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United States Patent [19] Mujtaba

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[45] **Date of Patent:** Jul. 18, 2000

- [54] **SINGLE SIDEBAND TRANSMISSION OF QPSK, QAM AND OTHER SIGNALS**
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- [73] Assignee: **Lucent Technologies Inc.**, Murray Hill, N.J.
- [21] Appl. No.: **08/970,987**
- [22] Filed: **Nov. 14, 1997**
- [51] **Int. Cl.⁷** **H04L 27/18**
- [52] **U.S. Cl.** **375/279; 375/270; 375/321**
- [58] **Field of Search** **375/270, 279, 375/321, 280, 308, 260, 329, 276, 340; 332/103, 108**

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Assistant Examiner—Kevin M Burd
Attorney, Agent, or Firm—Ryan & Mason, L.L.P.

[57] ABSTRACT

Methods, apparatus and system for transmitting signals in QPSK, QAM and other similar modulation formats as single sideband (SSB) signals. An exemplary SSB-QPSK transmitter receives an in-phase data signal and a quadrature-phase data signal. The in-phase data signal and a Hilbert transform of the quadrature-phase data signal are modulated onto a cosine carrier signal, the quadrature-phase data signal and a Hilbert transform of the in-phase data signal are modulated onto a sine carrier signal, and the modulated sine and cosine carrier signals are combined to provide a modulated SSB-QPSK signal. The in-phase and quadrature-phase data signals are time-aligned signals which are interpolated prior to modulation so as to include zero values at alternating instants of time. Their corresponding Hilbert transforms therefore also exhibit alternating zero values. During modulation, the in-phase data signal can thus be interleaved with Hilbert transforms of the quadrature-phase data signal, and the quadrature-phase data signal can be interleaved with Hilbert transforms of the in-phase data signal, without any interference between the signals. Coherent quadrature detection may be used to recover both the in-phase and quadrature-phase data signals at a receiver.

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19 Claims, 8 Drawing Sheets

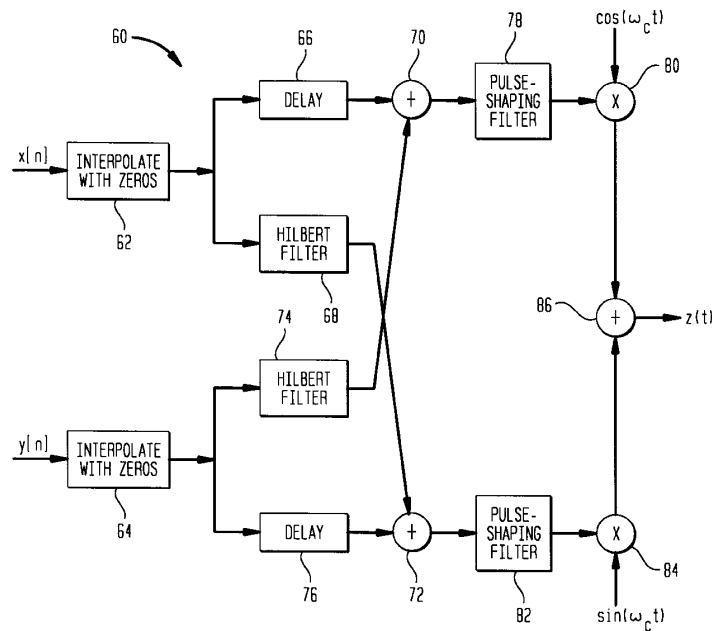


FIG. 1A
(PRIOR ART)

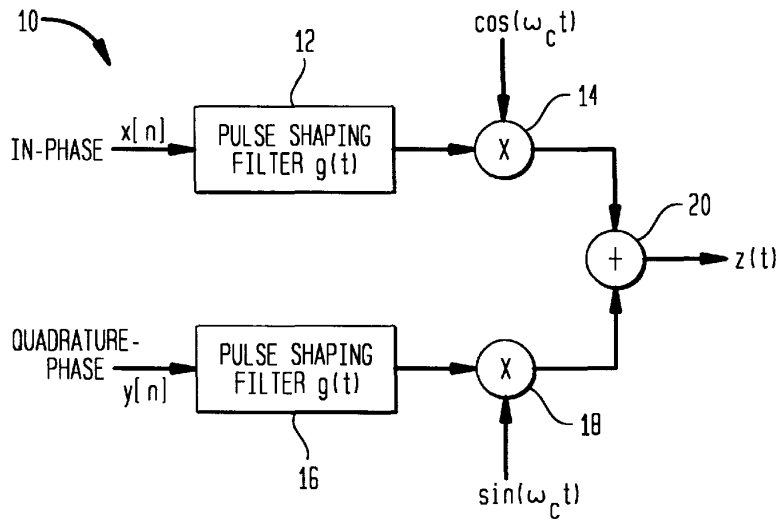


FIG. 1B
(PRIOR ART)

