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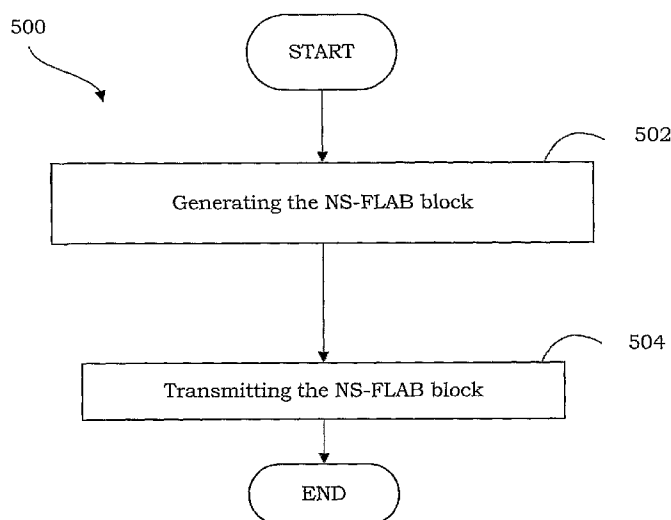
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(54) Title: A METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING NS-FLAB OVER F-SSCH IN WIRELESS COMMUNICATION SYSTEM



(57) Abstract: A method and apparatus for transmitting a NS-FLAB block is provided, comprising generating the NS-FLAB block comprising an 11-bit MACID field, a ChID field of length NRL CHID bits, wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein an access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace and the first bit of the PF indicates the pilot pattern, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames and transmitting the NS-FLAB block over the F-SSCH. A method and apparatus for receiving the NS-FLAB block is further provided, comprising receiving the NS-FLAB block and processing the FLAB block

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A METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING NS-FLAB OVER F-SSCH IN WIRELESS COMMUNICATION SYSTEM

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 on 10/27/2005, assigned to the assignee hereof, and expressly incorporated herein by reference.

BACKGROUND

Field

[0002] The present disclosure relates generally to wireless communication and more particularly to methods and apparatus for transmitting and receiving Non-Sticky Forward Link Assignment Block(NS-FLAB) over Forward Shared Signaling Channel (F-SSCH).

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.

SUMMARY

[0007] The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key or critical

elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

[0008] According to an embodiment, a method is provided for transmitting a Non-Sticky Forward Link Assignment Block(NS-FLAB) over a Forward Shared Signaling Channel (F-SSCH) in a wireless communication system, the method comprising generating the FLAB block comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits, wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein an access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames and transmitting the FLAB block over the F-SSCH.

[0009] According to another embodiment, a computer readable medium is described having a first set of instructions for generating a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein an access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames and a second set of instructions for transmitting the FLAB over the F-SSCH.

[0010] According to yet another embodiment, an apparatus operable in a wireless communication system is described which comprises means for generating a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits, wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein

the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames and means for transmitting the FLAB over the F-SSCH.

[0011] According to yet another embodiment, a method is provided for receiving a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits, wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the PF field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames and processing the FLAB.

[0012] According to yet another embodiment, a computer readable medium is described having a first set of instructions for receiving Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits, wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the PF field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames a second set of instructions for processing the FLAB.

[0013] According to yet another embodiment, an apparatus operable in a wireless communication system is described which comprises means for receiving a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits, wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the PF field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for

the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames and means for processing the FLAB.

[0014] To the accomplishment of the foregoing and related ends, the one or more aspects 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 aspects of the one or more aspects. These aspects are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed and the described aspects are intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Fig. 1 illustrates aspects of a multiple access wireless communication system.

[0016] Fig. 2 illustrates aspects of a transmitter and receiver in a multiple access wireless communication system.

[0017] Figs. 3A and 3B illustrate aspects of superframe structures for a multiple access wireless communication system.

[0018] Fig. 4 illustrates aspect of a communication between an access terminal and an access network.

[0019] Fig. 5A illustrates a flow diagram of a process used by the access network.

[0020] Fig. 5B illustrates one or more processors configured for transmitting a Non-Sticky Forward Link Assignment Block(NS-FLAB) over a F-SSCH.

[0021] Fig. 6A illustrates a flow diagram of a process used by the access terminal.

[0022] Fig. 6B illustrates one or more processors configured for receiving the Non-Sticky Forward Link Assignment Block(NS-FLAB).

DETAILED DESCRIPTION

[0023] Various aspects 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 aspects. It may be evident, however, that such aspect(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 aspects.

[0024] Referring to Fig. 1, a multiple access wireless communication system according to one aspect is illustrated. A multiple access wireless communication system 100 includes multiple cells, e.g. cells 102, 104, and 106. In the aspect 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.

[0025] 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 with access point 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.

[0026] 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 aspects, the scheduler may reside in each individual cell, each sector of a cell, or a combination thereof.

[0027] 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.

[0028] 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 co-pending US Patent Application Serial No. 11/260,895, entitled "Adaptive Sectorization in Cellular System."

[0029] Referring to Fig.2, a block diagram of an aspect 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 aspect, 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] 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 218 is complementary to that performed by TX processor 220 and TX data processor 214 at transmitter system 210.

[0034] 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.

[0035] 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 aspects, 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.

[0036] 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.

[0037] 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.

[0038] 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).

[0039] 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.

[0040] Referring to Figs. 3A and 3B, aspects of superframe structures for a multiple access wireless communication system are illustrated. Fig. 3A illustrates aspects of superframe structures for a frequency division duplexed (FDD) multiple access wireless communication system, while Fig. 3B illustrates aspects 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.

[0041] 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 be vary within a given superframe or between superframes.

[0042] In both FDD and TDD systems each superframe may comprise a superframe preamble. In certain aspects, 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.

[0043] 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 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.

