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United States Patent [19]

Marchetto et al.

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[54] **COMPENSATION FOR MULTI-PATH INTERFERENCE USING PILOT SYMBOLS**

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[51] **Int. Cl.**[6] **H04L 1/02**; H04L 25/08; H04B 1/10; H04B 15/00

[52] **U.S. Cl.** **375/267**; 375/285; 375/346; 375/347; 375/350

[58] **Field of Search** 375/99, 100, 102, 40, 375/58, 94, 103, 12, 14, 11; 455/303, 304, 306, 65, 521; 364/724.1, 577; 370/110.1, 110.2, 110.3, 110.4

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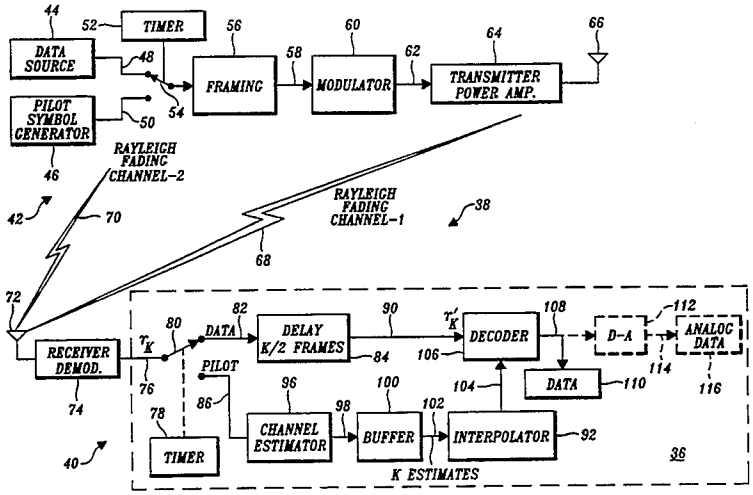
[57] **ABSTRACT**

A method and apparatus for compensating fading and interference in a radio signal. A plurality of pilot symbols are appended to a plurality of data symbols to form successive frames that are modulated at a transmitter. The transmitted modulated signal is subject to loss of data due to simple fading and multi-path and simulcast interference. The received signals are demodulated by a receiver and processed to provide a data signal comprising the data symbols and a pilot signal comprising the pilot symbols. The data signal is delayed for sufficient time to enable channel impulse response estimates to be made of successive blocks of pilot symbols, preferably using pilot symbol blocks that both precede and follow the data symbols in the frame being processed. The channel impulse response estimates for blocks of pilot symbols are buffered and used by an interpolator to determine an interpolated channel impulse response estimate for each data symbol as a function of both the pilot symbols and of predefined channel characteristics. The interpolated channel impulse response estimates are applied to successive data symbols in the delayed data signal, enabling the data to be decoded, compensating for fading and interference. Interpolation using predefined channel characteristics based on worst case conditions substantially improves the bit error rate (BER) for the data recovered, compared to the prior art.

