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Lin et al.

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(54) **METHOD AND DEVICE FOR ENCODING SPEECH USING OPEN-LOOP PITCH ANALYSIS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 22 days.

This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

(63) Continuation of application No. 10/924,398, filed on Aug. 23, 2004, now Pat. No. 7,013,270, which is a continuation of application No. 10/446,314, filed on May 28, 2003, now Pat. No. 6,782,359, which is a continuation of application No. 10/083,237, filed on Feb. 26, 2002, now Pat. No. 6,611,799, which is a continuation of application No. 09/805,634, filed on Mar. 14, 2001, now Pat. No. 6,385,577, which is a continuation of application No. 09/441,743, filed on Nov. 16, 1999, now Pat. No. 6,223,152, which is a continuation of application No. 08/950,658, filed on Oct. 15, 1997, now Pat. No. 6,006,174, which is a continuation of application No. 08/670,986, filed on Jun. 28, 1996, now abandoned, which is a continuation of application No. 08/104,174, filed on Aug. 9, 1993, now abandoned, which is a continuation of application No. 07/592,330, filed on Oct. 3, 1990, now Pat. No. 5,235,670.

(51) **Int. Cl.**
G10L 19/12 (2006.01)

(52) **U.S. Cl.** **704/219**

(58) **Field of Classification Search** **704/219**
See application for complete search history.

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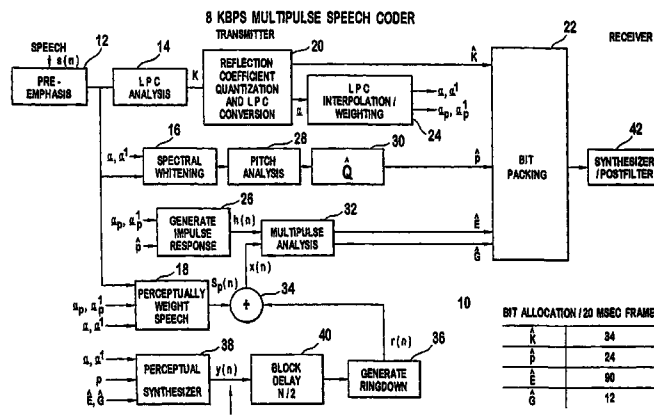
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(57) **ABSTRACT**

The present invention is a synthetic speech encoding device that produces a synthetic speech signal which closely matches an actual speech signal. The actual speech signal is digitized, and excitation pulses are selected by minimizing the error between the actual and synthetic speech signals. The preferred pattern of excitation pulses needed to produce the synthetic speech signal is obtained by using an excitation pattern containing a multiplicity of weighted pulses at timed positions. The selection of the location and amplitude of each excitation pulse is obtained by minimizing an error criterion between the synthetic speech signal and the actual speech signal. The error criterion function incorporates a perceptual weighting filter which shapes the error spectrum.