[0044] Fig. 4 illustrates communication between an access network 404 for transmitting a NS-FLAB block 408 to an access terminal 402. Using a communication link 406 and based upon predetermined timing, system conditions, or other decision criteria, the access network 404 transmits the NS-FLAB block 408 over a forward link 406 to the access terminal 402. The communication link 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.

[0045] The forward link control channel is referred to as the Shared Signaling Channel (SSCH) and contains resource assignment messages, such as, for example, power control commands, and acknowledgements for RL H-ARQ. The SSCH may be sent in each FL PHYFrame. An example F-SSCH may be assigned a minimum of 3 base nodes on the channel tree via signaling on the FL primary broadcast channel. Thus, in a 5MHz deployment, this amounts to about 10% minimum bandwidth overhead with granularity of 3.3%. The F-SSCH bandwidth may be subdivided into three segments of predefined sizes. The segmentation information may be signaled in an overhead channel. The first segment carries signaling messages and may be zero-padded if not fully used. Modulation symbols of each message are interleaved across the entire F-SSCH assignment to ensure maximum diversity. With the present design, we achieve at least third order diversity with block hopping (achieved with the minimum F-SSCH assignment of three tiles) and higher diversity in symbol rate hopping. The second segment carries ACK bits with every bit mapped to three QPSK modulation symbols. The specific mapping is a function of the base nodes belonging to the assignment being ACK'ed. Modulation symbols of every ACK bit are interleaved over the F-SSCH resources to achieve third order diversity. The third segment carries modulation symbols corresponding to RL power control bits (one modulation symbol per power control bit) ,

and the specific mapping is a function of the MACID of the terminal being power controlled. F-SSCH allocation parameters such as the total bandwidth allocation, sizing of the three F-SSCH segments (signaling messages, ACK and RL power control), power control interval for every MACID, number of modulation symbols per signaling message and a suitable packet format, may be periodically or aperiodically broadcast along with other sector parameters.

[0046] The access network 404 is configured to generate the F NS-FLAB block 408 comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the access network sets this field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames. The message is then transmitted over a F-SSCH. The access network 404 may incorporate the NS-FLAB block 408 into a data packet 410 or multiple data packets and the data packets 410 are transmitted on a link 406. In another aspect, the NS-FLAB block 408 may be transmitted without being incorporated in packets. The data packet comprises header information that indicates whether those data packets 410 contain the NS-FLAB block 408. The data packets 410 are transmitted on the communication link 406 using one or more channels.

[0047] The access terminal 402 is configured to receive data packets 410 on the communication link 406, one of which may comprise NS-FLAB block 408. Various methods may be used to extract the F NS-FLAB block 408 from the link. For example, once the access terminal 402 has extracted the data packets 410 from one of the channels of the link the access terminal 402 may check the header information of the data packets 410 to determine if the data packets 410 comprise the NS-FLAB block 408. If so, then the access terminal 402 extracts the designated bits of the message and stores the values in memory (such as memory 272 in Fig. 2).

[0048] Fig. 5A illustrates a flow diagram of process 500, according to an embodiment. At 502, a FLAB block comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the access

network sets this field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames. At 504, the generated NS-FLAB block is transmitted over a F-SSCH to the access terminal.

[0049] If the MACID in this block is not the broadcast MACID, this block informs the access terminal that holds the specific MACID that hop-ports specified by the ChID field have been assigned to the access terminal, and informs that access terminal of the PF that may be used on its assigned hop-port. The duration of the assignment is specified in the duration field, resulting in a duration of 3,6,9 or 12 PHY frames. If the MAC ID in this message is the broadcast MACID, then all access terminals are assigned the hop-ports specified by the ChID field, with the given packet format.

[0050] If the extended transmission field is equal to '0', an NS-FLAB assigns hop-ports for a particular interlace consisting of standard PHY Frames, and the duration field specifies the number of standard PHY Frames to be used for transmission for this assignment. If the Extended Transmission field is equal to '1', an FLAB assigns hop-ports for an interlace consisting of extended PHY Frames(6 contiguous standard PHY Frames), and the duration field specifies the number of extended PHY Frames to be used for transmission for this assignment.

[0051] Fig. 5B illustrates a processor 550 for transmitting a NS-FLAB block over a F-SSCH. The processor referred to may be electronic devices and may comprise one or more processors configured to transmit the block. Processor 552 is configured for generating a NS-FLAB comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the access network sets this field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames. Further, a processor 554 is configured for transmitting the generated NS-

FLAB block over a F-SSCH to the access terminal. The functionality of the discrete processors 552 and 554 depicted in the figure may be combined into a single processor 556. A memory 558 is also coupled to the processor 556.

[0052] In an embodiment, an apparatus is described which comprises means for generating a NS-FLAB block comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the access network sets this field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames. Further, a means is provided for transmitting the generated F NS-FLAB block over F-SSCH to the access terminal. The means described herein may comprise one or more processors.

[0053] Fig. 6A illustrates a flow diagram of process 600, according to an embodiment. At 602, a NS-FLAB block comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, this field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field is interpreted to indicate number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames. At 604, the received NS-FLAB block is processed.

[0054] Fig. 6B illustrates a processor 650 for receiving a NS-FLAB block. The processor referred to may be electronic devices and may comprise one or more processors configured to receive the block. Processor 652 is configured for receiving a NS-FLAB block comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, this field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field is interpreted to indicate number of

standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames. Further, a processor 654 is configured for processing the received NS-FLAB block. The functionality of the discrete processors 652 and 654 depicted in the figure may be combined into a single processor 656. A memory 658 is also coupled to the processor 656.

[0055] In an embodiment, an apparatus is described which comprises means for receiving a NS-FLAB block comprising a 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, this field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames. Further, a means is provided for processing the received FLAB block. The means described herein may comprise one or more processors.

[0056] 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

[0057] 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.

