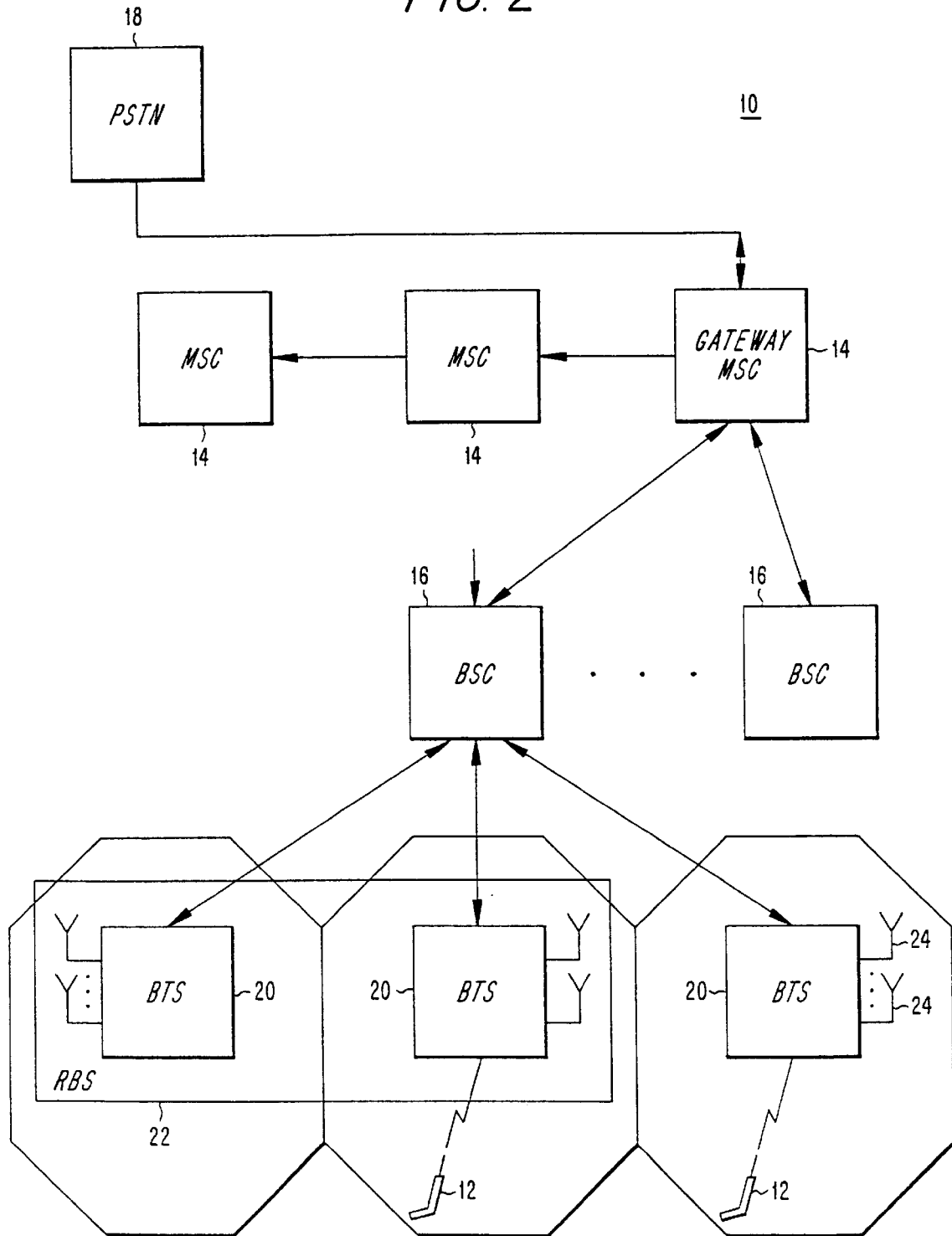


FIG. 2



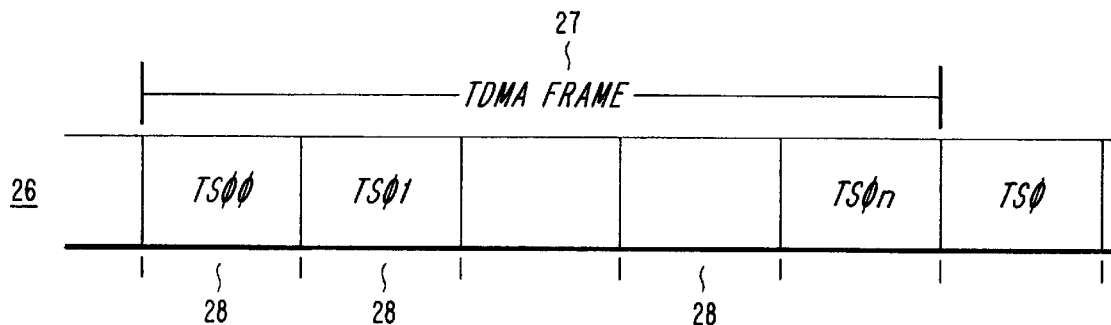


FIG. 3

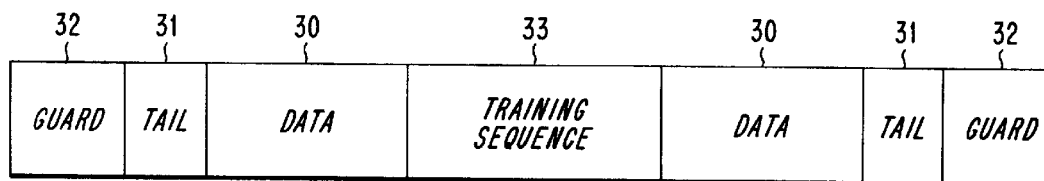


