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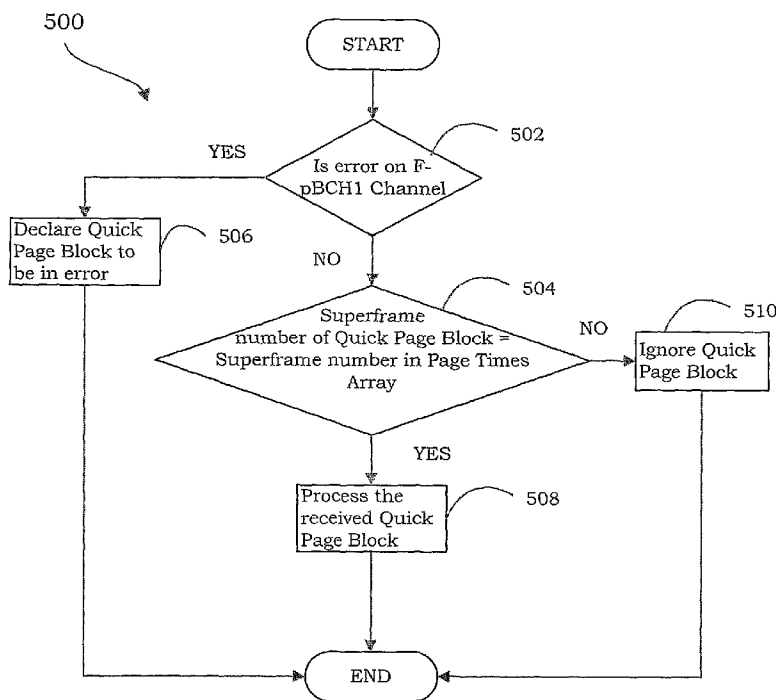
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[Continued on next page]

(54) Title: A METHOD AND APPARATUS FOR RECEIVING AND PROCESSING QUICKPAGE BLOCK IN WIRELESS COMMUNICATION SYSTEMS



(57) Abstract: A method and apparatus for receiving and processing QuickPage block is provided, comprising declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block, otherwise, comparing superframe number of PageTimes array with the superframes in which occur the QuickPage, determining first three bits (NumPages field) in the block and processing the QuickPage block.

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# A METHOD AND APPARATUS FOR RECEIVING AND PROCESSING QUICKPAGE BLOCK IN WIRELESS COMMUNICATION SYSTEMS

## CLAIM OF PRIORITY UNDER 35 U.S.C. § 119

[0001] The present Application for Patent claims priority to Provisional Application Serial No. 60/731,037, entitled "METHODS AND APPARATUS FOR PROVIDING MOBILE BROADBAND WIRELESS HIGHER MAC", filed 10/27/2005, assigned to the assignee hereof, and expressly incorporated herein by reference.

## BACKGROUND

### Field

[0002] The present disclosure relates generally to wireless communications, and more particularly to methods and apparatus for receiving and processing QuickPage blocks.

### Background

[0003] Wireless communication systems have become a prevalent means by which a majority of people worldwide have come to communicate. Wireless communication devices have become smaller and more powerful in order to meet consumer needs and to improve portability and convenience. The increase in processing power in mobile devices such as cellular telephones has lead to an increase in demands on wireless network transmission systems. Such systems typically are not as easily updated as the cellular devices that communicate there over. As mobile device capabilities expand, it can be difficult to maintain an older wireless network system in a manner that facilitates fully exploiting new and improved wireless device capabilities.

[0004] Wireless communication systems generally utilize different approaches to generate transmission resources in the form of channels. These systems may be code division multiplexing (CDM) systems, frequency division multiplexing (FDM) systems, and time division multiplexing (TDM) systems. One commonly utilized variant of FDM is orthogonal frequency division multiplexing (OFDM) that effectively partitions the overall system bandwidth into multiple orthogonal subcarriers. These subcarriers

may also be referred to as tones, bins, and frequency channels. Each subcarrier can be modulated with data. With time division based techniques, each subcarrier can comprise a portion of sequential time slices or time slots. Each user may be provided with a one or more time slot and subcarrier combinations for transmitting and receiving information in a defined burst period or frame. The hopping schemes may generally be a symbol rate hopping scheme or a block hopping scheme.

**[0005]** Code division based techniques typically transmit data over a number of frequencies available at any time in a range. In general, data is digitized and spread over available bandwidth, wherein multiple users can be overlaid on the channel and respective users can be assigned a unique sequence code. Users can transmit in the same wide-band chunk of spectrum, wherein each user's signal is spread over the entire bandwidth by its respective unique spreading code. This technique can provide for sharing, wherein one or more users can concurrently transmit and receive. Such sharing can be achieved through spread spectrum digital modulation, wherein a user's stream of bits is encoded and spread across a very wide channel in a pseudo-random fashion. The receiver is designed to recognize the associated unique sequence code and undo the randomization in order to collect the bits for a particular user in a coherent manner.

**[0006]** A typical wireless communication network (*e.g.*, employing frequency, time, and/or code division techniques) includes one or more base stations that provide a coverage area and one or more mobile (*e.g.*, wireless) terminals that can transmit and receive data within the coverage area. A typical base station can simultaneously transmit multiple data streams for broadcast, multicast, and/or unicast services, wherein a data stream is a stream of data that can be of independent reception interest to a mobile terminal. A mobile terminal within the coverage area of that base station can be interested in receiving one, more than one or all the data streams transmitted from the base station. Likewise, a mobile terminal can transmit data to the base station or another mobile terminal. In these systems the bandwidth and other system resources are assigned utilizing a scheduler.

**[0007]** The signals, signal formats, signal exchanges, methods, processes, and techniques disclosed herein provide several advantages over known approaches. These include, for example, reduced signaling overhead, improved system throughput, increased signaling flexibility, reduced information processing, reduced transmission

bandwidth, reduced bit processing, increased robustness, improved efficiency, and reduced transmission power.

### SUMMARY

[0008] The following presents a simplified summary of one or more embodiments in order to provide a basic understanding of such embodiments. This summary is not an extensive overview of all contemplated embodiments, and is intended to neither identify key or critical elements of all embodiments nor delineate the scope of any or all embodiments. Its sole purpose is to present some concepts of one or more embodiments in a simplified form as a prelude to the more detailed description that is presented later.

[0009] According to one embodiment, a method is provided for receiving and processing QuickPage block, the method comprising declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block, otherwise comparing superframe number of PageTimes array with the superframes in which occur the QuickPage, and processing the QuickPage block.

[0010] According to yet another embodiment, a computer readable medium is described which comprises a first set of instructions for declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block or a second set of instructions for comparing superframe number of PageTimes array with the superframes in which occur the QuickPage and a fourth set of instructions for processing the QuickPage block.

[0011] According to yet another embodiment, an apparatus is described which includes means for declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block, otherwise, means for comparing superframe number of PageTimes array with the superframes in which occur the QuickPage and means for processing the QuickPage block.

[0012] To the accomplishment of the foregoing and related ends, the one or more embodiments comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative embodiments of the one or more embodiments. These embodiments are indicative, however, of but a few of the various ways in which the principles of various embodiments may be employed and the described embodiments are intended to include all such embodiments and their equivalents.

