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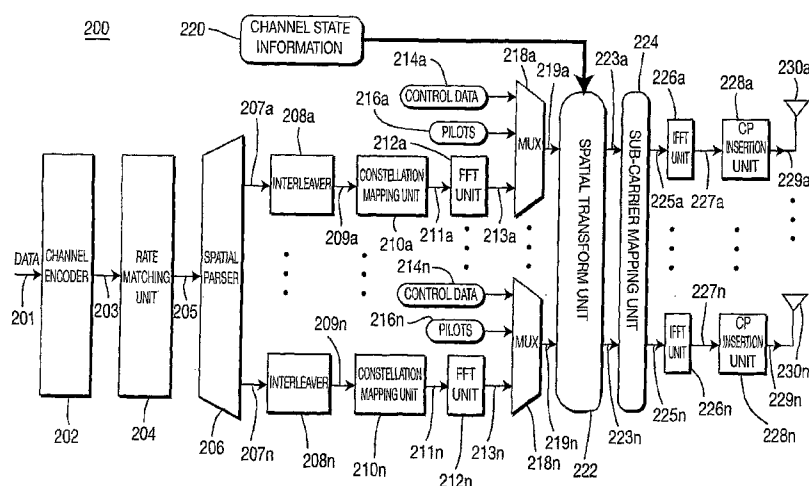
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(54) Title: METHOD AND APPARATUS FOR PERFORMING UPLINK TRANSMISSION IN A MULTIPLE-INPUT MULTIPLE-OUTPUT SINGLE CARRIER FREQUENCY DIVISION MULTIPLE ACCESS SYSTEM



(57) Abstract: A method and apparatus for performing uplink transmission in a multiple-input multiple-output (MIMO) single carrier frequency division multiple access (SC-FDMA) system are disclosed. At a wireless transmit/receive unit (WTRU), input data is encoded and parsed into a plurality of data streams. After modulation and Fourier transform, one of transmit beamforming, space time coding (STC) and spatial multiplexing is selectively performed based on channel state information. Symbols are then mapped to subcarriers and transmitted via antennas. The STC may be space frequency block coding (SFBC) or space time block coding (STBC). Per antenna rate control may be performed on each data stream based on the channel state information. At a Node-B, MIMO decoding may be performed based on one of minimum mean square error (MMSE) decoding, MMSE-successive interference cancellation (SIC) decoding and maximum likelihood (ML) decoding. Space time decoding may be performed if STC is performed at the WTRU.

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