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(54) **CODE DIVISION MULTIPLE ACCESS MOBILE COMMUNICATION SYSTEM**

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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.**[7] **H04B 7/216**
(52) **U.S. Cl.** **370/342**; 375/150
(58) **Field of Search** 370/328, 239, 370/335, 336, 342, 350; 375/149, 150, 151, 152

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,969,159 A		11/1990	Belcher et al.	
5,790,588 A	*	8/1998	Fukawa et al.	370/342
5,910,948 A	*	6/1999	Shou et al.	370/335
5,930,366 A	*	7/1999	Jamal et al.	370/509
6,167,037 A	*	12/2000	Higuchi et al.	370/342
6,226,315 B1	*	5/2001	Sriram et al.	370/342
6,345,069 B1	*	2/2002	Dabak et al.	375/152
6,385,232 B1	*	5/2002	Terashima	375/149
6,459,724 B1	*	10/2002	Yoneyama	375/150
6,507,576 B1	*	1/2003	Suzuki et al.	370/342
6,526,039 B1	*	2/2003	Dahlman et al.	370/350

FOREIGN PATENT DOCUMENTS

EP	693834 A1	1/1996
EP	0825737	2/1998
EP	0838910	4/1998
EP	0852430	7/1998
JP	67-248698	5/1986
JP	8-79131	3/1996

OTHER PUBLICATIONS

Translation of the Institute of Electronics, Invormation and Communication Engineers, Technical Report of IEICE DSP98–116, SAT96–111, RCS96–122 (1997–01).

Higuchi, K. et al, "Fast Cell Search Algorithm in DS–CDMA Mobile Radio Using Long Spreading Codes", IEEE, 47th, May 4–7, 1997, pp. 1430–1434.

IEEE, K. Higushi et al, "Fast Cell Research Algorithum in DS–CDMA Mobile Radio Using Long Spreading Codes," May 4, 1997, pp. 1430–1434.

* cited by examiner

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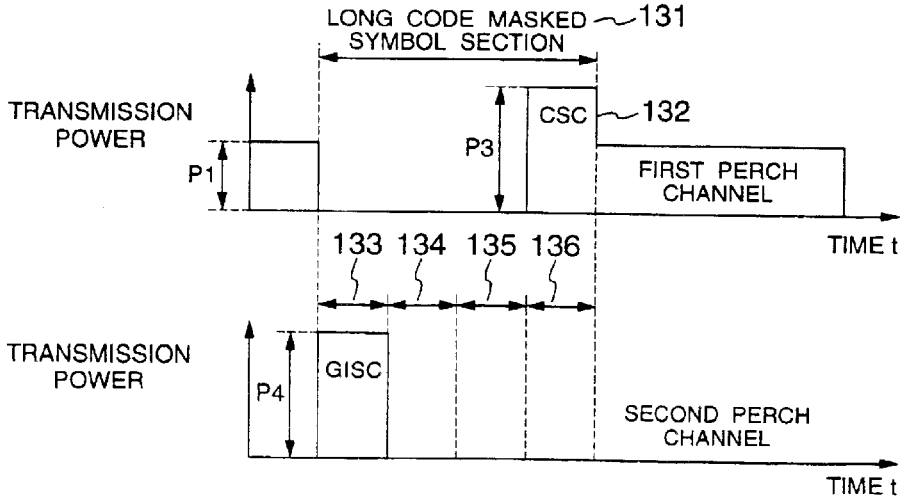
(57) **ABSTRACT**

In a mobile communication system using a code division multiple access (CDMA) method, spreading code detection and frame/slot timing synchronization (cell search) is conducted by using a long code masked symbol. The spreading factor of the long code masked symbol is set to a value lower than spreading factors of other ordinary symbols. As a result, it becomes possible to reduce the circuit scale and power dissipation of the mobile terminal and raise the speed of cell search.

8 Claims, 11 Drawing Sheets