[0058] For a software implementation, the transmission techniques may be implemented with modules (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.

[0059] 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.

[0060] 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.

[0061] Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the description is not intended to be limited to the aspects 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 transmitting a Non-Sticky Forward Link Assignment Block(NS-FLAB) over a Forward Shared Signaling Channel (F-SSCH) in a wireless communication system, the method characterized in that:
 - generating the NS-FLAB block comprising:
 - an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits, wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal;
 - a 6 bit Packet Format (PF) field, wherein an access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace;
 - a 2-bit duration field, wherein the duration field indicates number of standard or extended frames used for transmission for the assignment;
 - a 1 bit Extended Transmission field, wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY);
 - and
 - transmitting the NS-FLAB block over the F-SSCH.
2. The method as claimed in claim 1, characterized in that assigning hop-ports for a particular interlace consisting of standard Physical (PHY) frames such that the duration field specifies the number of standard PHY frames to be used for transmission for the assignment, if the Extended Transmission field is set to '0'.
3. The method as claimed in claim 1, characterized in that assigning hop-ports for a particular interlace consisting of extended PHY frames such that the duration field specifies the number of extended PHY frames to be used for transmission for the assignment, if the Extended Transmission field is set to '1'.
4. A computer-readable medium including instructions stored thereon, characterized in that:
 - a first set of instructions for generating a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID}

bits, wherein the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein an access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field, wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames; and
a second set of instructions for transmitting the NS-FLAB over the F-SSCH.

5. An apparatus operable in a wireless communication system, characterized in that:

means for generating a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{FL_CHID} bits wherein, the ChID field is set to a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein an access network sets the PF field to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field indicates whether hop-port assignment is on standard or extended Physical layer (PHY) frames; and
means for transmitting the NS-FLAB over the F-SSCH.

6. The apparatus as claimed in claim 5, characterized in that means for assigning hop-ports for a particular interlace consisting of standard Physical (PHY) frames such that the duration field specifies the number of standard PHY frames to be used for transmission for the assignment, if the Extended Transmission field is set to '0'.
7. The apparatus as claimed in claim 5, characterized in that means for assigning hop-ports for a particular interlace consisting of extended PHY frames such that the duration field specifies the number of extended PHY frames to be used for transmission for the assignment, if the Extended Transmission field is set to '1'.

8. A method for receiving a Non-Sticky Forward Link Assignment Block(NS-FLAB) over a Forward Shared Signaling Channel (F-SSCH) in a wireless communication system, the method characterized in that:

receiving a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, an ChID field of length N_{FL_CHID} bits, wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the PF field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames; and

processing the F NS-FLAB.

9. The method as claimed in claim8, characterized in that interpreting the Extended Transmission field to determine hop-ports assigned for a particular interlace consisting of standard Physical (PHY) frames such that the duration field specifies the number of standard PHY frames to be used for transmission for the assignment, if the Extended Transmission field is interpreted as '0'.

10. The method as claimed in claim 8 characterized in that interpreting the Extended Transmission field to determine the hop-ports assigned for the interlace consisting of extended PHY Frames such that the duration field specifies the number of extended PHY frames to be used for transmission for the assignment, if the Extended Transmission field is interpreted as '1'.

11. A computer-readable medium including instructions stored thereon, characterized in that:

a first set of instructions for receiving Forward Link Assignment Block (FLAB) comprising an 11-bit MACID field, a ChID field of length N_{RL_CHID} bits, wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the PF field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace

and the first bit of the PF indicates the pilot pattern, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames; and

a second set of instructions for processing the NS-FLAB.

12. An apparatus operable in a wireless communication system, characterized in that:

means for receiving a Non-Sticky Forward Link Assignment Block(NS-FLAB) comprising an 11-bit MACID field, a ChID field of length N_{RL_CHID} bits, wherein the ChID field is interpreted as a value to identify a set of hop-ports assigned to an access terminal, a 6 bit Packet Format (PF) field, wherein the PF field is interpreted to indicate the packet format that is to be used on subsequent transmissions on the same interlace and the first bit of the PF indicates the pilot pattern, a 2-bit duration field wherein the duration field indicates number of standard or extended frames used for transmission for the assignment and a 1 bit Extended Transmission field wherein the Extended transmission field is interpreted to indicate whether hop-port assignment is on standard or extended Physical layer (PHY) frames; and

means for processing the NS-FLAB.

13. The apparatus as claimed in claim 12, characterized in that means for interpreting the Extended Transmission field to determine the hop-ports assigned for a particular interlace consisting of standard Physical (PHY) frames such that the duration field specifies the number of standard PHY frames to be used for transmission for the assignment, if the Extended Transmission field is interpreted as '0'.

14. The apparatus as claimed in claim 12, characterized in that means for interpreting the Extended Transmission field to determine the hop-ports assigned for the interlace consisting of extended PHY frames such that the duration field specifies the number of extended PHY frames to be used for transmission for the assignment, if the Extended Transmission field is interpreted as '1'.

