

- [54] **DIGITAL CONTROL CHANNELS HAVING LOGICAL CHANNELS FOR MULTIPLE ACCESS RADIOCOMMUNICATION**
- [75] Inventors: **Håkan C. Andersson**, Ekerö, Sweden; **John W. Diachina**, Garner, N.C.; **Bengt Persson**, Djursholm, Sweden; **Alex K. Raith**, Durham; **Anthony J. Sammarco**, Garner, both of N.C.; **Francois Sawyer**, St-Hubert, Canada

- 445887 9/1991 European Pat. Off. .  
 462572 12/1991 European Pat. Off. .  
 505106 9/1992 European Pat. Off. .  
 WO92/10042 6/1992 WIPO .  
 WO92/14308 8/1992 WIPO .

**OTHER PUBLICATIONS**

*Supplementary European Search Report No. EP 95 90 1121*  
 Date of Completion of search: 31 Oct. 1995.

(List continued on next page.)

- [73] Assignee: **Telefonaktiebolaget LM Ericsson**, Stockholm, Sweden

*Primary Examiner*—Douglas W. Olms  
*Assistant Examiner*—Ajit Patel  
*Attorney, Agent, or Firm*—Burns, Doane, Swecker & Mathis, L.L.P.

- [21] Appl. No.: **331,703**

[57] **ABSTRACT**

- [22] Filed: **Oct. 31, 1994**

A communications system in which information is transmitted in successive time slots grouped into a plurality of superframes which are, in turn, grouped into a plurality of hyperframes. A remote station is assigned to one of the time slots in each of the superframes for paging the remote station, each hyperframe including at least two superframes, and the information sent in the assigned time slot in one superframe in each hyperframe is repeated in the assigned time slot in the other superframe(s) in each hyperframe. Each superframe can include a plurality of time slots used for sending paging messages to remote stations, grouped into a plurality of successive paging frames, and the time slot to which the remote station is assigned is included once in every paging frame. Also, each superframe may include time slots comprising a logical channel for broadcast control information and time slots comprising a logical paging channel. Information sent in the assigned time slot may direct the remote station to read the broadcast control information, and the information may have been encoded according to an error correcting code and include a plurality of bits having polarities that are inverses of cyclic redundancy check bits produced by the encoding. Also, the broadcast control information may comprise special messages that are included in respective time slots comprising a logical special message channel, the time slots of the special message channel may be grouped in successive SMS frames, and the SMS frames may be synchronized to start with a start of a superframe.

**Related U.S. Application Data**

- [63] Continuation-in-part of Ser. No. 147,254, Nov. 1, 1993, and a continuation-in-part of Ser. No. 956,640, Oct. 5, 1992, Pat. No. 5,404,355.
- [51] **Int. Cl.<sup>6</sup>** ..... **H04J 3/16**
- [52] **U.S. Cl.** ..... **370/347**
- [58] **Field of Search** ..... 370/95.1, 95.3, 370/85.7, 82, 99, 110.1; 455/34.1, 118, 33.1, 54.1, 32.1, 38.1; 379/59, 60; 340/825.44; 371/69.1, 67.1, 70

[56] **References Cited**

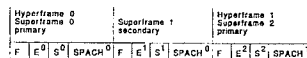
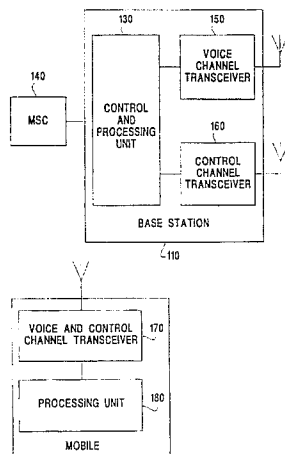
**U.S. PATENT DOCUMENTS**

- 4,797,654 1/1989 Young et al. .... 341/50  
 4,815,073 3/1989 Grauel et al. .... 370/95  
 5,081,704 1/1992 Umeda et al. .... 455/33  
 5,127,100 6/1992 D'Amico et al. .... 455/33.1  
 5,193,091 3/1993 Crisler et al. .... 370/95.1  
 5,228,030 7/1993 Dresher ..... 370/100.1  
 5,325,088 6/1994 Willard et al. .... 340/825.2  
 5,353,332 10/1994 Raith et al. .... 379/59

**FOREIGN PATENT DOCUMENTS**

- 240073 10/1987 European Pat. Off. .  
 291068 11/1988 European Pat. Off. .  
 321454 6/1989 European Pat. Off. .