22 Claims, 8 Drawing Sheets



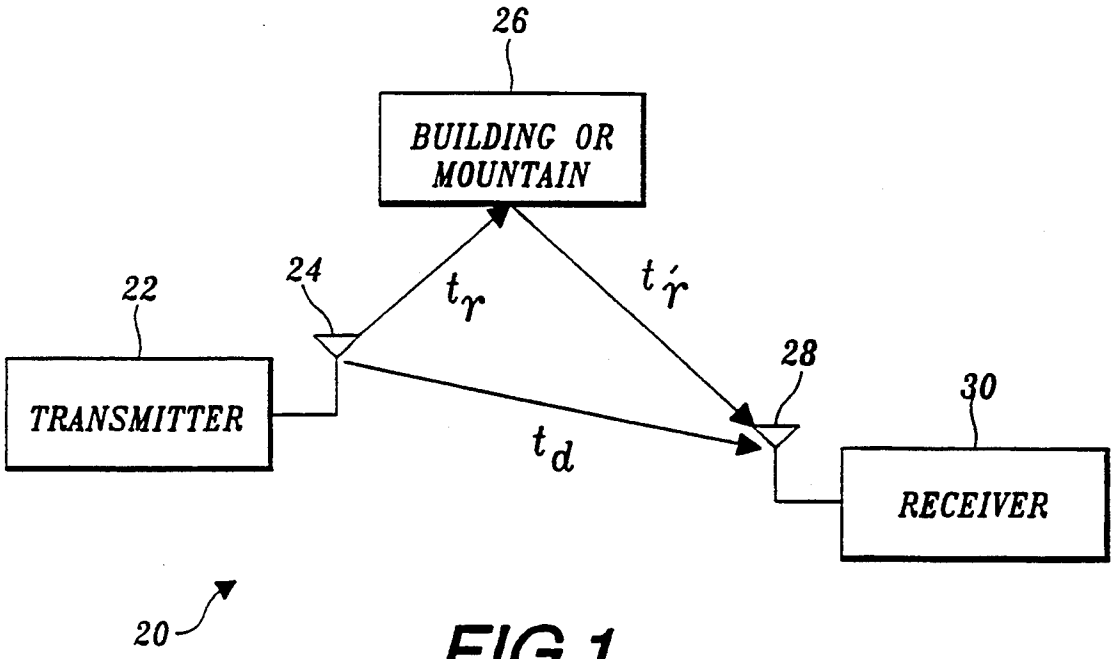


FIG. 1.