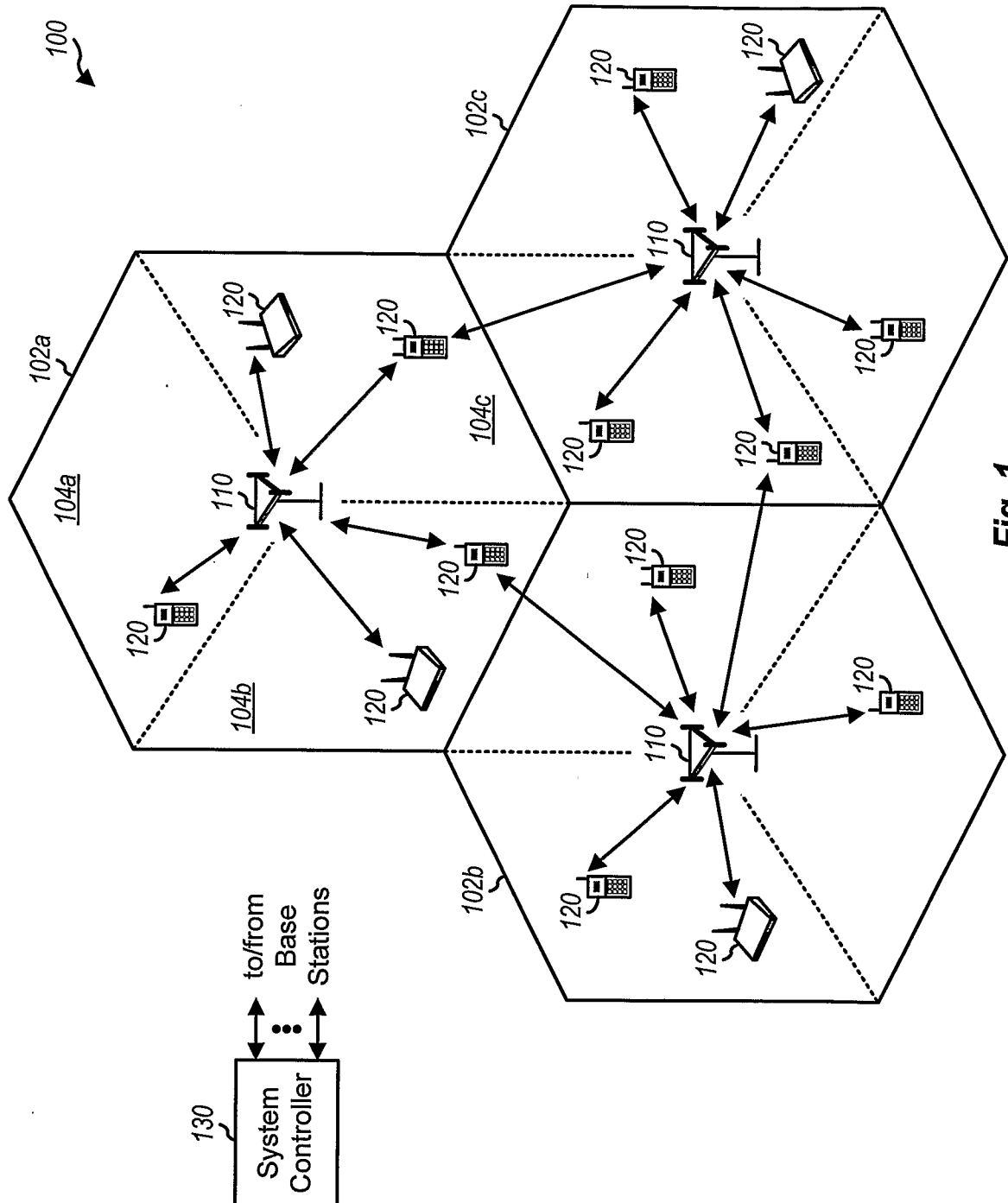
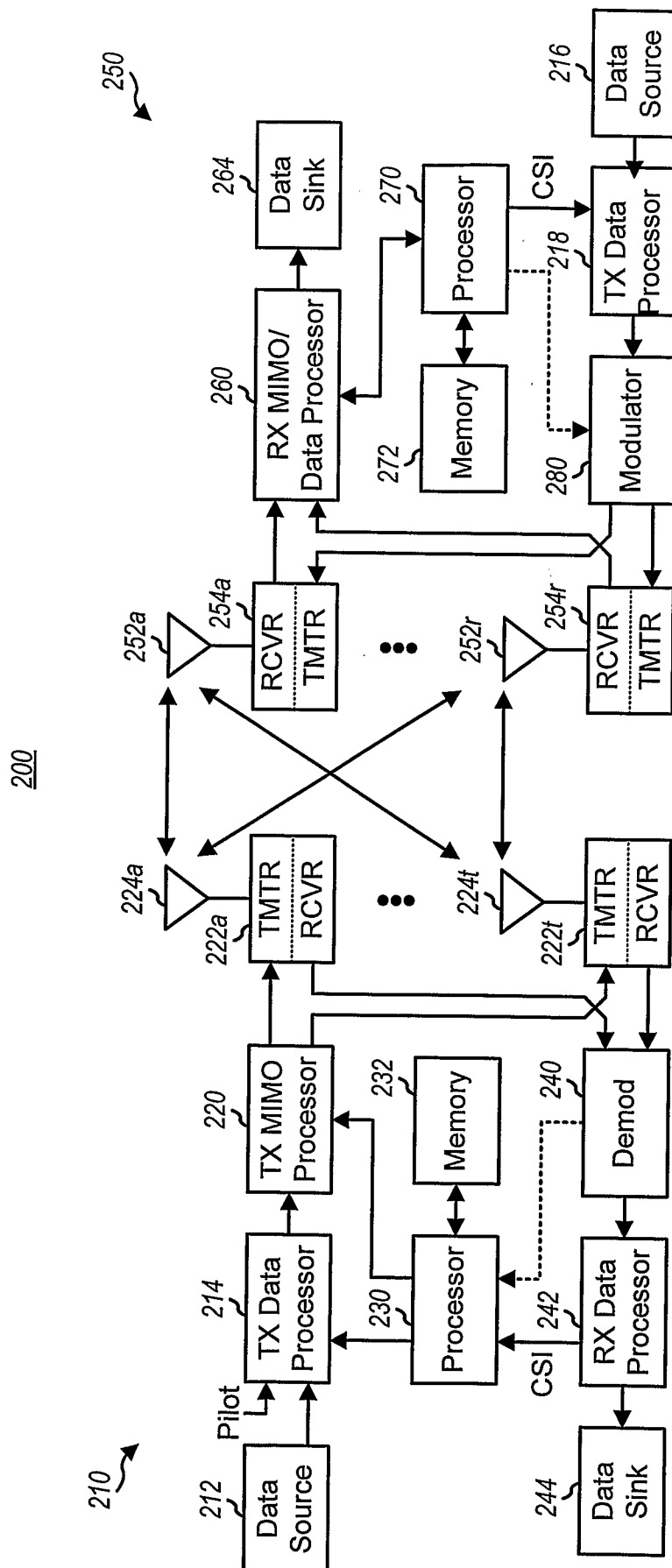


