United States Patent [19]

Taylor, Jr. et al.

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[54] **DIGITAL AUDIO AMPLIFIER HAVING A HIGH POWER OUTPUT LEVEL AND LOW DISTORTION**

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[58] **Field of Search** ..... 330/10, 207 A, 207 P, 330/251; 332/9 T, 11 D, 14

[56] **References Cited**

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[57] **ABSTRACT**

A digital amplifier having a modulator for transforming the analog audio input signal into two complimentary trains of pulse width modulated signals for driving the power switches, which modulator utilizes a precision triangular waveform to control the transformation. The modulator employs all differential processing without saturated transistors to achieve a minimal distortion modulation system. Upon the occurrence of over-modulation, pulses from the width modulated pulse train produced by the modulator are dropped, and the resulting loss of pulses is detected and fed back to a variable gain amplifier stage of the system. The distortion detection system for detecting the missing pulses utilizes a timing network to establish the missing pulse period necessary to begin input attenuation of the audio signal by the variable gain amplifier stage. A reconstruction filter includes a low-pass section for recovering the amplified audio and a notch filter section having notches centered to eliminate the fundamental of the switching frequency. A variable inductor is employed in connection with a section of the notch filter for aiding in the proper notching of the signals to maximize suppression of the switching frequency, such inductor being coupled to the feedback network, and is adjusted by the operator while observing output distortion until the distortion attains a minimum level. The reconstruction filter also includes a tapped inductor functioning as an autotransformer which introduces offsets in the output switching waveform of the power amplifier to effectively compensate for crossover distortion due to energy recovery diode overswings and power switch voltage drops.

35 Claims, 11 Drawing Figures