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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	ALPH.P010X
First Inventor	Gregory C. Burnett
Title	VAD-based Multiple-Microphone Acoustic Noise Suppression
Express Mail Label No.	EV 326 938 875 US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

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03916 U.S. PTO 10/667207 091803

1. ☑ Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. ☐ Applicant claims small entity status. See 37 CFR 1.27.
3. ☑ Specification [*Total Pages* 34] *(preferred arrangement set forth below)*
   - Descriptive title of the invention
   - Cross Reference to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☑ Drawing(s) (*35 U.S.C. 113*) [*Total Sheets* 12]
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   b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 18 completed)*
      i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76
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ACCOMPANYING APPLICATION PARTS

9. ☐ Assignment Papers (cover sheet & document(s))
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16. ☐ Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
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18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☑ Continuation-in-part (CIP) of prior application No.: 09/905,361

Prior application information: *Examiner* Tony Jacobson *Art Unit:* 2644

For CONTINUATION OF DIVISIONAL APPS only; The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

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Serial/Patent No.: _____ Filing/Issue Date: Herewith
Title: VAD-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION
Atty. Docket No.: ALPH.P010X Date Mailed: September 18, 2003

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☐ Amendment/Response (pgs.)	☐ Petition for Extension of Time (month(s))
☐ Preliminary Amendment (pgs.)	☑ Information Disclosure Statement & PTO/SB/08A
☑ Application - Utility (34 pgs.)	☐ Issue Fee Transmittal
☐ Application - Rule 1.53(b) Contin. (pgs.)	☐ Submission of Formal Drawings
☐ Application - Rule 1.53(b) Divis. (pgs.)	☐ Notice of Appeal
☐ Application - Rule 1.53(b) CIP (pgs.)	☐ Appeal Brief (pgs. in triplicate)
☐ Application - Rule 1.53(d) CPA (pgs.)	☐ Reply Brief
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☐ Application - Provisional (pgs.)	☑ Utility Patent Application Transmittal
☑ Drawings (12 sheets)	☐ Fee Transmittal (in duplicate)
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Attorney Docket No. ALPH.P010X

UNITED STATED PATENT APPLICATION

for

Voice Activity Detector (VAD) -Based Multiple-Microphone Acoustic Noise Suppression

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Voice Activity Detector (VAD) -Based Multiple-Microphone Acoustic Noise Suppression

RELATED APPLICATIONS

This patent application is a continuation-in-part of United States Patent Application Number 09/905,361, filed July 12, 2001, which claims priority from United States Patent Application Number 60/219,297, filed July 19, 2000. This patent application also claims priority from United States Patent Application Number 10/383,162, filed March 5, 2003.

FIELD OF THE INVENTION

The disclosed embodiments relate to systems and methods for detecting and processing a desired signal in the presence of acoustic noise.

BACKGROUND

Many noise suppression algorithms and techniques have been developed over the years. Most of the noise suppression systems in use today for speech communication systems are based on a single-microphone spectral subtraction technique first develop in the 1970's and described, for example, by S. F. Boll in "Suppression of Acoustic Noise in Speech using Spectral Subtraction," IEEE Trans. on ASSP, pp. 113-120, 1979. These techniques have been refined over the years, but the basic principles of operation have remained the same. See, for example, United States Patent Number 5,687,243 of McLaughlin, et al., and United States Patent Number 4,811,404 of Vilmur, et al. Generally, these techniques make use of a microphone-based Voice Activity Detector (VAD) to determine the background noise characteristics, where "voice" is generally understood to include human voiced speech, unvoiced speech, or a combination of voiced and unvoiced speech.

The VAD has also been used in digital cellular systems. As an example of such a use, see United States Patent Number 6,453,291 of Ashley, where a VAD configuration appropriate to the front-end of a digital cellular system is described. Further, some Code Division Multiple Access (CDMA) systems utilize a VAD to minimize the effective radio spectrum used, thereby allowing for more system capacity. Also, Global System for

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Mobile Communication (GSM) systems can include a VAD to reduce co-channel interference and to reduce battery consumption on the client or subscriber device.

These typical microphone-based VAD systems are significantly limited in capability as a result of the addition of environmental acoustic noise to the desired speech signal received by the single microphone, wherein the analysis is performed using typical signal processing techniques. In particular, limitations in performance of these microphone-based VAD systems are noted when processing signals having a low signal-to-noise ratio (SNR), and in settings where the background noise varies quickly. Thus, similar limitations are found in noise suppression systems using these microphone-based VADs.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a block diagram of a denoising system, under an embodiment.

Figure 2 is a block diagram including components of a noise removal algorithm, under the denoising system of an embodiment assuming a single noise source and direct paths to the microphones.

Figure 3 is a block diagram including front-end components of a noise removal algorithm of an embodiment generalized to n distinct noise sources (these noise sources may be reflections or echoes of one another).

Figure 4 is a block diagram including front-end components of a noise removal algorithm of an embodiment in a general case where there are n distinct noise sources and signal reflections.

Figure 5 is a flow diagram of a denoising method, under an embodiment.

Figure 6 shows results of a noise suppression algorithm of an embodiment for an American English female speaker in the presence of airport terminal noise that includes many other human speakers and public announcements.

Figure 7A is a block diagram of a Voice Activity Detector (VAD) system including hardware for use in receiving and processing signals relating to VAD, under an embodiment.

Figure 7B is a block diagram of a VAD system using hardware of a coupled noise suppression system for use in receiving VAD information, under an alternative embodiment.

Figure 8 is a flow diagram of a method for determining voiced and unvoiced speech using an accelerometer-based VAD, under an embodiment.

Figure 9 shows plots including a noisy audio signal (live recording) along with a corresponding accelerometer-based VAD signal, the corresponding accelerometer output signal, and the denoised audio signal following processing by the noise suppression system using the VAD signal, under an embodiment.

Figure 10 shows plots including a noisy audio signal (live recording) along with a corresponding SSM-based VAD signal, the corresponding SSM output signal, and the denoised audio signal following processing by the noise suppression system using the VAD signal, under an embodiment.

Figure 11 shows plots including a noisy audio signal (live recording) along with a corresponding GEMS-based VAD signal, the corresponding GEMS output signal, and the denoised audio signal following processing by the noise suppression system using the VAD signal, under an embodiment.

DETAILED DESCRIPTION

The following description provides specific details for a thorough understanding of, and enabling description for, embodiments of the noise suppression system. However, one skilled in the art will understand that the invention may be practiced without these details. In other instances, well-known structures and functions have not been shown or described in detail to avoid unnecessarily obscuring the description of the embodiments of the noise suppression system. In the following description, "signal" represents any acoustic signal (such as human speech) that is desired, and "noise" is any acoustic signal (which may include human speech) that is not desired. An example would be a person talking on a cellular telephone with a radio in the background. The person's speech is desired and the acoustic energy from the radio is not desired. In addition, "user" describes a person who is using the device and whose speech is desired to be captured by the system.

Also, "acoustic" is generally defined as acoustic waves propagating in air. Propagation of acoustic waves in media other than air will be noted as such. References to "speech" or "voice" generally refer to human speech including voiced speech, unvoiced speech, and/or a combination of voiced and unvoiced speech. Unvoiced speech or voiced speech is distinguished where necessary. The term "noise suppression" generally describes any method by which noise is reduced or eliminated in an electronic signal.

Moreover, the term "VAD" is generally defined as a vector or array signal, data, or information that in some manner represents the occurrence of speech in the digital or analog domain. A common representation of VAD information is a one-bit digital signal sampled at the same rate as the corresponding acoustic signals, with a zero value representing that no speech has occurred during the corresponding time sample, and a unity value indicating that speech has occurred during the corresponding time sample. While the embodiments described herein are generally described in the digital domain, the descriptions are also valid for the analog domain.

Figure 1 is a block diagram of a denoising system 1000 of an embodiment that uses knowledge of when speech is occurring derived from physiological information on voicing activity. The system 1000 includes microphones 10 and sensors 20 that provide

signals to at least one processor 30. The processor includes a denoising subsystem or algorithm 40.

Figure 2 is a block diagram including components of a noise removal algorithm 200 of an embodiment. A single noise source and a direct path to the microphones are assumed. An operational description of the noise removal algorithm 200 of an embodiment is provided using a single signal source 100 and a single noise source 101, but is not so limited. This algorithm 200 uses two microphones: a "signal" microphone 1 ("MIC1") and a "noise" microphone 2 ("MIC 2"), but is not so limited. The signal microphone MIC 1 is assumed to capture mostly signal with some noise, while MIC 2 captures mostly noise with some signal. The data from the signal source 100 to MIC 1 is denoted by s(n), where s(n) is a discrete sample of the analog signal from the source 100. The data from the signal source 100 to MIC 2 is denoted by $s_2(n)$. The data from the noise source 101 to MIC 2 is denoted by n(n). The data from the noise source 101 to MIC 1 is denoted by $n_2(n)$. Similarly, the data from MIC 1 to noise removal element 205 is denoted by $m_1(n)$, and the data from MIC 2 to noise removal element 205 is denoted by $m_2(n)$.

The noise removal element 205 also receives a signal from a voice activity detection (VAD) element 204. The VAD 204 uses physiological information to determine when a speaker is speaking. In various embodiments, the VAD can include at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration and/or motion detector/device, an electroglottograph, an ultrasound device, an acoustic microphone that is being used to detect acoustic frequency signals that correspond to the user's speech directly from the skin of the user (anywhere on the body), an airflow detector, and a laser vibration detector.

The transfer functions from the signal source 100 to MIC 1 and from the noise source 101 to MIC 2 are assumed to be unity. The transfer function from the signal source 100 to MIC 2 is denoted by $H_2(z)$, and the transfer function from the noise source 101 to MIC 1 is denoted by $H_1(z)$. The assumption of unity transfer functions does not inhibit the generality of this algorithm, as the actual relations between the signal, noise, and microphones are simply ratios and the ratios are redefined in this manner for simplicity.

In conventional two-microphone noise removal systems, the information from MIC 2 is used to attempt to remove noise from MIC 1. However, an (generally unspoken) assumption is that the VAD element 204 is never perfect, and thus the denoising must be performed cautiously, so as not to remove too much of the signal along with the noise. However, if the VAD 204 is assumed to be perfect such that it is equal to zero when there is no speech being produced by the user, and equal to one when speech is produced, a substantial improvement in the noise removal can be made.

In analyzing the single noise source 101 and the direct path to the microphones, with reference to **Figure 2**, the total acoustic information coming into MIC 1 is denoted by $m_1(n)$. The total acoustic information coming into MIC 2 is similarly labeled $m_2(n)$. In the z (digital frequency) domain, these are represented as $M_1(z)$ and $M_2(z)$. Then,

$$M_1(z) = S(z) + N_2(z)$$
$$M_2(z) = N(z) + S_2(z)$$

with

$$N_2(z) = N(z)H_1(z)$$
$$S_2(z) = S(z)H_2(z),$$

so that

$$M_1(z) = S(z) + N(z)H_1(z)$$
$$M_2(z) = N(z) + S(z)H_2(z). \qquad \text{Eq. 1}$$

This is the general case for all two microphone systems. In a practical system there is always going to be some leakage of noise into MIC 1, and some leakage of signal into MIC 2. Equation 1 has four unknowns and only two known relationships and therefore cannot be solved explicitly.

However, there is another way to solve for some of the unknowns in Equation 1. The analysis starts with an examination of the case where the signal is not being generated, that is, where a signal from the VAD element 204 equals zero and speech is not being produced. In this case, s(n) = S(z) = 0, and Equation 1 reduces to

$$M_{1n}(z) = N(z)H_1(z)$$
$$M_{2n}(z) = N(z),$$

where the n subscript on the M variables indicate that only noise is being received. This leads to

$$M_{1n}(z)=M_{2n}(z)H_1(z)$$
$$H_1(z)=\frac{M_{1n}(z)}{M_{2n}(z)}. \qquad \text{Eq. 2}$$

The function $H_1(z)$ can be calculated using any of the available system identification algorithms and the microphone outputs when the system is certain that only noise is being received. The calculation can be done adaptively, so that the system can react to changes in the noise.

A solution is now available for one of the unknowns in Equation 1. Another unknown, $H_2(z)$, can be determined by using the instances where the VAD equals one and speech is being produced. When this is occurring, but the recent (perhaps less than 1 second) history of the microphones indicate low levels of noise, it can be assumed that $n(s) = N(z) \sim 0$. Then Equation 1 reduces to

$$M_{1s}(z)=S(z)$$
$$M_{2s}(z)=S(z)H_2(z),$$

which in turn leads to

$$M_{2s}(z)=M_{1s}(z)H_2(z)$$
$$H_2(z)=\frac{M_{2s}(z)}{M_{1s}(z)},$$

which is the inverse of the $H_1(z)$ calculation. However, it is noted that different inputs are being used (now only the signal is occurring whereas before only the noise was occurring). While calculating $H_2(z)$, the values calculated for $H_1(z)$ are held constant and vice versa. Thus, it is assumed that while one of $H_1(z)$ and $H_2(z)$ are being calculated, the one not being calculated does not change substantially.

After calculating $H_1(z)$ and $H_2(z)$, they are used to remove the noise from the signal. If Equation 1 is rewritten as

$$S(z)=M_1(z)-N(z)H_1(z)$$
$$N(z)=M_2(z)-S(z)H_2(z)$$
$$S(z)=M_1(z)-[M_2(z)-S(z)H_2(z)]H_1(z)'$$
$$S(z)[1-H_2(z)H_1(z)]=M_1(z)-M_2(z)H_1(z),$$

then N(z) may be substituted as shown to solve for S(z) as

$$S(z)=\frac{M_1(z)-M_2(z)H_1(z)}{1-H_2(z)H_1(z)}. \qquad \text{Eq. 3}$$

If the transfer functions $H_1(z)$ and $H_2(z)$ can be described with sufficient accuracy, then the noise can be completely removed and the original signal recovered. This remains true without respect to the amplitude or spectral characteristics of the noise. The only assumptions made include use of a perfect VAD, sufficiently accurate $H_1(z)$ and $H_2(z)$, and that when one of $H_1(z)$ and $H_2(z)$ are being calculated the other does not change substantially. In practice these assumptions have proven reasonable.

The noise removal algorithm described herein is easily generalized to include any number of noise sources. **Figure 3** is a block diagram including front-end components 300 of a noise removal algorithm of an embodiment, generalized to n distinct noise sources. These distinct noise sources may be reflections or echoes of one another, but are not so limited. There are several noise sources shown, each with a transfer function, or path, to each microphone. The previously named path H_2 has been relabeled as H_0, so that labeling noise source 2's path to MIC 1 is more convenient. The outputs of each microphone, when transformed to the z domain, are:

$$\begin{aligned} M_1(z)&=S(z)+N_1(z)H_1(z)+N_2(z)H_2(z)+\ldots N_n(z)H_n(z) \\ M_2(z)&=S(z)H_0(z)+N_1(z)G_1(z)+N_2(z)G_2(z)+\ldots N_n(z)G_n(z). \end{aligned} \qquad \text{Eq. 4}$$

When there is no signal (VAD = 0), then (suppressing z for clarity)

$$\begin{aligned} M_{1n}&=N_1H_1+N_2H_2+\ldots N_nH_n \\ M_{2n}&=N_1G_1+N_2G_2+\ldots N_nG_n. \end{aligned} \qquad \text{Eq. 5}$$

A new transfer function can now be defined as

$$\tilde{H}_1=\frac{M_{1n}}{M_{2n}}=\frac{N_1H_1+N_2H_2+\ldots N_nH_n}{N_1G_1+N_2G_2+\ldots N_nG_n}, \qquad \text{Eq. 6}$$

where $\tilde{H}_1$ is analogous to $H_1(z)$ above. Thus $\tilde{H}_1$ depends only on the noise sources and their respective transfer functions and can be calculated any time there is no signal being transmitted. Once again, the "n" subscripts on the microphone inputs denote only that

noise is being detected, while an "s" subscript denotes that only signal is being received by the microphones.

Examining Equation 4 while assuming an absence of noise produces

$$M_{1s} = S$$
$$M_{2s} = SH_0 .$$

Thus, H_0 can be solved for as before, using any available transfer function calculating algorithm. Mathematically, then,

$$H_0 = \frac{M_{2s}}{M_{1s}} .$$

Rewriting Equation 4, using $\tilde{H}_1$ defined in Equation 6, provides,

$$\tilde{H}_1 = \frac{M_1 - S}{M_2 - SH_0} . \qquad \text{Eq. 7}$$

Solving for S yields,

$$S = \frac{M_1 - M_2 \tilde{H}_1}{1 - H_0 \tilde{H}_1} , \qquad \text{Eq. 8}$$

which is the same as Equation 3, with H_0 taking the place of H_2, and $\tilde{H}_1$ taking the place of H_1. Thus the noise removal algorithm still is mathematically valid for any number of noise sources, including multiple echoes of noise sources. Again, if H_0 and $\tilde{H}_1$ can be estimated to a high enough accuracy, and the above assumption of only one path from the signal to the microphones holds, the noise may be removed completely.

The most general case involves multiple noise sources and multiple signal sources. **Figure 4** is a block diagram including front-end components 400 of a noise removal algorithm of an embodiment in the most general case where there are n distinct noise sources and signal reflections. Here, signal reflections enter both microphones MIC 1 and MIC 2. This is the most general case, as reflections of the noise source into the microphones MIC 1 and MIC 2 can be modeled accurately as simple additional noise sources. For clarity, the direct path from the signal to MIC 2 is changed from $H_0(z)$ to

$H_{00}(z)$, and the reflected paths to MIC 1 and MIC 2 are denoted by $H_{01}(z)$ and $H_{02}(z)$, respectively.

The input into the microphones now becomes

$$M_1(z)=S(z)+S(z)H_{01}(z)+N_1(z)H_1(z)+N_2(z)H_2(z)+\ldots N_n(z)H_n(z)$$
$$M_2(z)=S(z)H_{00}(z)+S(z)H_{02}(z)+N_1(z)G_1(z)+N_2(z)G_2(z)+\ldots N_n(z)G_n(z). \quad \text{Eq. 9}$$

When the VAD = 0, the inputs become (suppressing z again)

$$M_{1n}=N_1H_1+N_2H_2+\ldots N_nH_n$$
$$M_{2n}=N_1G_1+N_2G_2+\ldots N_nG_n,$$

which is the same as Equation 5. Thus, the calculation of $\tilde{H}_1$ in Equation 6 is unchanged, as expected. In examining the situation where there is no noise, Equation 9 reduces to

$$M_{1s}=S+SH_{01}$$
$$M_{2s}=SH_{00}+SH_{02}.$$

This leads to the definition of $\tilde{H}_2$ as

$$\tilde{H}_2=\frac{M_{2s}}{M_{1s}}=\frac{H_{00}+H_{02}}{1+H_{01}}. \quad \text{Eq. 10}$$

Rewriting Equation 9 again using the definition for $\tilde{H}_1$ (as in Equation 7) provides

$$\tilde{H}_1=\frac{M_1-S(1+H_{01})}{M_2-S(H_{00}+H_{02})}. \quad \text{Eq. 11}$$

Some algebraic manipulation yields

$$S(1+H_{01}-\tilde{H}_1(H_{00}+H_{02}))=M_1-M_2\tilde{H}_1$$
$$S(1+H_{01})\left[1-\tilde{H}_1\frac{(H_{00}+H_{02})}{(1+H_{01})}\right]=M_1-M_2\tilde{H}_1$$
$$S(1+H_{01})\left[1-\tilde{H}_1\tilde{H}_2\right]=M_1-M_2\tilde{H}_1,$$

and finally

$$S(1+H_{01})=\frac{M_1-M_2\tilde{H}_1}{1-\tilde{H}_1\tilde{H}_2}. \qquad \text{Eq. 12}$$

Equation 12 is the same as equation 8, with the replacement of H_0 by $\tilde{H}_2$, and the addition of the $(1 + H_{01})$ factor on the left side. This extra factor $(1 + H_{01})$ means that S cannot be solved for directly in this situation, but a solution can be generated for the signal plus the addition of all of its echoes. This is not such a bad situation, as there are many conventional methods for dealing with echo suppression, and even if the echoes are not suppressed, it is unlikely that they will affect the comprehensibility of the speech to any meaningful extent. The more complex calculation of $\tilde{H}_2$ is needed to account for the signal echoes in MIC 2, which act as noise sources.

Figure 5 is a flow diagram 500 of a denoising algorithm, under an embodiment. In operation, the acoustic signals are received, at block 502. Further, physiological information associated with human voicing activity is received, at block 504. A first transfer function representative of the acoustic signal is calculated upon determining that voicing information is absent from the acoustic signal for at least one specified period of time, at block 506. A second transfer function representative of the acoustic signal is calculated upon determining that voicing information is present in the acoustic signal for at least one specified period of time, at block 508. Noise is removed from the acoustic signal using at least one combination of the first transfer function and the second transfer function, producing denoised acoustic data streams, at block 510.

An algorithm for noise removal, or denoising algorithm, is described herein, from the simplest case of a single noise source with a direct path to multiple noise sources with reflections and echoes. The algorithm has been shown herein to be viable under any environmental conditions. The type and amount of noise are inconsequential if a good estimate has been made of $\tilde{H}_1$ and $\tilde{H}_2$, and if one does not change substantially while the other is calculated. If the user environment is such that echoes are present, they can be compensated for if coming from a noise source. If signal echoes are also present, they will affect the cleaned signal, but the effect should be negligible in most environments.