**39 Claims, 9 Drawing Sheets**



F = F-BCCH  
 E = E-BCCH  
 S = S-BCCH  
 SPACH = PCH or ARCH of SMSCH

## OTHER PUBLICATIONS

B. Walke et al., "Cellpac: A Packet Radio Protocol Applied to the Cellular GSM Mobile Radio Network", 41st IEEE Vehicular Technology Conference Gateway to the Future. Technology in Motion (19–22 May 1991).

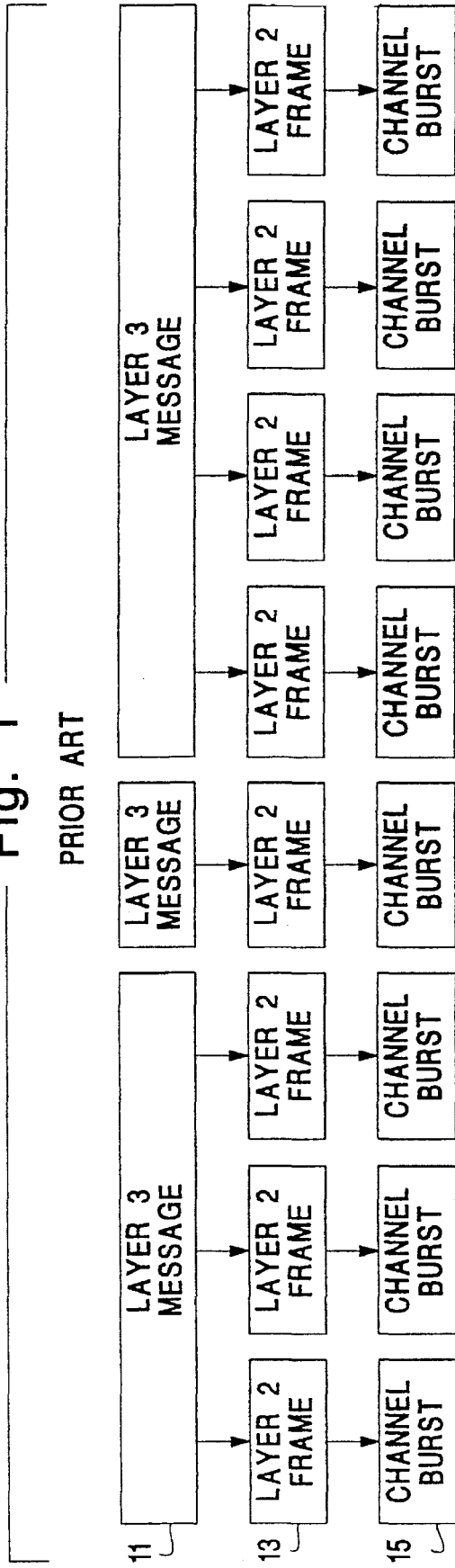
"A New Standard for North American Digital Cellular", Magnus Isaksson et al., *Ericsson Review*, No. 2, 1994.

"Cellular System Dual-Mode Mobile Station—Base Station Compatibility Standard", *EIA/TIA Interim Standard*, IS-54-B, pp. 101–106; 109–116; 139–140; and 163–166 (Apr., 1992).

"Radio Link Control Techniques for Digital Cellular Systems", Seizo Onoe et al., *NNT Review*, vol. 4, No. 1, pp. 47–54 (Jan. 1992).

"Call Setup Strategy Tradeoffs for Universal Digital Portable Communications", Yurdaer N. Doganata et al., *Computer Networks and ISDN Systems*, vol. 20, No. 1/5, pp. 455–464, (Dec. 1990).

