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United States Patent [19]

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Moose

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[54] ECHO CANCELLATION IN MULTI-FREQUENCY DIFFERENTIALLY ENCODED DIGITAL COMMUNICATIONS

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[73] Assignee: **Mercury Digital Communications, Inc.**, Monterey, Calif.

[21] Appl. No.: **566,290**

[22] Filed: **Aug. 10, 1990**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 490,769, Mar. 6, 1990, Pat. No. 5,063,574.

[51] Int. Cl.⁵ **H04L 5/14; H04M 9/08**

[52] U.S. Cl. **370/32.1; 379/410**

[58] Field of Search **370/32.1, 32; 379/410, 379/411**

[56] References Cited

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Primary Examiner—Douglas W. Olms

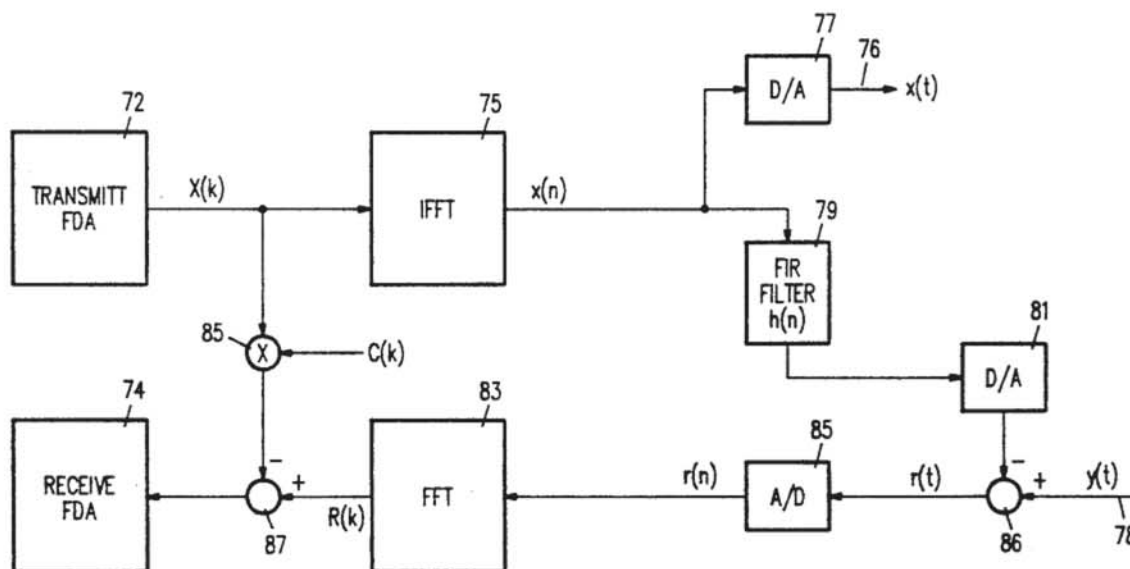
Assistant Examiner—Wellington Chin

Attorney, Agent, or Firm—Davis & Schroeder

[57] ABSTRACT

A differentially encoded digital signal waveform is generated as a discrete time representation of a desired analog signal utilizing multi-frequency modulation techniques. The computational capability of present day, industry-standard microcomputers equipped with a floating point array processor or digital signal processor chip is utilized to perform digital frequency encoding and compute both discrete Fourier transforms and inverse discrete Fourier transforms to provide a transmitter and receiver system utilizing suitably programmed microcomputers coupled by a communications channel.