In operation, the algorithm of an embodiment has shown excellent results in dealing with a variety of noise types, amplitudes, and orientations. However, there are always approximations and adjustments that have to be made when moving from

mathematical concepts to engineering applications. One assumption is made in Equation 3, where $H_2(z)$ is assumed small and therefore $H_2(z)H_1(z) \approx 0$, so that Equation 3 reduces to

$$S(z) \approx M_1(z) - M_2(z)H_1(z).$$

This means that only $H_1(z)$ has to be calculated, speeding up the process and reducing the number of computations required considerably. With the proper selection of microphones, this approximation is easily realized.

Another approximation involves the filter used in an embodiment. The actual $H_1(z)$ will undoubtedly have both poles and zeros, but for stability and simplicity an all-zero Finite Impulse Response (FIR) filter is used. With enough taps the approximation to the actual $H_1(z)$ can be very good.

To further increase the performance of the noise suppression system, the spectrum of interest (generally about 125 to 3700 Hz) is divided into subbands. The wider the range of frequencies over which a transfer function must be calculated, the more difficult it is to calculate it accurately. Therefore the acoustic data was divided into 16 subbands, and the denoising algorithm was then applied to each subband in turn. Finally, the 16 denoised data streams were recombined to yield the denoised acoustic data. This works very well, but any combinations of subbands (i.e., 4, 6, 8, 32, equally spaced, perceptually spaced, etc.) can be used and all have been found to work better than a single subband.

The amplitude of the noise was constrained in an embodiment so that the microphones used did not saturate (that is, operate outside a linear response region). It is important that the microphones operate linearly to ensure the best performance. Even with this restriction, very low signal-to-noise ratio (SNR) signals can be denoised (down to -10 dB or less).

The calculation of $H_1(z)$ is accomplished every 10 milliseconds using the Least-Mean Squares (LMS) method, a common adaptive transfer function. An explanation may be found in "Adaptive Signal Processing" (1985), by Widrow and Steams, published by Prentice-Hall, ISBN 0-13-004029-0. The LMS was used for demonstration purposes, but many other system idenfication techniques can be used to identify $H_1(z)$ and $H_2(z)$ in **Figure 2**.

The VAD for an embodiment is derived from a radio frequency sensor and the two microphones, yielding very high accuracy (>99%) for both voiced and unvoiced speech. The VAD of an embodiment uses a radio frequency (RF) vibration detector interferometer to detect tissue motion associated with human speech production, but is not so limited. The signal from the RF device is completely acoustic-noise free, and is able to function in any acoustic noise environment. A simple energy measurement of the RF signal can be used to determine if voiced speech is occurring. Unvoiced speech can be determined using conventional acoustic-based methods, by proximity to voiced sections determined using the RF sensor or similar voicing sensors, or through a combination of the above. Since there is much less energy in unvoiced speech, its detection accuracy is not as critical to good noise suppression performance as is voiced speech.

With voiced and unvoiced speech detected reliably, the algorithm of an embodiment can be implemented. Once again, it is useful to repeat that the noise removal algorithm does not depend on how the VAD is obtained, only that it is accurate, especially for voiced speech. If speech is not detected and training occurs on the speech, the subsequent denoised acoustic data can be distorted.

Data was collected in four channels, one for MIC 1, one for MIC 2, and two for the radio frequency sensor that detected the tissue motions associated with voiced speech. The data were sampled simultaneously at 40 kHz, then digitally filtered and decimated down to 8 kHz. The high sampling rate was used to reduce any aliasing that might result from the analog to digital process. A four-channel National Instruments A/D board was used along with Labview to capture and store the data. The data was then read into a C program and denoised 10 milliseconds at a time.

Figure 6 shows a denoised audio 602 signal output upon application of the noise suppression algorithm of an embodiment to a dirty acoustic signal 604, under an embodiment. The dirty acoustic signal 604 includes speech of an American English-speaking female in the presence of airport terminal noise where the noise includes many other human speakers and public announcements. The speaker is uttering the numbers "406 5562" in the midst of moderate airport terminal noise. The dirty acoustic signal 604 was denoised 10 milliseconds at a time, and before denoising the 10 milliseconds of data were prefiltered from 50 to 3700 Hz. A reduction in the noise of approximately 17 dB is

evident. No post filtering was done on this sample; thus, all of the noise reduction realized is due to the algorithm of an embodiment. It is clear that the algorithm adjusts to the noise instantly, and is capable of removing the very difficult noise of other human speakers. Many different types of noise have all been tested with similar results, including street noise, helicopters, music, and sine waves. Also, the orientation of the noise can be varied substantially without significantly changing the noise suppression performance. Finally, the distortion of the cleaned speech is very low, ensuring good performance for speech recognition engines and human receivers alike.

The noise removal algorithm of an embodiment has been shown to be viable under any environmental conditions. The type and amount of noise are inconsequential if a good estimate has been made of $\tilde{H}_1$ and $\tilde{H}_2$. If the user environment is such that echoes are present, they can be compensated for if coming from a noise source. If signal echoes are also present, they will affect the cleaned signal, but the effect should be negligible in most environments.

When using the VAD devices and methods described herein with a noise suppression system, the VAD signal is processed independently of the noise suppression system, so that the receipt and processing of VAD information is independent from the processing associated with the noise suppression, but the embodiments are not so limited. This independence is attained physically (i.e., different hardware for use in receiving and processing signals relating to the VAD and the noise suppression), but is not so limited.

The VAD devices/methods described herein generally include vibration and movement sensors, but are not so limited. In one embodiment, an accelerometer is placed on the skin for use in detecting skin surface vibrations that correlate with human speech. These recorded vibrations are then used to calculate a VAD signal for use with or by an adaptive noise suppression algorithm in suppressing environmental acoustic noise from a simultaneously (within a few milliseconds) recorded acoustic signal that includes both speech and noise.

Another embodiment of the VAD devices/methods described herein includes an acoustic microphone modified with a membrane so that the microphone no longer efficiently detects acoustic vibrations in air. The membrane, though, allows the microphone to detect acoustic vibrations in objects with which it is in physical contact (allowing a good mechanical impedance match), such as human skin. That is, the

acoustic microphone is modified in some way such that it no longer detects acoustic vibrations in air (where it no longer has a good physical impedance match), but only in objects with which the microphone is in contact. This configures the microphone, like the accelerometer, to detect vibrations of human skin associated with the speech production of that human while not efficiently detecting acoustic environmental noise in the air. The detected vibrations are processed to form a VAD signal for use in a noise suppression system, as detailed below.

Yet another embodiment of the VAD described herein uses an electromagnetic vibration sensor, such as a radiofrequency vibrometer (RF) or laser vibrometer, which detect skin vibrations. Further, the RF vibrometer detects the movement of tissue within the body, such as the inner surface of the cheek or the tracheal wall. Both the exterior skin and internal tissue vibrations associated with speech production can be used to form a VAD signal for use in a noise suppression system as detailed below.

Figure 7A is a block diagram of a VAD system 702A including hardware for use in receiving and processing signals relating to VAD, under an embodiment. The VAD system 702A includes a VAD device 730 coupled to provide data to a corresponding VAD algorithm 740. Note that noise suppression systems of alternative embodiments can integrate some or all functions of the VAD algorithm with the noise suppression processing in any manner obvious to those skilled in the art. Referring to **Figure 1**, the voicing sensors 20 include the VAD system 702A, for example, but are not so limited. Referring to **Figure 2**, the VAD includes the VAD system 702A, for example, but is not so limited.

Figure 7B is a block diagram of a VAD system 702B using hardware of the associated noise suppression system 701 for use in receiving VAD information 764, under an embodiment. The VAD system 702B includes a VAD algorithm 750 that receives data 764 from MIC 1 and MIC 2, or other components, of the corresponding signal processing system 700. Alternative embodiments of the noise suppression system can integrate some or all functions of the VAD algorithm with the noise suppression processing in any manner obvious to those skilled in the art.

The vibration/movement-based VAD devices described herein include the physical hardware devices for use in receiving and processing signals relating to the VAD and the noise suppression. As a speaker or user produces speech, the resulting vibrations

propagate through the tissue of the speaker and, therefore can be detected on and beneath the skin using various methods. These vibrations are an excellent source of VAD information, as they are strongly associated with both voiced and unvoiced speech (although the unvoiced speech vibrations are much weaker and more difficult to detect) and generally are only slightly affected by environmental acoustic noise (some devices/methods, for example the electromagnetic vibrometers described below, are not affected by environmental acoustic noise). These tissue vibrations or movements are detected using a number of VAD devices including, for example, accelerometer-based devices, skin surface microphone (SSM) devices, and electromagnetic (EM) vibrometer devices including both radio frequency (RF) vibrometers and laser vibrometers.

Accelerometer-based VAD Devices/Methods

Accelerometers can detect skin vibrations associated with speech. As such, and with reference to **Figure 2** and **Figure 7A**, a VAD system 702A of an embodiment includes an accelerometer-based device 730 providing data of the skin vibrations to an associated algorithm 740. The algorithm 740 of an embodiment uses energy calculation techniques along with a threshold comparison, as described herein, but is not so limited. Note that more complex energy-based methods are available to those skilled in the art.

Figure 8 is a flow diagram 800 of a method for determining voiced and unvoiced speech using an accelerometer-based VAD, under an embodiment. Generally, the energy is calculated by defining a standard window size over which the calculation is to take place and summing the square of the amplitude over time as

$$\text{Energy} = \sum_i x_i^2 ,$$

where i is the digital sample subscript and ranges from the beginning of the window to the end of the window.

Referring to **Figure 8**, operation begins upon receiving accelerometer data, at block 802. The processing associated with the VAD includes filtering the data from the accelerometer to preclude aliasing, and digitizing the filtered data for processing, at block 804. The digitized data is segmented into windows 20 milliseconds (msec) in length, and the data is stepped 8 msec at a time, at block 806. The processing further includes filtering the windowed data, at block 808, to remove spectral information that is

corrupted by noise or is otherwise unwanted. The energy in each window is calculated by summing the squares of the amplitudes as described above, at block 810. The calculated energy values can be normalized by dividing the energy values by the window length; however, this involves an extra calculation and is not needed as long as the window length is not varied.

The calculated, or normalized, energy values are compared to a threshold, at block 812. The speech corresponding to the accelerometer data is designated as voiced speech when the energy of the accelerometer data is at or above a threshold value, at block 814. Likewise, the speech corresponding to the accelerometer data is designated as unvoiced speech when the energy of the accelerometer data is below the threshold value, at block 816. Noise suppression systems of alternative embodiments can use multiple threshold values to indicate the relative strength or confidence of the voicing signal, but are not so limited. Multiple subbands may also be processed for increased accuracy.

Figure 9 shows plots including a noisy audio signal (live recording) 902 along with a corresponding accelerometer-based VAD signal 904, the corresponding accelerometer output signal 912, and the denoised audio signal 922 following processing by the noise suppression system using the VAD signal 904, under an embodiment. The noise suppression system of this embodiment includes an accelerometer (Model 352A24) from PCB Piezotronics, but is not so limited. In this example, the accelerometer data has been bandpass filtered between 500 and 2500 Hz to remove unwanted acoustic noise that can couple to the accelerometer below 500 Hz. The audio signal 902 was recorded using a microphone set and standard accelerometer in a babble noise environment inside a chamber measuring six (6) feet on a side and having a ceiling height of eight (8) feet. The microphone set, for example, is available from Aliph, Brisbane, California. The noise suppression system is implemented in real-time, with a delay of approximately 10 msec. The difference in the raw audio signal 902 and the denoised audio signal 922 shows noise suppression approximately in the range of 25-30 dB with little distortion of the desired speech signal. Thus, denoising using the accelerometer-based VAD information is very effective.

Skin Surface Microphone (SSM) VAD Devices/Methods

Referring again to **Figure 2** and **Figure 7A**, a VAD system 702A of an embodiment includes a SSM VAD device 730 providing data to an associated algorithm 740. The SSM is a conventional microphone modified to prevent airborne acoustic information from coupling with the microphone's detecting elements. A layer of silicone or other covering changes the impedance of the microphone and prevents airborne acoustic information from being detected to a significant degree. Thus this microphone is shielded from airborne acoustic energy but is able to detect acoustic waves traveling in media other than air as long as it maintains physical contact with the media. The silicone or similar material allows the microphone to mechanically couple efficiently with the skin of the user.

During speech, when the SSM is placed on the cheek or neck, vibrations associated with speech production are easily detected. However, airborne acoustic data is not significantly detected by the SSM. The tissue-borne acoustic signal, upon detection by the SSM, is used to generate the VAD signal in processing and denoising the signal of interest, as described above with reference to the energy/threshold method used with accelerometer-based VAD signal and **Figure 8**.

Figure 10 shows plots including a noisy audio signal (live recording) 1002 along with a corresponding SSM-based VAD signal 1004, the corresponding SSM output signal 1012, and the denoised audio signal 1022 following processing by the noise suppression system using the VAD signal 1004, under an embodiment. The audio signal 1002 was recorded using an Aliph microphone set and standard accelerometer in a babble noise environment inside a chamber measuring six (6) feet on a side and having a ceiling height of eight (8) feet. The noise suppression system is implemented in real-time, with a delay of approximately 10 msec. The difference in the raw audio signal 1002 and the denoised audio signal 1022 clearly show noise suppression approximately in the range of 20-25 dB with little distortion of the desired speech signal. Thus, denoising using the SSM-based VAD information is effective.

Electromagnetic (EM) Vibrometer VAD Devices/Methods

Returning to **Figure 2** and **Figure 7A**, a VAD system 702A of an embodiment includes an EM vibrometer VAD device 730 providing data to an associated algorithm

740. The EM vibrometer devices also detect tissue vibration, but can do so at a distance and without direct contact of the tissue targeted for measurement. Further, some EM vibrometer devices can detect vibrations of internal tissue of the human body. The EM vibrometers are unaffected by acoustic noise, making them good choices for use in high noise environments. The noise suppression system of an embodiment receives VAD information from EM vibrometers including, but not limited to, RF vibrometers and laser vibrometers, each of which are described in turn below.

The RF vibrometer operates in the radio to microwave portion of the electromagnetic spectrum, and is capable of measuring the relative motion of internal human tissue associated with speech production. The internal human tissue includes tissue of the trachea, cheek, jaw, and/or nose/nasal passages, but is not so limited. The RF vibrometer senses movement using low-power radio waves, and data from these devices has been shown to correspond very well with calibrated targets. As a result of the absence of acoustic noise in the RF vibrometer signal, the VAD system of an embodiment uses signals from these devices to construct a VAD using the energy/threshold method described above with reference to the accelerometer-based VAD and **Figure 8**.

An example of an RF vibrometer is the General Electromagnetic Motion Sensor (GEMS) radiovibrometer available from Aliph, located in Brisbane, California. Other RF vibrometers are described in the Related Applications and by Gregory C. Burnett in "The Physiological Basis of Glottal Electromagnetic Micropower Sensors (GEMS) and Their Use in Defining an Excitation Function for the Human Vocal Tract", Ph.D. Thesis, University of California Davis, January 1999.

Laser vibrometers operate at or near the visible frequencies of light, and are therefore restricted to surface vibration detection only, similar to the accelerometer and the SSM described above. Like the RF vibrometer, there is no acoustic noise associated with the signal of the laser vibrometers. Therefore, the VAD system of an embodiment uses signals from these devices to construct a VAD using the energy/threshold method described above with reference to the accelerometer-based VAD and **Figure 8**.

Figure 11 shows plots including a noisy audio signal (live recording) 1102 along with a corresponding GEMS-based VAD signal 1104, the corresponding GEMS output signal 1112, and the denoised audio signal 1122 following processing by the noise

suppression system using the VAD signal 1104, under an embodiment. The GEMS-based VAD signal 1104 was received from a trachea-mounted GEMS radiovibrometer from Aliph, Brisbane, California. The audio signal 1102 was recorded using an Aliph microphone set in a babble noise environment inside a chamber measuring six (6) feet on a side and having a ceiling height of eight (8) feet. The noise suppression system is implemented in real-time, with a delay of approximately 10 msec. The difference in the raw audio signal 1102 and the denoised audio signal 1122 clearly show noise suppression approximately in the range of 20-25 dB with little distortion of the desired speech signal. Thus, denoising using the GEMS-based VAD information is effective. It is clear that both the VAD signal and the denoising are effective, even though the GEMS is not detecting unvoiced speech. Unvoiced speech is normally low enough in energy that it does not significantly affect the convergence of $H_1(z)$ and therefore the quality of the denoised speech.

Aspects of the noise suppression system may be implemented as functionality programmed into any of a variety of circuitry, including programmable logic devices (PLDs), such as field programmable gate arrays (FPGAs), programmable array logic (PAL) devices, electrically programmable logic and memory devices and standard cell-based devices, as well as application specific integrated circuits (ASICs). Some other possibilities for implementing aspects of the noise suppression system include: microcontrollers with memory (such as electronically erasable programmable read only memory (EEPROM)), embedded microprocessors, firmware, software, etc. If aspects of the noise suppression system are embodied as software at least one stage during manufacturing (e.g. before being embedded in firmware or in a PLD), the software may be carried by any computer readable medium, such as magnetically- or optically-readable disks (fixed or floppy), modulated on a carrier signal or otherwise transmitted, etc.

Furthermore, aspects of the noise suppression system may be embodied in microprocessors having software-based circuit emulation, discrete logic (sequential and combinatorial), custom devices, fuzzy (neural) logic, quantum devices, and hybrids of any of the above device types. Of course the underlying device technologies may be provided in a variety of component types, e.g., metal-oxide semiconductor field-effect transistor (MOSFET) technologies like complementary metal-oxide semiconductor (CMOS), bipolar technologies like emitter-coupled logic (ECL), polymer technologies

(e.g., silicon-conjugated polymer and metal-conjugated polymer-metal structures), mixed analog and digital, etc.

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in a sense of "including, but not limited to." Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words "herein," "hereunder," "above," "below," and words of similar import, when used in this application, shall refer to this application as a whole and not to any particular portions of this application. When the word "or" is used in reference to a list of two or more items, that word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list and any combination of the items in the list.

The above descriptions of embodiments of the noise suppression system are not intended to be exhaustive or to limit the noise suppression system to the precise forms disclosed. While specific embodiments of, and examples for, the noise suppression system are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the noise suppression system, as those skilled in the relevant art will recognize. The teachings of the noise suppression system provided herein can be applied to other processing systems and communication systems, not only for the processing systems described above.

The elements and acts of the various embodiments described above can be combined to provide further embodiments. These and other changes can be made to the noise suppression system in light of the above detailed description.

All of the above references and United States patent applications are incorporated herein by reference. Aspects of the noise suppression system can be modified, if necessary, to employ the systems, functions and concepts of the various patents and applications described above to provide yet further embodiments of the noise suppression system.

In general, in the following claims, the terms used should not be construed to limit the noise suppression system to the specific embodiments disclosed in the specification and the claims, but should be construed to include all processing systems that operate under the claims to provide a method for compressing and decompressing data files or

streams. Accordingly, the noise suppression system is not limited by the disclosure, but instead the scope of the noise suppression system is to be determined entirely by the claims.

While certain aspects of the noise suppression system are presented below in certain claim forms, the inventors contemplate the various aspects of the noise suppression system in any number of claim forms. For example, while only one aspect of the noise suppression system is recited as embodied in computer-readable medium, other aspects may likewise be embodied in computer-readable medium. Accordingly, the inventors reserve the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the noise suppression system.

CLAIMS

What we claim is:

1. A method for removing noise from acoustic signals, comprising:

receiving a plurality of acoustic signals;

receiving information on the vibration of human tissue associated with human voicing activity;

generating at least one first transfer function representative of the plurality of acoustic signals upon determining that voicing information is absent from the plurality of acoustic signals for at least one specified period of time; and

removing noise from the plurality of acoustic signals using the first transfer function to produce at least one denoised acoustic data stream.

2. The method of claim 1, wherein removing noise further comprises:

generating at least one second transfer function representative of the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time; and

removing noise from the plurality of acoustic signals using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

3. The method of claim 1, wherein the plurality of acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

4. The method of claim 1, wherein receiving the plurality of acoustic signals includes receiving using a plurality of independently located microphones.

5. The method of claim 2, wherein removing noise further includes generating at least one third transfer function using the at least one first transfer function and the at least one second transfer function.

6. The method of claim 1, wherein generating the at least one first transfer function comprises recalculating the at least one first transfer function during at least one prespecified interval.

7. The method of claim 2, wherein generating the at least one second transfer function comprises recalculating the at least one second transfer function during at least one prespecified interval.

8. The method of claim 1, wherein generating the at least one first transfer function comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. The method of claim 1, wherein information on the vibration of human tissue is provided by a mechanical sensor in contact with the skin.

10. The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

11. The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

12. A method for removing noise from electronic signals, comprising:

detecting an absence of voiced information during at least one period, wherein detecting includes measuring the vibration of human tissue;

receiving at least one noise source signal during the at least one period;

generating at least one transfer function representative of the at least one noise source signal;

receiving at least one composite signal comprising acoustic and noise signals; and

removing the noise signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream.

13. The method of claim 12, wherein the at least one noise source signal includes at least one reflection of at least one associated noise source signal.

14. The method of claim 12, wherein the at least one composite signal includes at least one reflection of at least one associated composite signal.

15. The method of claim 12, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

16. The method of claim 12, wherein detecting includes use of a mechanical sensor in contact with the human tissue.

17. The system of claim 12, wherein detecting includes use of a sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

18. The method of claim 12, wherein receiving includes receiving the at least one noise source signal using at least one microphone.

19. The method of claim 18, wherein the at least one microphone includes a plurality of independently located microphones.

20. The method of claim 12, wherein removing the noise signal from the at least one composite signal using the at least one transfer function includes generating at least one other transfer function using the at least one transfer function.

