



# United States Patent [19]

[11] Patent Number: **5,555,268**

Fattouche et al.

[45] Date of Patent: **Sep. 10, 1996**

[54] **MULTICODE DIRECT SEQUENCE SPREAD SPECTRUM**

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[57] **ABSTRACT**

In this patent, we present MultiCode Direct Sequence Spread Spectrum (MC-DSSS) which is a modulation scheme that assigns up to N DSSS codes to an individual user where N is the number of chips per DSSS code. When viewed as DSSS, MC-DSSS requires up to N correlators (or equivalently up to N Matched Filters) at the receiver with a complexity of the order of N<sup>2</sup> operations. In addition, a non ideal communication channel can cause InterCode Interference (ICI), i.e., interference between the N DSSS codes. In this patent, we introduce new DSSS codes, which we refer to as the "MC" codes. Such codes allow the information in a MC-DSSS signal to be decoded in a sequence of low complexity parallel operations which reduce the ICI. In addition to low complexity decoding and reduced ICI. MC-DSSS using the MC codes has the following advantages: (1) it does not require the stringent synchronization DSSS requires, (2) it does not require the stringent carrier recovery DSSS requires and (3) it is spectrally efficient.

[21] Appl. No.: **186,784**

[22] Filed: **Jan. 24, 1994**

[51] Int. Cl.<sup>6</sup> ..... **H04B 1/707**; H04B 1/69

[52] U.S. Cl. .... **375/206**; 375/200; 380/34; 370/19; 370/21; 370/22

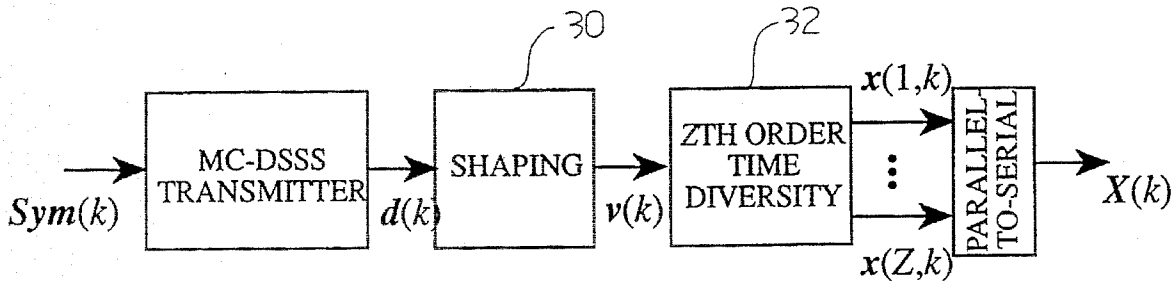
[58] Field of Search ..... 375/1, 200-210; 380/34, 46; 370/18, 19, 20, 21, 22, 23, 24; 331/78; 364/717

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**32 Claims, 20 Drawing Sheets**