### BRIEF DESCRIPTION OF THE DRAWINGS

- [0013] Fig. 1 illustrates embodiments of a multiple access wireless communication system.
- [0014] Fig. 2 illustrates embodiments of a transmitter and receiver in a multiple access wireless communication system.
- [0015] Figs. 3A and 3B illustrate embodiments of superframe structures for a multiple access wireless communication system.
- [0016] Fig. 4 illustrates a communication link between access terminal and access point.
- [0017] Fig. 5A illustrates a flow diagram of a process used by access terminal.
- [0018] Fig. 5B illustrates one or more processors for reception of the QuickPage block.
- [0019] Fig. 6A illustrates a flow diagram of a process used by access terminal.
- [0020] Fig. 6B illustrates one or more processors for processing the received QuickPage block.

### DETAILED DESCRIPTION

[0021] Various embodiments are now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more embodiments. It may be evident, however, that such embodiment(s) may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing one or more embodiments.

[0022] Referring to Fig. 1, a multiple access wireless communication system according to one embodiment is illustrated. A multiple access wireless communication system 100 includes multiple cells, e.g. cells 102, 104, and 106. In the embodiment of Fig. 1, each cell 102, 104, and 106 may include an access point 150 that includes multiple sectors. The multiple sectors are formed by groups of antennas each responsible for communication with access terminals in a portion of the cell. In cell 102, antenna groups 112, 114, and 116 each correspond to a different sector. In cell 104, antenna groups 118, 120, and 122 each correspond to a different sector. In cell 106, antenna groups 124, 126, and 128 each correspond to a different sector.

[0023] Each cell includes several access terminals which are in communication with one or more sectors of each access point. For example, access terminals 130 and 132 are in communication base 142, access terminals 134 and 136 are in communication with access point 144, and access terminals 138 and 140 are in communication with access point 146.

[0024] Controller 130 is coupled to each of the cells 102, 104, and 106. Controller 130 may contain one or more connections to multiple networks, e.g. the Internet, other packet based networks, or circuit switched voice networks that provide information to, and from, the access terminals in communication with the cells of the multiple access wireless communication system 100. The controller 130 includes, or is coupled with, a scheduler that schedules transmission from and to access terminals. In other embodiments, the scheduler may reside in each individual cell, each sector of a cell, or a combination thereof.

[0025] As used herein, an access point may be a fixed station used for communicating with the terminals and may also be referred to as, and include some or all the functionality of, a base station, a Node B, or some other terminology. An access terminal may also be referred to as, and include some or all the functionality of, a user equipment (UE), a wireless communication device, terminal, a mobile station or some other terminology.

[0026] It should be noted that while Fig. 1, depicts physical sectors, i.e. having different antenna groups for different sectors, other approaches may be utilized. For example, utilizing multiple fixed "beams" that each cover different areas of the cell in frequency space may be utilized in lieu of, or in combination with physical sectors. Such an approach is depicted and disclosed in copending US Patent Application Serial No. 11/260,895, entitled "Adaptive Sectorization In Cellular System."

[0027] Referring to Fig.2, a block diagram of an embodiment of a transmitter system 210 and a receiver system 250 in a MIMO system 200 is illustrated. At transmitter system 210, traffic data for a number of data streams is provided from a data source 212 to transmit (TX) data processor 214. In an embodiment, each data stream is transmitted over a respective transmit antenna. TX data processor 214 formats, codes, and interleaves the traffic data for each data stream based on a particular coding scheme selected for that data stream to provide coded data.

[0028] The coded data for each data stream may be multiplexed with pilot data using OFDM, or other orthogonalization or non-orthogonalization techniques. The pilot data

is typically a known data pattern that is processed in a known manner and may be used at the receiver system to estimate the channel response. The multiplexed pilot and coded data for each data stream is then modulated (i.e., symbol mapped) based on one or more particular modulation schemes (e.g., BPSK, QSPK, M-PSK, or M-QAM) selected for that data stream to provide modulation symbols. The data rate, coding, and modulation for each data stream may be determined by instructions performed on provided by processor 230.

[0029] The modulation symbols for all data streams are then provided to a TX processor 220, which may further process the modulation symbols (e.g., for OFDM). TX processor 220 then provides  $N_T$  modulation symbol streams to  $N_T$  transmitters (TMTR) 222a through 222t. Each transmitter 222 receives and processes a respective symbol stream to provide one or more analog signals, and further conditions (e.g., amplifies, filters, and upconverts) the analog signals to provide a modulated signal suitable for transmission over the MIMO channel.  $N_T$  modulated signals from transmitters 222a through 222t are then transmitted from  $N_T$  antennas 224a through 224t, respectively.

[0030] At receiver system 250, the transmitted modulated signals are received by  $N_R$  antennas 252a through 252r and the received signal from each antenna 252 is provided to a respective receiver (RCVR) 254. Each receiver 254 conditions (e.g., filters, amplifies, and downconverts) a respective received signal, digitizes the conditioned signal to provide samples, and further processes the samples to provide a corresponding "received" symbol stream.

[0031] An RX data processor 260 then receives and processes the  $N_R$  received symbol streams from  $N_R$  receivers 254 based on a particular receiver processing technique to provide  $N_T$  "detected" symbol streams. The processing by RX data processor 260 is described in further detail below. Each detected symbol stream includes symbols that are estimates of the modulation symbols transmitted for the corresponding data stream. RX data processor 260 then demodulates, deinterleaves, and decodes each detected symbol stream to recover the traffic data for the data stream. The processing by RX data processor 260 is complementary to that performed by TX processor 220 and TX data processor 214 at transmitter system 210.

[0032] RX data processor 260 may be limited in the number of subcarriers that it may simultaneously demodulate, e.g. 512 subcarriers or 5 MHz, and such a receiver should be scheduled on a single carrier. This limitation may be a function of its FFT



range, e.g. sample rates at which the processor 260 may operate, the memory available for FFT, or other functions available for demodulation. Further, the greater the number of subcarriers utilized, the greater the expense of the access terminal.

[0033] The channel response estimate generated by RX processor 260 may be used to perform space, space/time processing at the receiver, adjust power levels, change modulation rates or schemes, or other actions. RX processor 260 may further estimate the signal-to-noise-and-interference ratios (SNRs) of the detected symbol streams, and possibly other channel characteristics, and provides these quantities to a processor 270. RX data processor 260 or processor 270 may further derive an estimate of the “operating” SNR for the system. Processor 270 then provides channel state information (CSI), which may comprise various types of information regarding the communication link and/or the received data stream. For example, the CSI may comprise only the operating SNR. In other embodiments, the CSI may comprise a channel quality indicator (CQI), which may be a numerical value indicative of one or more channel conditions. The CSI is then processed by a TX data processor 278, modulated by a modulator 280, conditioned by transmitters 254a through 254r, and transmitted back to transmitter system 210.

[0034] At transmitter system 210, the modulated signals from receiver system 250 are received by antennas 224, conditioned by receivers 222, demodulated by a demodulator 240, and processed by a RX data processor 242 to recover the CSI reported by the receiver system. The reported CSI is then provided to processor 230 and used to (1) determine the data rates and coding and modulation schemes to be used for the data streams and (2) generate various controls for TX data processor 214 and TX processor 220. Alternatively, the CSI may be utilized by processor 270 to determine modulation schemes and/or coding rates for transmission, along with other information. This may then be provided to the transmitter which uses this information, which may be quantized, to provide later transmissions to the receiver.

[0035] Processors 230 and 270 direct the operation at the transmitter and receiver systems, respectively. Memories 232 and 272 provide storage for program codes and data used by processors 230 and 270, respectively.

[0036] At the receiver, various processing techniques may be used to process the  $N_R$  received signals to detect the  $N_T$  transmitted symbol streams. These receiver processing techniques may be grouped into two primary categories (i) spatial and space-time receiver processing techniques (which are also referred to as equalization techniques);

and (ii) “successive nulling/equalization and interference cancellation” receiver processing technique (which is also referred to as “successive interference cancellation” or “successive cancellation” receiver processing technique).