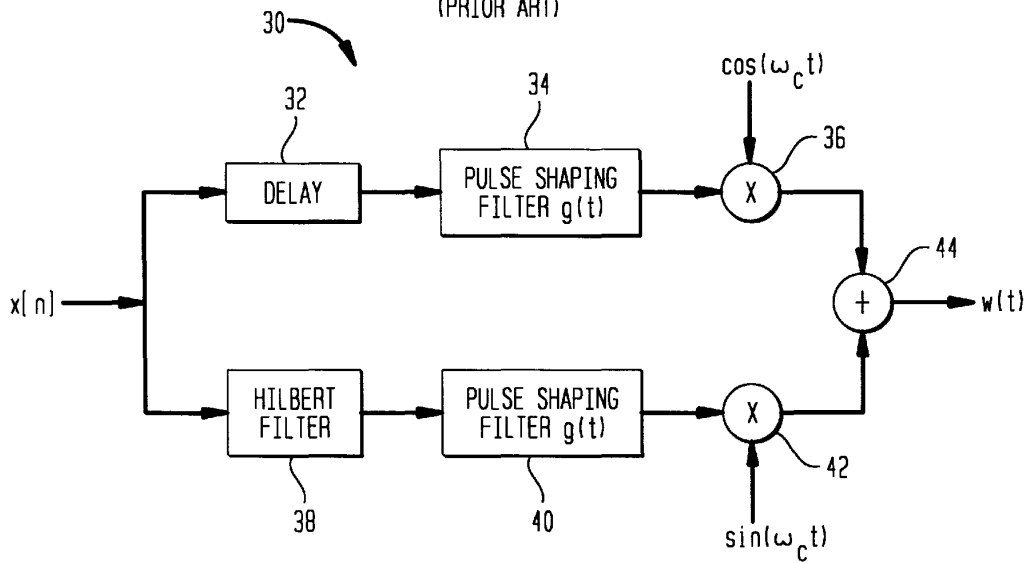


FIG. 2A

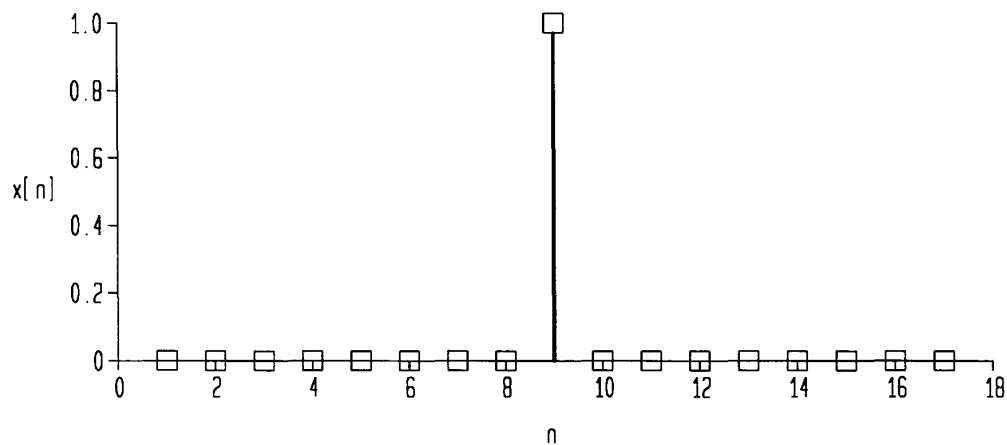


FIG. 2B

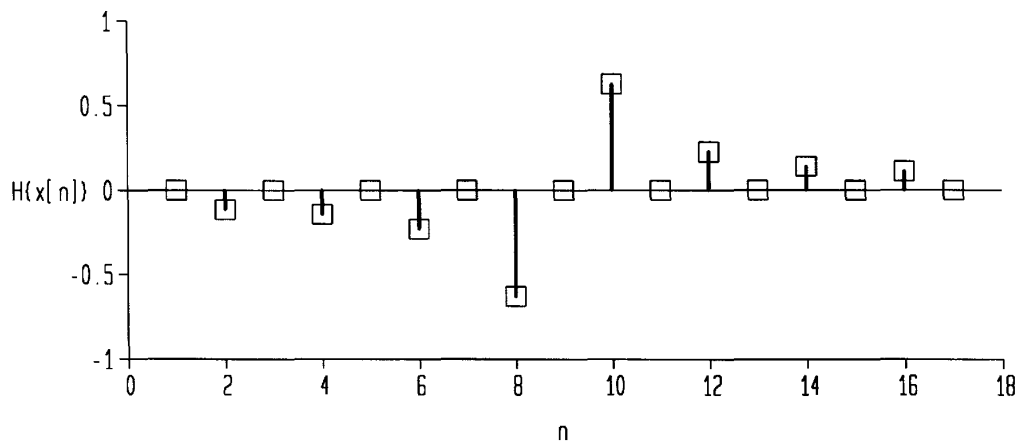


FIG. 3A

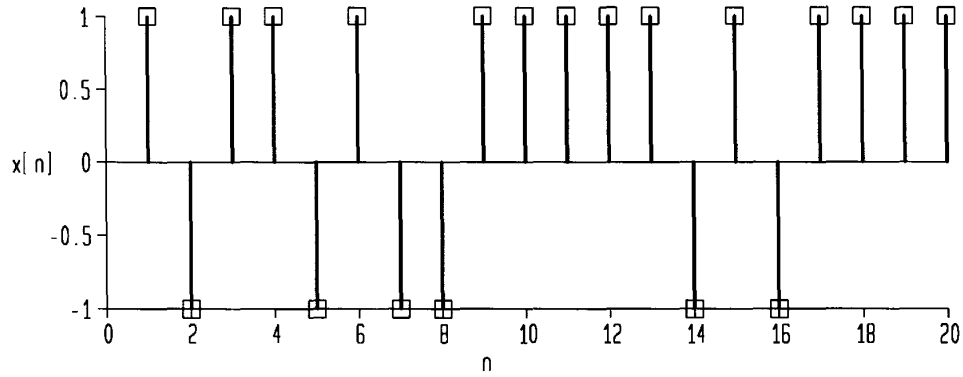


FIG. 3B

