## CLAIMS

*What is claimed is:*

1. A microphone system comprising:

at least two microphones in a a dual microphone end firing array configuration wherein the at least two microphones and delay elements combine to form a front cardioid signal and a rear cardioid signal wherein a null of the rear cardioid is positioned to point in the direction of a desired signal and a null of the front cartioid in an opposite direction;

a filter bank configured to separate the front cardioid signal and the rear cardioid signal into a plurality of spectral bands;

an amplifier configured to apply a gain to the rear cardioid signal as an adaptive rear reference signal for spectral subtraction from the front cardioid, wherein said amplifier is capable of applying different gain values in different ones of the plurality of spectral bands and changes the gain values when there is no speech detected in the front cardioid; and

a subtraction module configured to suppress noise by adaptively subtracting in the plurality of spectral bands spectral signals corresponding to the rear reference signal derived from the rear cardioid signal from the front cardioid signal.

2. The microphone system as recited in claim 1 wherein a determination is made as to whether the amplifier gain values should be updated based on the energy measured in the rear cardioid signal and front cardioid signal.

3. The microphone system as recited in claim 1 wherein an updating of the amplifier gain values provides a time variable gain that suppresses on a subband by subband basis noise.

4. The microphone system as recited in claim 1 wherein the amplifier gain values are updated when no speech is detected and the system is further configured to remove background noise by spectral subtraction of the rear cardioid reference signal from the front cardioid signal.

5. The microphone system as recited in claim 1 wherein the system is further configured to maintain in a buffer a history of the reference signal for canceling reflected noise sounds.

6. The microphone system as recited in claim 1 wherein the end firing array is positioned on a headset ear cup.

7. The microphone system as recited in claim 2 wherein amplifier gain values are updated when the rear signal is determined to be dominant.

8. The microphone system as recited in claim 1 further comprising a module performing a signal detect function that activates when the energy of the front cardioid signal falls below a threshold with respect to energy of the rear cardioid signal.

9. A method for suppressing unwanted sounds using at least 2 microphones configured in a dual microphone end firing configuration comprising:

forming a front cardioid signal and a rear cardioid signal from the end firing array; and

using an adaptive spectral subtraction, wherein noise is suppressed in selected spectral bands by spectrally subtracting a rear reference signal generated from the rear cardioid signal having its null facing in the direction of the desired signal, wherein the adaptive spectral subtraction involves updating coefficient values derived from the rear reference signal only when no speech is detected from the front cardioid.

10. The method recited in claim 9 wherein the method is performed in an end firing microphone array arranged on a headset and further comprising:

using a polyphase filter bank to separate the front cardioid signal and rear cardioid signal into spectral bands.

11. The method recited in claim 9 wherein a determination is made as to whether the coefficient values should be updated based on the energy measured in the rear cardioid signal relative to the front cardioid signal.

12. The method recited in claim 9 wherein the at least two microphones are configured such that the null of the rear cardioid is positioned to point in the direction of the desired signal and the front cardioid's null points in the opposite direction, with the rear facing cardioid signal being used as a reference signal to determine any similarities between the front cardioid signal and the rear cardioid signal.