[0037] While Fig. 2 discusses a MIMO system, the same system may be applied to a multi-input single-output system where multiple transmit antennas, e.g. those on a base station, transmit one or more symbol streams to a single antenna device, e.g. a mobile station. Also, a single output to single input antenna system may be utilized in the same manner as described with respect to Fig. 2.

[0038] The transmission techniques described herein may be implemented by various means. For example, these techniques may be implemented in hardware, firmware, software, or a combination thereof. For a hardware implementation, the processing units at a transmitter may be implemented within one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, electronic devices, other electronic units designed to perform the functions described herein, or a combination thereof. The processing units at a receiver may also be implemented within one or more ASICs, DSPs, processors, and so on.

[0039] For a software implementation, the transmission techniques may be implemented with processors (e.g., procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in a memory (e.g., memory 230, 272x or 272y in Fig. 2) and executed by a processor (e.g., processor 232, 270x or 270y). The memory may be implemented within the processor or external to the processor.

[0040] It should be noted that the concept of channels herein refers to information or transmission types that may be transmitted by the access point or access terminal. It does not require or utilize fixed or predetermined blocks of subcarriers, time periods, or other resources dedicated to such transmissions.

[0041] Referring to Figs. 3A and 3B, embodiments of *superframe* structures for a multiple access wireless communication system are illustrated. Fig. 3A illustrates embodiments of *superframe* structures for a frequency division duplexed (FDD) multiple access wireless communication system, while Fig. 3B illustrates embodiments of *superframe* structures for a time division duplexed (TDD) multiple access wireless

communication system. The superframe preamble may be transmitted separately for each carrier or may span all of the carriers of the sector.

**[0042]** In both Figs. 3A and 3B, the forward link transmission is divided into units of superframes. A superframe may consist of a superframe preamble followed by a series of frames. In an FDD system, the reverse link and the forward link transmission may occupy different frequency bandwidths so that transmissions on the links do not, or for the most part do not, overlap on any frequency subcarriers. In a TDD system, N forward link frames and M reverse link frames define the number of sequential forward link and reverse link frames that may be continuously transmitted prior to allowing transmission of the opposite type of frame. It should be noted that the number of N and M may vary within a given superframe or between superframes.

**[0043]** In both FDD and TDD systems each superframe may comprise a superframe preamble. In certain embodiments, the superframe preamble includes a pilot channel that includes pilots that may be used for channel estimation by access terminals, a broadcast channel that includes configuration information that the access terminal may utilize to demodulate the information contained in the forward link frame. Further acquisition information such as timing and other information sufficient for an access terminal to communicate on one of the carriers and basic power control or offset information may also be included in the superframe preamble. In other cases, only some of the above and/or other information may be included in this superframe preamble.

**[0044]** As shown in Figs. 3A and 3B, the superframe preamble is followed by a sequence of frames. Each frame may consist of a same or a different number of OFDM symbols, which may constitute a number of subcarriers that may simultaneously be utilized for transmission over some defined period. Further, each frame may operate according to a symbol rate hopping mode, where one or more non-contiguous OFDM symbols are assigned to a user on a forward link or reverse link, or a block hopping mode, where users hop within a block of OFDM symbols. The actual blocks or OFDM symbols may or may not hop between frames.

**[0045]** Fig. 4 illustrates communication between an access terminal (for example the transmitter system 250 of Fig. 2) 402 and an access point (for example the transmitter system 210 of Fig. 2) 404 according to an embodiment. Using a communication link 406 and based upon predetermined timing, system conditions, or other decision criteria, the access point 404 will transmit QuickPage block through a F-pBCH1 channel to the access terminal 402. The communication link 406 may be implemented using

communication protocols/standards such as World Interoperability for Microwave Access (WiMAX), infrared protocols such as Infrared Data Association (IrDA), short-range wireless protocols/technologies, Bluetooth® technology, ZigBee® protocol, ultra wide band (UWB) protocol, home radio frequency (HomeRF), shared wireless access protocol (SWAP), wideband technology such as a wireless Ethernet compatibility alliance (WECA), wireless fidelity alliance (Wi-Fi Alliance), 802.11 network technology, public switched telephone network technology, public heterogeneous communications network technology such as the Internet, private wireless communications network, land mobile radio network, code division multiple access (CDMA), wideband code division multiple access (WCDMA), universal mobile telecommunications system (UMTS), advanced mobile phone service (AMPS), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal frequency division multiple (OFDM), orthogonal frequency division multiple access (OFDMA), orthogonal frequency division multiple FLASH (OFDM-FLASH), global system for mobile communications (GSM), single carrier (1X) radio transmission technology (RTT), evolution data only (EV-DO) technology, general packet radio service (GPRS), enhanced data GSM environment (EDGE), high speed downlink data packet access (HSPDA), analog and digital satellite systems, and any other technologies/protocols that may be used in at least one of a wireless communications network and a data communications network.

**[0046]** The access point 404 is configured to transmit a QuickPage block and access terminal 402 is configured to receive the QuickPage block from the access point 404 using the communication link 406. The access terminal 402 may declare the QuickPage block to be in error if there is an error on the F-pBCH1 channel that contains the QuickPage block. The error information may be used by the Idle State Protocol. The access terminal 402 processes only those QuickPage blocks that occur in superframes with superframe number contained in the PageTimes array that is public data of the Overhead Messages Protocol. The access terminal 402 ignores QuickPage blocks in other superframes. The QuickPage block may contain multiple QuickPages or a single Page. The number of Pages in a QuickPage block is decided by the access point 404.

**[0047]** The access terminal 402 processes each received QuickPage block. The format of the QuickPage block may depend on the first three bits which is NumPages field in the QuickPage block. NumPages is the number of pages or quick pages in the QuickPage block. If the value of NumPages is '0' then the access terminal 402 ignores

the QuickPage block. The QuickPage format with NumPages=0 comprise 3 bit NumPages field and  $N_{qp\_blk}-3$  bit Reserved field. If the value of NumPages is '1' then the access terminal 402 matches the ReceiveATIList of the Address Management Protocol and the protocol issues a PageReceived indication. The QuickPage format with NumPages=1 comprise a 3 bit NumPages field, a 32 bit ATI field having value equal to ATI of paged terminal and  $N_{qp\_blk}-35$  bit Reserved field. If the value of NumPages is between 1 and 6, including 6, then if the least significant bits of RQuickPage, that is public data of the Idle State Protocol, match one of the RQuickPage $i$  fields in the QuickPage block, the protocol generates a QuickPageReceived indication. The QuickPage format with NumPages=2 comprises 3 bits NumPages field, 16 bit RQuickPage1 field with value RQuickPageLSBs, 16 bit RQuickPage2 field with value RQuickPageLSBs and  $N_{qp\_blk}-35$  bit Reserved field. The QuickPage format with NumPages=3 comprise 3 bits NumPages field, 10 bit RQuickPage1 field with value RQuickPageLSBs, 10 bit RQuickPage2 field with value RQuickPageLSBs, 10 bit RQuickPage3 field with value RQuickPageLSBs and  $N_{qp\_blk}-33$  bit Reserved field. The QuickPage format with NumPages=4 comprise 3 bits NumPages field, 8 bit RQuickPage1 field with value RQuickPageLSBs, 8 bit RQuickPage2 field with value RQuickPageLSBs, 8 bit RQuickPage3 field with value RQuickPageLSBs, 8 bit RQuickPage4 field with value RQuickPageLSBs and  $N_{qp\_blk}-33$  bit Reserved field. The QuickPage format with NumPages=5 comprise 3 bits NumPages field, 6 bit RQuickPage1 field with value RQuickPageLSBs, 6 bit RQuickPage2 field with value RQuickPageLSBs, 6 bit RQuickPage3 field with value RQuickPageLSBs, 6 bit RQuickPage4 field with value RQuickPageLSBs, 6 bit RQuickPage5 field with value RQuickPageLSBs and  $N_{qp\_blk}-33$  bit Reserved field. The QuickPage format with NumPages=6 comprise 3 bits NumPages field, 5 bit RQuickPage1 field with value RQuickPageLSBs, 5 bit RQuickPage2 field with value RQuickPageLSBs, 5 bit RQuickPage3 field with value RQuickPageLSBs, 5 bit RQuickPage4 field with value RQuickPageLSBs, 5 bit RQuickPage5 field with value RQuickPageLSBs, 5 bit RQuickPage6 field with value RQuickPageLSBs and  $N_{qp\_blk}-33$  bit Reserved field.