21. The method of claim 12, wherein generating at least one transfer function comprises recalculating the at least one transfer function during at least one prespecified interval.

22. The method of claim 12, wherein generating the at least one transfer function comprises calculating the at least one transfer function using at least one technique selected from a group consisting of adaptive techniques and recursive technidques.

23. A method for removing noise from electronic signals, comprising:

determining at least one unvoicing period during which voiced information is absent based on vibration of human tissue;

receiving at least one noise signal input during the at least one unvoicing period and generating at least one unvoicing transfer function representative of the at least one noise signal;

receiving at least one composite signal comprising acoustic and noise signals; and

removing the noise signal from the at least one composite signal using the at least unvoicing transfer function to produce at least one denoised acoustic data stream.

24. The method of claim 23, wherein producing at least one denoised acoustic data stream further includes:

determining at least one voicing period during which voiced information is present;

receiving at least one acoustic signal input from at least one signal sensing device during the at least one voicing period and generating at least one voicing transfer function representative of the at least one acoustic signal; and

removing the noise signal from the at least one composite signal using at least one combination of the at least one unvoicing transfer function and the at least one voicing transfer function to produce the denoised acoustic data stream.

25. The method of claim 23, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

26. A system for removing noise from the acoustic signals, comprising:

at least one receiver that receives at least one acoustic signal;

at least one sensor that receives human tissue vibration information associated with human voicing activity;

at least one processor coupled among the at least one receiver and the at least one sensor that generates a plurality of transfer functions, wherein at least one first transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent from the at least one acoustic signal for at least one specified period of time, wherein noise is removed from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream.

27. The system of claim 26, wherein at least one second transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is present in the at least one acoustic signal for the at least one specified period of time, wherein noise is removed from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce the at least one denoised acoustic data stream.

28. The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

30. The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. The system of claim 26, further comprising:

dividing acoustic data of the at least one acoustic signal into a plurality of subbands;

removing noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream.

32. The system of claim 26, wherein the at least one receiver includes a plurality of independently located microphones.

33. A system for removing noise from acoustic signals, comprising at least one processor coupled among at least one microphone and at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing, wherein an absence of voiced information is detected during at least one period using the at least one voicing sensor, wherein at least one noise source signal is received during the at least one period using the at least one microphone, wherein the at least one processor generates at least one transfer function representative of the at least one noise source signal, wherein the at least one microphone receives at least one composite signal comprising acoustic and noise signals, and the at least one processor removes the noise signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream.

34. The system of claim 33, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

35. A signal processing system coupled among at least one user and at least one electronic device, wherein the signal processing system includes at least one denoising subsystem for removing noise from acoustic signals, the denoising subsystem comprising at least one processor coupled among at least one receiver and at least one sensor, wherein the at least one receiver is coupled to receive at least one acoustic signal, wherein

the at least one sensor detects human tissue vibration associated with human voicing activity, wherein the at least one processor generates a plurality of transfer functions, wherein at least one first transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent from the at least one acoustic signal for at least one specified period of time, wherein noise is removed from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream.

36. The system of claim 35, wherein at least one second transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is present in the at least one acoustic signal for at least one specified period of time, wherein noise is removed from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

37. The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

38. The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

39. A computer readable medium comprising executable instructions which, when executed in a processing system, remove noise from received acoustic signals by:

receiving at least one acoustic signal;

receiving human tissue vibration information associated with human voicing activity;

generating at least one first transfer function representative of the at least one acoustic signal upon determining that voicing information is absent from the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using the at least one first transfer function to produce at least one denoised acoustic data stream.

40. The medium of claim 39, wherein removing noise from received acoustic signals further includes:

generating at least one second transfer function representative of the at least one acoustic signal upon determining that voicing information is present in the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

41. The medium of claim 39, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

42. An electromagnetic medium comprising executable instructions which, when executed in a processing system, remove noise from received acoustic signals by:

receiving at least one acoustic signal;

receiving human tissue vibration information associated with human voicing activity;

generating at least one first transfer function representative of the at least one acoustic signal upon determining that voicing information is absent from the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using the at least one first transfer function to produce at least one denoised acoustic data stream.

43. The medium of claim 42, wherein removing noise from received acoustic signals further includes:

generating at least one second transfer function representative of the at least one acoustic signal upon determining that voicing information is present in the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

44. The medium of claim 42, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Voice Activity Detector (VAD) -Based Multiple-Microphone Acoustic Noise Suppression

ABSTRACT

Acoustic noise suppression is provided in multiple-microphone systems using Voice Activity Detectors (VAD). A host system receives acoustic signals via multiple microphones. The system also receives information on the vibration of human tissue associated with human voicing activity via the VAD. In response, the system generates a transfer function representative of the received acoustic signals upon determining that voicing information is absent from the received acoustic signals during at least one specified period of time. The system removes noise from the received acoustic signals using the transfer function, thereby producing a denoised acoustic data stream.

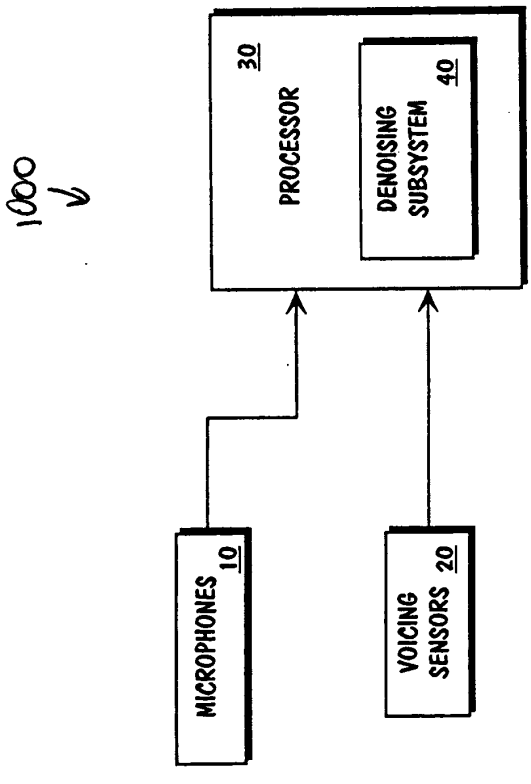
1000
MICROPHONES 10
VOICING SENSORS 20
PROCESSOR 30
DENOISING SUBSYSTEM 40

FIG. 1

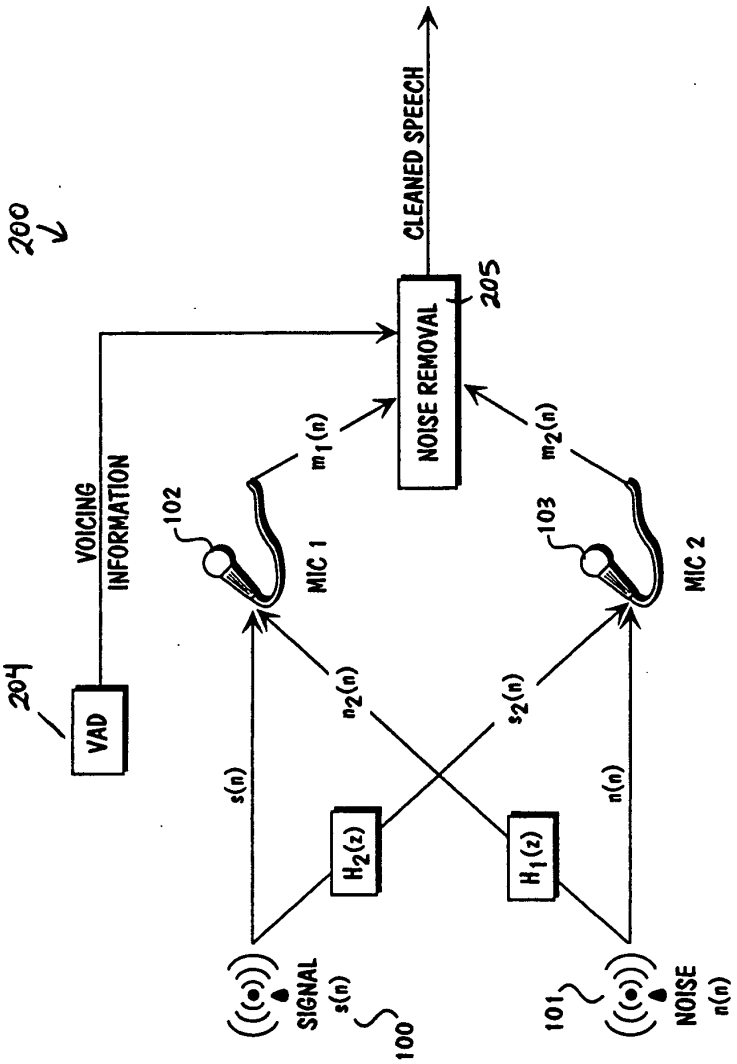
200
CLEANED SPEECH
NOISE REMOVAL
205
VOICING INFORMATION
VAD
204
MIC 1
102
MIC 2
103
$m_1(n)$
$m_2(n)$
$n_2(n)$
$s_2(n)$
s(n)
n(n)
$H_2(z)$
$H_1(z)$
SIGNAL
s(n)
100
101
NOISE
n(n)

FIG. 2

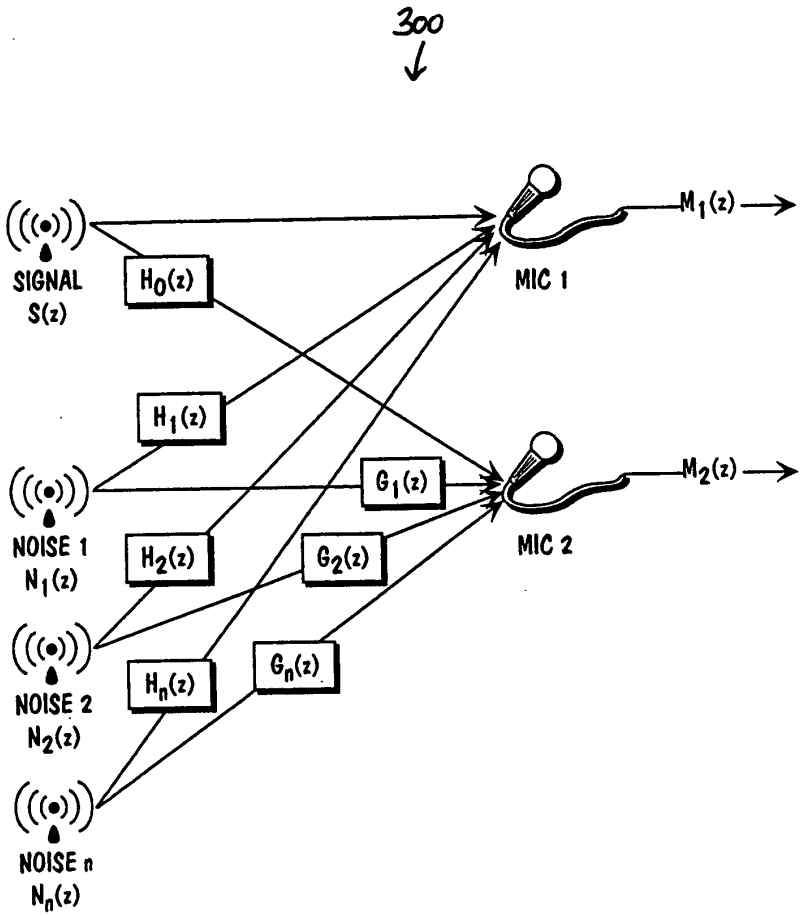
300
SIGNAL
S(z)
NOISE 1
N1(z)
NOISE 2
N2(z)
NOISE n
Nn(z)
H0(z)
H1(z)
H2(z)
Hn(z)
G1(z)
G2(z)
Gn(z)
MIC 1
MIC 2
M1(z)
M2(z)

FIG. 3

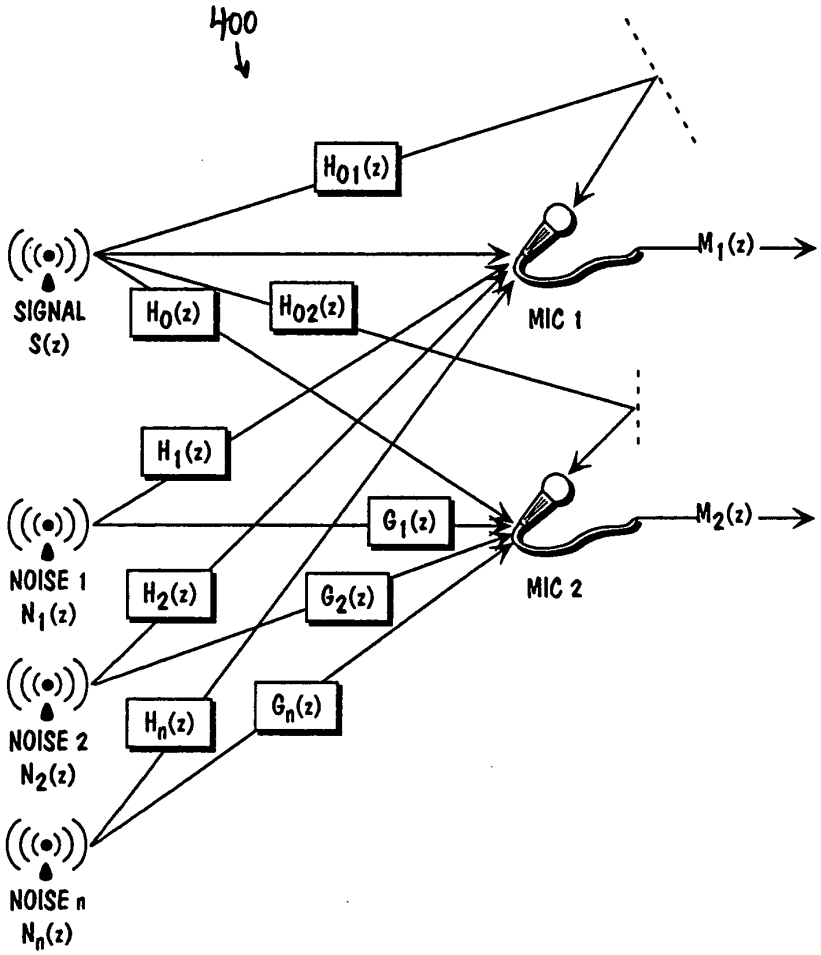
400
$H_{01}(z)$
$M_1(z)$
SIGNAL
S(z)
$H_0(z)$
$H_{02}(z)$
MIC 1
$H_1(z)$
$G_1(z)$
$M_2(z)$
NOISE 1
$N_1(z)$
$H_2(z)$
$G_2(z)$
MIC 2
NOISE 2
$N_2(z)$
$H_n(z)$
$G_n(z)$
NOISE n
$N_n(z)$

FIG. 4

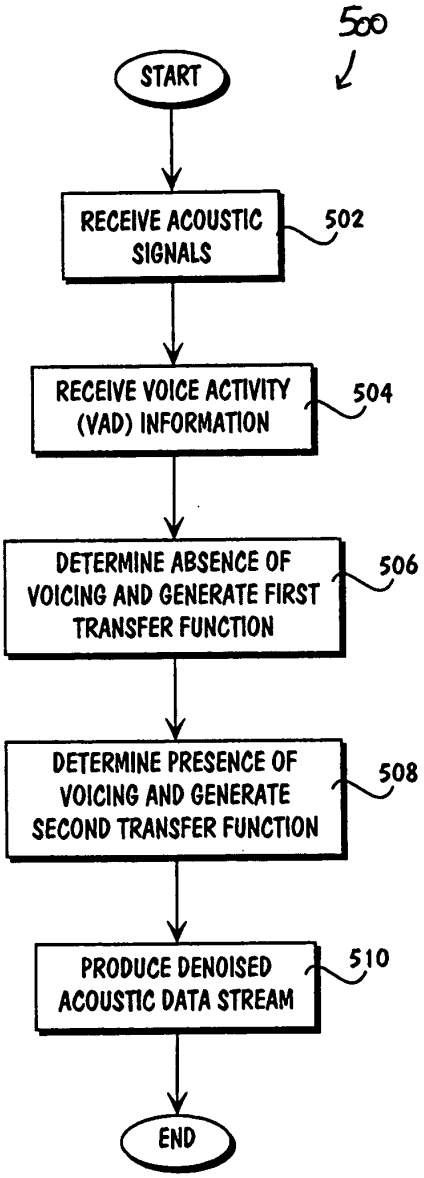
500
START
RECEIVE ACOUSTIC SIGNALS
502
RECEIVE VOICE ACTIVITY (VAD) INFORMATION
504
DETERMINE ABSENCE OF VOICING AND GENERATE FIRST TRANSFER FUNCTION
506
DETERMINE PRESENCE OF VOICING AND GENERATE SECOND TRANSFER FUNCTION
508
PRODUCE DENOISED ACOUSTIC DATA STREAM
510
END

FIG. 5

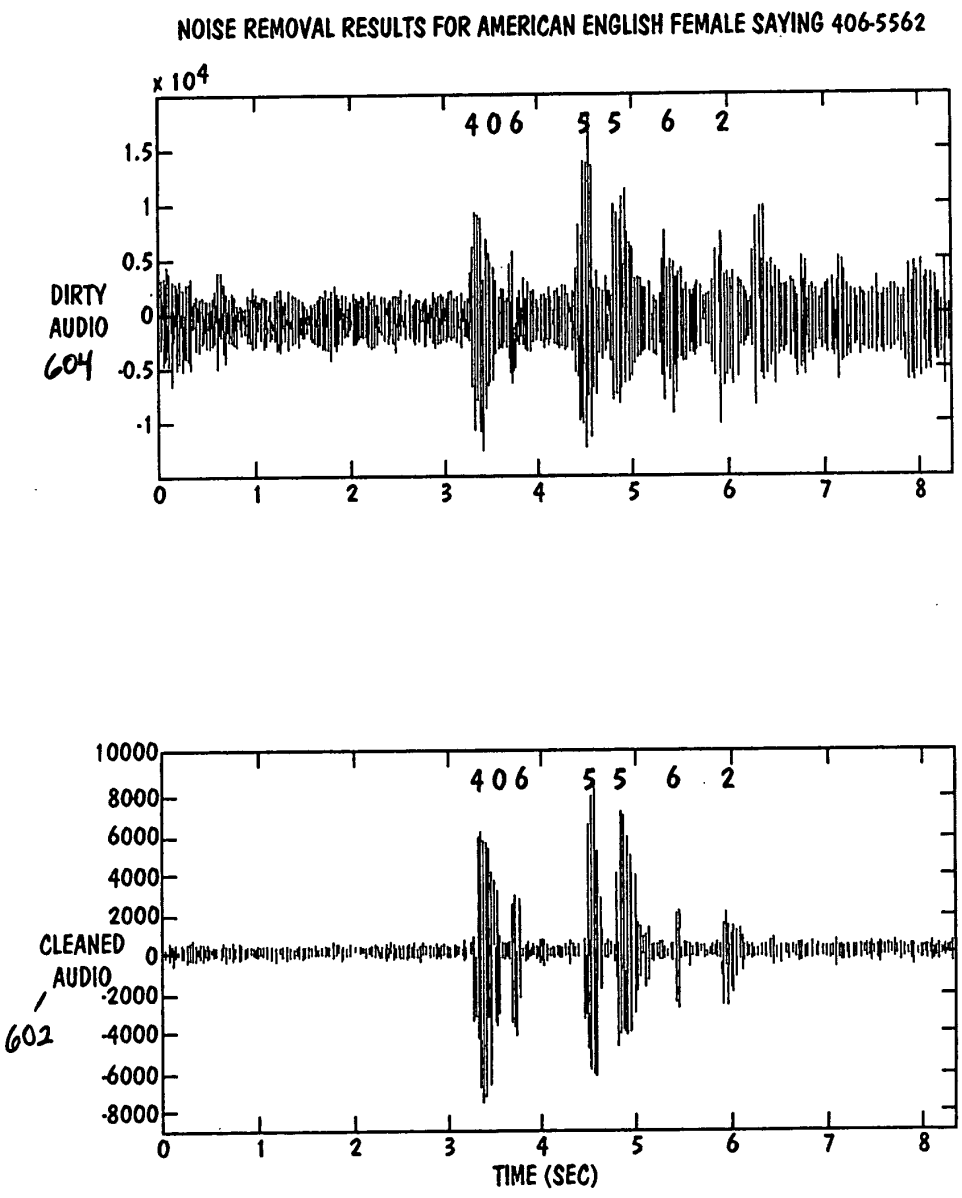
NOISE REMOVAL RESULTS FOR AMERICAN ENGLISH FEMALE SAYING 406-5562
x 10^4
406 5 5 6 2
DIRTY AUDIO
604
CLEANED AUDIO
602
TIME (SEC)

