[54] **METHOD AND APPARATUS FOR ESTIMATING THE LEVEL OF ACOUSTIC FEEDBACK BETWEEN A LOUDSPEAKER AND MICROPHONE**

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Related U.S. Application Data

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[52] U.S. Cl. 370/32.1; 379/406; 381/83
[58] Field of Search 370/32.1, 32; 381/46, 381/47, 66, 71, 83; 379/345, 392, 410, 406

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[57] **ABSTRACT**

An improved echo cancelling device for reducing the effects of acoustic feedback between a loudspeaker and microphone in a communication system. The device includes an adjustable filter for receiving a loudspeaker signal and generating in response thereto an echo estimation signal. The device subtracts the echo estimation signal from the microphone signal to produce an echo corrected microphone signal. During periods of time when the microphone signal is substantially derived from acoustic feedback between the loudspeaker and the microphone, the device adjusts transfer characteristics of the filter to reduce the echo corrected microphone signal. The improvement includes estimating from the adjusted transfer characteristics an energy transfer ratio representative of the ratio of the energy of the microphone signal to the energy of the loudspeaker signal. The device compares the microphone signal to the energy transfer ratio multiplied by the loudspeaker signal to identify periods of time when the microphone signal is substantially derived from acoustic feedback between the loudspeaker and the microphone.