**[0048]** If the value of NumPages is '7', the protocol may generate a QuickPageReceived indication if the least significant bits of RQuickPage match one of the RQuickPage $i$  fields in the QuickPage block or RQuickPage7 is not equal to RQuickPage 8, and the 4 least significant bits of RQuickPage are larger than RQuickPage8. the Quick format with NumPages=7 comprise 3 bits NumPages field, 4

bit RQuickPage1 field with value RQuickPageLSBs, 4 bit RQuickPage2 field with value RQuickPageLSBs, 4 bit RQuickPage3 field with value RQuickPageLSBs, 4 bit RQuickPage4 field with value RQuickPageLSBs, 4 bit RQuickPage5 field with value RQuickPageLSBs, 4 bit RQuickPage6 field with value RQuickPageLSBs, 4 bit RQuickPage7 field with value RQuickPageLSBs, 4 bit RQuickPage8 field with value RQuickPageLSBs and  $N_{qp\_blk}$ -35 bit Reserved field.

**[0049]** Fig. 5A illustrates a flow diagram of the process 500, according to an embodiment. The access point (such as access point 404 in Fig.4) transmits QuickPage block to access terminal (such as access terminal 402 in Fig.4) for processing. At 502, access terminal 402 determines if there is an error on the F-pBCH1 channel that contains a QuickPage block. If there is an error in the F-pBCH1 channel then the access terminal 402 declares the received QuickPage block to be in error at 506. At 504, the access terminal 402 determines if the superframes in which the QuickPage blocks occur have superframe number contained in the PageTimes array. If yes, the access terminal 402 processes the received QuickPage block at 508, otherwise, at 510 the access terminal 402 ignores the QuickPage block at 510.

**[0050]** Fig. 5B illustrates a processor 550 for receiving and processing QuickPage block. The processor referred to may be electronic devices and may comprise one or more processors configured to process the block. A processor 552 is configured to determine if there is an error on the F-pBCH1 channel that contains a QuickPage block. If there is an error in the F-pBCH1 channel then a processor 556 is configured to declare the received QuickPage block to be in error. A processor 554 is configured to determine if the superframes in which the QuickPage blocks occur have superframe number contained in the PageTimes array. If yes, a processor 558 is configured to process the received QuickPage block, otherwise a processor 560 is configured to ignore the QuickPage block. The functionality of the discrete processors 552 to 560 depicted in the figure may be combined into a single processor 562. A memory 564 is also coupled to the processor 562.

**[0051]** In another embodiment, an apparatus is described which includes means for declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block, otherwise, means for comparing superframe number of PageTimes array with the superframes in which occur the QuickPage, means for determining first three bits (NumPages field) in the block and means for processing the QuickPage block. The means described herein may comprise one or more processors..

**[0052]** Fig. 6A illustrates a flow diagram of process 600, according to another embodiment. The access terminal (such as access terminal 402 in Fig.4) processes information received from one or more access points (such as access point 404 in Fig.4). At 602 the access terminal 402 determines if NumPage=0. If NumPage=0 the access terminal 402 ignores the QuickPage block at 622. At 604, the access terminal determines if NumPage=1. If NumPage=1, the access terminal 402 matches the ReceiveATIList of the Address Management Protocol with the ATI in the QuickPage block at 618. If the ATI in the QuickPage block matches the ReceiveATIList of the Address Management Protocol, the protocol may issue a PageReceived indication at 620. At 606, the access terminal 402 determines if  $1 < \text{NumPage} < 6$ . If yes, the access terminal 402 determines if LSBs of RQuickPage match one of the RQuickPage $i$  in the QuickPage block at 614. If yes, a QuickPageReceived indication is transmitted at 624. At 608, the access terminal 402 determines if NumPage=7. If NumPage=7, then the access terminal 402 further determines if LSBs of RQuickPage match one of the RQuickPage $i$  fields in the QuickPage block at 610. If yes, a QuickPageReceived indication is generated at 624. When if NumPage=7 at 612, the access terminal 402 determines if RQuickPage7 is not equal to RQuickPage8 and the 4 LSBs of RQuickPage are larger than RQuickPage8. If yes, the access terminal 402 issues QuickPageReceived indication at 624.

**[0053]** Fig. 6B illustrates a processor 650 for processing the received QuickPage block. The processor referred to may be electronic devices and may comprise one or more processors configured to process the block. A processor 652 is configured to determine if NumPage=0. If NumPage=0 a processor 672 is configured to ignore the QuickPage block. A processor 654 is configured to determine if NumPage=1. If NumPage=1, a processor 668 is configured to match the ReceiveATIList of the Address Management Protocol with the ATI in the QuickPage block. If the ATI in the QuickPage block matches the ReceiveATIList of the Address Management Protocol, a processor 670 is configured to issue a PageReceived indication. A processor 656 is configured to determine if NumPage  $1 < \text{NumPage} < 6$ . If yes, a processor 664 is configured to determine if LSBs of RQuickPage match one of the RQuickPage $i$  in the QuickPage block. If yes, a processor 674 is configured for transmitting QuickPageReceived indication. A processor 658 is configured to determine if NumPage=7. If NumPage=7, then a processor 660 is configured to further determine if LSBs of RQuickPage match one of the RQuickPage $i$  fields in the QuickPage block. If true, a processor 674 is configured to generate a QuickPageReceived indication. When NumPage=7, a processor

662 is configured to determine if RQuickPage7 is not equal to RQuickPage8 and the 4 LSBs of RQuickPage are larger than RQuickPage8, if yes, a processor 674 is configured to issue QuickPageReceived indication. The functionality of the discrete processors 652 to 674 depicted in the figure may be combined into a single processor 676. A memory 678 is also coupled to the processor 676.

**[0054]** In another embodiment, an apparatus is described which includes means for processing the received QuickPage block in wireless communication. The apparatus further comprises means for determining the value of NumPage filed in the received QuickPage block. The apparatus further comprises means for issuing PageReceived and QuickPageReceived indications. The means described herein may comprise one or more processors.

**[0055]** Furthermore, embodiments may be implemented by hardware, software, firmware, middleware, microcode, or any combination thereof. When implemented in software, firmware, middleware or microcode, the program code or code segments to perform the necessary tasks may be stored in a machine readable medium such as a separate storage(s) not shown. A processor may perform the necessary tasks. A code segment may represent a procedure, a function, a subprogram, a program, a routine, a subroutine, a module, a software package, a class, or any combination of instructions, data structures, or program statements. A code segment may be coupled to another code segment or a hardware circuit by passing and/or receiving information, data, arguments, parameters, or memory contents. Information, arguments, parameters, data, etc. may be passed, forwarded, or transmitted via any suitable means including memory sharing, message passing, token passing, network transmission, etc.