FIG. 6

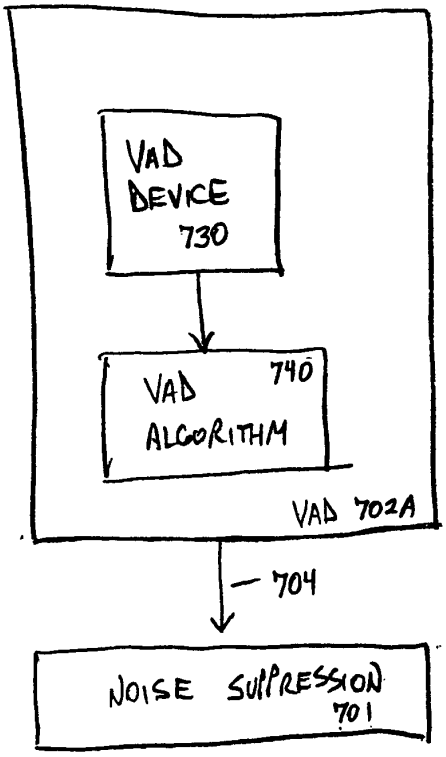
VAD
DEVICE
730
VAD
ALGORITHM
740
VAD 702A
704
NOISE SUPPRESSION
701

FIGURE 7A

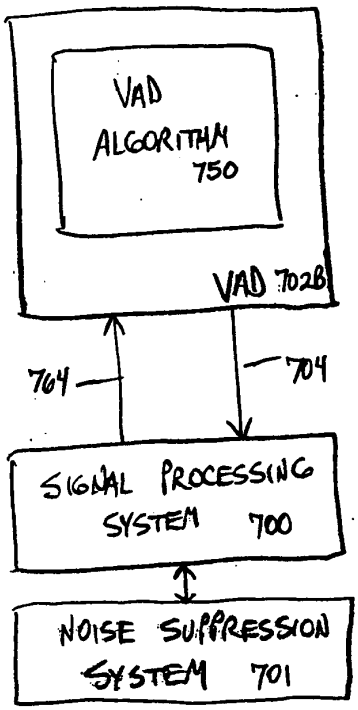
VAD
ALGORITHM
750
VAD 702B
764
704
SIGNAL PROCESSING
SYSTEM 700
NOISE SUPPRESSION
SYSTEM 701

FIGURE 7B

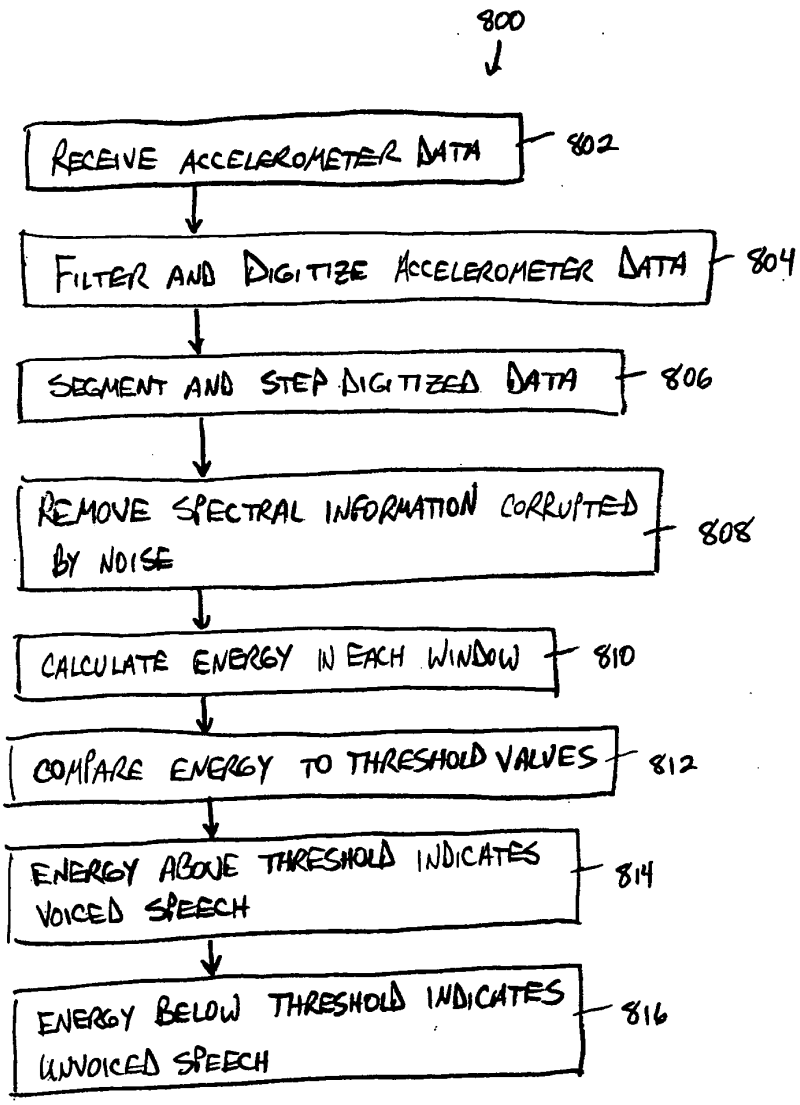
800
RECEIVE ACCELEROMETER DATA
802
FILTER AND DIGITIZE ACCELEROMETER DATA
804
SEGMENT AND STEP DIGITIZED DATA
806
REMOVE SPECTRAL INFORMATION CORRUPTED BY NOISE
808
CALCULATE ENERGY IN EACH WINDOW
810
COMPARE ENERGY TO THRESHOLD VALUES
812
ENERGY ABOVE THRESHOLD INDICATES VOICED SPEECH
814
ENERGY BELOW THRESHOLD INDICATES UNVOICED SPEECH
816

FIGURE 8

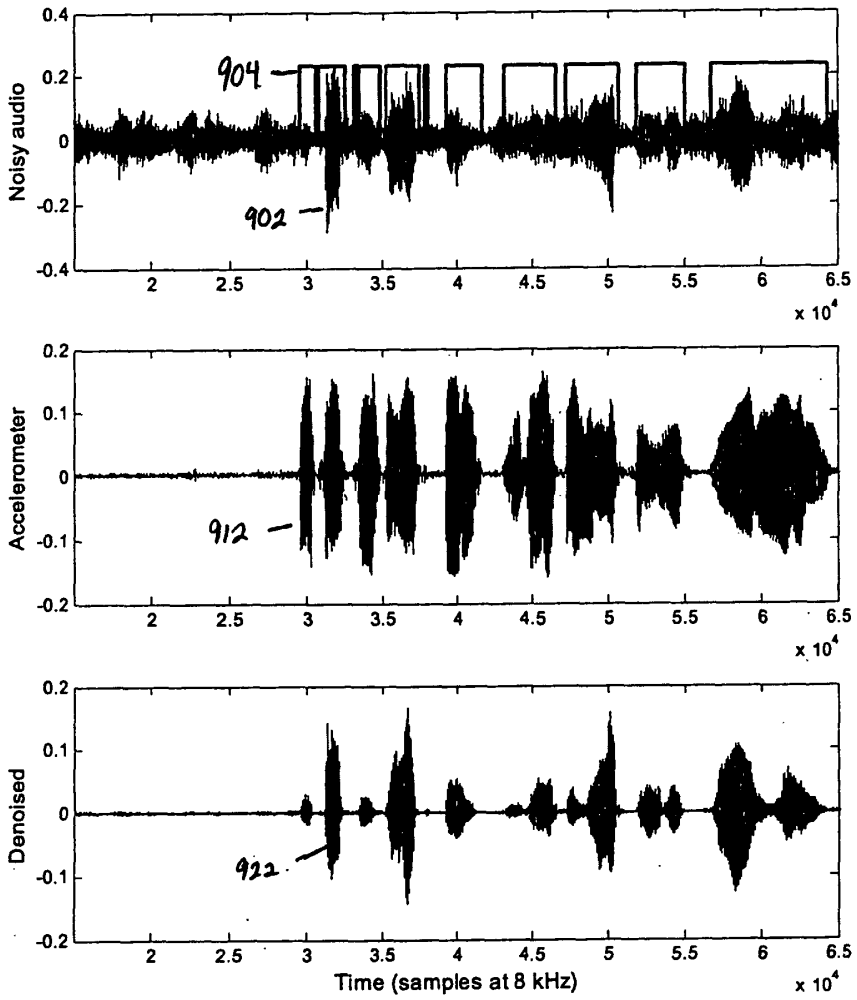
Noisy audio
Accelerometer
Denoised
904
902
912
922
Time (samples at 8 kHz)
x 10^4

Figure 9

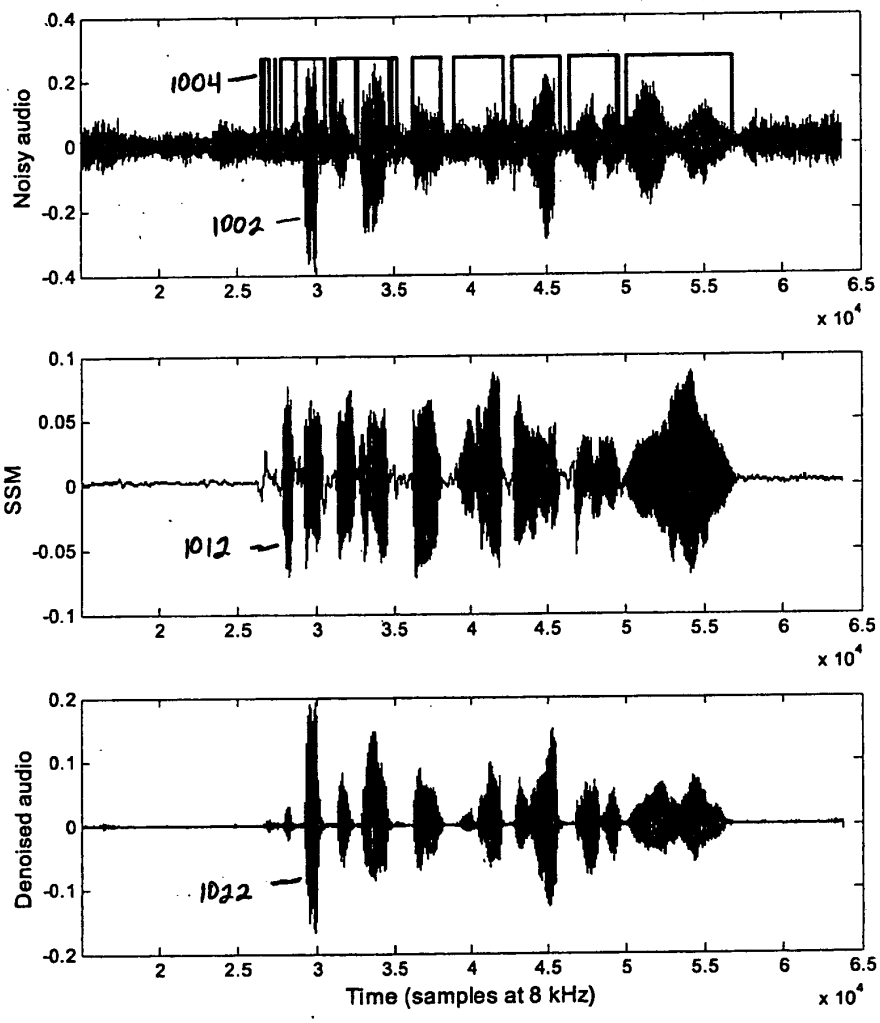
Noisy audio
1004
1002
SSM
1012
Denoised audio
1022
Time (samples at 8 kHz)
x 10^4

Figure 10

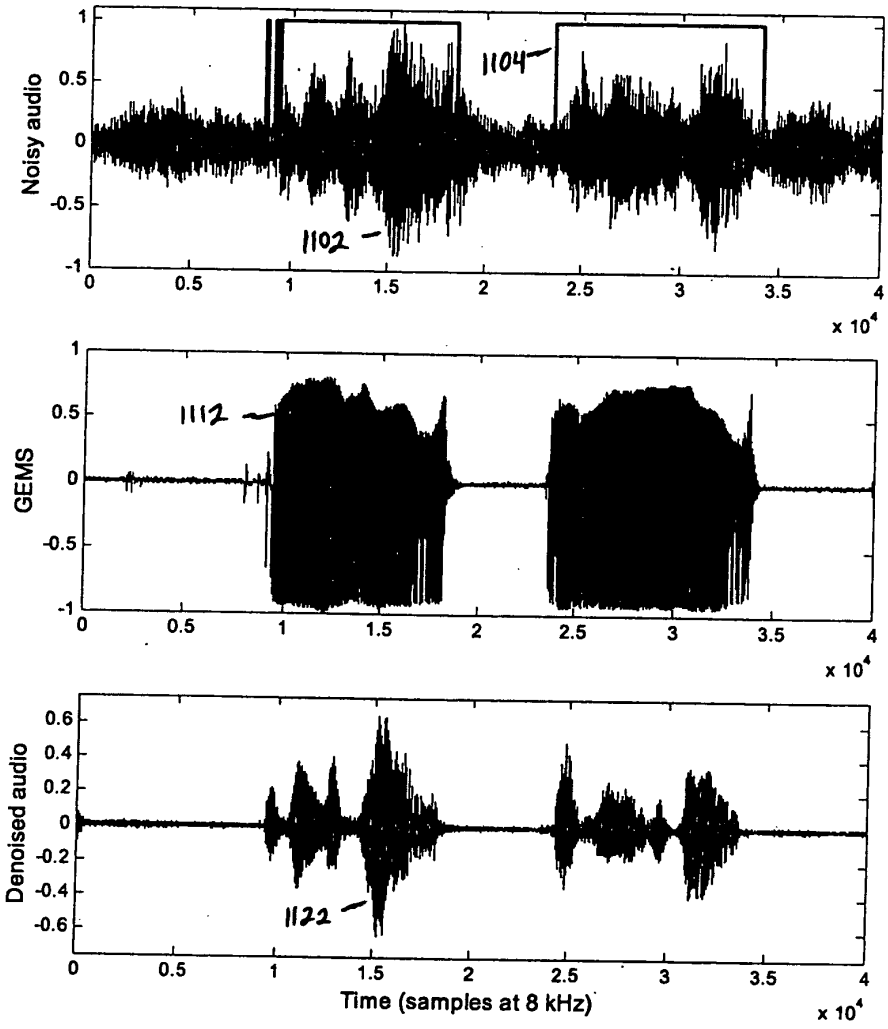
Noisy audio
1104
1102
GEMS
1112
Denoised audio
1122
Time (samples at 8 kHz)
x 10^4

Figure 11

Atty. Docket No. ALPH.P010X *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	
Burnett et al.	)	Examiner: Not yet assigned
	)	
Application No. Not yet assigned	)	Art Unit: Not yet assigned
	)	
Filed: September 18, 2003	)	
	)	
For: VAD-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	)	

Assistant Commissioner for Patents
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

Sir:

Enclosed is an Information Disclosure Citation Form PTO/SB/08 together with a copy of the references cited therein. It is respectfully requested that the cited references be considered and that the enclosed copy of the Form PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant.

Pursuant to 37 CFR 1.97(h), the submission of this Information Disclosure Statement is not to be construed as an admission that the information cited in this statement is material to patentability.

This Information Disclosure Statement is being submitted pursuant to 37 CFR 1.97(b)(3).

The Commissioner is hereby authorized to charge any fees which may be required in connection with this submission to Deposit Account No. 501914.

Respectfully submitted,

SHEMWELL GREGORY & COURTNEY LLP

Dated: September 18, 2003

Richard L. Gregory, Jr.
Registration No. 42,607

Please type a plus sign (+) inside this box → [+]

PTO/SB/08A (08-00)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	To be assigned
Filing Date	September 18, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	ALPH.P010X

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (*if known*)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,212,764		Ariyoshi	05-18-1993	
		5,400,409		Linhard	03-21,1995	
		5,414,776		Sims, Jr.	05-09-1995	
		5,539,859		Robbe et al.	07-23-1996	
		5,633,935		Kanamori et al.	05-27-1997	
		5,835,608		Warnaka et al.	11-10-1998	
		5,917,921		Sasaki et al.	06-29-1999	
		6,000,396		Nagata	12-28-1999	
		6,191,724	B1	McEwan	02-20-2001	
		5,986,600		McEwan	11-16-1999	
		5,966,090		McEwan	10-12-1999	
		6,006,175		Holzrichter	12-21-1999	
		5,406,622		Silverberg et al.	04-11-1995	
		5,517,435		Sugiyama	05-14-1996	
		5,649,055		Gupta et al.	07-15-1997	
		6,266,422		Ikeda	07-24-2001	
		6,430,295		Handel et al.	08-06-2002	
		5,754,665		Hosoi	05-19-1998	
		5,473,702		Yoshida et al.	12-05-1995	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (*if known*)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Unique citation designation number. [2] See attached Kinds of U.S. Patent Documents. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U. S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 2 of 2

Complet if Known	
Application Number	To be assigned
Filing Date	September 18, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	ALPH.P010X

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		ZHAO LI et al: "Robust Speech Coding Using Microphone Arrays", Signals Systems and Computers, 1997. Conf. record of 31st Asilomar Conf., Nov. 2-5, 1997, IEEE Comput. Soc. Nov. 2, 1997, USA.	
		L.C. NG et al.: "Denoising of Human Speech Using Combined Acoustic and EM Sensor Signal Processing", 2000 IEEE Intl Conf on Acoustics Speech and Signal Processing. Proceedings (Cat. No. 00CH37100), Istanbul, Turkey, June 5-9, 2000 XP002186255, ISBN 0-7803-6293-4	
		S. AFFES et al.: "A Signal Subspace Tracking Algorithm for Microphone Array Processing of Speech". IEEE Transactions on Speech and Audio Processing, N.Y, USA Vol. 5, No. 5, Sept. 1, 1997, XP000774303, ISBN 1063-6676	
		GREGORY C. BURNETT: "The Physiological Basis of Glottal Electromagnetic Micropower Sensors (GEMS) and Their Use in Defining an Excitation Function for the Human Vocal Tract", Dissertation, University of California at Davis, January, 1999, USA.	
		L.C. NG et al.: "Speaker Verification Using Combined Acoustic and EM Sensor Signal Processing", ICASSP-2001, Salt Lake City, USA.	
		A. HUSSAIN: "Intelligibility Assessment of a Multi-Band Speech Enhancement Scheme", Proceedings IEEE Intl. Conf. on Acoustics, Speech & Signal Processing (ICASSP-2000). Istanbul, Turkey, June 2000.	

Examiner Signature		Date Consider d	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Unique citation designation number. [2] Applicant is to place a check mark here if English language Translation is attached.

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PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number: 10667207

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS 44		
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	44 minus 20=	* 24
INDEPENDENT CLAIMS	8 minus 3 =	* 5
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	385.00	OR	BASIC FEE	770.00
X$ 9=		OR	X$18=	432
X43=		OR	X86=	430
+145=		OR	+290=	
TOTAL		OR	TOTAL	1632

CLAIMS AS AMENDED - PART II

AMENDMENT A	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 7159

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/667,207	09/18/2003 RULE	381	2644	ALPH.P010X

APPLICANTS

Gregory C. Burnett, Dodge Center, MN;
Eric F. Breitfeller, Dublin, CA;

**** CONTINUING DATA ***************************

This application is a CIP of 09/905,361 07/12/2001 ABN
which claims benefit of 60/219,297 07/19/2000

**** FOREIGN APPLICATIONS ********************

IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** SMALL ENTITY **
** 12/12/2003

Foreign Priority claimed	☐ yes ☐ no	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119 (a-d) conditions met	☐ yes ☐ no ☐ Met after Allowance	MN	12	44	8
Verified and Acknowledged	Examiner's Signature Initials				

ADDRESS

Shemwell Gregory & Courtney LLP
Suite 201
4880 Stevens Creek Boulevard
San Jose ,CA 95129

TITLE

Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression

FILING FEE RECEIVED		
881	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X

CONFIRMATION NO. 7159

Shemwell Gregory & Courtney LLP
Suite 201
4880 Stevens Creek Boulevard
San Jose, CA 95129

FORMALITIES LETTER

OC000000011482905

Date Mailed: 12/12/2003

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  Applicant must submit $ **770** *to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).*
- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **$862** as a non-small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **$1762** for a Large Entity

- **$770** Statutory basic filing fee.
- **$130** Late oath or declaration Surcharge.

- Total additional claim fee(s) for this application is **$862**
  - **$430** for **5** independent claims over 3.
  - **$432** for **24** total claims over 20.

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

A copy of this notice MUST be returned with the reply.

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PART 3 - OFFICE COPY

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PATENT & TR

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted With Initial Filing **OR** ☑ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	ALPH.P010X
First Named Inventor	Gregory C. Burnett
COMPLETE IF KNOWN	
Application Number	10/667,207
Filing Date	September 18, 2003
Art Unit	1775
Examiner Name	Not assigned

I hereby declare that:

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Voice Activity Detector (VAD) - Based Multiple-Microphone Acoustic Noise Suppression

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☑ was filed on (MM/DD/YYYY) 09/18/2003 as United States Application Number or PCT International Application Number 10/667,207 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? Yes	No
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 21 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Shemwell Gregory & Courtney LLP

Address
4880 Stevens Creek Blvd., Suite 201

City	State	ZIP
San Jose	CA	95129

Country	Telephone	Fax
US	408-236-6647	408-236-6641

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any]) GREGORY C.
Family Name or Surname BURNETT

Inventor's Signature _____ Date _____

Residence: City	State	Country	Citizenship
Dodge Center	Minnesota	US	US

Mailing Address
62568 174th Avenue

City	State	ZIP	Country
Dodge Center	Minnesota	55927	US

NAME OF SECOND INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any]) ERIC F.
Family Name or Surname BREITFELLER

Inventor's Signature Eric F. Breitfeller Date 01/09/04

Residence: City	State	Country	Citizenship
Dublin	California	US	US

Mailing Address
11526 Streambed Place

City	State	ZIP	Country
Dublin	California	94568	US

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted With Initial Filing **OR** ☑ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	ALPH.P010X
First Named Inventor	Gregory C. Burnett
COMPLETE IF KNOWN	
Application Number	10/667,207
Filing Date	September 18, 2003
Art Unit	1775
Examiner Name	Not assigned

I hereby declare that:

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Voice Activity Detector (VAD) - Based Multiple-Microphone Acoustic Noise Suppression

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☑ was filed on (MM/DD/YYYY) 09/18/2003 as United States Application Number or PCT International Application Number 10/667,207 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? Yes	No
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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Address
4880 Stevens Creek Blvd., Suite 201

City	State	ZIP
San Jose	CA	95129

Country	Telephone	Fax
US	408-236-6647	408-236-6641

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
GREGORY C.	BURNETT

Inventor's Signature: G. B Date: 1/13/04

Residence: City	State	Country	Citizenship
Dodge Center	Minnesota	US	US

Mailing Address
62568 174th Avenue

City	State	ZIP	Country
Dodge Center	Minnesota	55927	US

NAME OF SECOND INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
ERIC F.	BREITFELLER

Inventor's Signature: Date:

Residence: City	State	Country	Citizenship
Dublin	California	US	US

Mailing Address
11526 Streambed Place

City	State	ZIP	Country
Dublin	California	94568	US

☐ Additional inventors or a legal representative are being named on the _____supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.