18 Claims, 7 Drawing Sheets
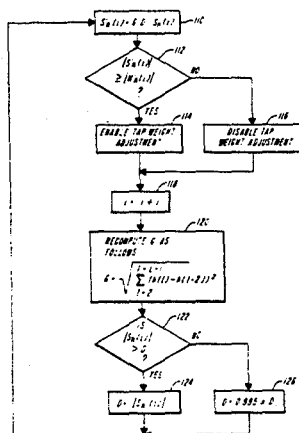
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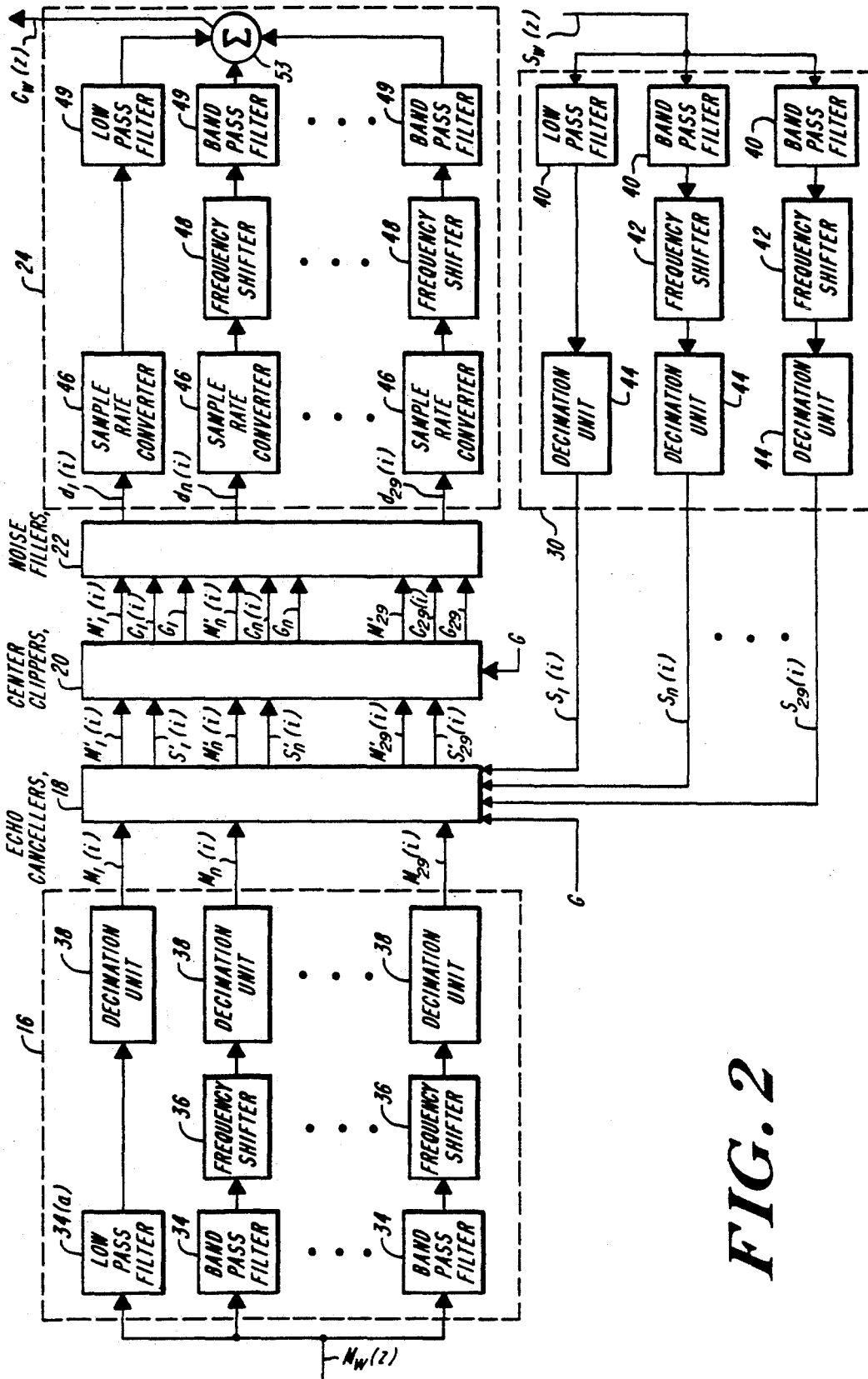