5 Claims, 11 Drawing Sheets



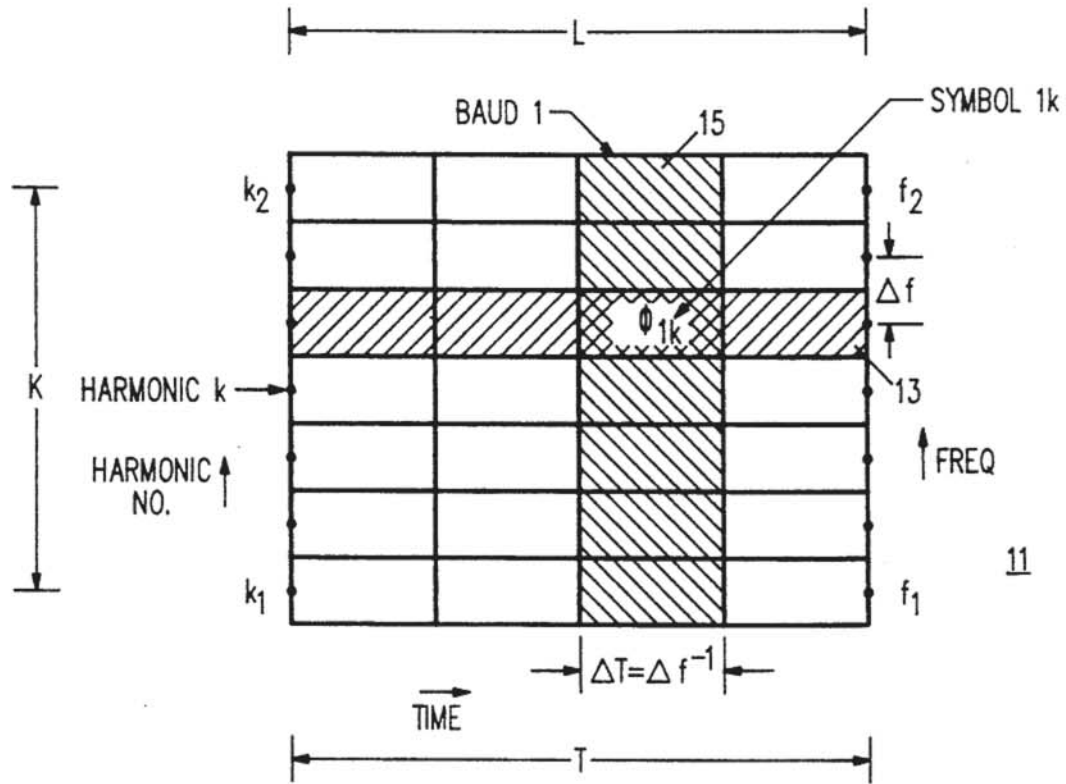


FIG. 1

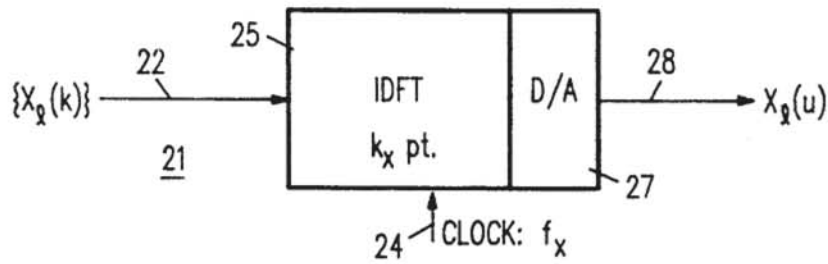
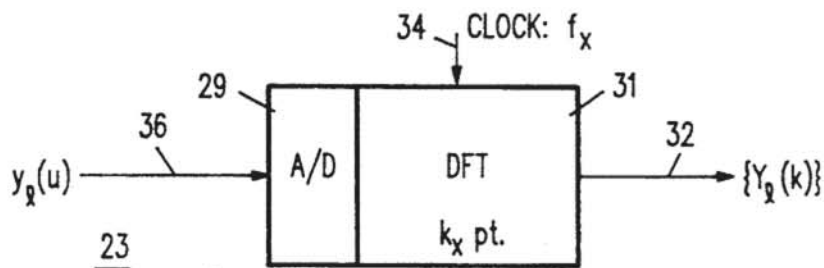