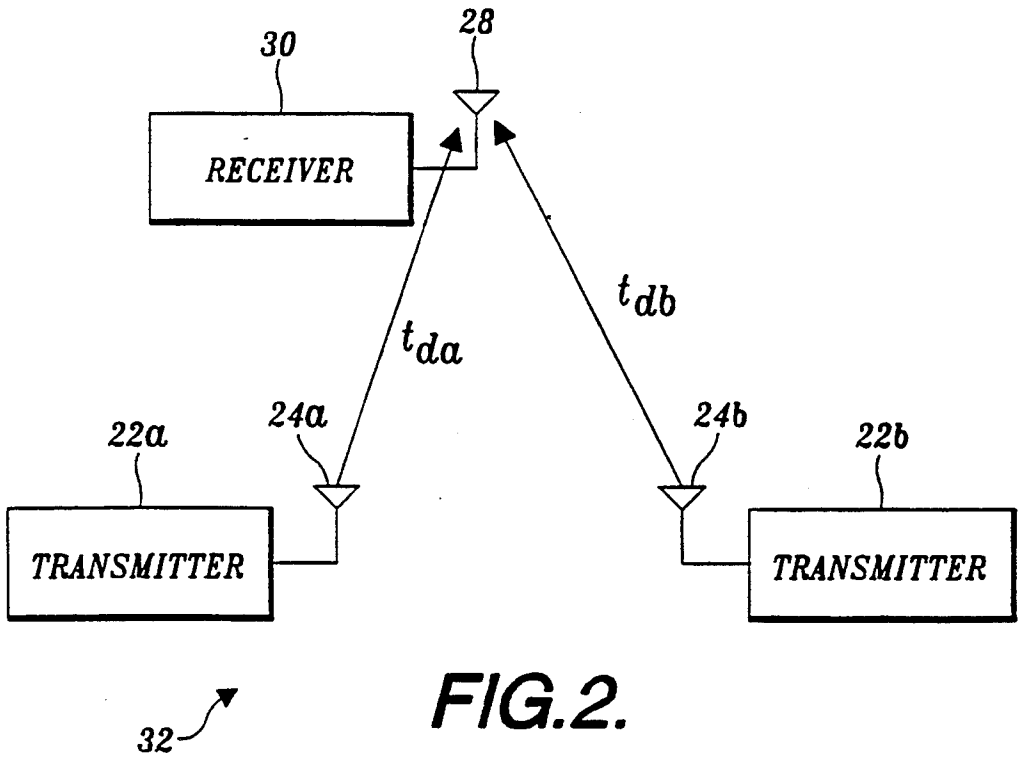
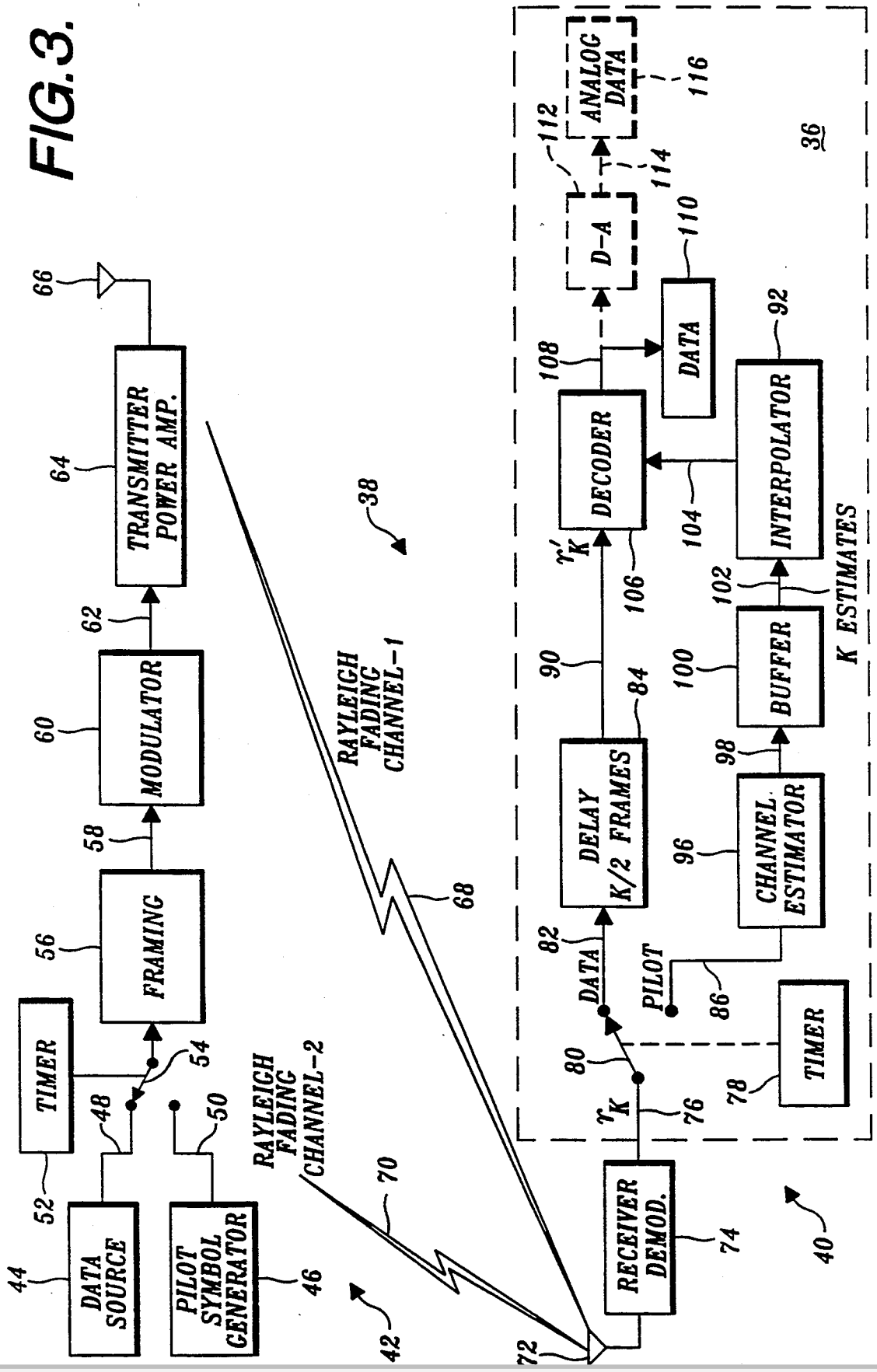


FIG. 2.