FIG. 4

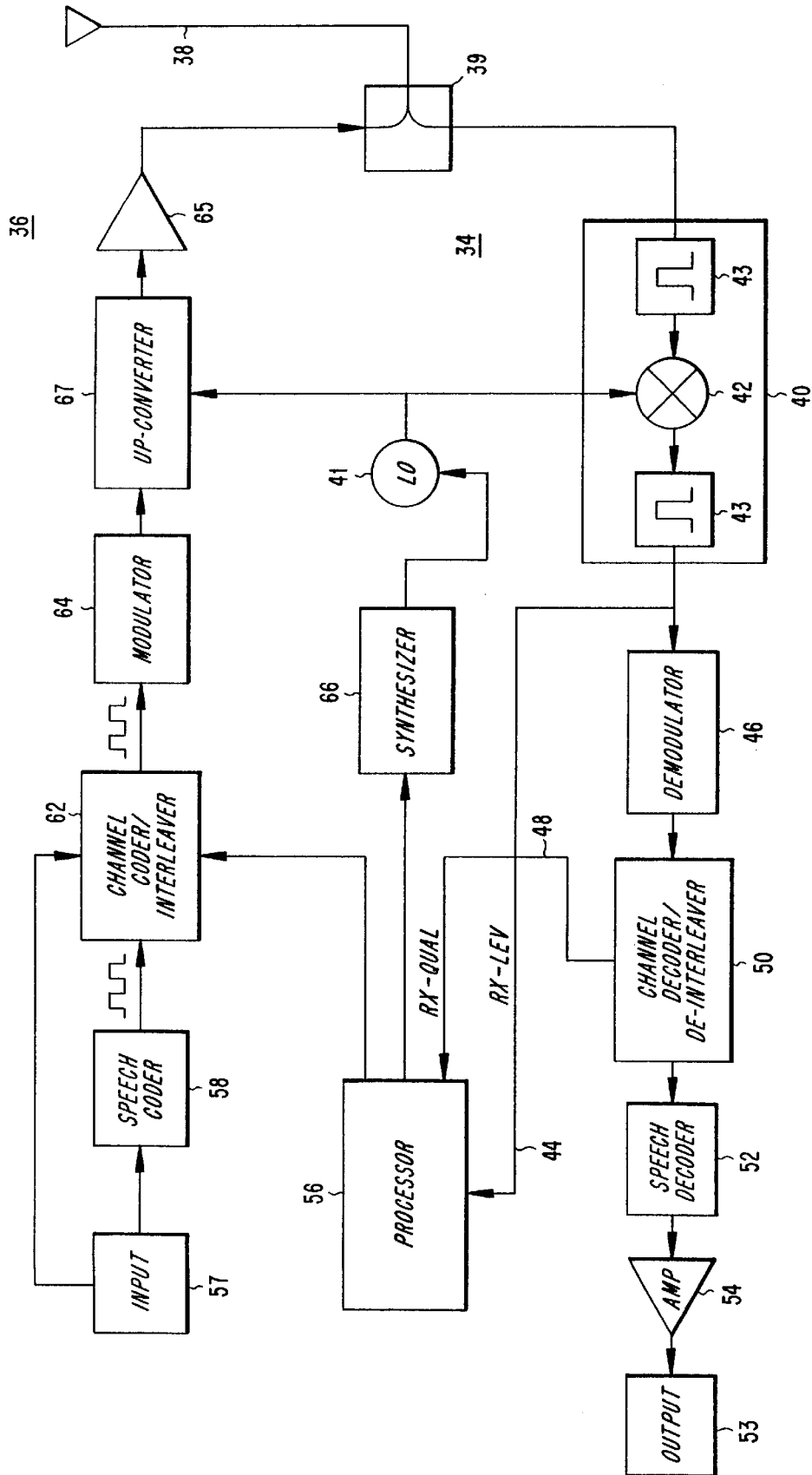


FIG. 5

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.