FIG. 2a



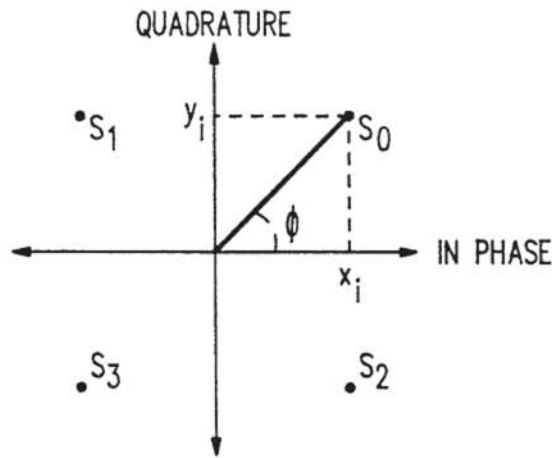


FIG. 3

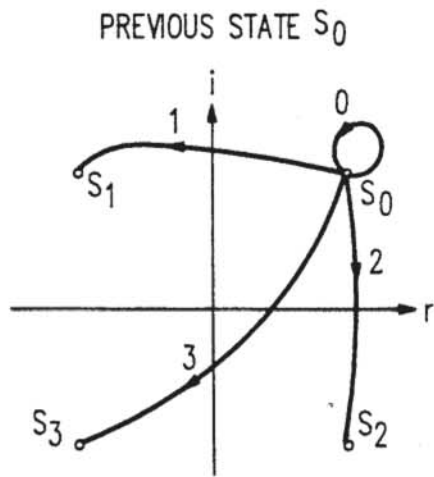


FIG. 4a

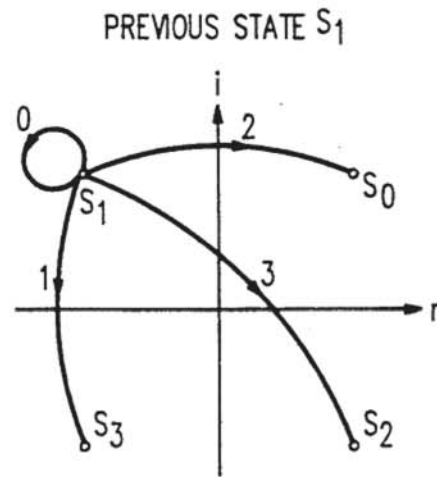


FIG. 4b