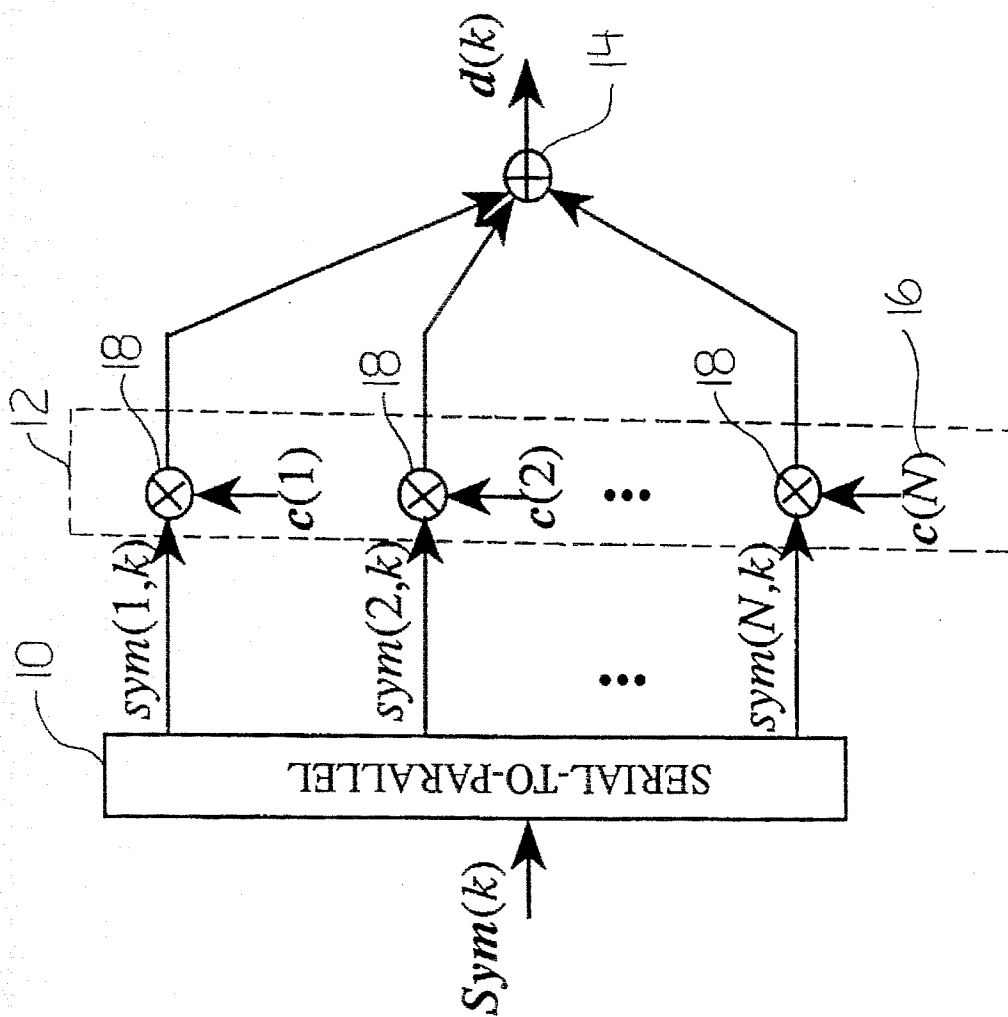


FIGURE 1

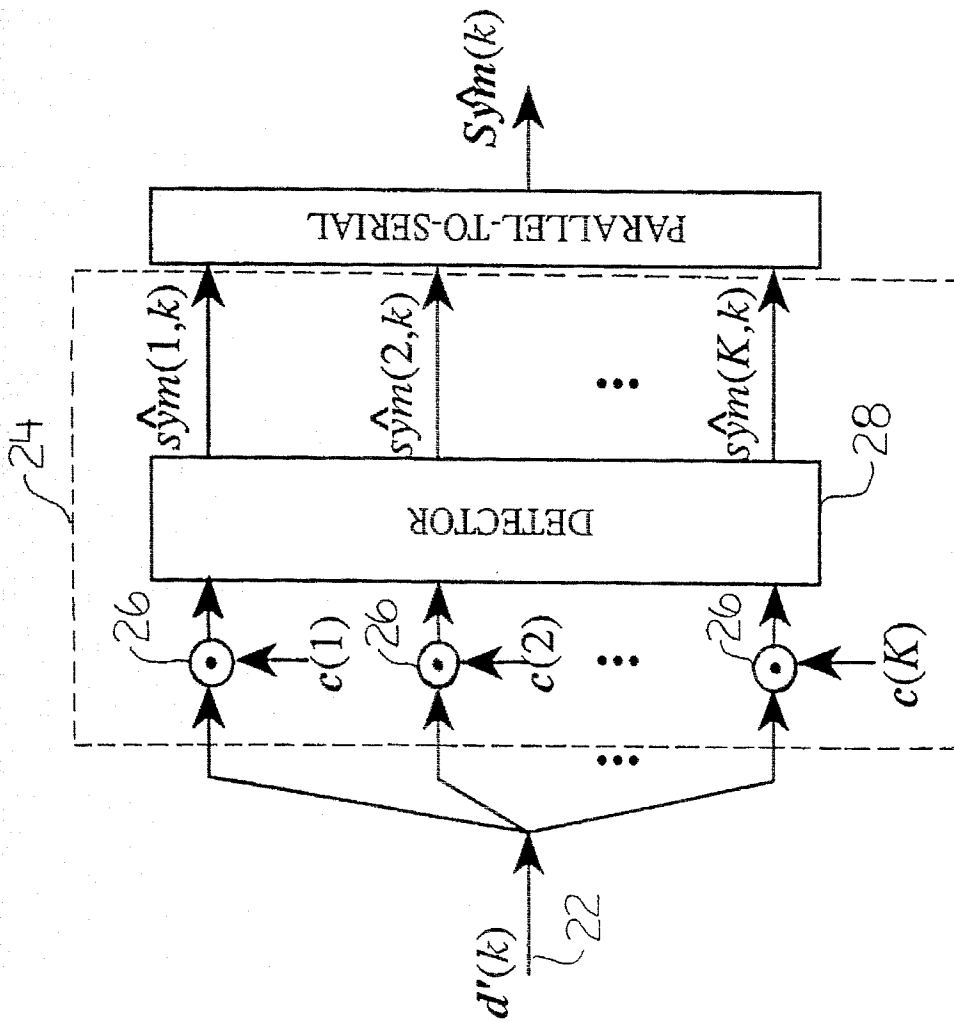


FIGURE 2

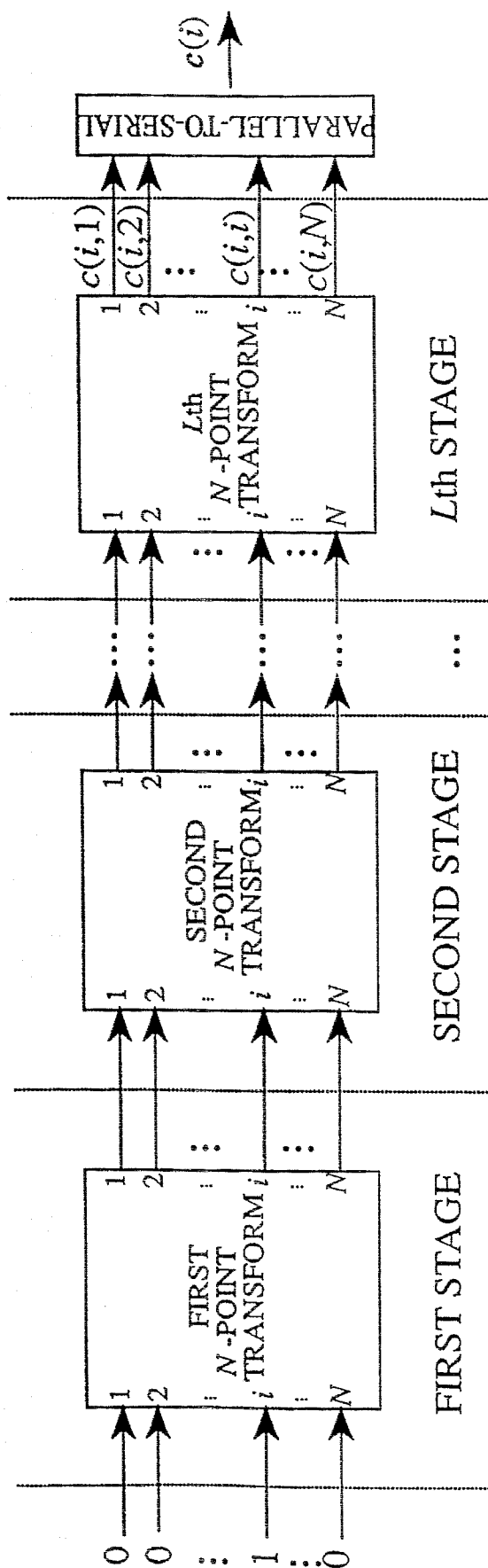