Fig. 1



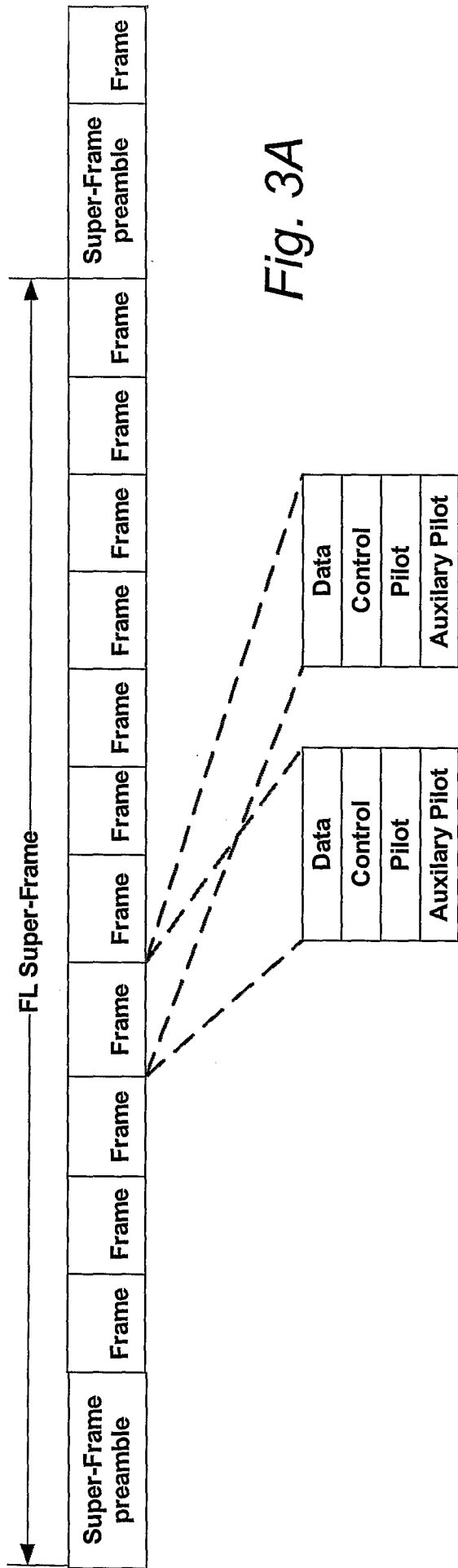


Fig. 3A

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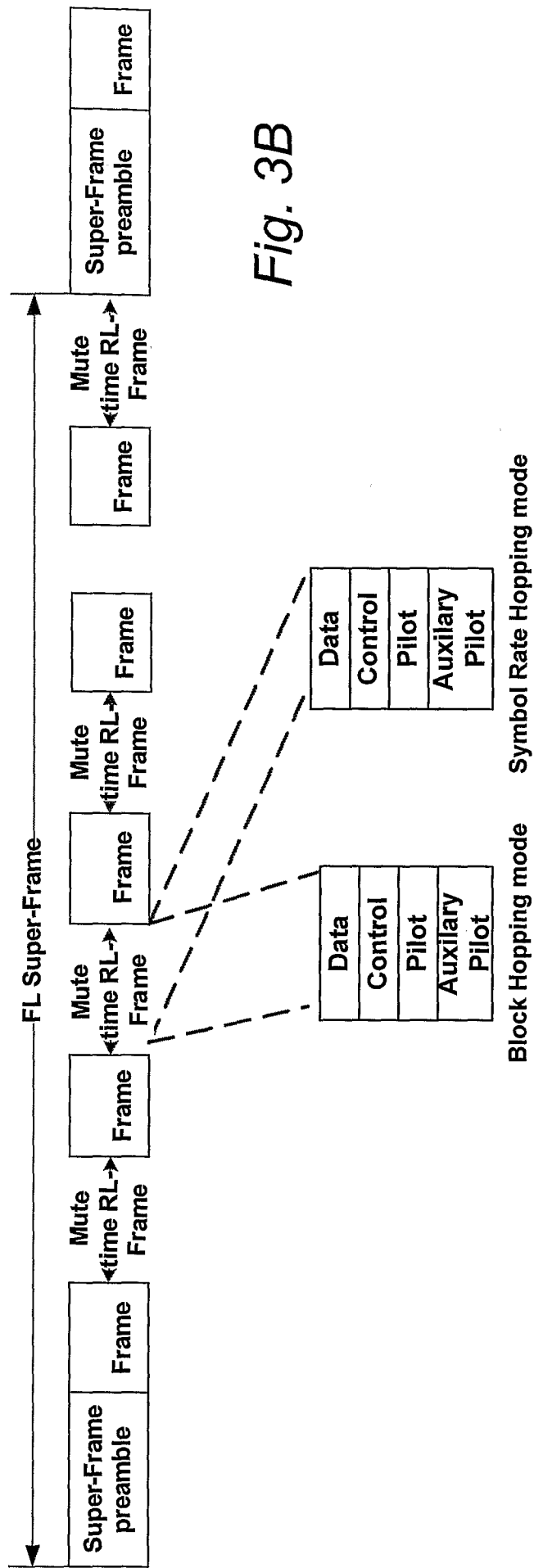