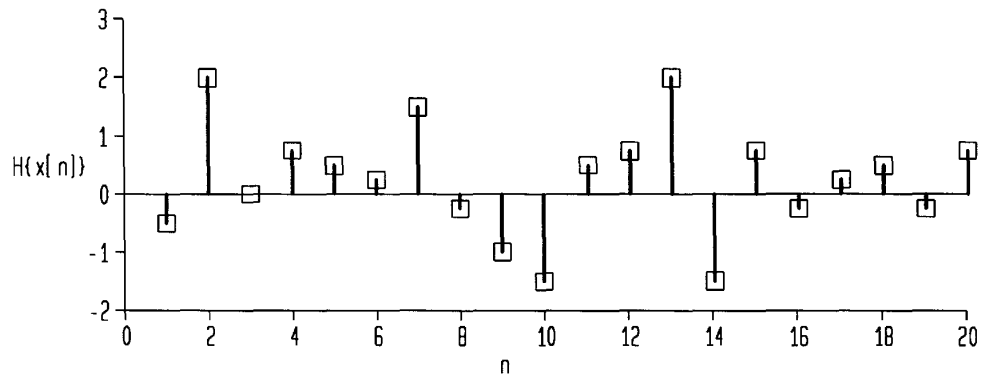


FIG. 4A

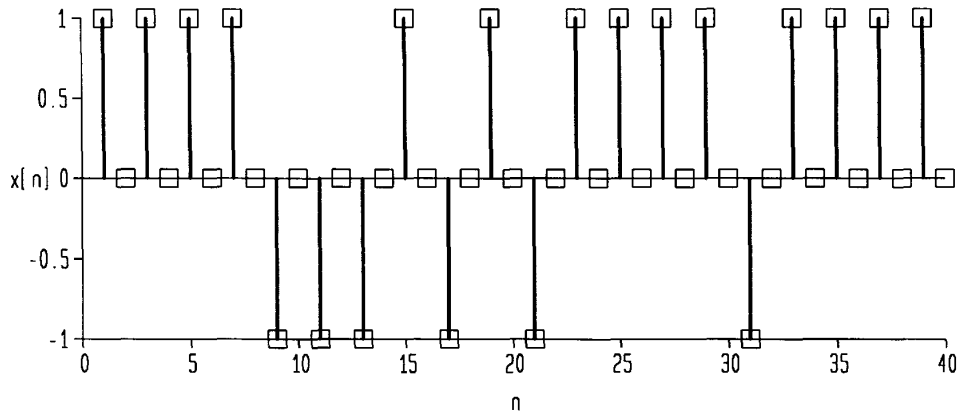
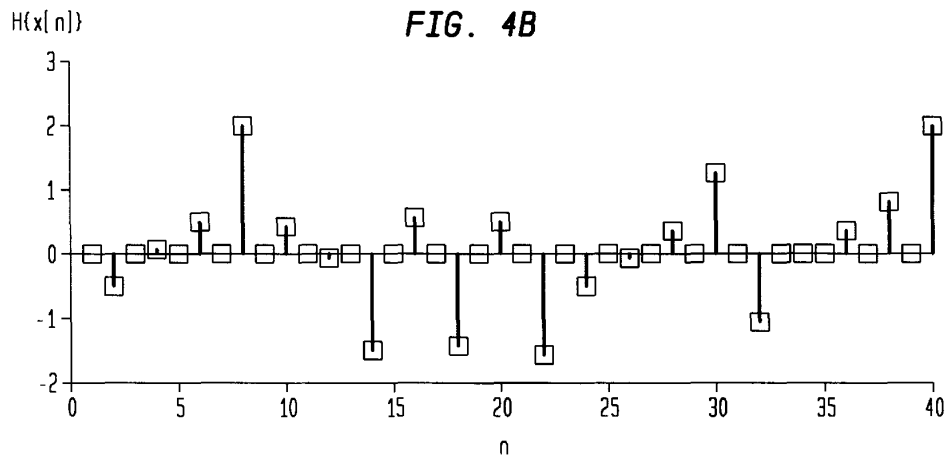


FIG. 4B



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