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Papasakellariou et al.

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(54) **CONTROL AND DATA SIGNALING IN SC-FDMA COMMUNICATION SYSTEMS**

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Related U.S. Application Data

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(51) **Int. Cl.**
H04B 7/216 (2006.01)
H04B 7/208 (2006.01)

(52) **U.S. Cl.** **370/335; 370/344**

(58) **Field of Classification Search** **370/344**
See application file for complete search history.

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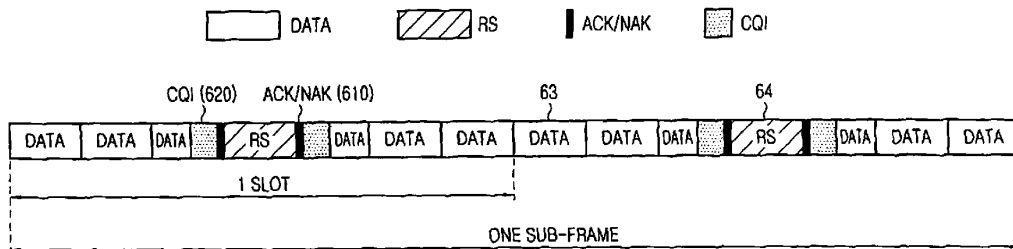
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(57) **ABSTRACT**

Apparatus and method for multiplexing control information bits and data information bits into sub-frame symbols depending on the location of symbols carrying a reference signal (RS), to provide an estimate for the channel medium and enable coherent demodulation for signals carrying information bits. The control information bits include ACK or NAK and/or channel CQI bits. The ACK/NAK bits are placed with priority in symbols around the symbols carrying the RS, to allow for improved accuracy of the channel estimate, followed by the CQI bits when both ACK/NAK and CQI bits exist. Moreover, the sub-frame resources required to achieve the desired reception reliability for the control information depend on the operating conditions and can varied to minimize the associated control overhead.