**[0056]** Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments. Thus, the description is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.



**CLAIMS****WE CLAIM:**

1. A method for receiving and processing QuickPage blocks in a wireless communication system, characterized in that:
  - declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block;
  - otherwise;
  - comparing superframe number of PageTimes array with the superframes in which the QuickPage occurs; and
  - processing the QuickPage block.
2. The method as claimed in claim 1, characterized in that ignoring QuickPage block if the superframe number in which QuickPage block occurs is different from the superframe number contained in the PageTimes array.
3. The method as claimed in claim 1, characterized in that determining first three bits (NumPages field) in the block.
4. The method as claimed in claim 3, characterized in that ignoring QuickPage block if NumPages is equal to 0.
5. The method as claimed in claim 3, characterized in that issuing PageReceived indication if NumPages is equal to 1 and the ATI in the QuickPage block matches the ReceiveATIList of the Address Management Protocol.
6. The method as claimed in claim 3, characterized in that generating QuickPageReceived indication if NumPages is greater than 1 and equal to or less than 6 and the least significant bits of QuickPage that is public data of the Idle State Protocol match one of the RQuickPage<sub>i</sub> fields in the QuickPage block.
7. The method as claimed in claim 3, characterized in that generating QuickPageReceived indication if NumPages is equal to 7 and the least significant bits of RQuickPage match one of the RQuickPage<sub>i</sub> fields in the QuickPage block.

8. The method as claimed in claim 7, characterized in that generating QuickPageReceived indication if NumPages is equal to 7 and RQuickPage7 is not equal to RQuickPage8, and the 4 least significant bits of RQuickPage are larger than RQuickPage8.
9. A computer readable medium including instructions stored thereon, characterized in that:
  - a set of instructions for declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block; or
  - a set of instructions for comparing superframe number of PageTimes array with the superframes in which the QuickPage occurs; and
  - a set of instructions for processing the QuickPage block.
10. An apparatus operable in a wireless communication system, comprising:
  - means for declaring a QuickPage block to be in error if there is an error on the F-pBCH1 channel containing the QuickPage block;
  - otherwise;
  - means for comparing superframe number of PageTimes array with the superframes in which occur the QuickPage occurs; and
  - means for processing the QuickPage block.
11. The apparatus as claimed in claim 10, characterized in that having means for ignoring QuickPage block if the superframe number in which QuickPage block occurs is different from the superframe number contained in the PageTimes array.
12. The apparatus as claimed in claim 10, characterized in that having means for determining first three bits (NumPages field) in the block.
13. The apparatus as claimed in claim 12, characterized in that having means for ignoring QuickPage block if NumPages is equal to 0.

14. The apparatus as claimed in claim 12, characterized in that having means for issuing PageReceived indication if NumPages is equal to 1 and the ATI in the QuickPage block matches the ReceiveATIList of the Address Management Protocol.

15. The apparatus as claimed in claim 12, characterized in that having means for generating QuickPageReceived indication if NumPages is greater than 1 and equal to or less than 6 and the least significant bits of QuickPage that is public data of the Idle State Protocol match one of the RQuickPage<sub>i</sub> fields in the QuickPage block.

16. The apparatus as claimed in claim 12, characterized in that having means for generating QuickPageReceived indication if NumPages is equal to 7 and the least significant bits of RQuickPage match one of the RQuickPage<sub>i</sub> fields in the QuickPage block.

17. The apparatus as claimed in claim 16, characterized in that having means for generating QuickPageReceived indication if NumPages is equal to 7 and RQuickPage<sub>7</sub> is not equal to RQuickPage<sub>8</sub>, and the 4 least significant bits of RQuickPage are larger than RQuickPage<sub>8</sub>.