Fig. 1



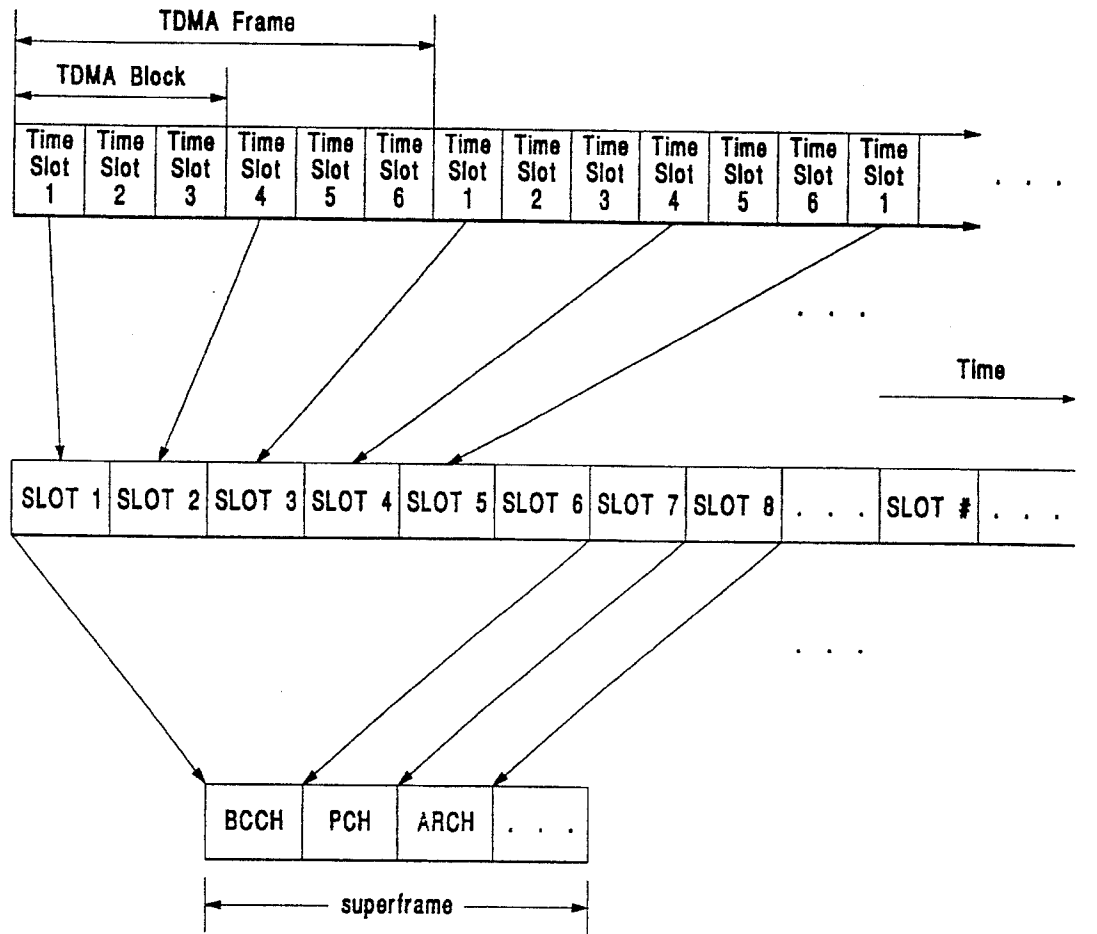


FIG. 2

Hyperframe 0 Superframe 0 primary	Superframe 1 secondary	Hyperframe 1 Superframe 2 primary
F E <sup>0</sup> S <sup>0</sup> SPACH <sup>0</sup>	F E <sup>1</sup> S <sup>1</sup> SPACH <sup>0</sup>	F E <sup>2</sup> S <sup>2</sup> SPACH <sup>1</sup>