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Atty. Docket No. ALPH.P010X

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:

Gregory C. Burnett, et al.

Application No. 10/667,207

Filed: September 18, 2003

For: VOICE ACTIVITY DETECTOR(VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSSION

Examiner: Not assigned
Art Unit: 1775

CERTIFICATE OF MAILING UNDER 37 C.F.R. 1.8

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Barbara B. Courtney
(Name of person transmitting correspondence)

September 10, 2004
Date

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TRANSMITTAL OF FORMAL DRAWINGS

Sir:

Enclosed herewith for filing in the above-identified patent application are ten (10) sheets of formal drawings.

The Commissioner is hereby authorized to charge any deficiencies in fees or credit any overpayment to our Deposit Account No. 501914.

Respectfully Submitted,

Date: September 10, 2004

Barbara B. Courtney, Reg. No. 42,442
Tel. 408-236-6647

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OIPE JC93 SEP 14 2004 PATENT & TRADEMARK OFFICE

FIG.1

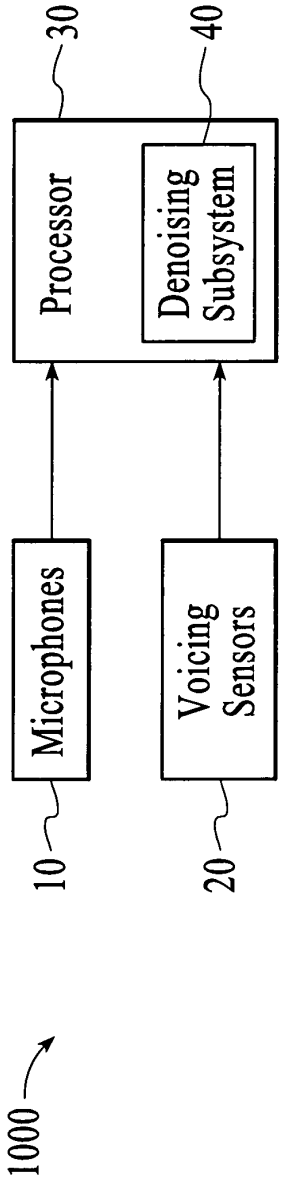
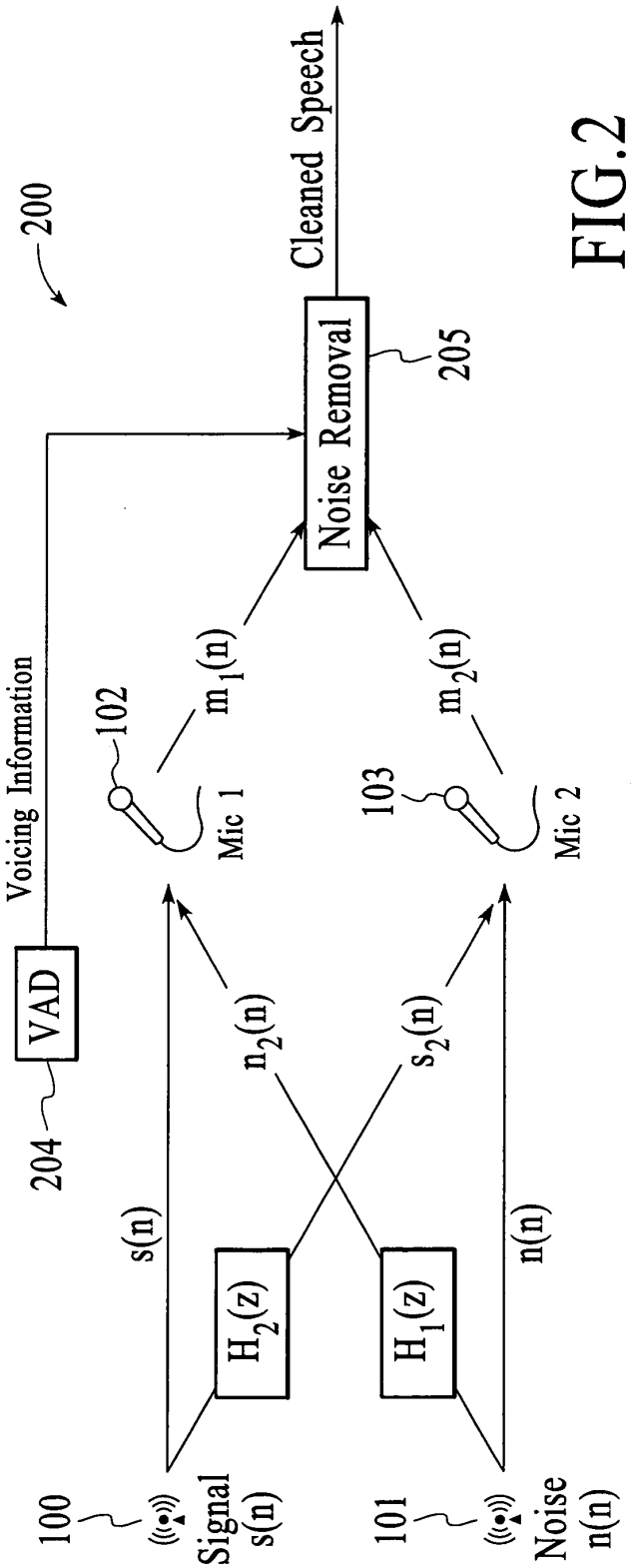


FIG.2



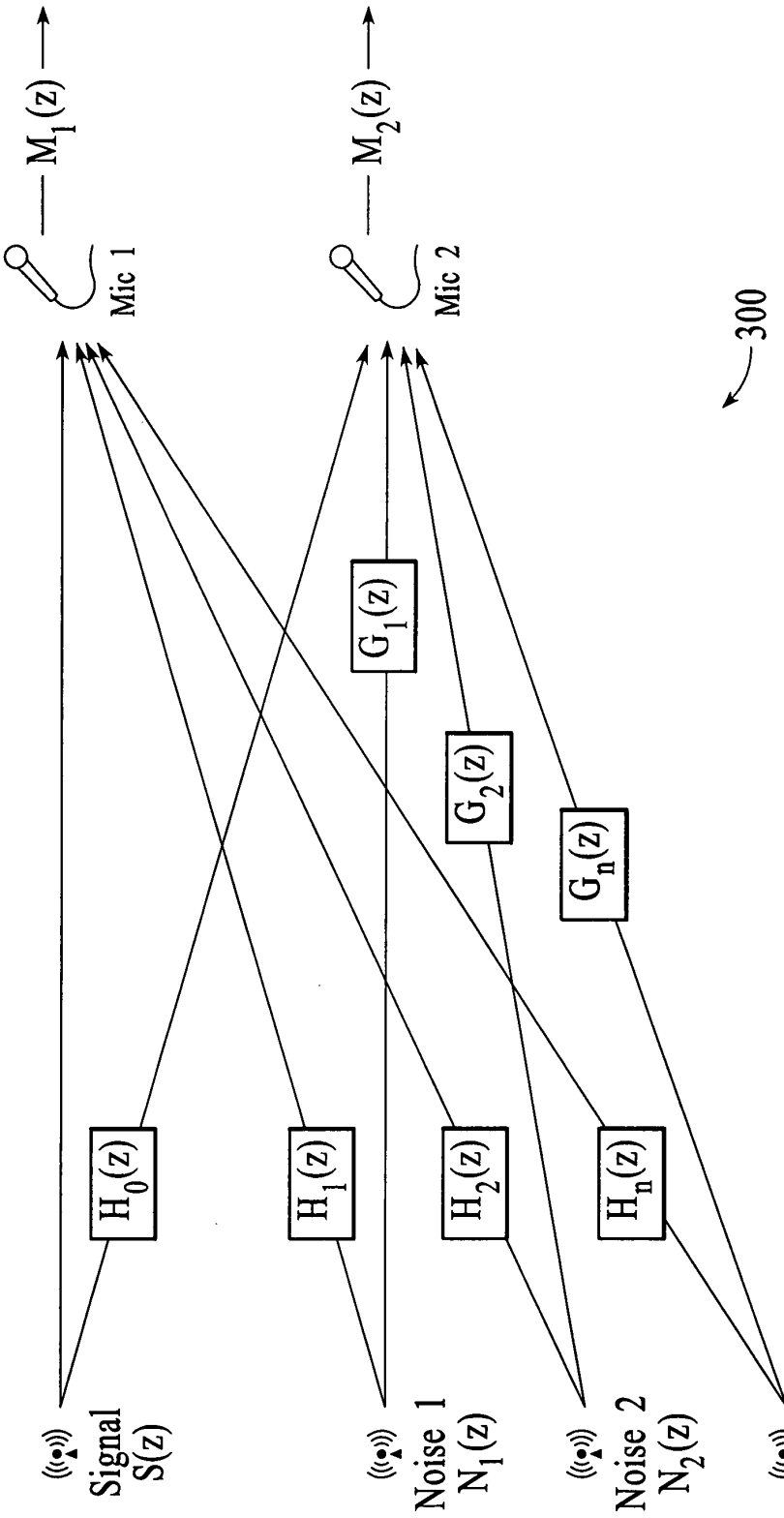

M1(z)
M2(z)
Mic 1
Mic 2
300
H0(z)
H1(z)
H2(z)
Hn(z)
G1(z)
G2(z)
Gn(z)
Signal
S(z)
Noise 1
N1(z)
Noise 2
N2(z)
Noise n
Nn(z)

FIG.3

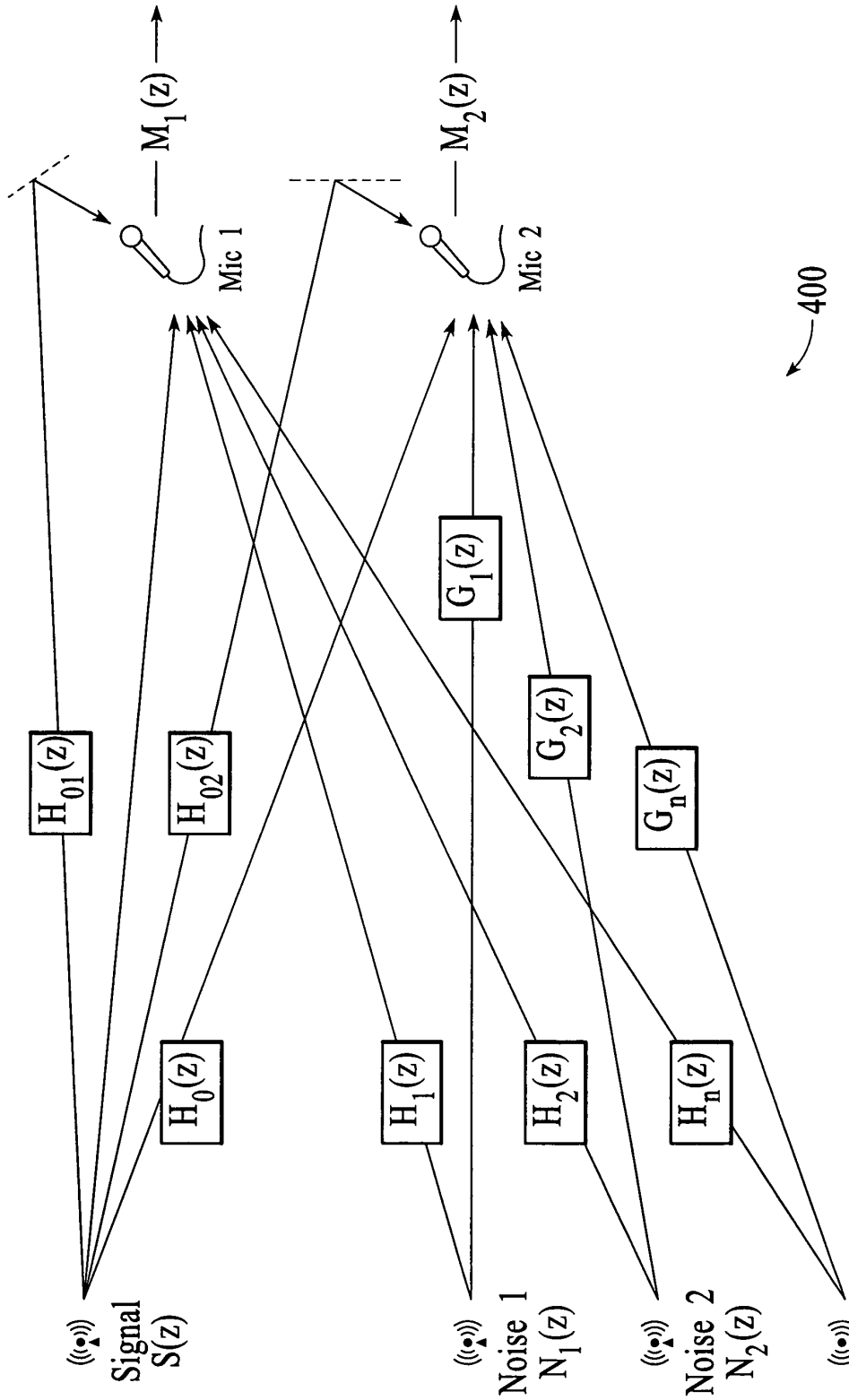

M1(z)
M2(z)
Mic 1
Mic 2
400
H01(z)
H02(z)
H0(z)
H1(z)
H2(z)
Hn(z)
G1(z)
G2(z)
Gn(z)
Signal
S(z)
Noise 1
N1(z)
Noise 2
N2(z)
Noise n
Nn(z)

FIG.4

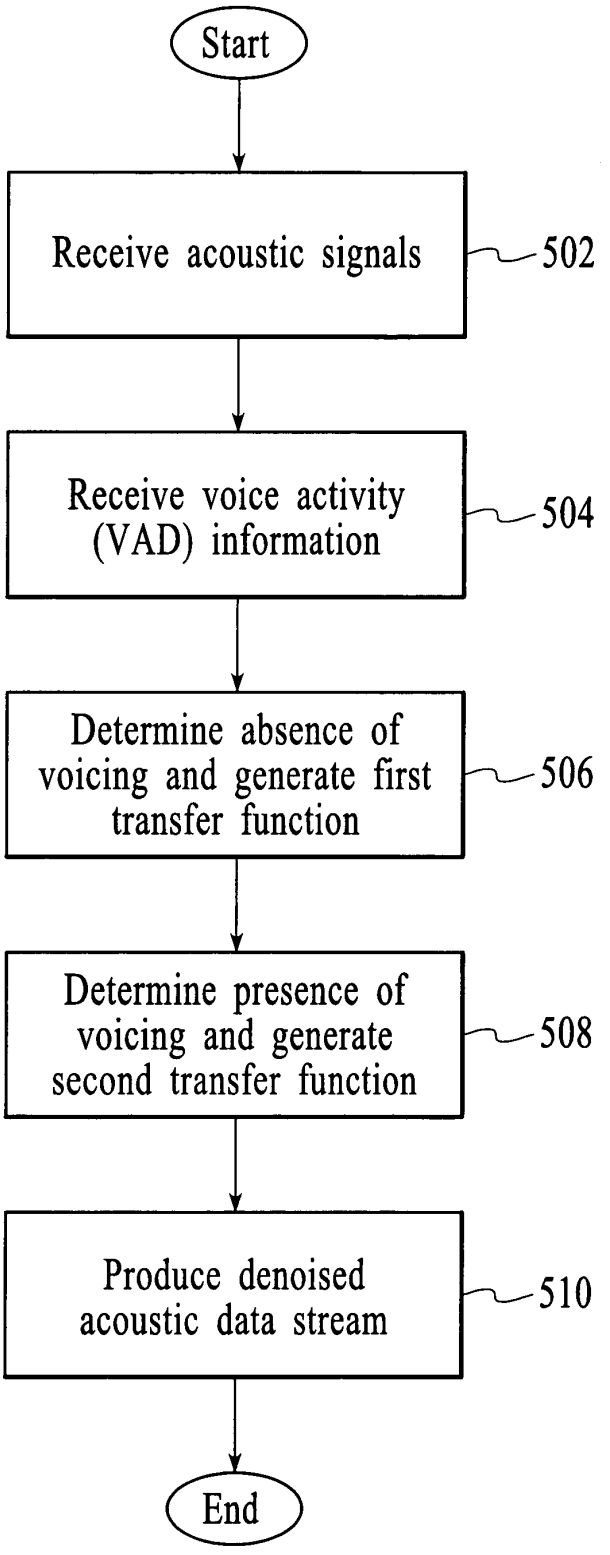

Start
500
Receive acoustic signals
502
Receive voice activity (VAD) information
504
Determine absence of voicing and generate first transfer function
506
Determine presence of voicing and generate second transfer function
508
Produce denoised acoustic data stream
510
End

FIG.5

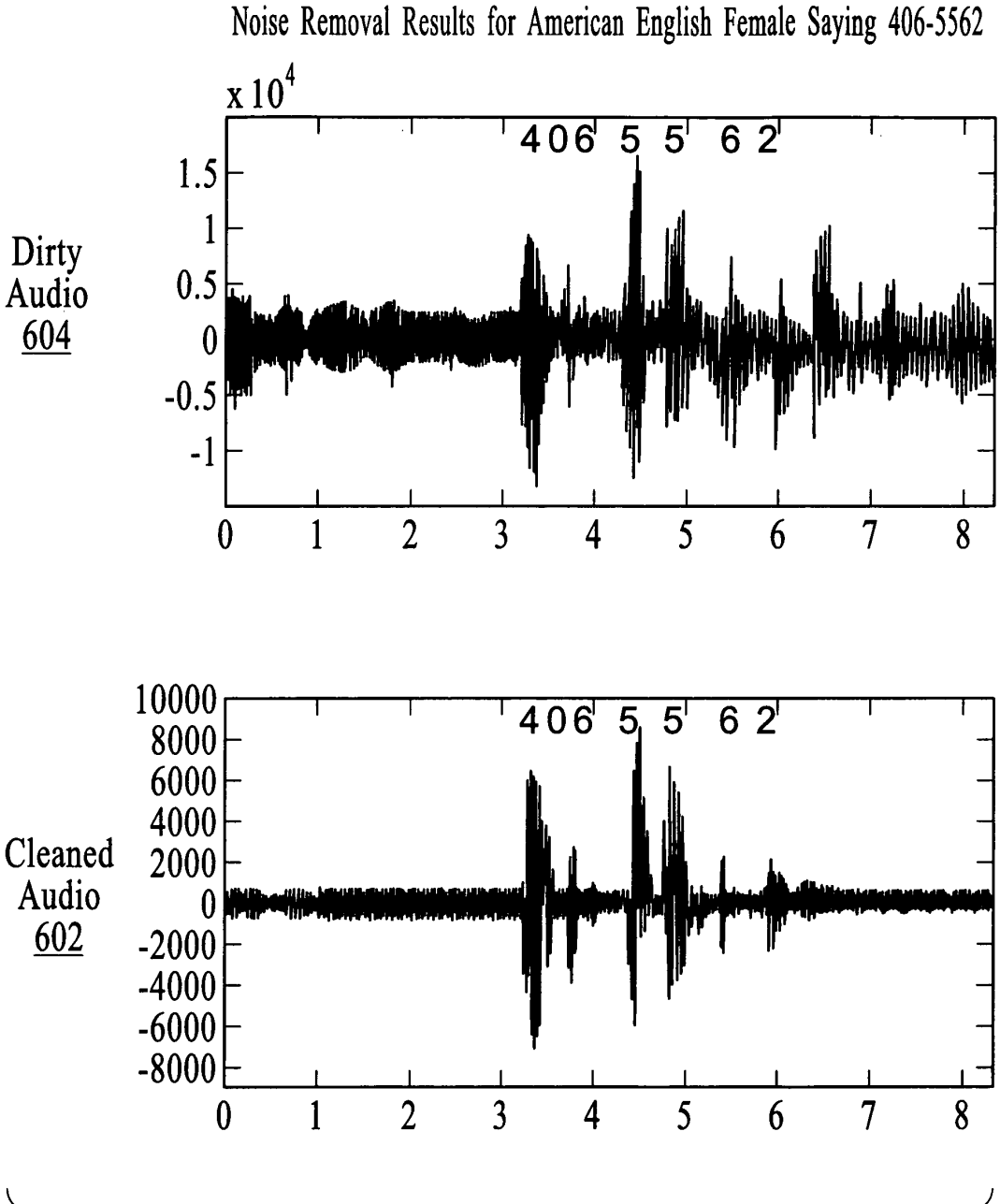

Noise Removal Results for American English Female Saying 406-5562
x 10^4
406 5 5 6 2
1.5
1
0.5
0
-0.5
-1
0 1 2 3 4 5 6 7 8
Dirty Audio 604
406 5 5 6 2
10000
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
0 1 2 3 4 5 6 7 8
Cleaned Audio 602