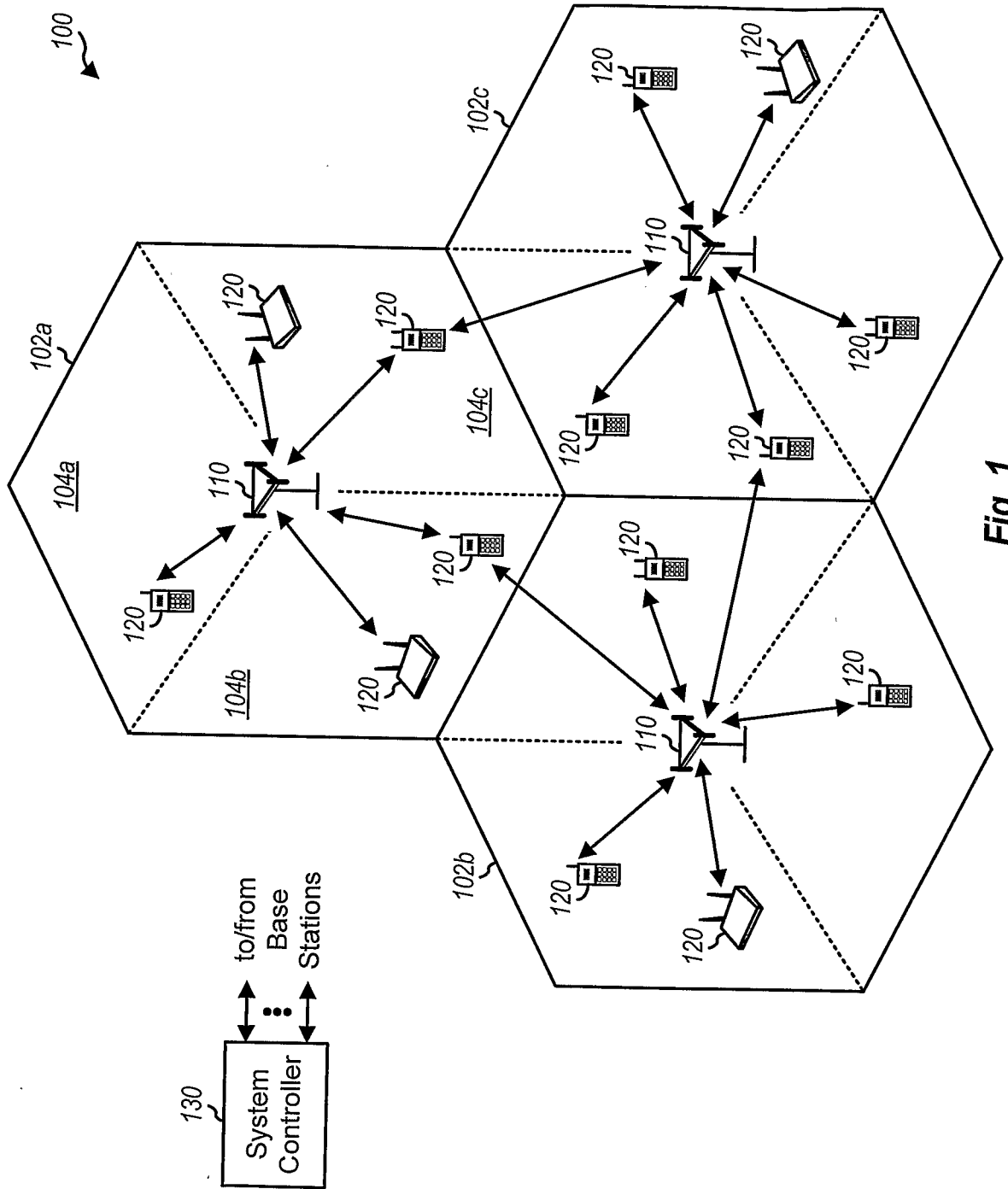


Fig. 1

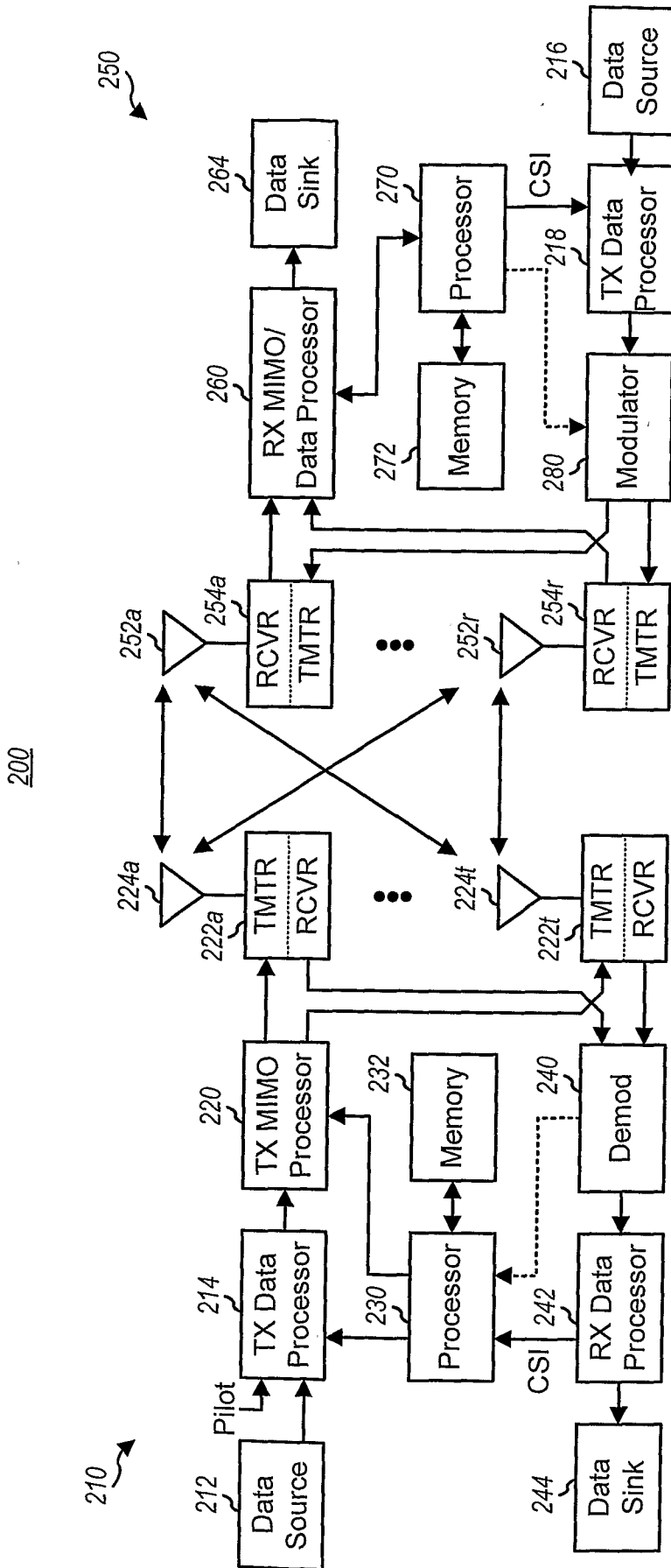


Fig 2

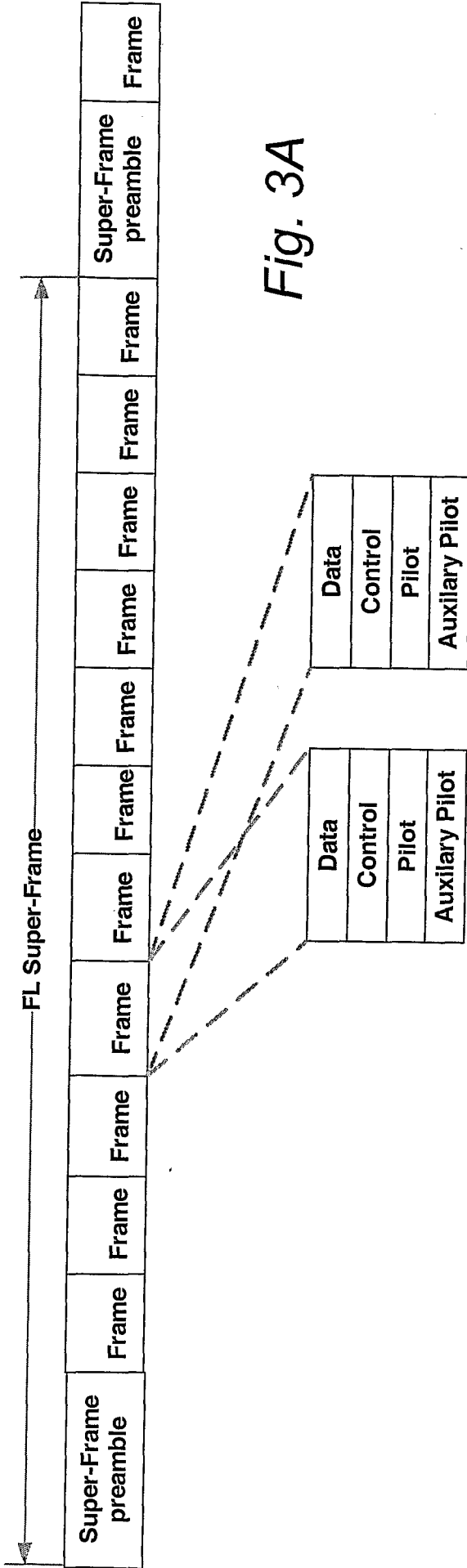


Fig. 3A