FIGURE 3

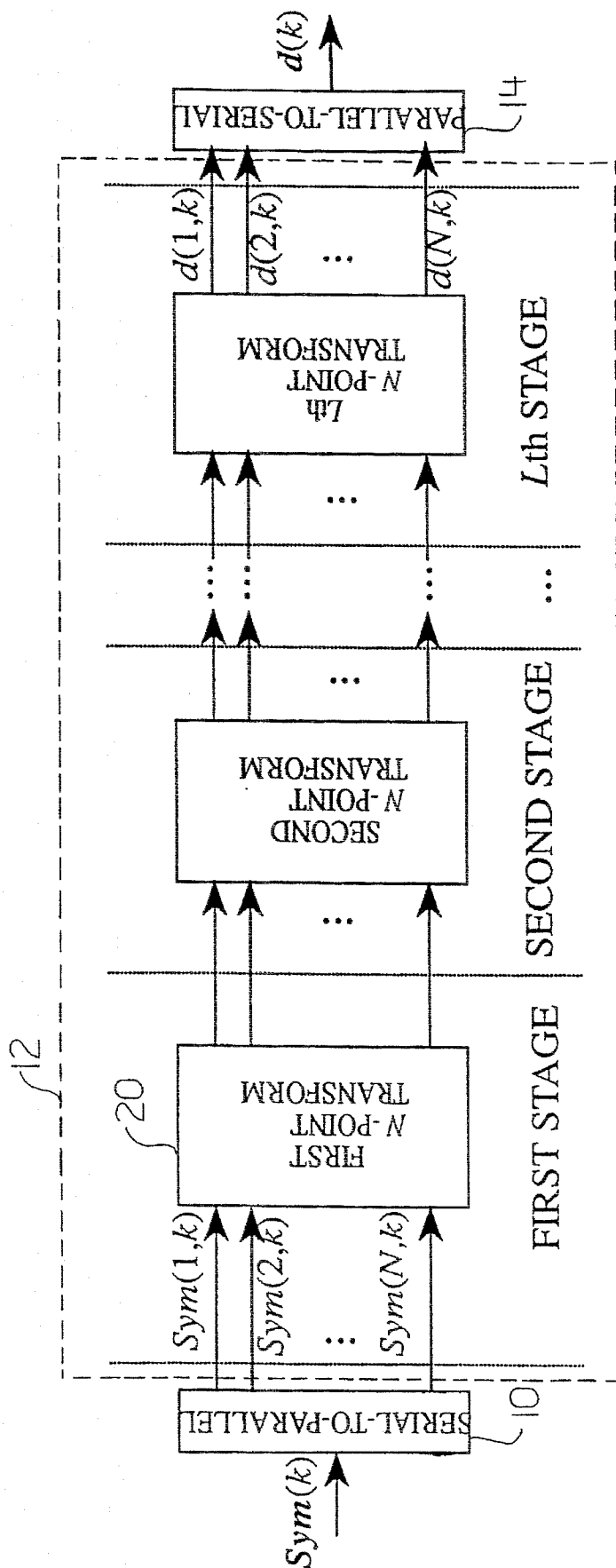


FIGURE 4

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