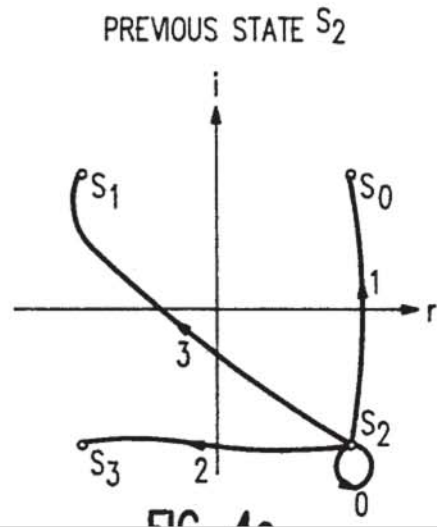


FIG. 4c

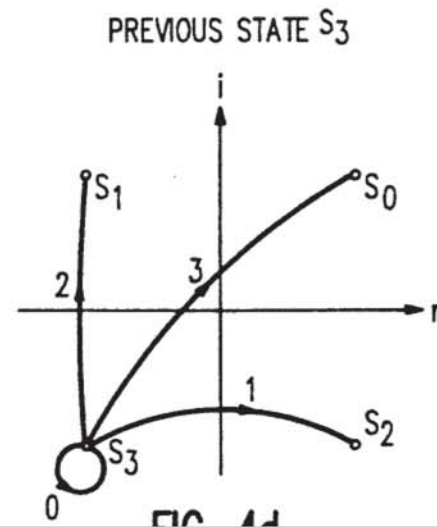


FIG. 4d

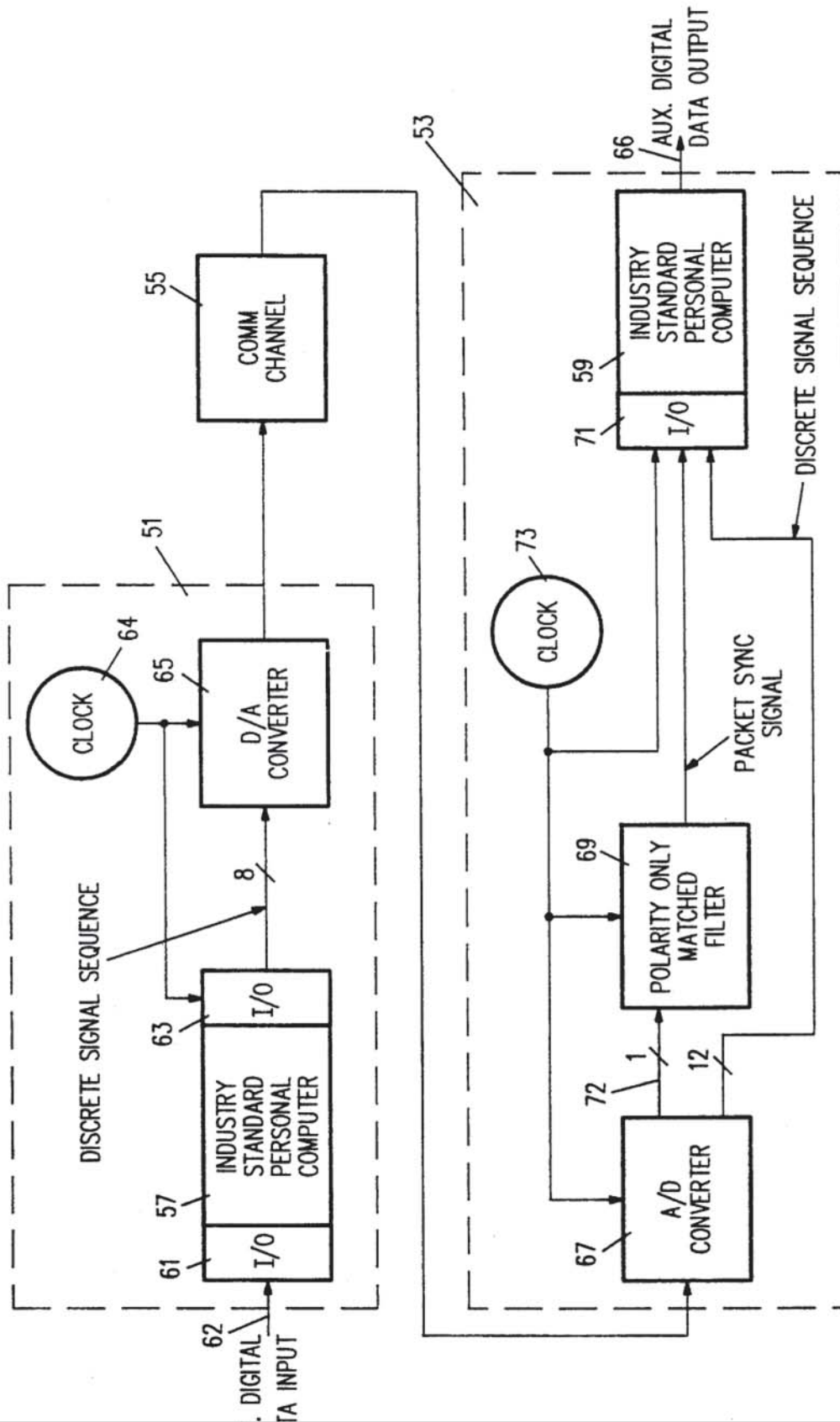


FIG. 5

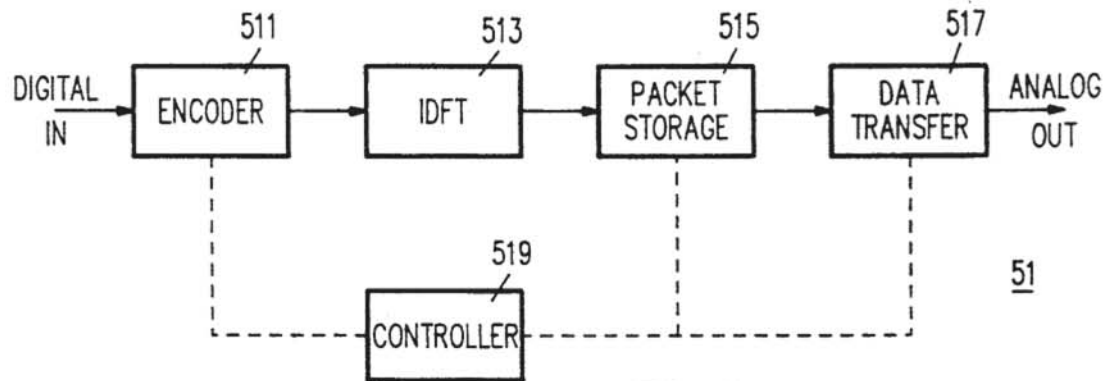


