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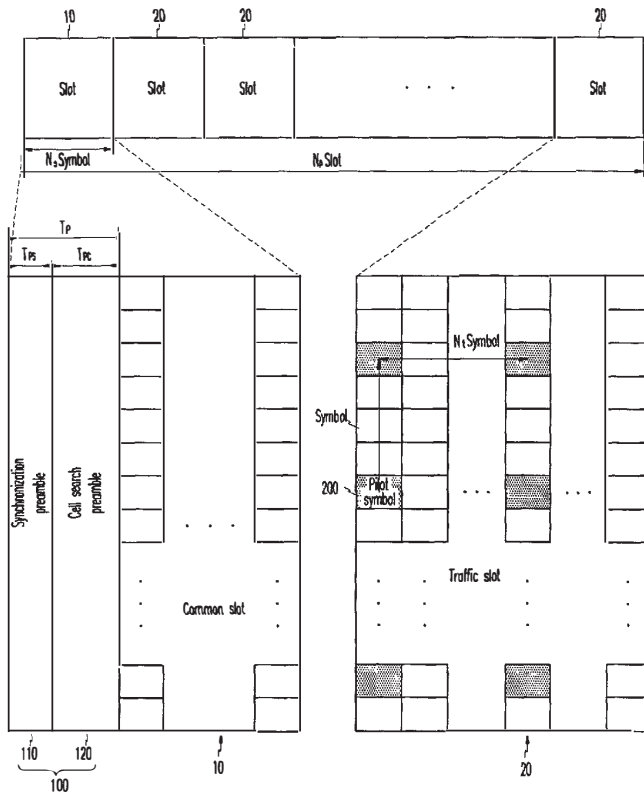
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(54) Title: METHOD AND APPARATUS FOR EMBODYING AND SYNCHRONIZING DOWNLINK SIGNAL IN MOBILE COMMUNICATION SYSTEM AND METHOD FOR SEARCHING CELL USING THE SAME



(57) Abstract: In an OFDMA-based cellular system, a frame of a downlink signal includes a common slot and traffic slots. The common slot includes a synchronization preamble and a cell search preamble. The synchronization preamble has a structure for synchronizing time and frequency, and the cell search preamble has a cell search structure. The traffic slot includes pilot symbols provided on the time and frequency axes. A cyclic prefix is used to estimate initial symbol synchronization, and the initial symbol synchronization and the synchronization preamble are used to synchronize the frame. The synchronization frame and the cell search preamble are used to estimate time and frequency synchronization. The cell search preamble is used to search cells. When the initial synchronization is performed, the cyclic prefix is used to track the frequency, the synchronization preamble is used to track symbol synchronization, and the cell search preamble is used to track fine frequency synchronization.

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**METHOD AND APPARATUS FOR EMBODYING AND SYNCHRONIZING
DOWNLINK SIGNAL IN MOBILE COMMUNICATION SYSTEM AND
METHOD FOR SEARCHING CELL USING THE SAME**

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CROSS REFERENCE TO RELATED APPLICATION

This application claims priority to and the benefit of Korea Patent Application No. 2002-73789 filed on November 26, 2002 in the Korean Intellectual Property Office, the entire content of which is incorporated
10 herein by reference.

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates to a method and apparatus for
15 embodying and synchronizing downlink signals in a mobile communication system, and a method for searching cells using the same. More specifically, the present invention relates to a method for generating a structure of a preamble and a pilot appropriate for downlinks of an OFDMA (orthogonal frequency division multiplexing access)-based cellular
20 system, performing synchronization, and searching cells at a terminal by using the structure.

(b) Description of the Related Art

In general, a terminal is required to read signals of a base station and synchronize its time and frequency with the terminal for initial
25 synchronization, and search cells in a cellular system. When initially

synchronized, the terminal is also needed to track the time and frequency, synchronize time and frequency of adjacent cells, and search the cells thereof for handover.

Downlinks for enabling initial synchronization, cell search, tracking, and adjacent cell search are provided to the GSM which is a conventional TDMA (time division multiplexing access)-based cellular system, or the IS-95, cdma2000, and W-CDMA which are CDMA (code division multiplexing access)-based cellular systems.

For example, in the W-CDMA system, a P-SCH (primary synchronization channel) and an S-SCH (secondary synchronization channel) of 256-chip lengths are provided for each slot start point so that slot synchronization may be estimated by using the P-SCH, and a scrambling code group number and frame synchronization may be estimated by using the S-SCH. In this instance, a time for estimating the synchronization is minimized by using the P-SCHs of the same pattern for respective slots of each cell, and frame synchronization and a scrambling code group are estimated by using a different pattern per 64 different scrambling code groups and using a different pattern per slot. A P-CPICH (primary common pilot channel) is used to find one of eight major scrambling codes within a scrambling code group, the scrambling code is used to demodulate cell information provided on a P-CCPCH (primary common control channel) and obtain the cell information, and hence, the cell search is finished.

Conventional OFDMA-based systems include the DAB (digital audio broadcasting), the DVB (digital video broadcasting), the IEEE802.11a, and the Hiperlan/2. The DAB uses a null symbol and a phase reference symbol for frame synchronization, and the DVB uses a pilot for the frame synchronization. Also, the IEEE802.11a and the Hiperlan/2 use a preamble to synchronize downlink burst. However, it is difficult for the OFDMA-based cellular systems to perform synchronization and search the cells through the conventional structure since the OFDMA-based systems are not cellular systems.

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SUMMARY OF THE INVENTION

It is an advantage of the present invention to provide a structure of a preamble and a pilot for synchronizing downlinks and searching cells with a lesser amount of calculation in the OFDMA-based cellular system.

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In a first aspect of the present invention, in a device for configuring a downlink signal in a mobile communication system, a device for configuring a downlink signal comprises: a first preamble generator for generating a first preamble having a first symbol and a second symbol so that a phase difference between the first and second symbols may be 180° for the purpose of time and frequency synchronization; a second preamble generator for generating a second preamble including at least one transmit symbol so that the second preamble may have specific patterns for a plurality of cells for the purpose of cell search; and a pilot

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