14 Claims, 10 Drawing Sheets



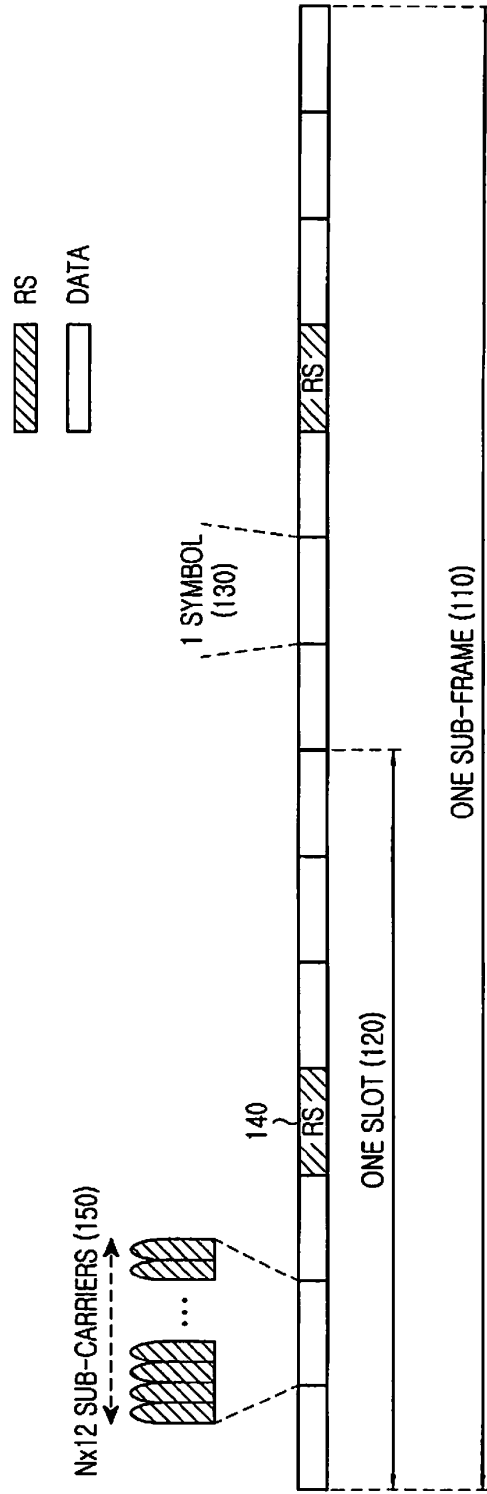


FIG.1

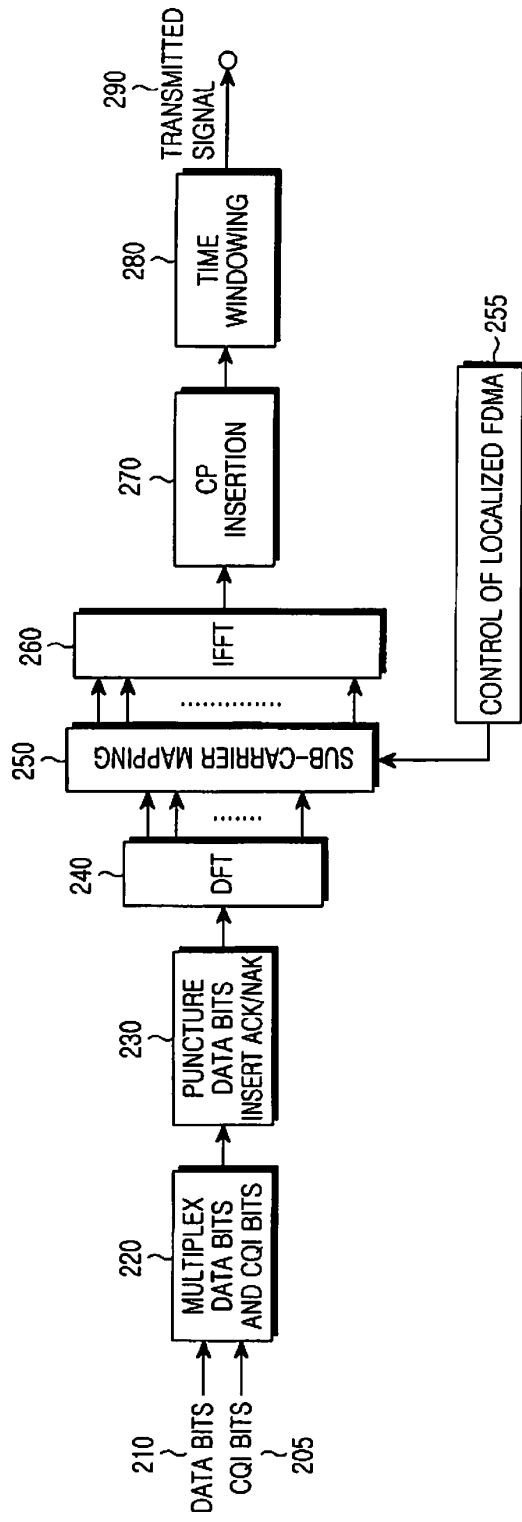


FIG.2