FIG.3.



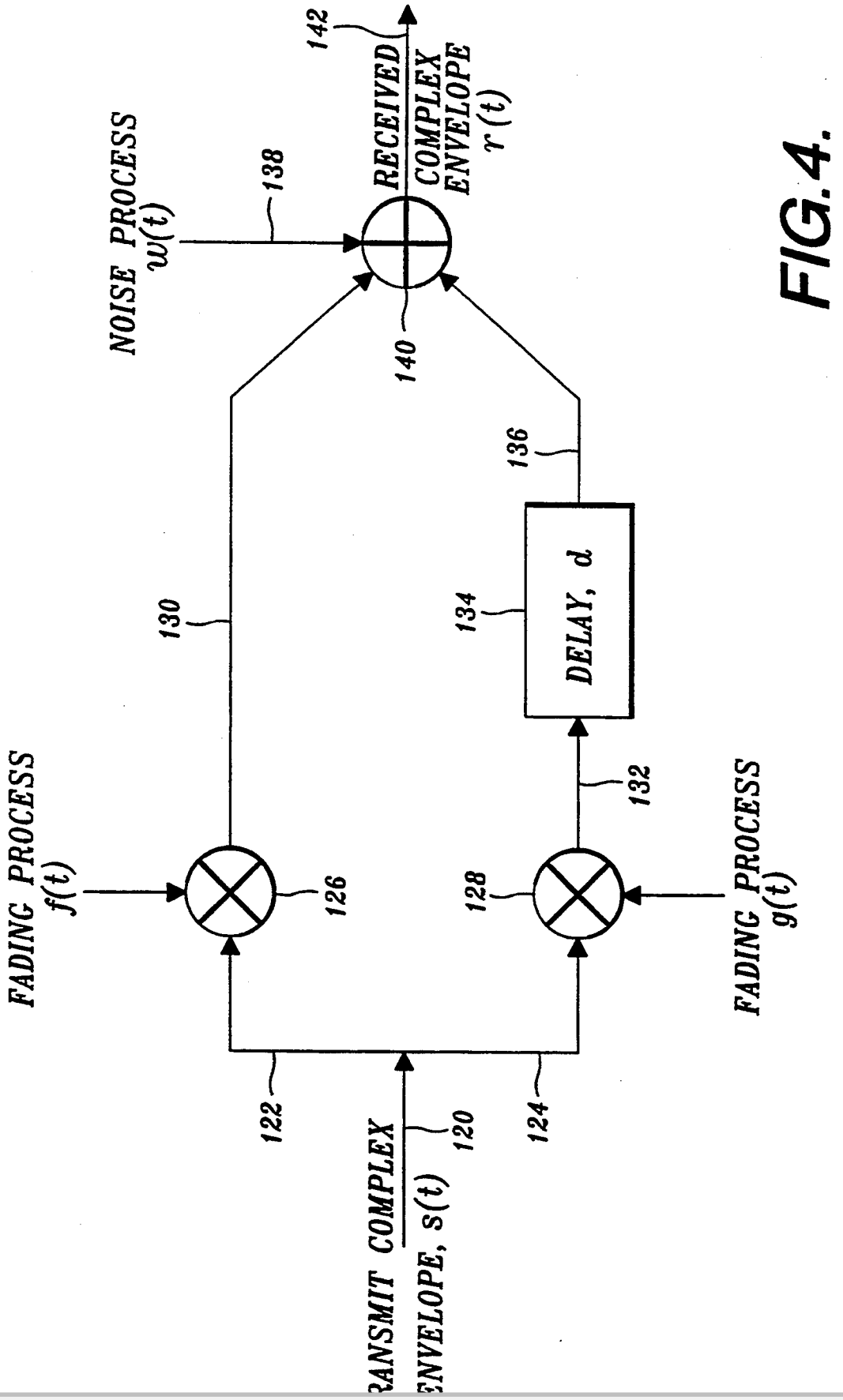


FIG. 4.