16 Claims, 12 Drawing Sheets



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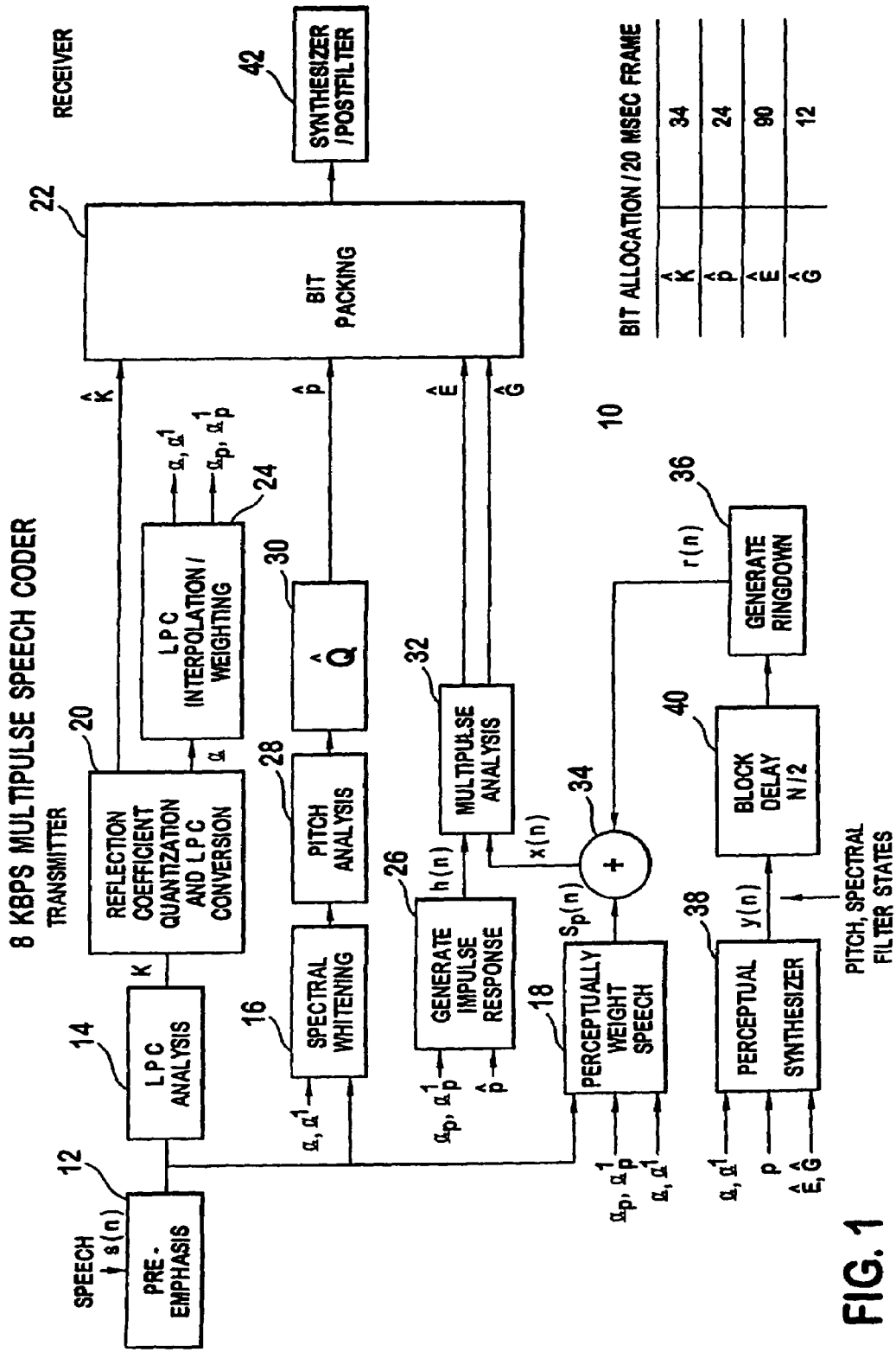