FIG. 6

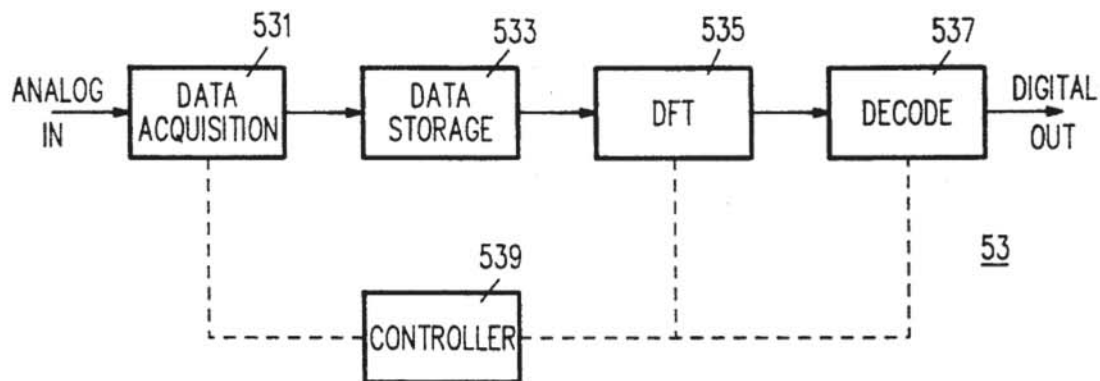


FIG. 7

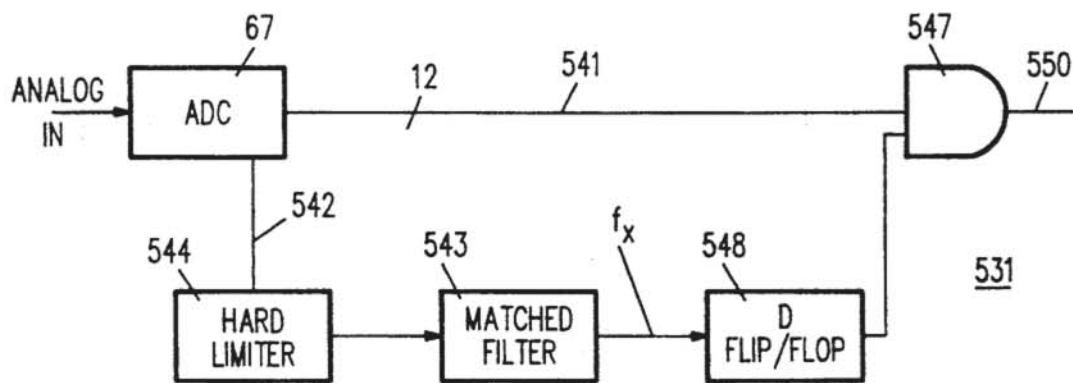


FIG. 8

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