Fig. 3B

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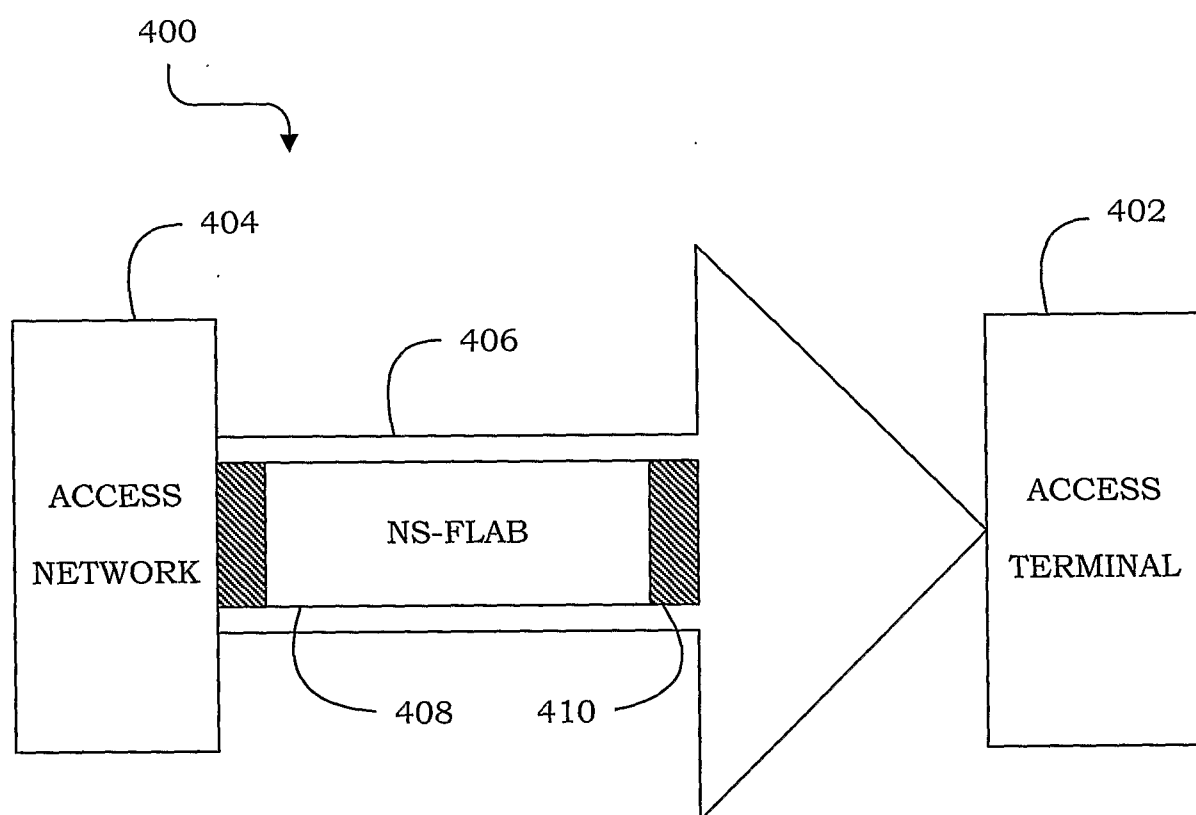


Fig. 4

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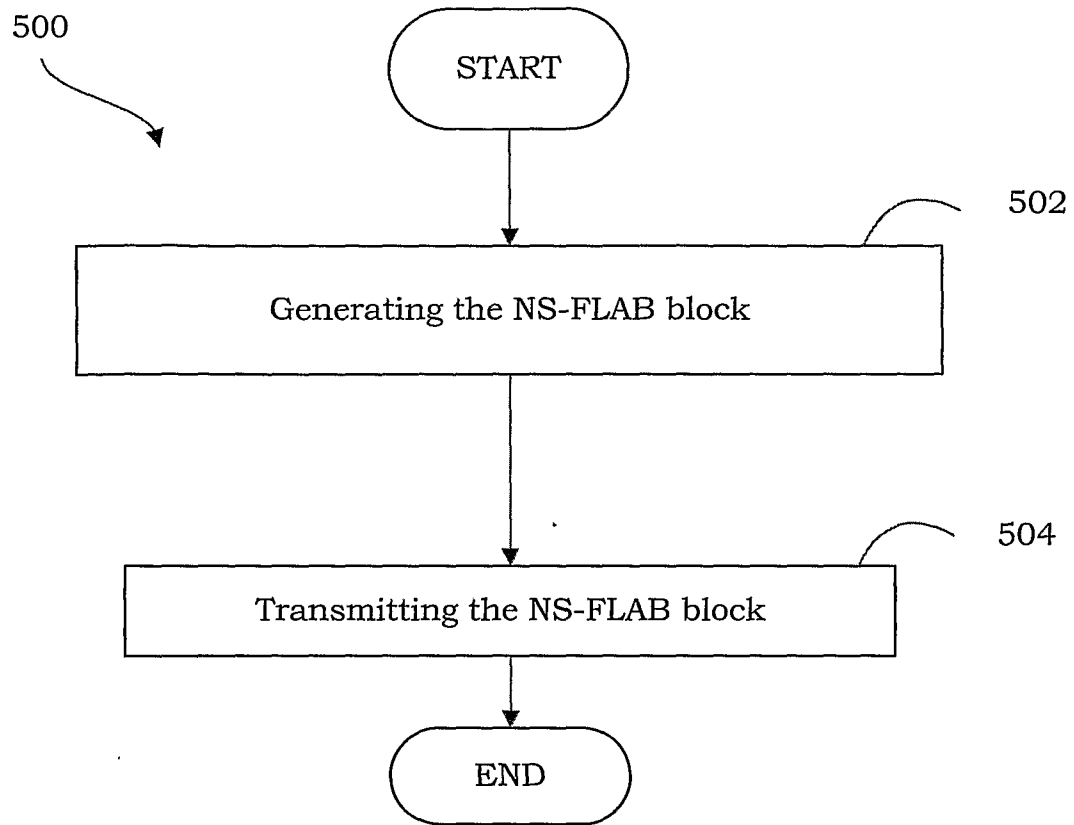