FIG. 1

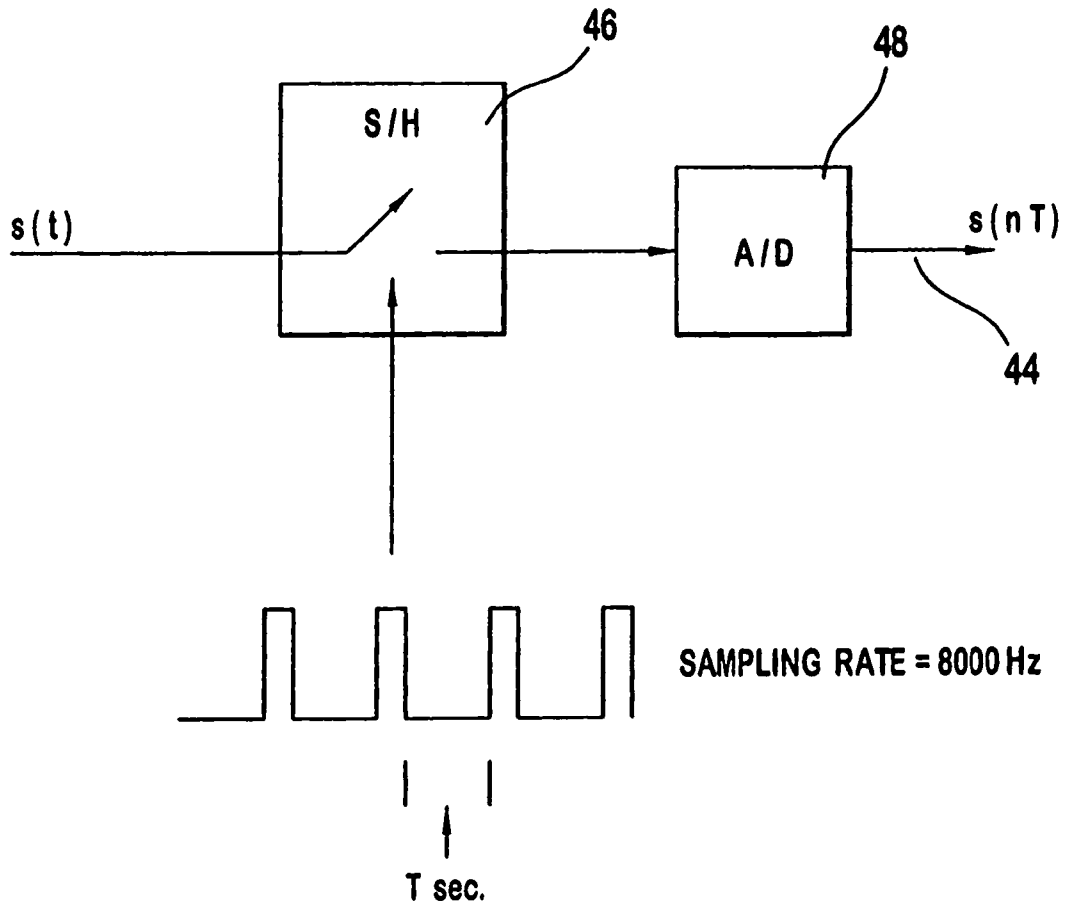


FIG. 2

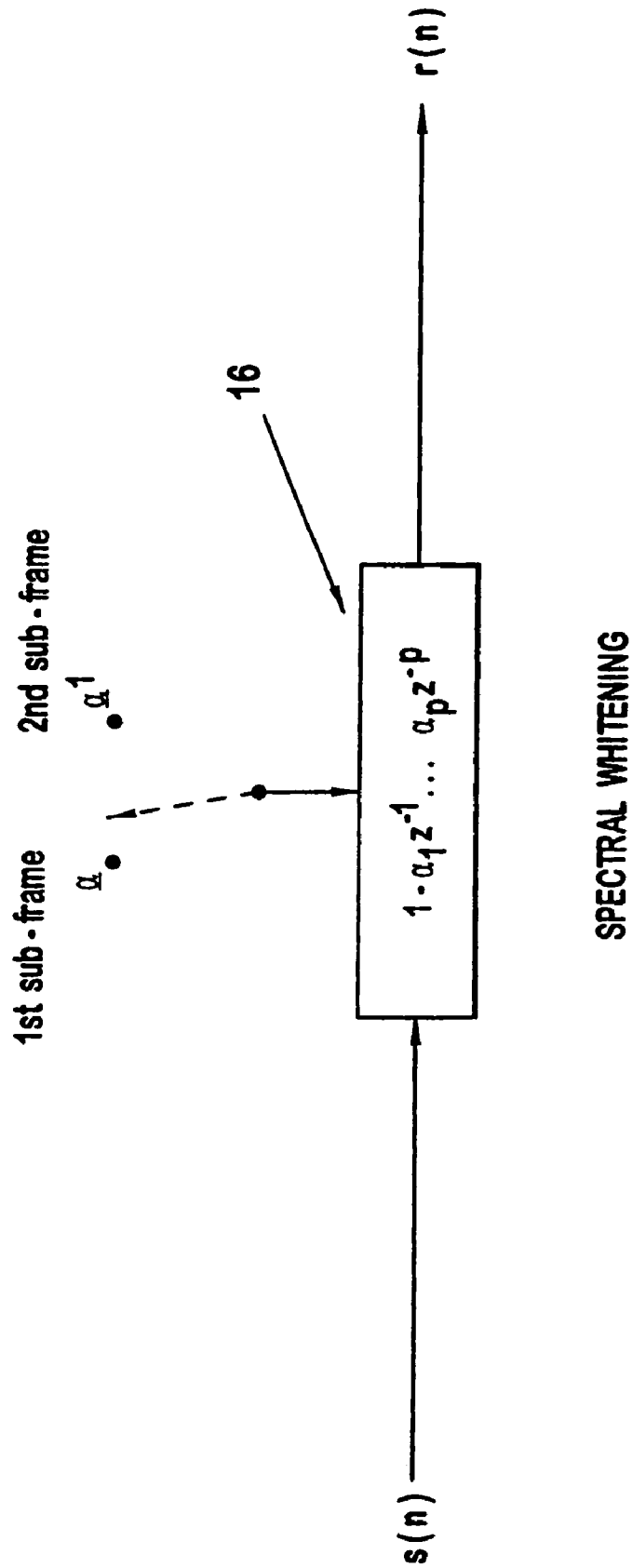


FIG. 3

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