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Block Hopping mode

Symbol Rate Hopping mode

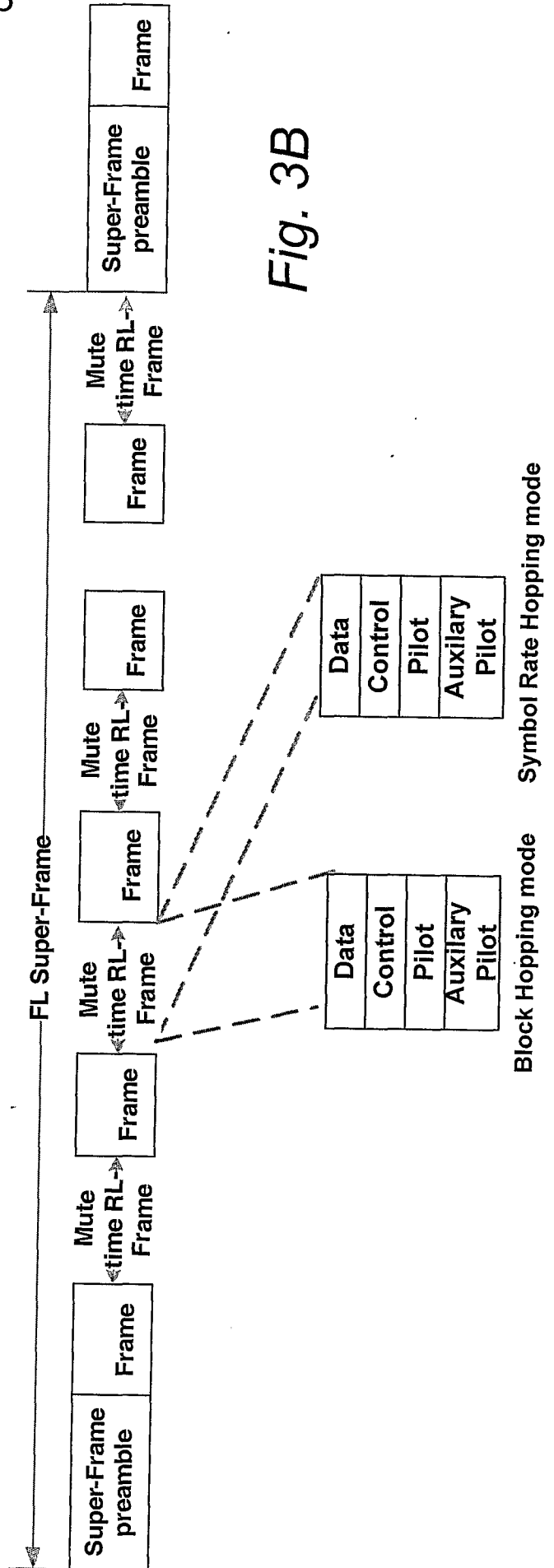
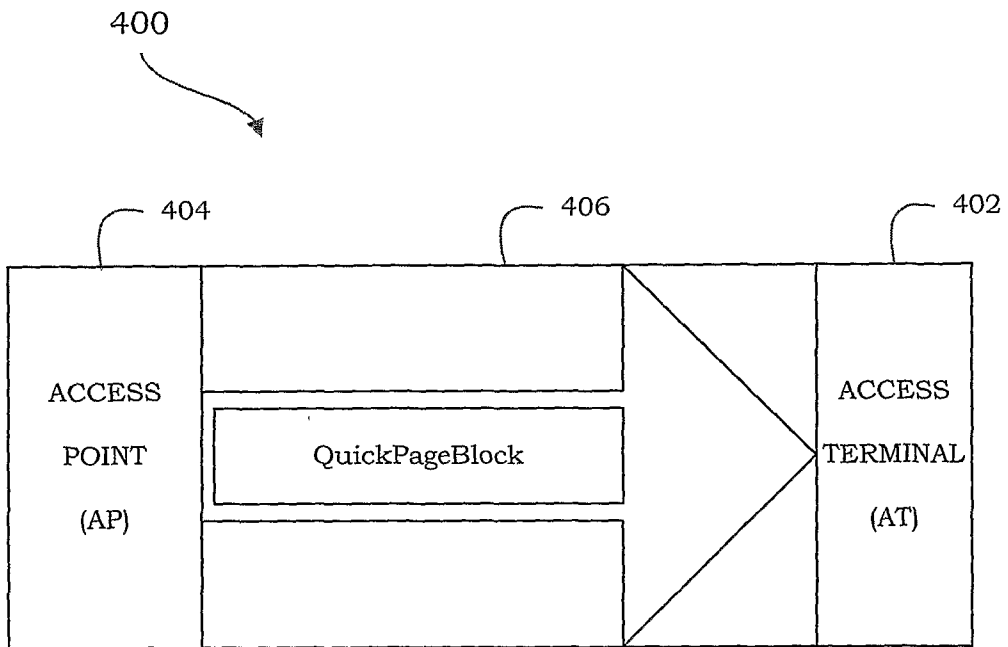