FIG.6

FIG.7A

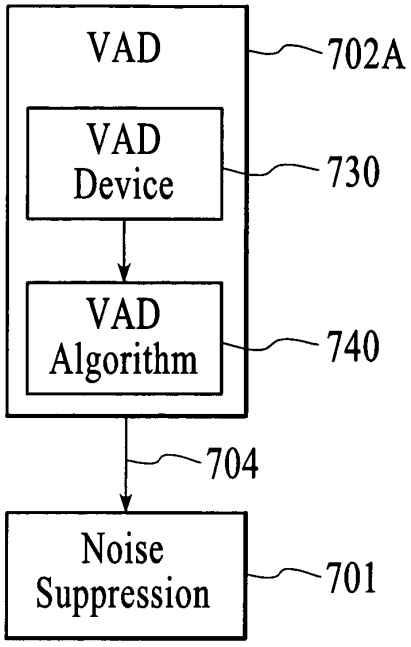
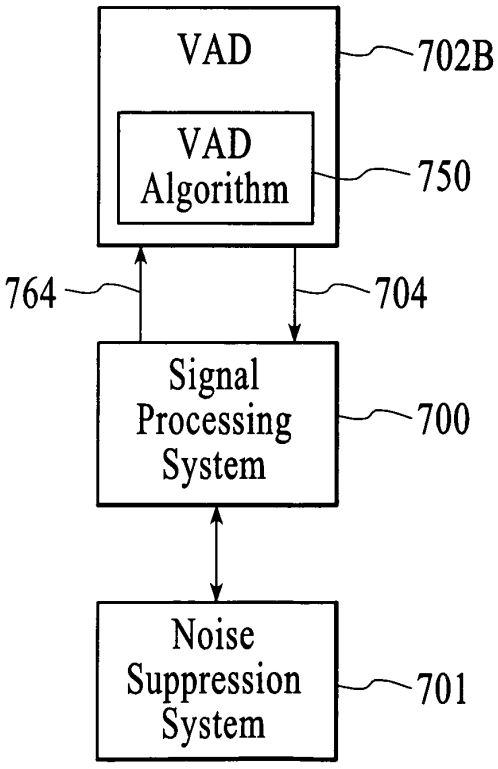

VAD
702A
VAD Device
730
VAD Algorithm
740
704
Noise Suppression
701

FIG.7B


VAD
702B
VAD Algorithm
750
764
704
Signal Processing System
700
Noise Suppression System
701

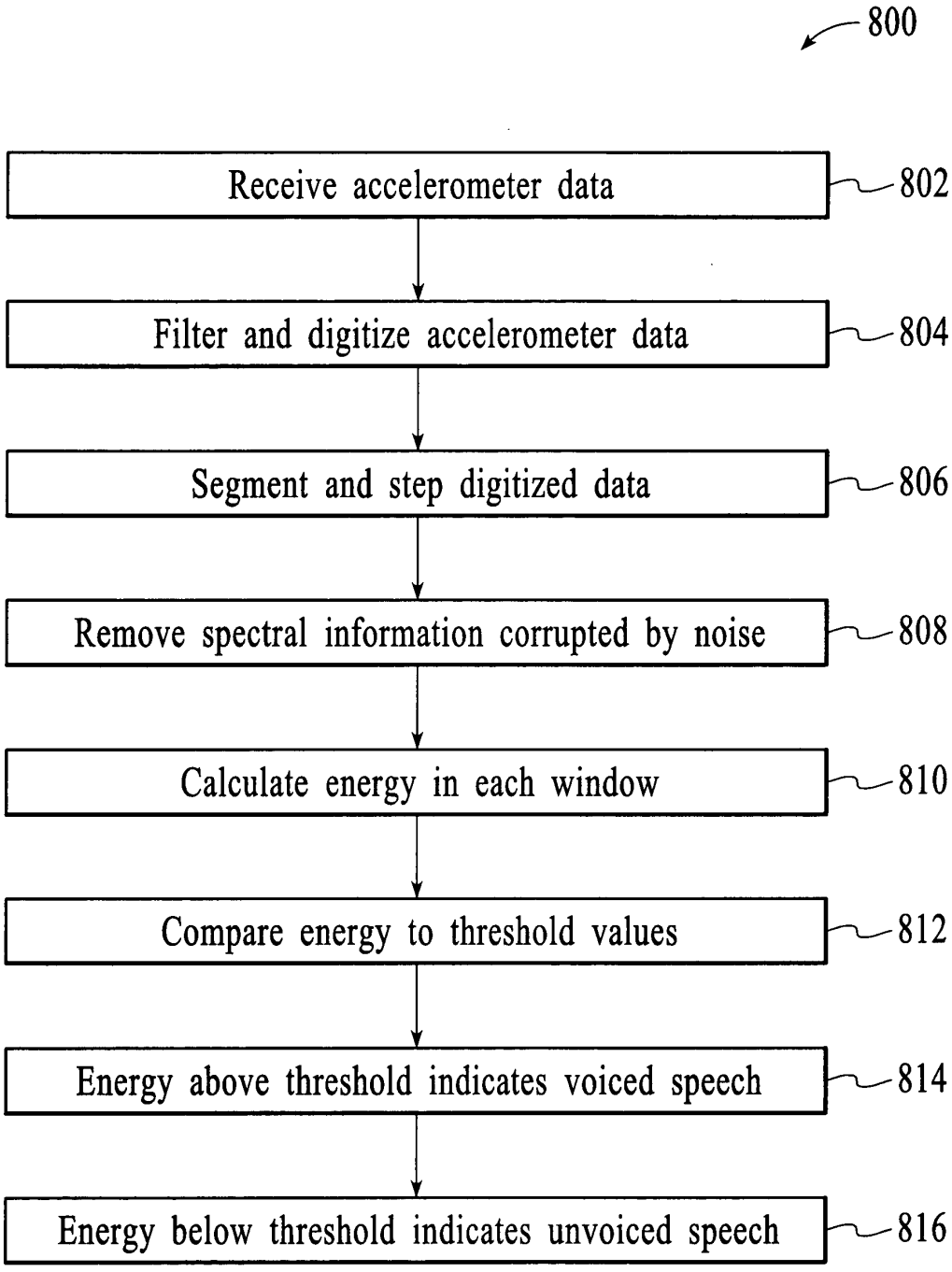

800
Receive accelerometer data
802
Filter and digitize accelerometer data
804
Segment and step digitized data
806
Remove spectral information corrupted by noise
808
Calculate energy in each window
810
Compare energy to threshold values
812
Energy above threshold indicates voiced speech
814
Energy below threshold indicates unvoiced speech
816

FIG.8

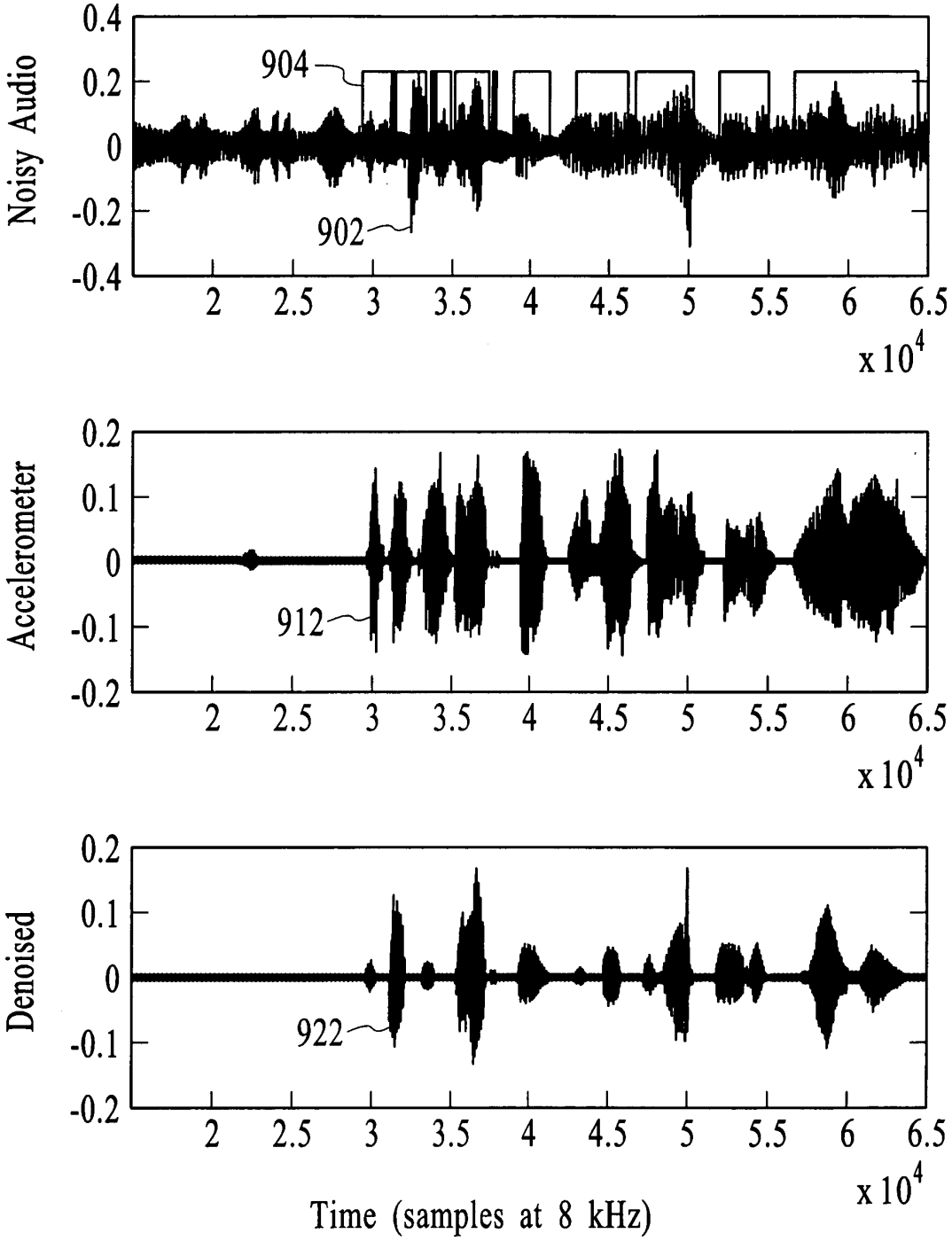

Noisy Audio
0.4
0.2
0
-0.2
-0.4
904
902
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
x 10^4
Accelerometer
0.2
0.1
0
-0.1
-0.2
912
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
x 10^4
Denoised
0.2
0.1
0
-0.1
-0.2
922
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
x 10^4
Time (samples at 8 kHz)

FIG.9

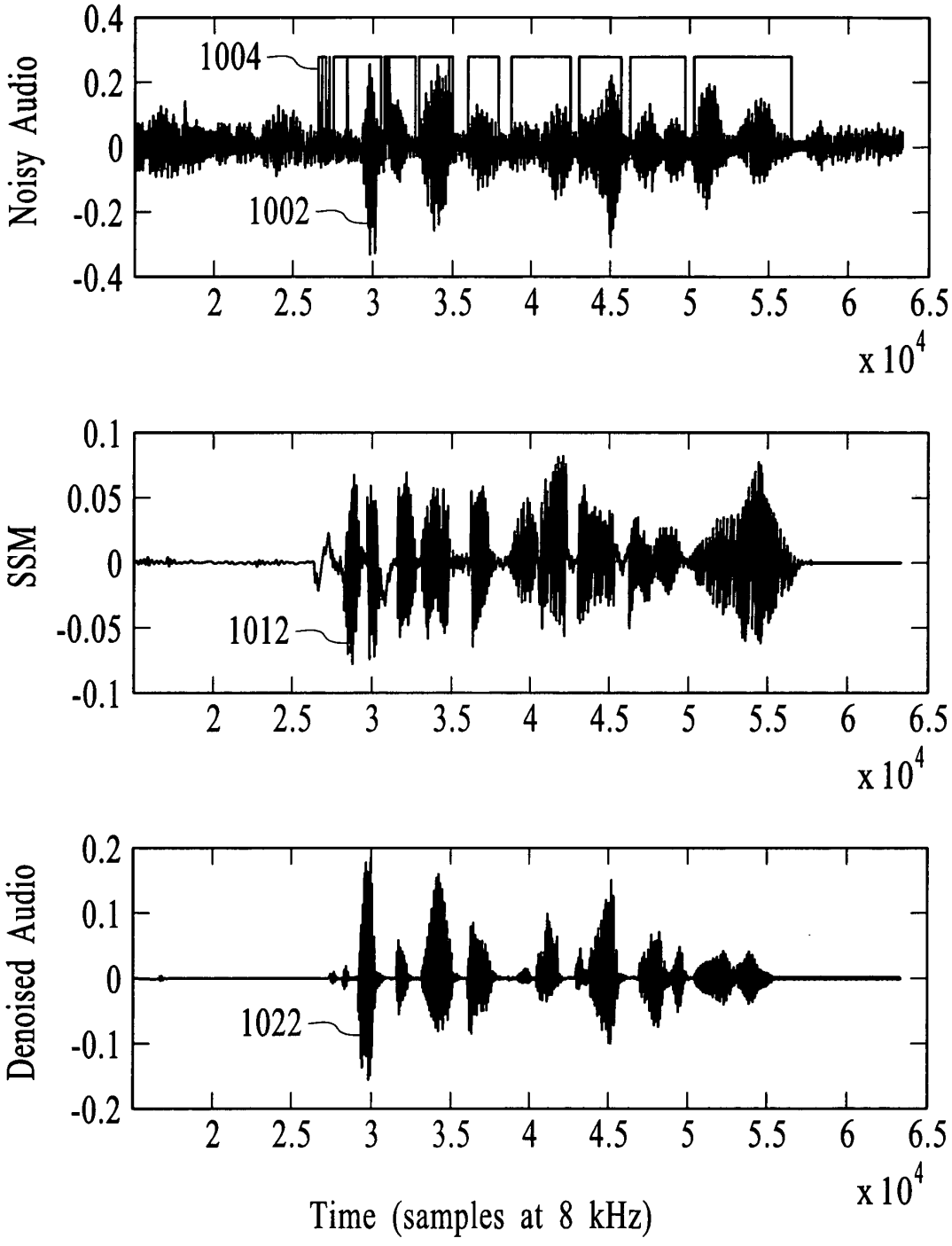

Noisy Audio
0.4
0.2
0
-0.2
-0.4
1004
1002
2 2.5 3 3.5 4 4.5 5 5.5 6 6.5
x 10^4
SSM
0.1
0.05
0
-0.05
-0.1
1012
2 2.5 3 3.5 4 4.5 5 5.5 6 6.5
x 10^4
Denoised Audio
0.2
0.1
0
-0.1
-0.2
1022
2 2.5 3 3.5 4 4.5 5 5.5 6 6.5
x 10^4
Time (samples at 8 kHz)

FIG.10

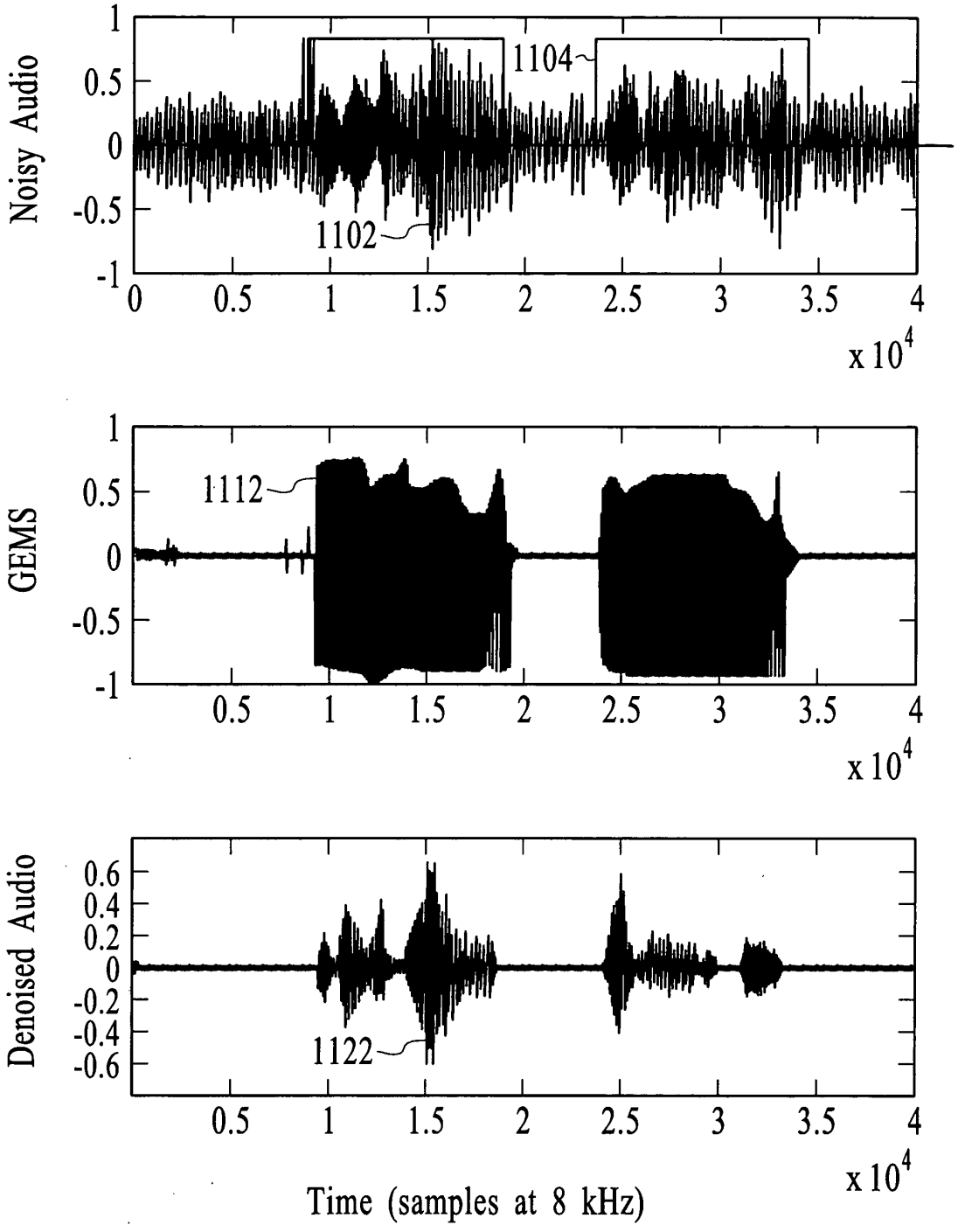

Noisy Audio
1
0.5
0
-0.5
-1
1104
1102
0
0.5
1
1.5
2
2.5
3
3.5
4
x 10^4
GEMS
1112
Denoised Audio
0.6
0.4
0.2
-0.2
-0.4
-0.6
1122
Time (samples at 8 kHz)

FIG.11

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Atty. Docket No. ALPH.P010X

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	
Gregory C. Burnett	)	Examiner: To be assigned
	)	
Application No. 10/667,207	)	Art Unit: 1775
	)	
Filed: September 18, 2003	)	
	)	
For: VOICE ACTIVITY DETECTOR (VAD)-BASED MULTIPLE MICROPHONE ACOUSTIC NOISE SUPPRESSION	)	

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR § 1.97

Sir:

Enclosed is an Information Disclosure Citation Form PTO/SB/08. Also enclosed are copies of all references that are not U.S. Patent references. It is respectfully requested that all cited references be considered and that a copy of the enclosed Form PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant.

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This Information Disclosure Statement is being submitted pursuant to 37 CFR 1.97(b)(3) before the mailing of a first office action on the merits.

The Commissioner is hereby authorized to charge any fees which may be required in connection with this submission to Deposit Account No. 501914.