F = F-BCCH

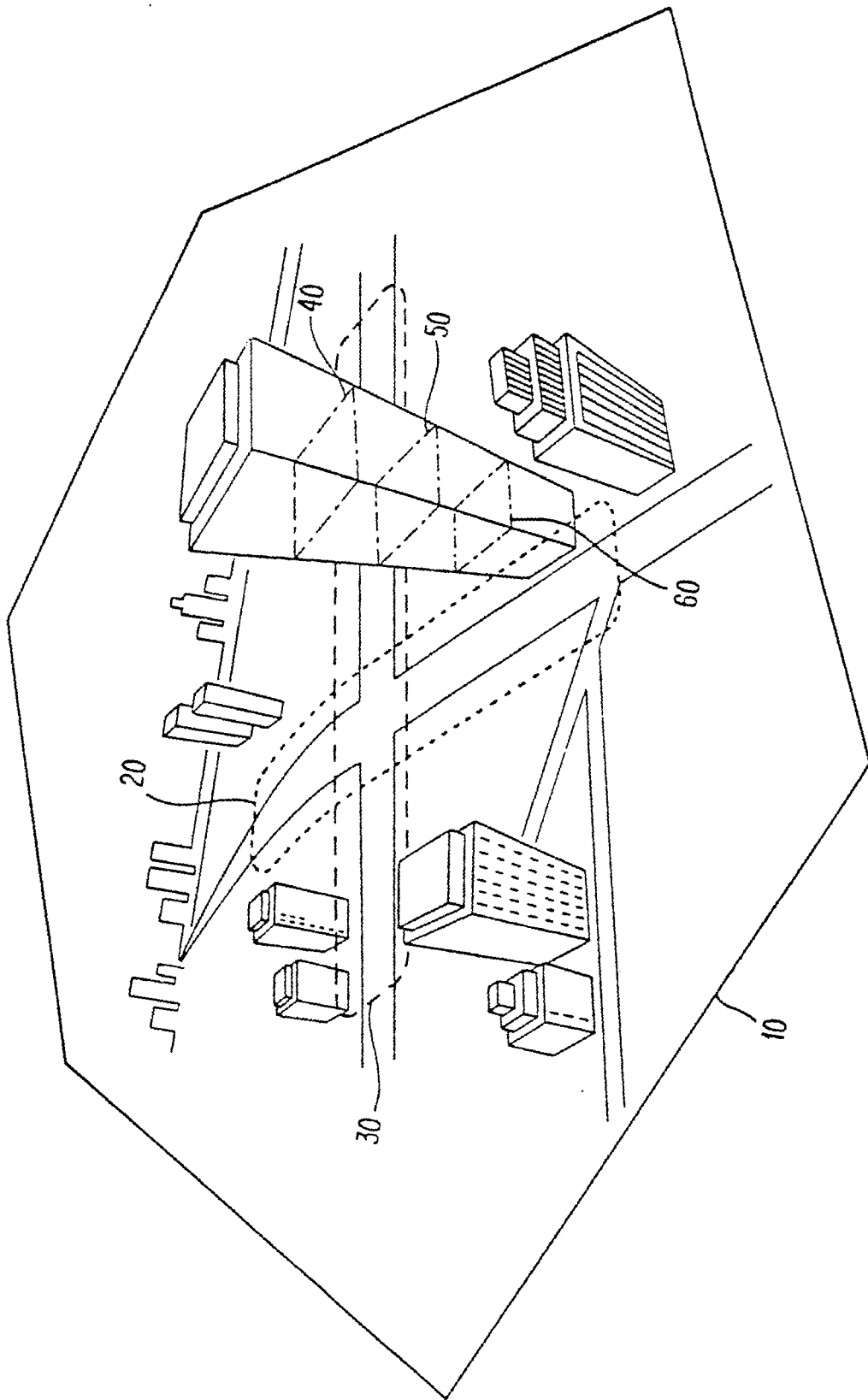
E = E-BCCH

S = S-BCCH

SPACH = PCH or ARCH or SMSCH

FIG. 5

Fig. 3



# 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.