Fig. 3B

Block Hopping mode      Symbol Rate Hopping mode



**FIG. 4**

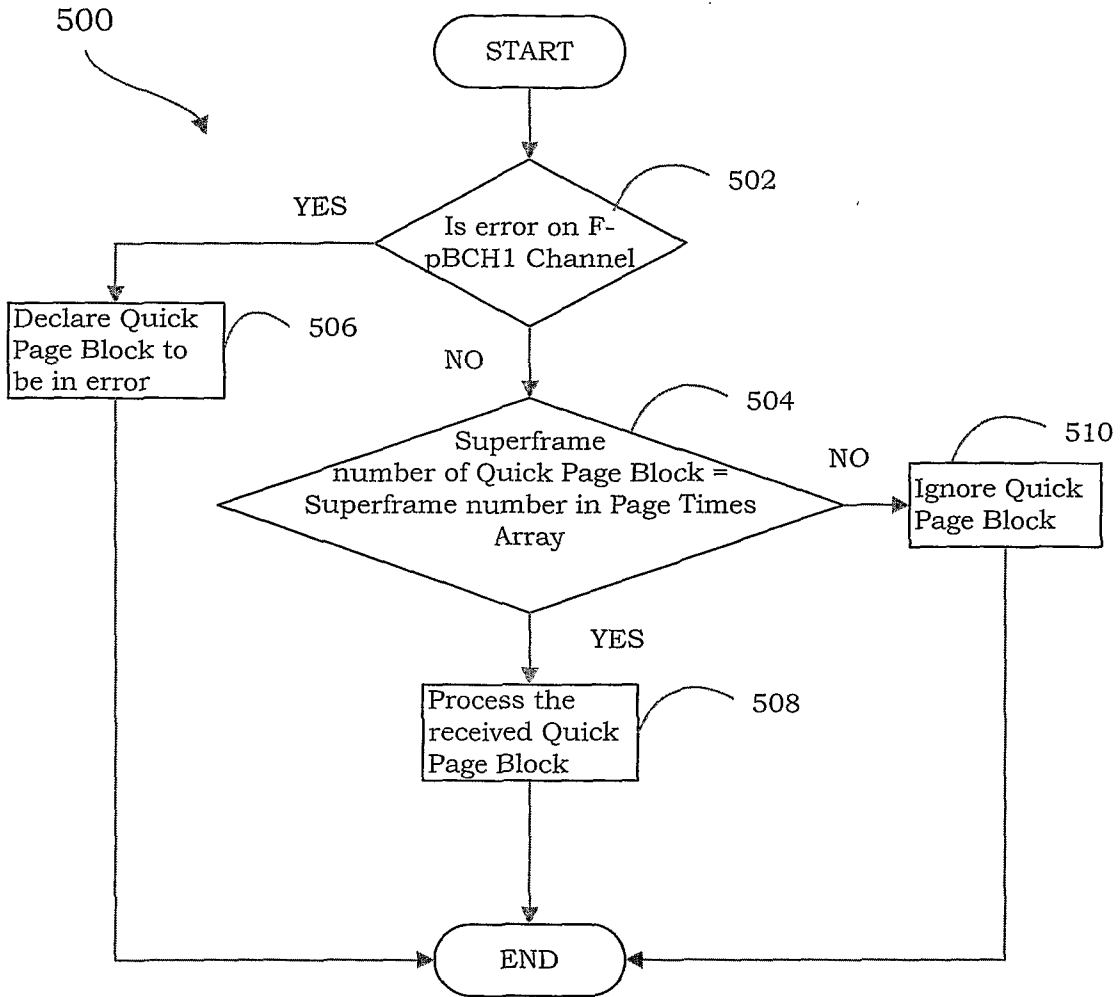


FIG. 5A



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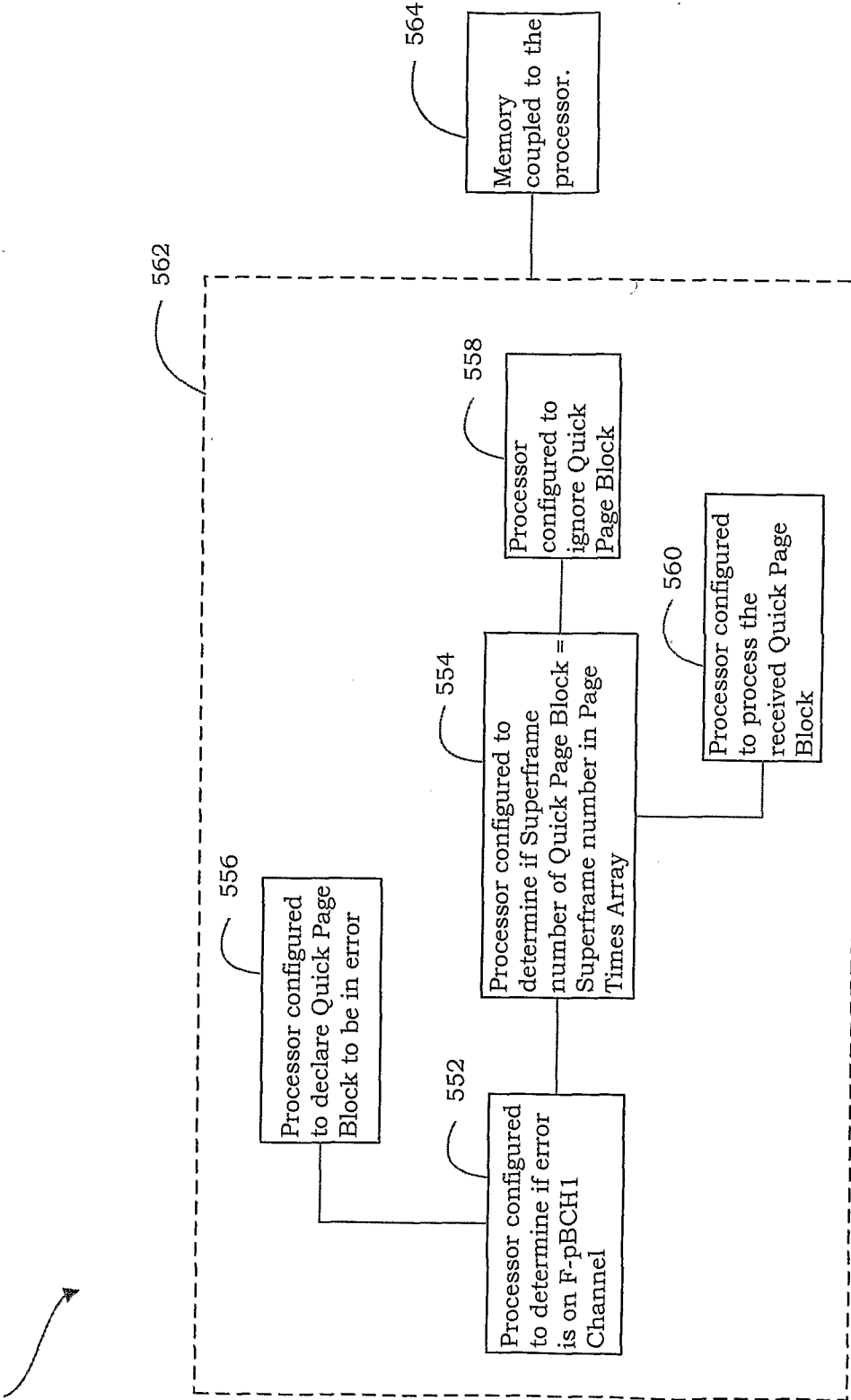


FIG. 5B

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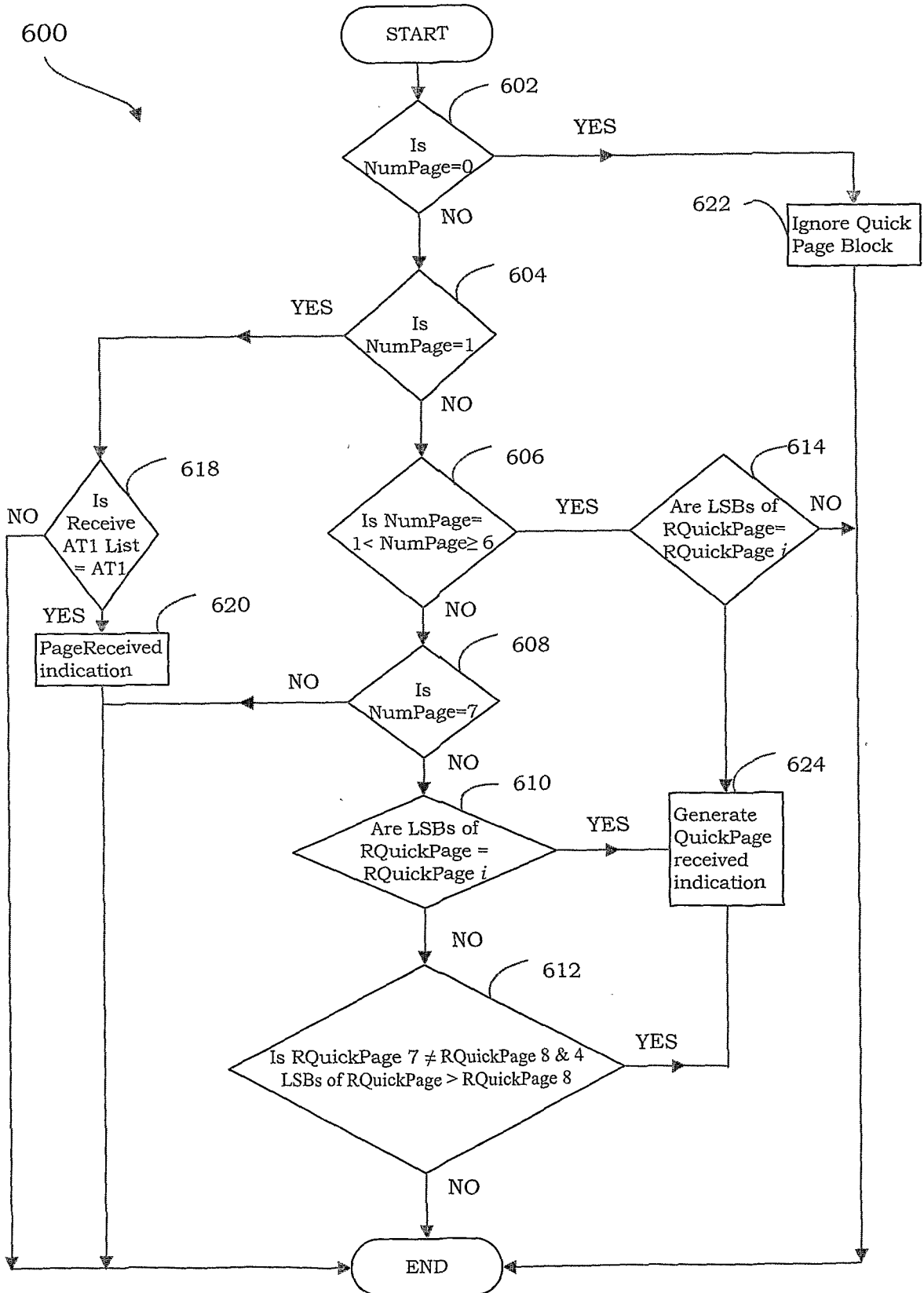


FIG. 6A



## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2006/042328A. CLASSIFICATION OF SUBJECT MATTER  
INV. H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	JIM TOMCIK, CANCHI RADHAKRISHNA: "MBFDD and MBTDD: Proposed Draft Air Interface Specification" C802.20-06/04, 6 January 2006 (2006-01-06), pages 361-365, XP002422229 the whole document	1-17
A	----- WO 00/57662 A (QUALCOMM INC [US]) 28 September 2000 (2000-09-28) page 5, line 17 - page 20, line 8 -----	1-17

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2006/042328

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