Respectfully submitted,

SHEMWELL GREGORY & COURTNEY LLP

Dated: November 4, 2004

Barbara B. Courtney
Registration No. 42,442

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NOV 05 2004
PATENT & TRADEMARK OFFICE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/667,207
Filing Date	09/18/2003
First Named Inventor	Gregory C. Burnett
Art Unit	1775
Examiner Name	Not yet assigned
Attorney Docket Number	ALPH.P010X

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 2002/039425 A1	04-04-2002	Burnett et al.	
		US- 3,789,166	01-29-1974	Sebesta	
		US- 4,006,318	02-01-1977	Sebesta et al.	
		US- 4,591,668	05-27-1986	Iwata	
		US- 4,901,354	02-13-1990	Gollmar et al.	
		US- 5,097,515	03-17-2002	Baba	
		US- 5,515,865	05-14-1996	Scanlon et al.	
		US- 5,684,460	11-04-1997	Scanlon et al.	
		US- 5,729,694	03-17-1998	Holzrichter et al.	
		US- 5,853,005	12-29-1998	Scanlon	
		US- 6,069,963	05-30-2000	Martin et al.	
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		EP 0 637 187 A	02-01-1995	Pan Communicati		
		EP 0 795 851 A2	09-17-1997	Tokyo Shibaura		
		EP 0 984 660 A2	03-08-2000	Nippon T&T Corp		
		JP 2000 312 395	11-07-2000	Alpine Electron		
		JP 2001 189 987	07-10-2001	Pioneer Electro		
		WO 02 07151	01-24-2002	ALIPHCOM, Inc.		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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Barbara B. Courtney
(Name of person transmitting correspondence)

November 4, 2004
Date

Serial/Patent No.: 10/667,207 Filing/Issue Date: September 18, 2003 Client: ALIPH, Inc.
Title: Voice Activity Detector (VAD)-Based Multiple Microphone Acoustic Noise Suppression

Atty. Docket No.: ALPH.P010X Date Mailed: November 4, 2004

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

- ☐ Amendment/Response (pgs.)
- ☐ Preliminary Amendment (pgs.)
- ☐ Application - Utility (pgs.)
- ☐ Application - Rule 1.53(b) Contin. (pgs.)
- ☐ Application - Rule 1.53(b) Divis. (pgs.)
- ☐ Application - Rule 1.53(b) CIP (pgs.)
- ☐ Application - Rule 1.53(d) CPA (pgs.)
- ☐ Application - PCT (pgs.)
- ☐ Application - Provisional (pgs.)
- ☐ Drawings (sheets)
- ☐ Declaration & POA (pgs.)
- ☐ Assignment & Cover Sheet (pgs.)
- ☐ Power of Attorney
- ☐ Nonpublication Request (35 USC 122(b))
- ☑ Other Seven (7) cited references
- ☐ Petition for Extension of Time (month(s))
- ☑ Information Disclosure Statement & PTO/SB/08A
- ☑ Information Disclosure Statement Transmittal
- ☐ Submission of Formal Drawings
- ☐ Notice of Appeal
- ☐ Appeal Brief (pgs. in triplicate)
- ☐ Reply Brief
- ☐ Response to Notice of Missing Parts
- ☐ Utility Patent Application Transmittal
- ☐ Fee Transmittal (in duplicate)
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PLUS Search Results for S/N 10667207, Searched Fri Jan 19 14:03:07 EST 2007

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(((381/94.7or381/70or381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:53
L2	579	(((381/94.7 or 381/70 or 381/94.1). ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
L3	1052	(((381/71.8 or 381/91-92 or 381/122). ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
L4	579	(((381/94.7 or 381/70 or 381/94.1). ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
L5	579	((381/94.7 or 381/70 or 381/94.1). ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
L6	1052	((381/71.8 or 381/91-92 or 381/122). ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
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L8	1046	((704/214-215 or 704/246).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:59
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L10	2	((removing or cancel$4) adj noise) and plurality and (acoustic or sound speech$4 or audio) and (human adj tissue) and (human adj voicing adj activity) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
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L12	13	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:13
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L16	0	7 and 13 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
L17	0	8 and 13 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
L18	53	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human near2 tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
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L22	0	8 and 18 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17

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EAST Search History

S1	49	(("5867574") or ("6597787") or ("6904146") or ("20030206624") or ("20030228023") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060120537") or ("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6182035") or ("6415253") or ("6810273") or ("20040131178") or ("20050027520") or ("6081732") or ("6269093") or ("6707910") or ("6990194") or ("20040234067") or ("20040234069") or ("20060025994") or ("20020039425") or ("5602913") or ("5533133") or ("6104993") or ("5459814") or ("5649055") or ("6453285") or ("7020605") or ("20010014857") or ("20020035470") or ("20060053007") or ("6266410") or ("5689615") or ("5774849") or ("6188981") or ("6223154") or ("6223154") or ("6424942") or ("6807525") or ("6850617") or ("6959167") or ("20020103636")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:52
S2	11	(("2002039425") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,097,515") or ("5,515,865") or ("5,684,460") or ("5,729,694") or ("5,853,005") or ("6,069,963")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S3	19	(("5,212,764") or ("5,400,409") or ("5,414,776") or ("5,539,859") or ("5,633,935") or ("5,835,608") or ("5,917,921") or ("6,000,396") or ("6,191,724") or ("5,986,600") or ("5,966,090") or ("6,006,175") or ("5,406,622") or ("5,517,435") or ("5,649,055") or ("6,266,422") or ("6,430,295") or ("5,754,665") or ("5,473,702")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S4	8	((GREGORY) near2 (BURNETT)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/31 16:41
S5	3	(("5406622") or ("6006175") or ("5517435")).PN.	USPAT; USOCR	OR	OFF	2007/01/31 15:47
S6	1	("5729694").PN.	USPAT; USOCR	OR	OFF	2007/01/31 16:41

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EAST Search History

S7	1	("5729694").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/01 11:05
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S9	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/01 14:13
S10	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/02 10:04

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

7590 02/09/2007

Shemwell Gregory & Courtney LLP
Suite 201
4880 Stevens Creek Boulevard
San Jose, CA 95129

EXAMINER	
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ART UNIT	PAPER NUMBER
2615	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/667,207	BURNETT ET AL.	
	Examiner	Art Unit	
	Lun-See Lao	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is responsive to the applicant filed on 09-18-2003. Claims 1-44 are pending.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-44 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-39 and US Patent application

publication (US 2003/0228023). Although the conflicting claims are not identical, they are not patentably distinct from each other.

Consider claims 1-44, substantially all the claimed steps in these claims were recited in claims 1-39 of the patent identified above, such as the steps of:" a method for removing noise from acoustic signals, comprising: receiving a plurality of acoustic signals; 3 receiving information on the vibration of human tissue associated with human voicing activity; generating at least one first transfer function representative of the plurality of 6 acoustic signals upon determining that voicing information is absent from the plurality of 7 acoustic signals for at least one specified period of time; and 8 removing noise from the plurality of acoustic signals Using the first transfer 9 function to produce at least one denoised acoustic data stream" (see US 2003/0228023, claims 1-39, page 14 line 7-page16 line 9).

Because claims 1-44 of US patent application 10/667,207 are similar in scope to claims 1-39 of the US Patent application publication (US 2003/0228023) with obvious wording variation, they are both describing "the voice activity detector and denoice acoustic data stream ". Claims 1-44 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-39 of US Patent application publication (US 2003/0228023).

Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim1-3, 5-18, 20-30 and 33-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Holzrichter (US PAT. 5,729,694).

Consider claim 1 Holzrihter teaches a method for removing noise from acoustic signals, comprising:

receiving (see fig.43, 52) a plurality of acoustic signals;

receiving (43) information on the vibration of human tissue associated with human voicing activity;

generating at least one first transfer function (57) representative of the plurality of acoustic signals upon determining that voicing information is absent (such as, unvoice) from the plurality of acoustic signals for at least one specified period of time (such as, time frames)(see col.28 line 38-48); and

removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the plurality of acoustic signals using the first transfer (57) function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Consider claim 39 it is the computer readable medium claim corresponding to method claim 1. See previous method claim 1 rejection.

Consider claim 42 it is the electromagnetic medium claim corresponding to method claim 1. See previous method claim 1 rejection.

Consider claims 2-3 Holzrihter teaches the method of removing noise further comprises:

generating at least one second transfer function (see fig.5 (56)) representative of the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time (such as, time frames)(see col.28 line 38-48), and removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the plurality of acoustic signals using at least one combination (58) of the at least one first transfer function (57) and the at least one second transfer function (56) to produce at least one denoised acoustic data stream(see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and the plurality of acoustic signals include inherently (because the EM sensor 43 and microphone 52 picks up the noise source signal and the acoustic signal) at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal (see col. 14 line 46-67 and col.24 line 29-61).

Consider claims 27 and 36, 40, 43, they are essentially similar to claim 2 and are rejected for the reason stated above apropos to claim 2.

Consider claims 13-14, they are essentially similar to claim 3 and are rejected for the reason stated above apropos to claim 3.

Consider claims 5-8 Holzrichter teaches that the method of removing noise further includes generating at least one third transfer function (see fig.5 (59)) using the at least one first transfer function (57) and the at least one second transfer function (56); the method of generating the at least one first transfer function (see fig.5 (57)) comprises recalculating the at least one first transfer function during at least one prespecified interval (see col. 19 line 26-col. 20 line 15); and the method of generating the at least one second transfer function (see fig.5 (56)) comprises recalculating the at least one second transfer function during at least one prespecified interval (see col. 19 line 26-col. 20 line 15); and the method of generating the at least one first transfer function (see fig.5 (57) comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques (see col. 19 line 26-col. 20 line 15).

Consider claims 21-22, they are essentially similar to claims 7-8 and are rejected for the reason stated above apropos to claims 7-8.

Consider claims 9-11 Holzrichter teaches that the method of information on the vibration of human tissue is provided by a mechanical sensor (such as, motion sensor) in contact with the skin (see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(see figs 3a-

3b(29,30,33) and see col. 14 line 46-col. 15 line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claims 16 and 28, they are essentially similar to claim 9 and are rejected for the reason stated above apropos to claim 9.

Consider claims 17 and 29, they are essentially similar to claim 10 and are rejected for the reason stated above apropos to claim 10.

Consider claims 15, 25, 30, 34, 38 and 41, 44, they are essentially similar to claim 11 and are rejected for the reason stated above apropos to claim 11.

Consider claim 12 Holzrichter teaches that a method for removing noise from electronic signals, comprising:

detecting (see fig.5, (43, EM sensor)) an absence (unvoice) of voiced information during at least one period (see col. 28 line 38-48), wherein detecting includes measuring the vibration of human tissue (see col. 5 line 66-col. 6 line 55); receiving at least one noise source signal during the at least one period (see col. 24 line 29-61); generating at least one transfer function (57) representative of the at least one noise source signal; receiving at least one composite signal comprising acoustic and noise signals; and removing the noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) signal from the at least one composite signal using the at least one transfer function to produce at least one

denoised acoustic data stream(60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Consider claims 18 and 20 Holzrichter teaches that the method of receiving includes receiving the at least one noise source signal using at least one microphone (see fig.5 (52)); and the method of removing the noise signal from the at least one composite signal using the at least one transfer function (see fig.5 (59)) includes generating at least one other transfer function (57) using the at least one transfer function (see col. 15 line 29-col. 16 line 3).

Consider claim 23 Holzrichter teaches a method for removing noise from electronic signals, comprising:

determining (see fig.5 (40)) at least one unvoicing period during which voiced information is absent (such as, unvoice) based on vibration of human tissue;

receiving (43, 52) at least one noise signal input during the at least one unvoicing period (see col.28 line 38-48) and generating at least one unvoicing transfer function(56) representative of the at least one noise signal (see col. 24 line 29-61);

receiving (43,52) at least one composite signal comprising acoustic and noise signals; and removing the noise signal (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one composite signal using the at least unvoicing transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Consider claim 24 Holzrichter teaches that the method of producing at least one denoised acoustic data stream further includes:

determining (see fig.5 (40)) at least one voicing period during which voiced information is present; receiving (52) at least one acoustic signal input from at least one signal sensing device during the at least one voicing period (see col.28 line 38-48) and generating at least one voicing transfer function (57) representative of the at least one acoustic signal; and removing the noise signal from the at least one composite signal using at least one combination of the at least one unvoicing transfer function (56) and the at least one voicing transfer function (57) to produce the denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Consider claim 26 Holzrichter teaches a system for removing noise from the acoustic signals, comprising:

at least one receiver (see fig.5 (52)) that receives at least one acoustic signal;

at least one sensor (43) that receives human tissue vibration information associated with human voicing activity;

at least one processor (see fig.3b (proceeding electronics)) coupled among the at least one receiver and the at least one sensor (52,43) that generates a plurality of transfer functions (56, 57,59), wherein at least one first transfer function (57) representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent (unvoice) from the at least one acoustic signal for at least one specified period of time (such as, time frames)(see col.28 line 38-48), wherein noise is removed (removing noise is inherent to speech recognition

algorithm to extract the best speech feature and avoid noise) from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col.16 line 3 and col. 60 line 19-30).

Consider claim 33 Holzrichter teaches a system for removing noise from acoustic signals, comprising at least one processor (see fig.3b (processing electronics)) coupled among at least one microphone (see fig.5 (52)) and at least one voicing sensor (43), wherein the at least one voicing sensor (43) detects human tissue vibration associated with voicing, wherein an absence of voiced information (unvoice) is detected during at least one period (such as, time frames)(see col.28 line 38-48) using the at least one voicing sensor, wherein at least one noise source signal is received during the at least one period using the at least one microphone (52), wherein the at least one processor generates at least one transfer function (57) representative of the at least one noise source signal, wherein the at least one microphone(52) receives at least one composite signal comprising acoustic and noise signals, and the at least one processor removes the noise signal(removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one composite signal using the at least one transfer function (57) to produce at least one denoised acoustic data stream(60, see col. 15 line 4-col.16 line 3 and col. 60 line 19-30).

Consider claim 35 Holzrichter teaches a signal processing system (see fig.3b, (processing electronic)) coupled among at least one user and at least one electronic device (see fig.3b, (processing electronic)), wherein the signal processing system (processing electronic) includes at least one denoising subsystem (see fig. 5) for

removing noise from acoustic signals, the denoising subsystem (fig.5) comprising at least one processor coupled among at least one receiver and at least one sensor (43, EM sensor), wherein the at least one receiver is coupled to receive at least one acoustic signal, wherein least one sensor (43) detects human tissue vibration associated with human voicing activity (see col. 15 line 4-18), wherein the at least one processor generates a plurality of transfer functions (56, 57,59), wherein at least one first transfer function (56) representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent (such as, unvoice) from the at least one acoustic signal for at least one specified period of time(such as, time frames)(see col.28 line 38-48), wherein noise is removed (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 4-col.16 line 3 and col. 60 line 19-30).

Consider claim 37Holzrichter teaches that the system of the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems(see col. 16 line 51-67).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 4, 19 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holzrichter (US PAT. 5,729,694).

Consider claim 4 Holzrichter teaches implementing a microphone (acoustic sensor, e.g. microphone, col. 16 lines 14-15; col. 11 lines 29-30) coupled to a processor but does not teach implementing a plurality of microphones. At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement a plurality of microphones for flexibility, thus gathering acoustic information in various areas instead of implementing one microphone in that is restricted to a certain area.

Consider claims 19 and 32, they are essentially similar to claim 4 and are rejected for the reason stated above apropos to claim 4.

8. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holzrichter (US PAT. 5,729,694) in view of Sugiyama(US PAT 5,517,435).

Consider claim 31 Holzrichter does not clearly teach the system of further comprising: dividing acoustic data of the at least one acoustic signal into a plurality of subbands; removing noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and 6 combining the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream.

However, Sugiyama teaches the system of further comprising:

dividing (see fig.1, (50)) acoustic data of the at least one acoustic signal into a plurality of subbands;

removing (60) noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining (8) the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream (see col. 1 lines 12-35).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Sugiyama and Holizrichter to provide faster convergence of filter coefficients and more efficient computation.

Conclusion

9. The prior art made of record and not relied upon is considered to applicant's disclosure. Holzrichter (US PAT. 6,006,175) is recited to show other related the voice activity detector (VAD)- based multiple-microphone acoustic noise suppression.

10. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Facsimile responses should be faxed to:
(571) 273-8300

Hand-delivered responses should be brought to:
Customer Service Window
Randolph Building

401 Dulany Street
Alexandria, VA 22314

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lao,Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chin Vivian, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao,Lun-See L.S.
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501
Date 02-01-2007

VIVIAN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

Notice of References Cited	Application/Control No. 10/667,207	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner Lun-See Lao	Art Unit 2615	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,517,435	05-1996	Sugiyama, Akihiko	708/322
*	B	US-5,729,694	03-1998	Holzrichter et al.	705/17
*	C	US-6,006,175	12-1999	Holzrichter, John F.	704/208
*	D	US-2003/0228023	12-2003	Burnett et al.	381/92
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

IDS - 09/18/2003

Atty. Docket No. ALPH.P010X *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	
Burnett et al.	)	Examiner: Not yet assigned
	)	
Application No. Not yet assigned	)	Art Unit: Not yet assigned
	)	
Filed: September 18, 2003	)	
	)	
For: VAD-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	)	

Assistant Commissioner for Patents
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

Sir:

Enclosed is an Information Disclosure Citation Form PTO/SB/08 together with a copy of the references cited therein. It is respectfully requested that the cited references be considered and that the enclosed copy of the Form PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant.

Pursuant to 37 CFR 1.97(h), the submission of this Information Disclosure Statement is not to be construed as an admission that the information cited in this statement is material to patentability.

This Information Disclosure Statement is being submitted pursuant to 37 CFR 1.97(b)(3).

The Commissioner is hereby authorized to charge any fees which may be required in connection with this submission to Deposit Account No. 501914.

Respectfully submitted,

SHEMWELL GREGORY & COURTNEY LLP

Dated: September 18, 2003

Richard L. Gregory, Jr.
Registration No. 42,607

9/18/03

Please type a plus sign (+) inside this box → [+]

PTO/SB/08A (08-00)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	To be assigned
Filing Date	September 18, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	ALPH.P010X

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
LL		5,212,764		Ariyoshi	05-18-1993	
		5,400,409		Linhard	03-21,1995	
		5,414,776		Sims, Jr.	05-09-1995	
		5,539,859		Robbe et al.	07-23-1996	
		5,633,935		Kanamori et al.	05-27-1997	
		5,835,608		Warnaka et al.	11-10-1998	
		5,917,921		Sasaki et al.	06-29-1999	
		6,000,396		Nagata	12-28-1999	
		6,191,724	B1	McEwan	02-20-2001	
		5,986,600		McEwan	11-16-1999	
		5,966,090		McEwan	10-12-1999	
		6,006,175		Holzrichter	12-21-1999	
		5,406,622		Silverberg et al.	04-11-1995	
		5,517,435		Sugiyama	05-14-1996	
		5,649,055		Gupta et al.	07-15-1997	
		6,266,422		Ikeda	07-24-2001	
		6,430,295		Handel et al.	08-06-2002	
		5,754,665		Hosoi	05-19-1998	
LL		5,473,702		Yoshida et al.	12-05-1995	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	/Lun Lao/	Date Considered	01/31/2007

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[1] Unique citation designation number. [2] See attached Kinds of U.S. Patent Documents. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 2 of 2

Complet if Known	
Application Number	To be assigned
Filing Date	September 18, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	ALPH.P010X

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
LL		ZHAO LI et al: "Robust Speech Coding Using Microphone Arrays", Signals Systems and Computers, 1997. Conf. record of 31st Asilomar Conf., Nov. 2-5, 1997, IEEE Comput. Soc. Nov. 2, 1997, USA.	
LL		L.C. NG et al.: "Denoising of Human Speech Using Combined Acoustic and EM Sensor Signal Processing", 2000 IEEE Intl Conf on Acoustics Speech and Signal Processing. Proceedings (Cat. No. 00CH37100), Istanbul, Turkey, June 5-9, 2000 XP002186255, ISBN 0-7803-6293-4	
LL		S. AFFES et al.: "A Signal Subspace Tracking Algorithm for Microphone Array Processing of Speech". IEEE Transactions on Speech and Audio Processing, N.Y, USA Vol. 5, No. 5, Sept. 1, 1997, XP000774303, ISBN 1063-6676	
LL		GREGORY C. BURNETT: "The Physiological Basis of Glottal Electromagnetic Micropower Sensors (GEMS) and Their Use in Defining an Excitation Function for the Human Vocal Tract", Dissertation, University of California at Davis, January, 1999, USA.	
LL		L.C. NG et al.: "Speaker Verification Using Combined Acoustic and EM Sensor Signal Processing", ICASSP-2001, Salt Lake City, USA.	
LL		A. HUSSAIN: "Intelligibility Assessment of a Multi-Band Speech Enhancement Scheme", Proceedings IEEE Intl. Conf. on Acoustics, Speech & Signal Processing (ICASSP-2000). Istanbul, Turkey, June 2000.	

Examiner Signature	/Lun Lao/	Date Considered	01/31/2007

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Unique citation designation number. [2] Applicant is to place a check mark here if English language Translation is attached.

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IDS - 11/05/2004

PTO JC73 NOV 05 2004 PATENT & TRADEMARK OFFICE

Atty. Docket No. ALPH.P010X

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	
Gregory C. Burnett	)	Examiner: To be assigned
	)	
Application No. 10/667,207	)	Art Unit: 1775
	)	
Filed: September 18, 2003	)	
	)	
For: VOICE ACTIVITY DETECTOR (VAD)-BASED MULTIPLE MICROPHONE ACOUSTIC NOISE SUPPRESSION	)	

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR § 1.97

Sir:

Enclosed is an Information Disclosure Citation Form PTO/SB/08. Also enclosed are copies of all references that are not U.S. Patent references. It is respectfully requested that all cited references be considered and that a copy of the enclosed Form PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant.

Pursuant to 37 CFR 1.97(h), the submission of this Information Disclosure Statement is not to be construed as an admission that the information cited in this statement is material to patentability.

This Information Disclosure Statement is being submitted pursuant to 37 CFR 1.97(b)(3) before the mailing of a first office action on the merits.

The Commissioner is hereby authorized to charge any fees which may be required in connection with this submission to Deposit Account No. 501914.

Respectfully submitted,

SHEMWELL GREGORY & COURTNEY LLP

Dated: November 4, 2004

Barbara B. Courtney
Registration No. 42,442

OIPE JC73
NOV 05 2004
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11/5/04

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 1

Complete if Known	
Application Number	10/667,207
Filing Date	09/18/2003
First Named Inventor	Gregory C. Burnett
Art Unit	1775
Examiner Name	Not yet assigned
Attorney Docket Number	ALPH.P010X

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
LL		US- 2002/039425 A1	04-04-2002	Burnett et al.	
		US- 3,789,166	01-29-1974	Sebesta	
		US- 4,006,318	02-01-1977	Sebesta et al.	
		US- 4,591,668	05-27-1986	Iwata	
		US- 4,901,354	02-13-1990	Gollmar et al.	
		US- 5,097,515	03-17-2002	Baba	
		US- 5,515,865	05-14-1996	Scanlon et al.	
		US- 5,684,460	11-04-1997	Scanlon et al.	
LL		US- 5,729,694	03-17-1998	Holzrichter et al.	
LL		US- 5,853,005	12-29-1998	Scanlon	
LL		US- 6,069,963	05-30-2000	Martin et al.	
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
LL		EP 0 637 187 A	02-01-1995	Pan Communicati		
		EP 0 795 851 A2	09-17-1997	Tokyo Shibaura		
		EP 0 984 660 A2	03-08-2000	Nippon T&T Corp		
		JP 2000 312 395	11-07-2000	Alpine Electron		
		JP 2001 189 987	07-10-2001	Pioneer Electro		
LL		WO 02 07151	01-24-2002	ALIPHCOM, Inc.		