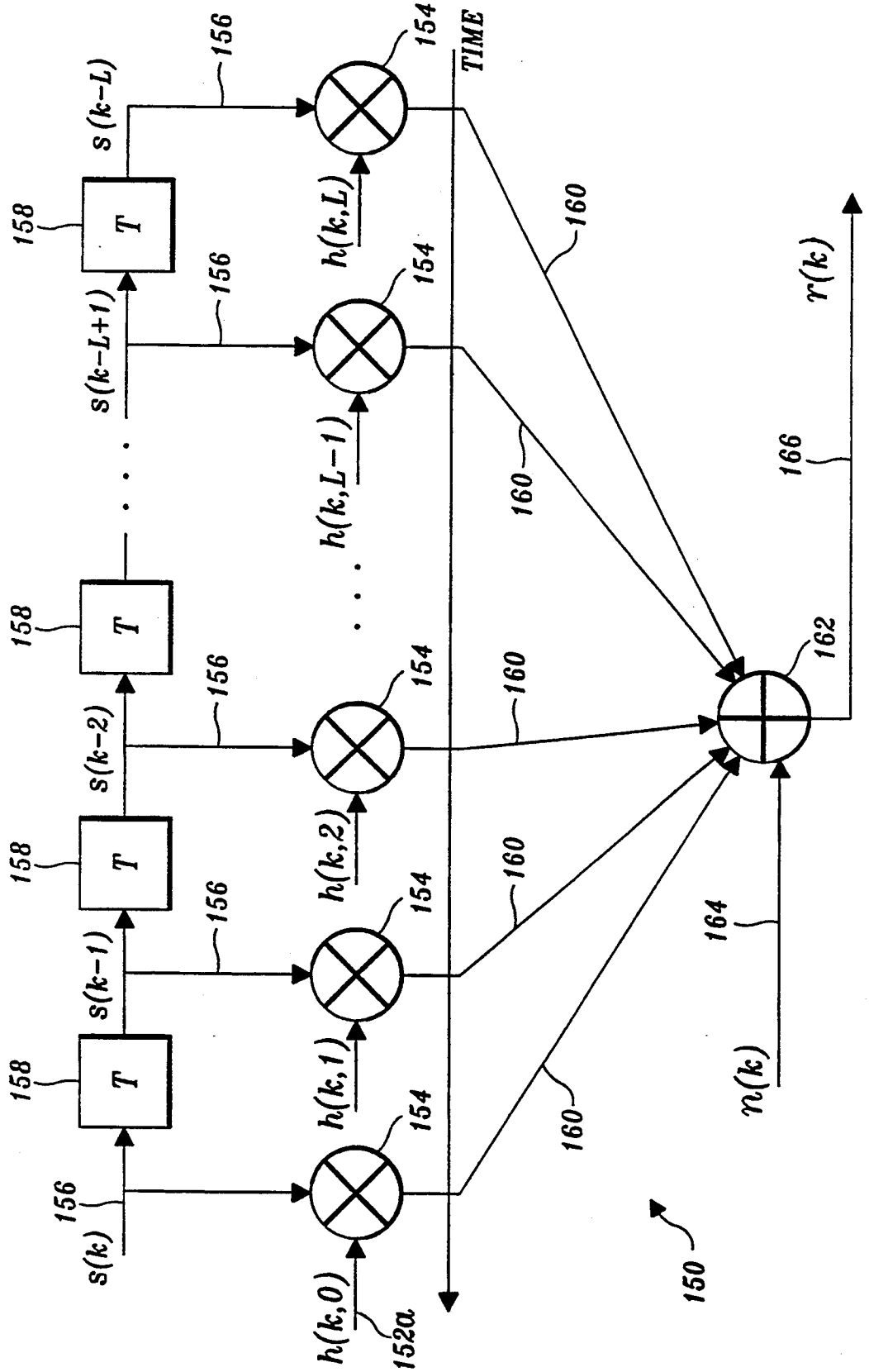


FIG.5.

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