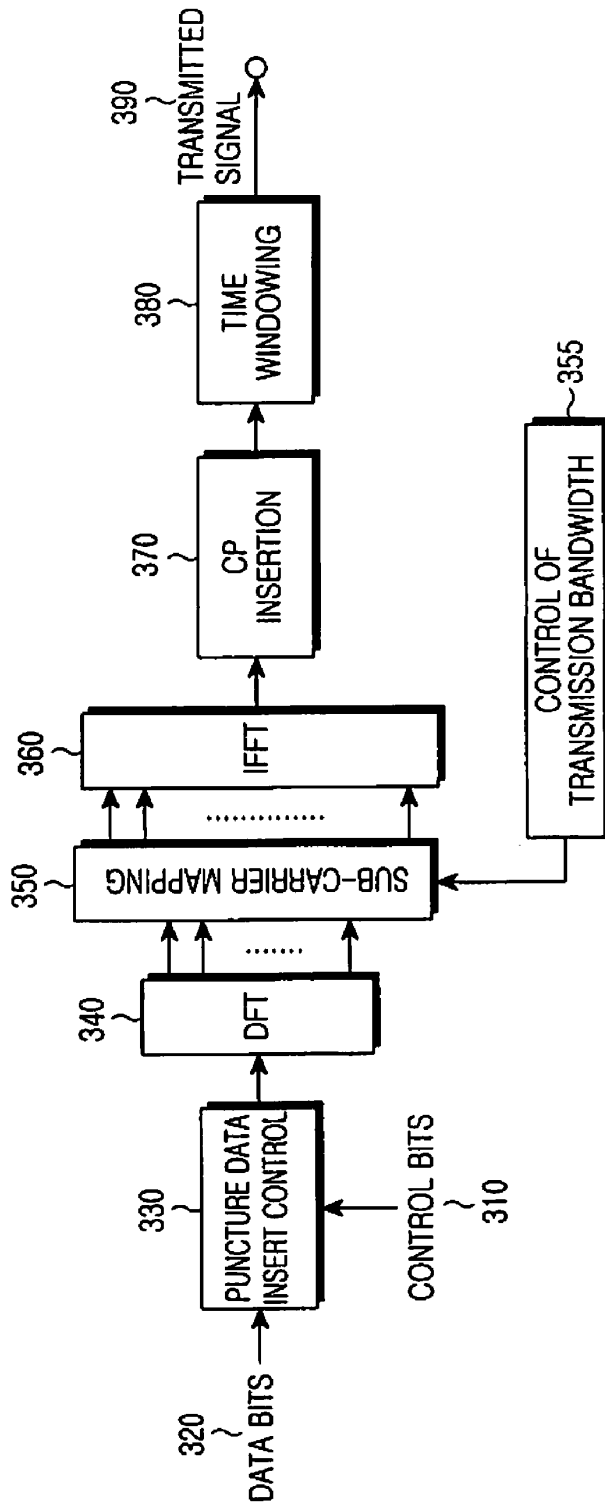


FIG.3

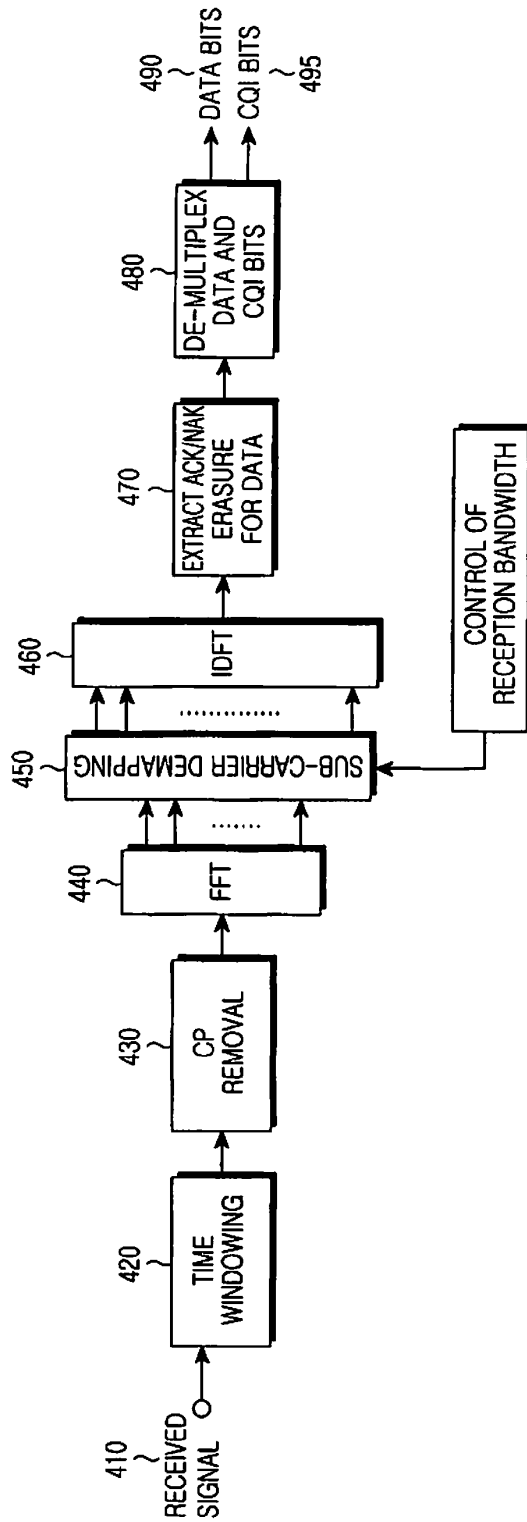


FIG. 4

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