Fig. 5A

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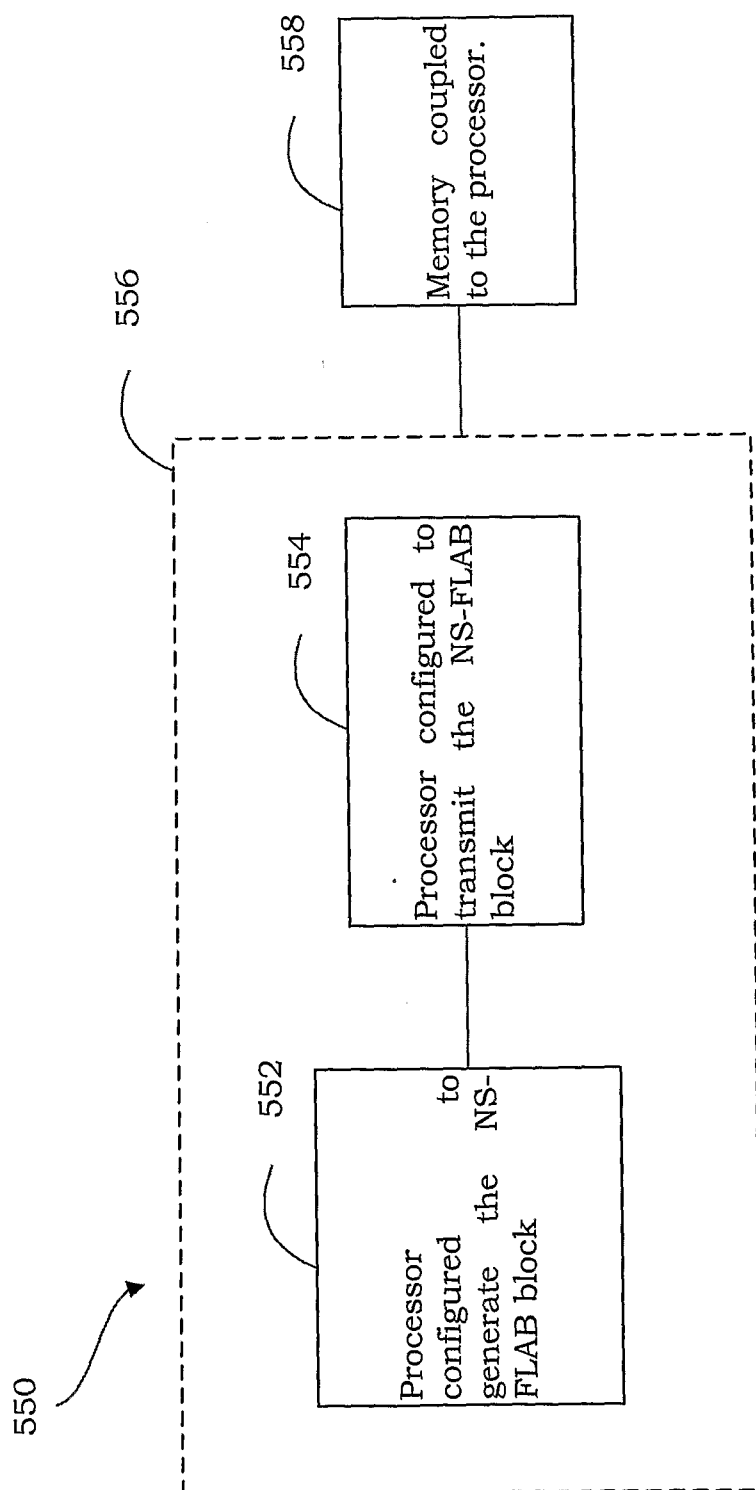


Fig. 5B

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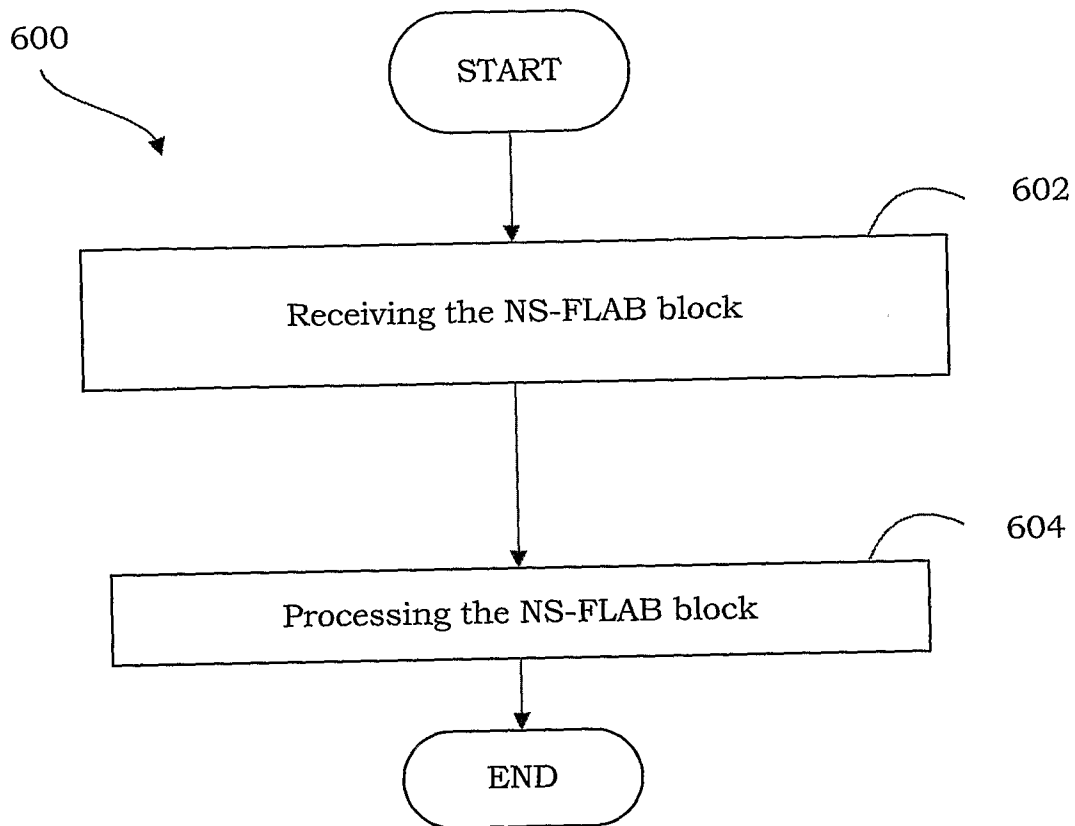


