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## (12) United States Patent Lee et al.

#### (54) METHOD FOR TRANSMITTING UPLINK SIGNALS

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- Subject to any disclaimer, the term of this (\*) Notice: patent is extended or adjusted under 35 U.S.C. 154(b) by 725 days.
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#### **Related U.S. Application Data**

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#### (30)**Foreign Application Priority Data**

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

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- (58) Field of Classification Search ...... 370/206, 370/278, 344, 208, 252, 294, 295, 315, 319, 370/328, 329, 330, 335, 336, 338; 455/450, 455/509

See application file for complete search history.

#### US 8,102,833 B2 (10) Patent No.: (45) Date of Patent: Jan. 24, 2012

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Primary Examiner - Derrick Ferris

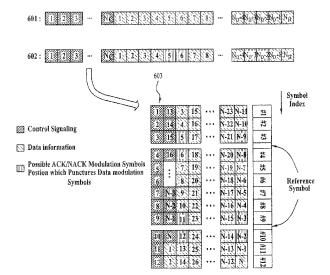
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#### (57) ABSTRACT

A method for transmitting uplink signals, which include ACK/NACK signals, control signals other than the ACK/ NACK signals, and data signals, is disclosed. The method comprises serially multiplexing the control signals and the data signals; sequentially mapping the multiplexed signals within a specific resource region in accordance with a timefirst mapping method, the specific resource region including a plurality of symbols and a plurality of virtual subcarriers; and arranging the ACK/NACK signals at both symbols near symbols to which a reference signal of the plurality of symbols is transmitted. Thus, the uplink signals can be transmitted to improve receiving reliability of signals having high priority.

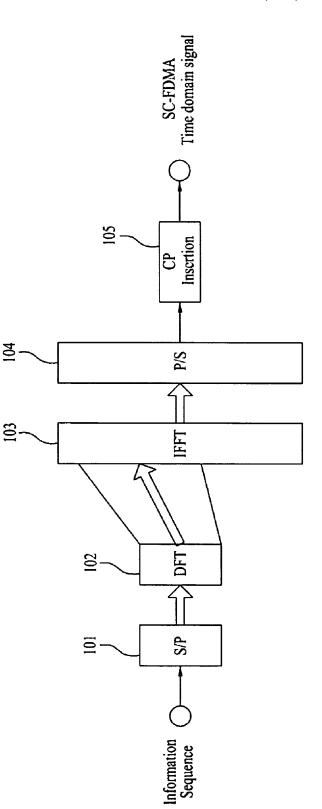
#### 14 Claims, 9 Drawing Sheets



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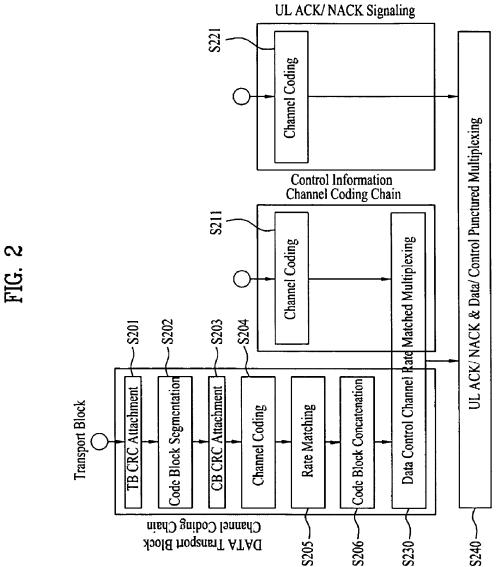
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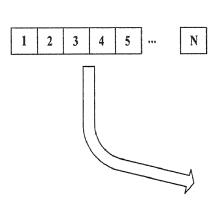
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# FIG. 3



	1	13	25	37	•••	N
	2	14	26	38	***	N
	3	15	27	39		N
A REAL PROPERTY AND A REAL	4	16	28	40		N
	5	17	29	41	***	N
	6	18	30	42	***	N
	7	19	31	43	***	N
	8	20	32	44	***	ľ
	9	21	33	45	***	ľ
	10	22	34	46	•••	r
	11	23	35	47	•••	r
	12	24	36	48		ľ

			-
N-23	N-11		#1
N-22	N-10		#2
N-21	N-9		#3
		ſ	
N-20	N-8		#4
N-19	N-7		艿
N-18	N-6		#6
N-17	N-5		#7
N-16	N-4		#8
N-15	N-3		<b>#</b> 9
N-14	N-2		#10
N-13	N-1		#11
N-12	N		#12
••••••	<u></u>		

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# FIG. 4

		<b></b>	P	
1 13 25 37	N-D DFT	>IFFT+CP	- SC-FDMA Symbol #1	
2 14 26 38	N-10 DFT -	►IFFT+CP →	- SC-FDMA Symbol #2	
3 15 27 39	N-9 DFT		- SC-FDMA Symbol #3	
La transmiture and a second		RS IFFT+CP	- RS Symbol	
4 16 28 40	N-8 DFT	→ IFFT+CP	- SC-FDMA Symbol #4	
5 17 29 41	N-7 DFT	IFFT+CP -	- SC-FDMA Symbol #5	
6 18 30 42	N-6 DFT	IFFT+CP	SC-FDMA Symbol #6	
7 19 31 43	N-5 DFT		- SC-FDMA Symbol #7	
8 20 32 44	N-4 DFT		- SC-FDMA Symbol #8	
9 21 33 45	N-3 DFT	IFFT+CP -	SC-FDMA Symbol #9	
Land the second s		RS FIFFT+CP	- RS Symbol	1
10 22 34 46	N-2 DFT	IFFT+CP -	SC-FDMA Symbol #10	l
11 23 35 47	N-D DFT	IFFT+CP -	SC-FDMA Symbol #11	
12 24 36 48	N DFT		SC-FDMA Symbol #12	Time
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