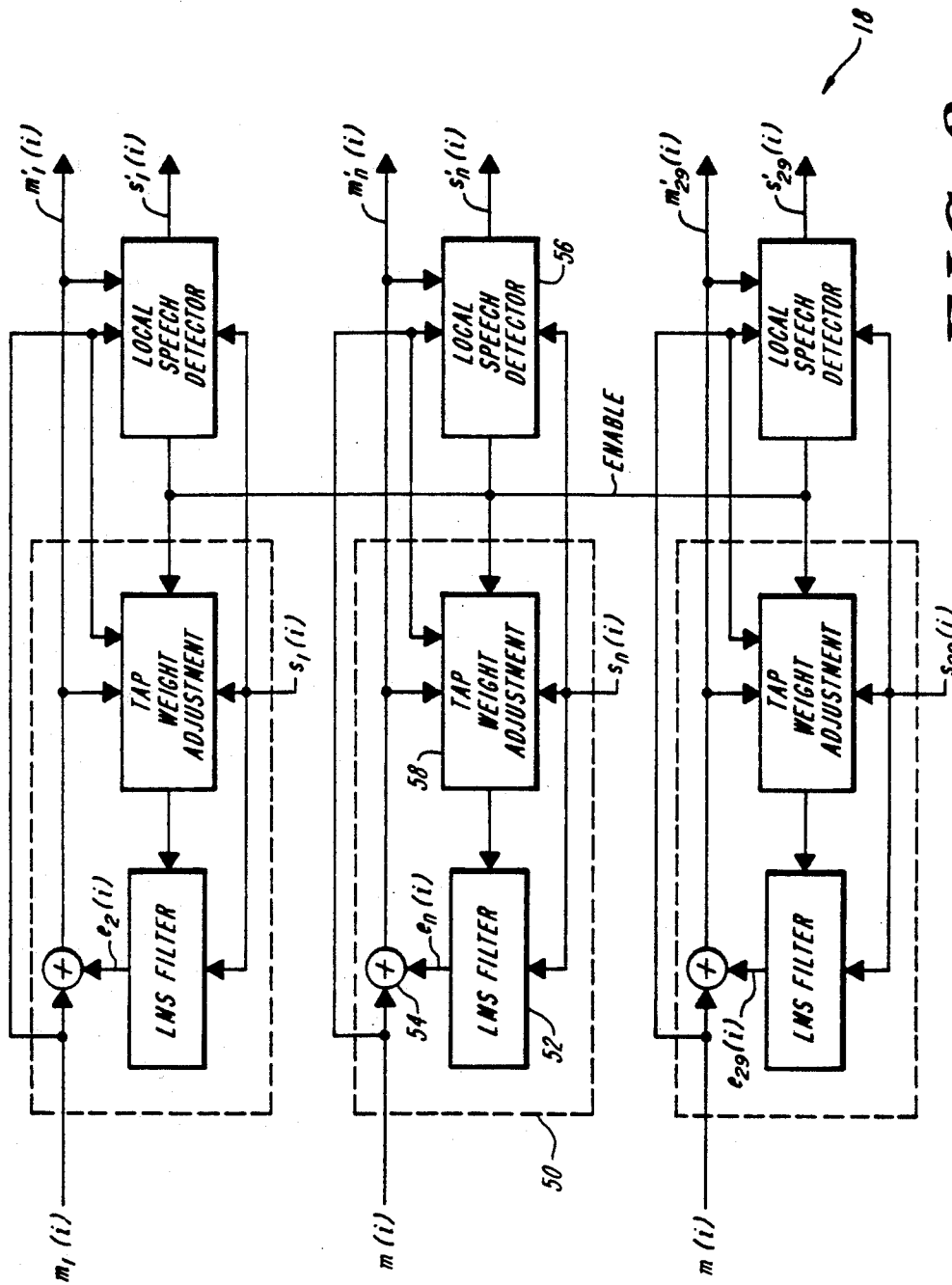
FIG. 1
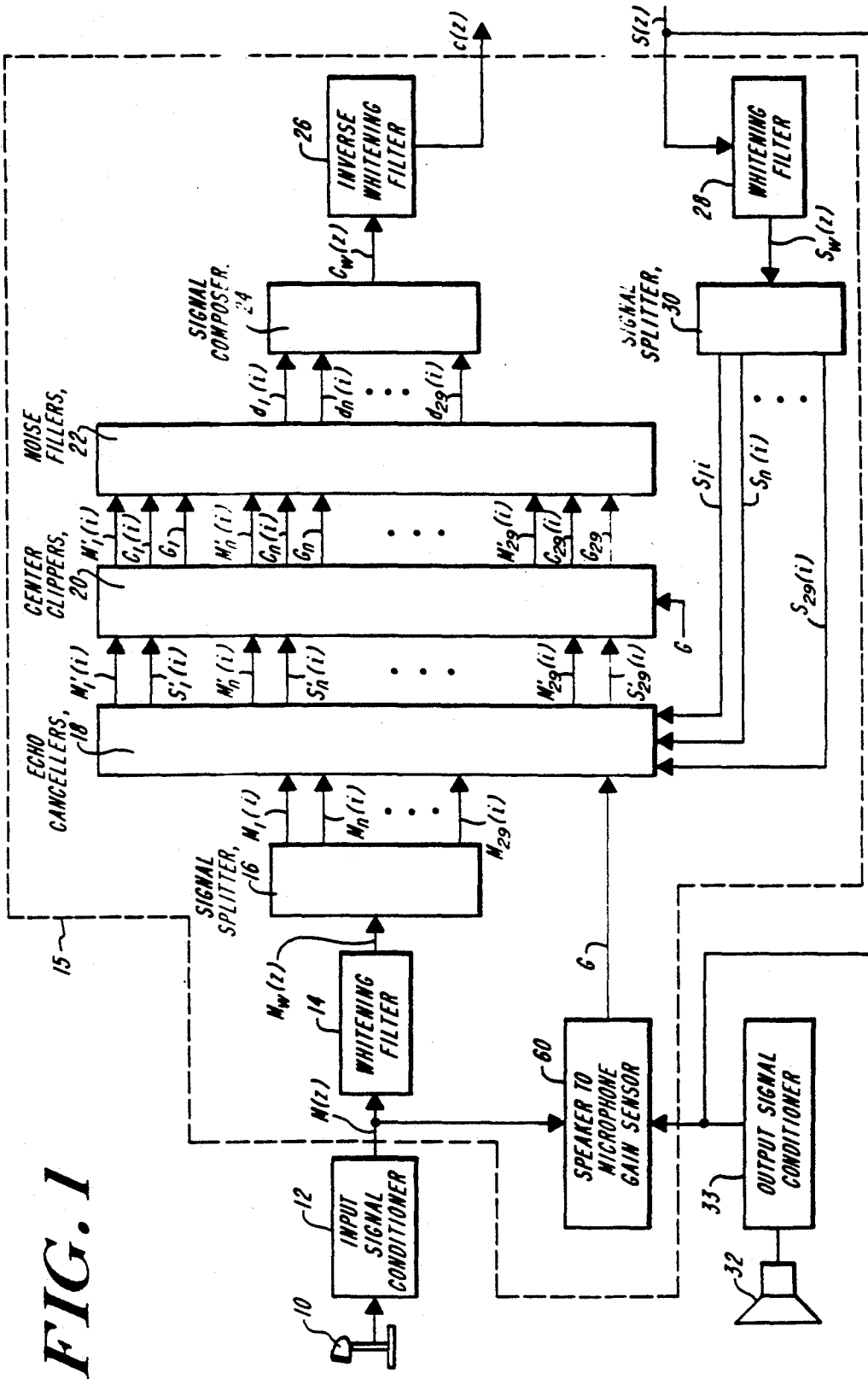
FIG. 2

FIG. 3

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