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[54] **METHOD AND APPARATUS FOR FAST PILOT CHANNEL ACQUISITION USING A MATCHED FILTER IN A CDMA RADIOTELEPHONE**

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[58] **Field of Search** 455/434, 515, 455/442; 375/207, 343; 370/335, 342, 332

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,109,390	4/1992	Gilhousen et al.	370/335
5,179,571	1/1993	Schilling	37/331
5,267,261	11/1993	Blakeney, II et al.	370/332
5,311,544	5/1994	Park et al.	375/206
5,410,568	4/1995	Schilling	375/205
5,469,469	11/1995	Haines	375/201
5,490,165	2/1996	Blakeney, II et al.	375/205
5,544,156	8/1996	Teder et al.	370/342
5,703,873	12/1997	Ojanpera et al.	370/335
5,715,276	2/1998	Tran et al.	375/207

FOREIGN PATENT DOCUMENTS

0 615 355 A2	9/1994	European Pat. Off. .
0 756 391 A1	1/1997	European Pat. Off. .
3834457 C2	4/1989	Germany .
4425354 A1	2/1995	Germany .
5-344093	12/1993	Japan .
8-111653	4/1996	Japan .
WO 96/37968	11/1996	WIPO .

OTHER PUBLICATIONS

R. C. Dixon, "Integrate–and–Dump Filters", *Spread Spectrum Systems*, 2nd Edition, John Wiley & Sons, 1984, pp. 203–204.

R. C. Dixon, "Matched–Filter Synchronizers", *Spread Spectrum Systems*, 2nd Edition, John Wiley & Sons, 1984, pp. 229–234.

K. Higuchi et al., "Two–Stage Rapid Cell Search Scheme in DS–CDMA Asynchronous Cellular System using Long Code", Technical Report of IEICE, NTT Mobile Communications Network, Aug. 1996, pp. 51–56.

R. L. Peterson et al., Section 5–1, *Introduction to Spread–Spectrum Communications*, Prentice–Hall, Inc., 1995, pp. 221–223.

D. L. Schilling, Unpublished Paper, "A Matched Filter–Based Wideband CDMA Implementation", Jul. 1996, pp. 1–16.

G. L. Turin. "An Introduction to Digital Matched Filters", *Proceedings of the IEEE*, Jul. 1976, pp. 1092–1112.

G. L. Turin, "An Introduction of Matched Filters", *IEEE Transactions on Information Theory*, Jun. 1960, pp. 310–329.

R. B. Ward et al., "Acquisition of Pseudonoise Signals by Recursion–Aided Sequential Estimation", *IEEE Transactions on Communications*, vol. Com–25, No. 8, Aug. 1977, pp. 784–794.

R. B. Ward, "Acquisition of Pseudonoise Signals by Sequential Estimation", *IEEE Transactions on Communication Technology*, Dec. 1965, pp. 475–483.

TIA/EIA Interim Standard, Mobile Station–Base Station Compatibility Standard for Dual–Mode Wideband Spread Spectrum Cellular System, TIA/EIA/IS–95, Telecommunications Industry Association, Jul. 1993, pp. 7–2 & 7–18.

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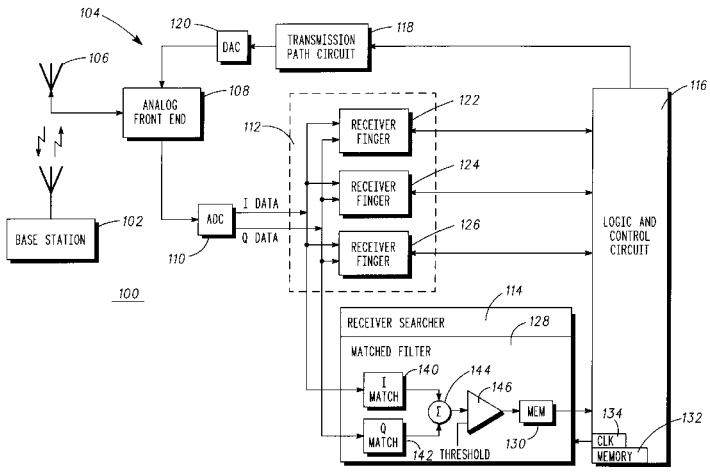
[57] **ABSTRACT**

Performance of a radiotelephone **(104)** in a CDMA communication system **(100)** is enhanced using a receiver searcher **(114)** that includes a matched filter **(128)** to capture the pilot energies of all receivable transmissions from a base station **(102)** and other nearby base stations. A detected PN sequence is compared with a predetermined PN sequence stored at the radiotelephone **(104)**. The predetermined PN sequence includes, for example, the last 512 chips in the short PN sequence used for spreading the in-phase channel and the quadrature-phase channel.

26 Claims, 5 Drawing Sheets