Fig. 6A

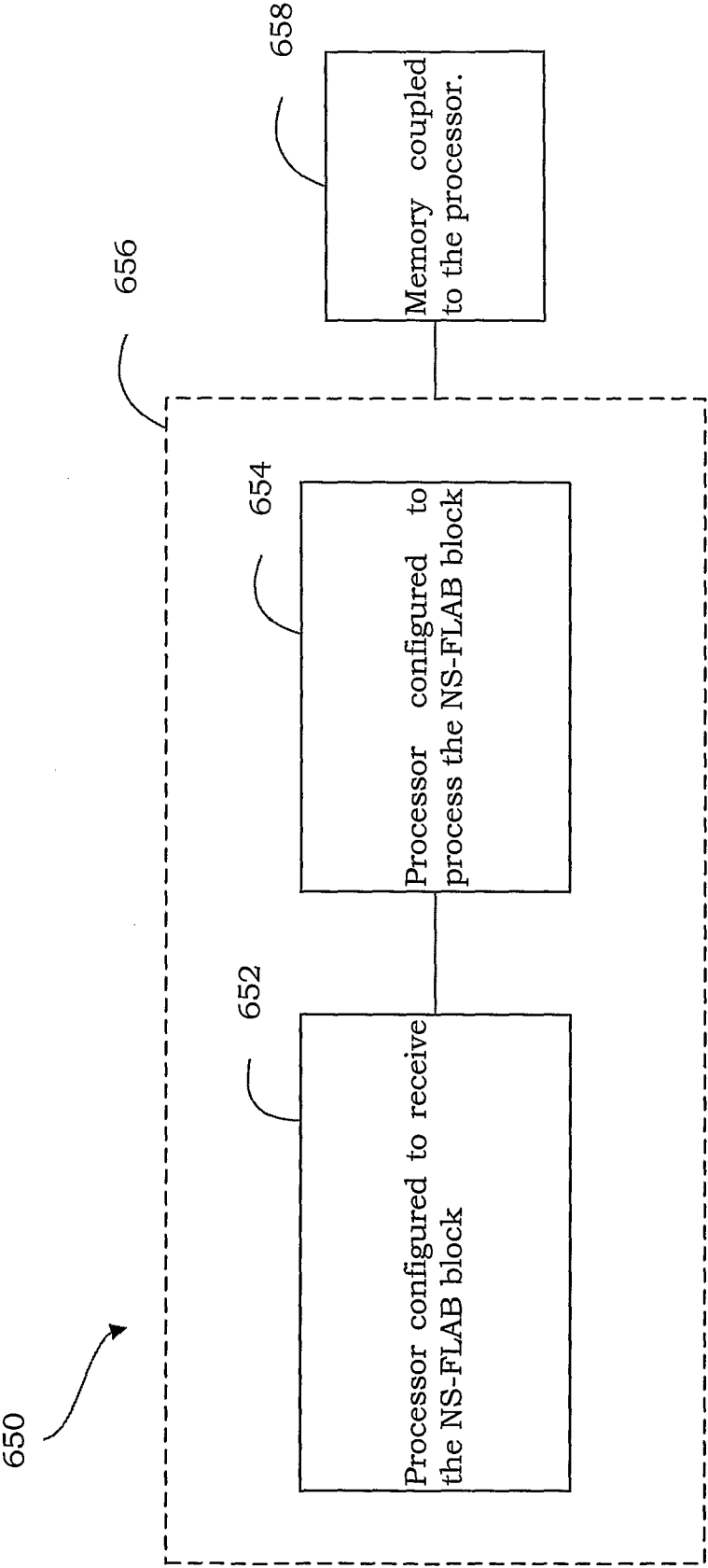


Fig. 6B

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2006/041882

A. 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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/165949 A1 (TEAGUE EDWARD H [US]) 28 July 2005 (2005-07-28) figures 1-6 paragraphs [0006], [0023] - [0025], [0032] - [0038], [0040], [0045], [0052]	1-14
Y	US 2005/120097 A1 (WALTON J R [US] ET AL) 2 June 2005 (2005-06-02) the whole document	1-14



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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- *O* document referring to an oral disclosure, use, exhibition or other means
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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

19 February 2007

Date of mailing of the international search report

01/03/2007

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2006/041882

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005165949 A1	28-07-2005	AU 2005208695 A1 CA 2554556 A1 EP 1714416 A2 KR 20060125877 A WO 2005074184 A2	11-08-2005 11-08-2005 25-10-2006 06-12-2006 11-08-2005
US 2005120097 A1	02-06-2005	AU 2004310960 A1 CA 2547112 A1 CN 1906892 A EP 1695489 A1 KR 20060095576 A WO 2005055527 A1	16-06-2005 16-06-2005 31-01-2007 30-08-2006 31-08-2006 16-06-2005