Examiner Signature	/Lun Lao/	Date Considered	01/31/2007

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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Barbara B. Courtney
(Name of person transmitting correspondence)

November 4, 2004
Date

Serial/Patent No.: 10/667,207 Filing/Issue Date: September 18, 2003 Client: ALIPH, Inc.
Title: Voice Activity Detector (VAD)-Based Multiple Microphone Acoustic Noise Suppression

Atty. Docket No.: ALPH.P010X Date Mailed: November 4, 2004

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

- ☐ Amendment/Response (pgs.)
- ☐ Preliminary Amendment (pgs.)
- ☐ Application - Utility (pgs.)
- ☐ Application - Rule 1.53(b) Contin. (pgs.)
- ☐ Application - Rule 1.53(b) Divis. (pgs.)
- ☐ Application - Rule 1.53(b) CIP (pgs.)
- ☐ Application - Rule 1.53(d) CPA (pgs.)
- ☐ Application - PCT (pgs.)
- ☐ Application - Provisional (pgs.)
- ☐ Drawings (sheets)
- ☐ Declaration & POA (pgs.)
- ☐ Assignment & Cover Sheet (pgs.)
- ☐ Power of Attorney
- ☐ Nonpublication Request (35 USC 122(b))
- ☑ Other Seven (7) cited references
- ☐ Petition for Extension of Time (month(s))
- ☑ Information Disclosure Statement & PTO/SB/08A
- ☑ Information Disclosure Statement Transmittal
- ☐ Submission of Formal Drawings
- ☐ Notice of Appeal
- ☐ Appeal Brief (pgs. in triplicate)
- ☐ Reply Brief
- ☐ Response to Notice of Missing Parts
- ☐ Utility Patent Application Transmittal
- ☐ Fee Transmittal (in duplicate)
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- ☐ Express Mail No. _____
- ☐ Check No. ____ Amt $_____

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/667,207	BURNETT ET AL.	
Examiner	**Art Unit**	
Lun-See Lao	2615	

SEARCHED			
Class	Subclass	Date	Examiner
381	94.7, 70	1/31/2007	L.S.
	94.1, 92		
	71.8, 91		
	122		
704	200, 231		
	233,246		
	214-215		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	1/31/2007	L.S.

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/667,207	BURNETT ET AL.
Examiner	**Art Unit**
Lun-See Lao	2615

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
Final	Original	2/1/07								
	1	√								
	2	√								
	3	√								
	4	√								
	5	√								
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Claim		Date								
Final	Original									

Claim		Date								
Final	Original									

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CONFIRMATION NO. 7159

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/667,207	09/18/2003 RULE	381	2644	ALPH.P010X

APPLICANTS

Gregory C. Burnett, Dodge Center, MN;
Eric F. Breitfeller, Dublin, CA;

** CONTINUING DATA ********** YES. L.S.

This application is a CIP of 09/905,361 07/12/2001 ABN which claims benefit of 60/219,297 07/19/2000

** FOREIGN APPLICATIONS ********** NONE L.S.

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** 12/12/2003

		STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed	☐ yes ☑ no	MN	12	44	8
35 USC 119 (a-d) conditions met	☐ yes ☑ no ☐ Met after Allowance L.S.				
Verified and Acknowledged	Examiner's Signature Initials				

ADDRESS

Shemwell Gregory & Courtney LLP
Suite 201
4880 Stevens Creek Boulevard
San Jose ,CA 95129

TITLE

Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression

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Attorney Docket No. ALPH.P010X Patent

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Atty. Docket No. ALPH.P010X *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:
Gregory C. Burnett, et al.

Application No.: 10/667,207

Filed: September 18, 2003

For: VOICE ACTIVITY DETECTION (VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

Examiner: Lun S. Lao
Art Unit: 2615

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION UNDER 37 C.F.R. § 1.111

Sir:

This is in response to the Office action mailed February 7, 2007. Please enter and consider the following amendments and Remarks.

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IN THE CLAIMS

1. (Currently amended) A method for removing noise from acoustic signals, comprising:

receiving a plurality of acoustic signals, wherein receiving the plurality of acoustic signals includes receiving using a plurality of independently located microphones;

receiving information on the vibration of human tissue associated with human voicing activity;

generating at least one first transfer function representative of the plurality of acoustic signals upon determining that voicing information is absent from the plurality of acoustic signals for at least one specified period of time; and

removing noise from the plurality of acoustic signals using the first transfer function to produce at least one denoised acoustic data stream.

2. (Original) The method of claim 1, wherein removing noise further comprises:

generating at least one second transfer function representative of the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time; and

removing noise from the plurality of acoustic signals using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

3. (Original) The method of claim 1, wherein the plurality of acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

4. (Original) The method of claim 1, wherein receiving the plurality of acoustic signals includes receiving using a plurality of independently located microphones.

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5. (Original) The method of claim 2, wherein removing noise further includes generating at least one third transfer function using the at least one first transfer function and the at least one second transfer function.

6. (Original) The method of claim 1, wherein generating the at least one first transfer function comprises recalculating the at least one first transfer function during at least one prespecified interval.

7. (Original) The method of claim 2, wherein generating the at least one second transfer function comprises recalculating the at least one second transfer function during at least one prespecified interval.

8. (Original) The method of claim 1, wherein generating the at least one first transfer function comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. (Original) The method of claim 1, wherein information on the vibration of human tissue is provided by a mechanical sensor in contact with the skin.

10. (Original) The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

11. (Original) The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

12. (Currently amended) A method for removing noise from electronic signals, comprising:

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detecting an absence of voiced information during at least one period, wherein detecting includes measuring the vibration of human tissue, wherein detecting the plurality of acoustic signals includes detecting using a plurality of independently located microphones;

receiving at least one noise source signal during the at least one period;

generating at least one transfer function representative of the at least one noise source signal;

receiving at least one composite signal comprising acoustic and noise signals; and

removing the noise signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream.

13. (Original) The method of claim 12, wherein the at least one noise source signal includes at least one reflection of at least one associated noise source signal.

14. (Original) The method of claim 12, wherein the at least one composite signal includes at least one reflection of at least one associated composite signal.

15. (Original) The method of claim 12, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

16. (Original) The method of claim 12, wherein detecting includes use of a mechanical sensor in contact with the human tissue.

17. (Currently amended) The method ~~system~~ of claim 12, wherein detecting includes use of a sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

18. (Original) The method of claim 12, wherein receiving includes receiving the at least one noise source signal using at least one microphone.

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19. (Original) The method of claim 18, wherein the at least one microphone includes a plurality of independently located microphones.

20. (Original) The method of claim 12, wherein removing the noise signal from the at least one composite signal using the at least one transfer function includes generating at least one other transfer function using the at least one transfer function.

21. (Original) The method of claim 12, wherein generating at least one transfer function comprises recalculating the at least one transfer function during at least one prespecified interval.

22. (Original) The method of claim 12, wherein generating the at least one transfer function comprises calculating the at least one transfer function using at least one technique selected from a group consisting of adaptive techniques and recursive technidques.

23. (Currently amended) A multiple microphone method for removing noise from electronic signals, comprising:

determining at least one unvoicing period during which voiced information is absent based on vibration of human tissue;

receiving at least one noise signal input during the at least one unvoicing period and generating at least one unvoicing transfer function representative of the at least one noise signal;

receiving at least one composite signal comprising acoustic and noise signals; and

removing the noise signal from the at least one composite signal using the at least unvoicing transfer function to produce at least one denoised acoustic data stream.

24. (Original) The method of claim 23, wherein producing at least one denoised acoustic data stream further includes:

determining at least one voicing period during which voiced information is present;

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receiving at least one acoustic signal input from at least one signal sensing device during the at least one voicing period and generating at least one voicing transfer function representative of the at least one acoustic signal; and

removing the noise signal from the at least one composite signal using at least one combination of the at least one unvoicing transfer function and the at least one voicing transfer function to produce the denoised acoustic data stream.

25. (Original) The method of claim 23, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

26. (Original) A system for removing noise from the acoustic signals, comprising:

at least one receiver that receives at least one acoustic signal;

at least one sensor that receives human tissue vibration information associated with human voicing activity;

at least one processor coupled among the at least one receiver and the at least one sensor that generates a plurality of transfer functions, wherein at least one first transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent from the at least one acoustic signal for at least one specified period of time, wherein noise is removed from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream.

27. (Original) The system of claim 26, wherein at least one second transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is present in the at least one acoustic signal for the at least one specified period of time, wherein noise is removed from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce the at least one denoised acoustic data stream.

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28. (Original) The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. (Original) The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

30. (Original) The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. (Original) The system of claim 26, further comprising:

dividing acoustic data of the at least one acoustic signal into a plurality of subbands;

removing noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream.

32. (Original) The system of claim 26, wherein the at least one receiver includes a plurality
of independently located microphones.

33. (Original) A system for removing noise from acoustic signals, comprising at least one processor coupled among at least one microphone and at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing, wherein an absence of voiced information is detected during at least one period using the at least one voicing sensor, wherein at least one noise source signal is received during the at least one period using the at least one microphone, wherein the at least one processor generates at least one transfer function representative of the at least one noise

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source signal, wherein the at least one microphone receives at least one composite signal comprising acoustic and noise signals, and the at least one processor removes the noise signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream.

34. (Original) The system of claim 33, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

35. (Original) A signal processing system coupled among at least one user and at least one electronic device, wherein the signal processing system includes at least one denoising subsystem for removing noise from acoustic signals, the denoising subsystem comprising at least one processor coupled among at least one receiver and at least one sensor, wherein the at least one receiver is coupled to receive at least one acoustic signal, wherein the at least one sensor detects human tissue vibration associated with human voicing activity, wherein the at least one processor generates a plurality of transfer functions, wherein at least one first transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent from the at least one acoustic signal for at least one specified period of time, wherein noise is removed from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream.

36. (Original) The system of claim 35, wherein at least one second transfer function representative of the at least one acoustic signal is generated in response to a determination that voicing information is present in the at least one acoustic signal for at least one specified period of time, wherein noise is removed from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

37. (Original) The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable

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communication devices, computers, video cameras, digital cameras, and telematics systems.

38. (Original) The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

39. (Original) A computer readable medium comprising executable instructions which, when executed in a processing system, remove noise from received acoustic signals by:

receiving at least one acoustic signal;

receiving human tissue vibration information associated with human voicing activity;

generating at least one first transfer function representative of the at least one acoustic signal upon determining that voicing information is absent from the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using the at least one first transfer function to produce at least one denoised acoustic data stream.

40. (Original) The medium of claim 39, wherein removing noise from received acoustic signals further includes:

generating at least one second transfer function representative of the at least one acoustic signal upon determining that voicing information is present in the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

41. (Original) The medium of claim 39, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

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42. (Original) An electromagnetic medium comprising executable instructions which, when executed in a processing system, remove noise from received acoustic signals by:

receiving at least one acoustic signal;

receiving human tissue vibration information associated with human voicing activity;

generating at least one first transfer function representative of the at least one acoustic signal upon determining that voicing information is absent from the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using the at least one first transfer function to produce at least one denoised acoustic data stream.

43. (Original) The medium of claim 42, wherein removing noise from received acoustic signals further includes:

generating at least one second transfer function representative of the at least one acoustic signal upon determining that voicing information is present in the at least one acoustic signal for at least one specified period of time; and

removing noise from the at least one acoustic signal using at least one combination of the at least one first transfer function and the at least one second transfer function to produce at least one denoised acoustic data stream.

44. (Original) The medium of claim 42, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

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REMARKS

Claims 1-44 are pending in the application. Claims 1, 12, 17, and 23 have been amended. No claims have been allowed. Applicants respectfully request entry of the foregoing amendments and allowance of the application as amended.

Petition for extension of time

A petition for a three month extension of time under 37 C.F.R. § 1.136(a) is included herewith, as well as the fee under 37 C.F.R. § 1.117(a)(3).

Double Patenting Rejection

Claims 1-44 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-39 of U.S. Patent application publication number 2003/0228023 (U.S. Patent Application No. 10/400,282). Applicants submit herewith a Terminal Disclaimer in compliance with 37 C.F.R. § 1.130(c), as well as the fee under C.F.R. § 1.20(d). Applicants respectfully request withdrawal of the rejection.

Rejections under 35 U.S.C. § 102

Claims 1-3, 5-18, 20-30, and 33-34 were rejected under 35 U.S.C. § 102(b) as being anticipated by Holzrichter (U.S. patent number 5,729,694, hereinafter "Holzrichter"). Applicants respectfully traverse the rejection.
The examiner states in paragraph 5 of the Office action:

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5. Claim1-3, 5-18, 20-30 and 33-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Holzrichter (US PAT. 5,729,694).

Consider claim 1 Holzrihter teaches a method for removing noise from acoustic signals, comprising:

receiving (see fig.43, 52) a plurality of acoustic signals;

receiving (43) information on the vibration of human tissue associated with human voicing activity;

generating at least one first transfer function (57) representative of the plurality of acoustic signals upon determining that voicing information is absent (such as, unvoice) from the plurality of acoustic signals for at least one specified period of time (such as, time frames)(see col.28 line 38-48); and

removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the plurality of acoustic signals using the first transfer (57) function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Applicants respectfully submit that claims 1-3, 5-18, 20-30, and 33-34 are not anticipated by Holzrichter. Holzrichter lacks at least one element of the claims. Specifically, Holzrichter lacks at least the following elements: transfer function(s); and use of more than one microphone. To explain the differences between the claimed invention and Holzrichter, and to support Applicants statement that Holzrichter lacks the stated elements, Applicants submit the following ananlysis.

Applicants submit that while Holzrichter does discuss receiving both acoustic (microphone-based) and "EM wave" (col. 15, lines 19) based measurements, Holzrichter uses only a single microphone. Further, Holzrichter uses the "EM wave" only to measure "the conditions of the vocal folds and the glottal tissue surrounding the vocal fold structure" (col. 15, lines 26-28). Applicants do not claim to measure the conditions of vocal folds or surrounding structure; but rather claim the use of physiologically-based device to determine the VAD signal, which is not mentioned in Holzrichter. In addition, in contrast to Holzrichter , Applicants claim "receiving a plurality of acoustic signals, wherein receiving the plurality of acoustic signals

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includes receiving using a plurality of independently located microphones." (Claim 1 as amended).

Holzrichter does not generate any transfer function as in (57). Rather, Holzrichter generates a Fourier Transform, which is a measure of the frequency content of a signal. In order to generate a transfer function, two signals (an input and output) are needed. Holzrichter has only one signal and simply transforms it into the frequency domain, which is completely different from, and exclusive of, taking two signals and generating a transfer function. Even the quoted passage at col. 28 lines 38-48 does not discuss time frames – it is simply a discussion of how Holzrichter thinks the end of a speech period should be calculated when a voiced to unvoiced transition takes place:

> **In the case that the speech changes from voiced to unvoiced, the last glottal open/close period of the voiced speech sequence has no "next" glottal cycle to use to define its end of period. In one approach, the algorithm continually tests the length of each glottal closed-time in each time frame for excessive length (e.g. 20% longer than the preceding glottal period closure-time). If the period is texted to be too long, the algorithm terminates the period and assigns, for example, a glottal-closure time-duration equal to the fractional closure time of the glottal function measured in the preceding time frames.**

The foregoing is not related to segmenting data into time frames for processing.

Finally, (57) and (60) along with col. 15 line 29 – col. 16 line 3 and col. 60 lines 19-30 have nothing to do with removing noise. (57) is a Fourier Transform, as noted above, and (60) is a "Vocal tract feature extractor" which is unrelated to present claims. Col. 15 lines 29-col. 16 line 3 describes Holzrichter's perception of how a "vocal tract Fourier Transform" would appear (col. 15 line 67-col. 16 line 1). This is to be distinguished as being completely different from a calculating transfer function as claimed.

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FIG. 5 shows a system in which knowledge of the vocalized excitation function is used to deconvolve the speech vocal tract transfer function information from measured acoustic speech output each time frame. All of the information gathered during each speech time frame, including acoustics, EM sensor information, and deconvolved transfer function information, can be processed, normalized, quantized, and stored (along with control information) in a feature vector representing the speaker's voice during one or more speech time frames. Similar deconvolving procedures are used with unvoiced excitation functions. As shown in FIG. 5, an EM sensor control unit 40 drives a repetition rate trigger 41, which drives pulse generator 42, which transmits one or more pulses from antenna 43. EM sensor control unit 40 sets the pulse format, time frame interval, integration times, memory locations, function forms, and controls and initializes pulse generator 42. Control unit 40 and trigger 41 also actuate switch 45 through delay 44 to range gate received pulses. Antenna 43 is positioned to direct transmitted pulses towards the vocal organs and receive pulses reflected therefrom. The received pulses pass through switch 45 and are integrated by integrator 46, then amplified by amplifier 47, and passed through a high pass filter 48 to a processing unit 49. Processing unit 49 contains an AD converter for digitizing the EM signals and also includes zero location detector, memory detector, and obtains glottal area versus time. The digitized and processed data from unit 49 is stored in memory bins 50, from which excitation function feature vectors are formed in block 51. Simultaneously, signals from an acoustic microphone 52 are digitized by AD converter 53, which is also controlled and synchronized by EM sensor control unit 40. The digitized data from AD converter 53 is stored in memory bins 54 from which acoustic feature vectors are formed in block 55. The digitized vocal fold data from memory bins 50 is used to produce a glottal Fourier transform 56, while the digitized acoustic data in memory bin 54 is used to produce an acoustic Fourier transform 57. The two Fourier transforms 56, 57 are deconvolved in block 58 to produce a vocal tract Fourier transform 59 which is then fit to a prechosen functional form to form a vocal tract feature vector in block 60.

Finally, in col. 60 lines 19-30, Holzrichter discusses removing "acoustically generated noise" from the "glottal signal" using "Fourier transform techniques" (col. 60 lines 19-22). This is not related to the present claims because:

1. The noisy signal of Holzrichter is a "glottal signal", while the claimed noisy signal is an acoustic microphone signal.
2. Holzrichter does not describe or embody his "Fourier transform techniques", so they are not available to be compared to the claimed techniques.

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> Acoustically generated noise can be removed from the glottal signal by using microphone information to subtract the noise signal, or by using Fourier transform techniques to filter out acoustic signals from the glottal motion signals.
>
> The functional shape of the volume air flow excitation function in real time, and in transform space (Fourier or Z transform), can be approximated, including the glottal zero (or closed) time. An excitation feature vector is constructed by defining an approximation functional (or table) to the measured excitation function and by obtaining a series of numerical coefficients that describe the functional fitting to the numerical data for the defined time frame(s).

The last part (col. 60 lines 23-30) discusses how to approximate a "volume flow excitation function" using "functional [sic] (or table)". This has no bearing on the claims. For example, the claims do not include a "volume flow excitation function". In addition, Applicants respectfully submit that Holzrichter's "functional [sic] (or table)" is described with enough specificity to determine what is being referred to.

The examiner also states:

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Consider claims 2-3 Holzrihter teaches the method of removing noise further comprises:

generating at least one second transfer function (see fig.5 (56)) representative of the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time (such as, time frames)(see col.28 line 38-48), and removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the plurality of acoustic signals using at least one combination (58) of the at least one first transfer function (57) and the at least one second transfer function (56) to produce at least one denoised acoustic data stream(see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and the plurality of acoustic signals include inherently (because the EM sensor 43 and microphone 52 picks up the noise source signal and the acoustic signal) at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal (see col. 14 line 46-67 and col.24 line 29-61).

Applicant respectfully submits that Holzrichter only mentions noise removal in a single context. Specifically, Holzrichter desires to remove "acoustically generated noise" from the "glottal signal" using "Fourier transform techniques" (col. 60 lines 19-22). Not once, in any context, does Holzrichter mention the removal of acoustic noise from a microphone signal using a second microphone signal. The references to (col. 28 lines 38-48) and (col. 15 lines 29-col. 16 line 3) and (col. 60 lines 19-30) have been shown to be unrelated above. Col. 14 lines 46-67 states:

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FIGS. 3A and FIG. 3B show two types of laboratory apparatus for measuring the simultaneous properties of several speech organs using EM sensors and for obtaining simultaneous acoustic information. FIG. 3A, in particular, shows highly accurate laboratory instrumentation assembled to obtain very high fidelity, linear, and very large dynamic range information on the vocal system during each speech time frame. FIG. 3A shows a view of a head with three antennas 21, 22, 23 and an acoustic microphone 24 mounted on a support stand 25. Antennas 21, 22, 23 are connected to pulse generators 26*a, b, c* through transmit/receiver switches 27*a, b, c* respectively. Pulse generators 26*a, b, c* apply pulses to antennas 21, 22, 23, which are directed to various parts of the vocal system. Antennas 21, 22, 23 pick up reflected pulses, which are then transmitted back through switches 27*a, b, c* to pulse receivers and digitizers (e.g., sample and hold units) 28*a, b, c*. Acoustic information from microphone 24 is also input into pulse receiver and digitizer 28d. Support stand 25 positions the antennas 21, 22, 23 to detect signals from various parts of the vocal tract, e.g., by using face positioning structure 29 and chest positioning structure 30. As shown, antenna 21 is positioned to detect the tongue, lip,

This is a simple description of the multiple antenna and SINGLE microphone configuration envisioned by Holzrichter. In contrast, Applicants claim the use of multiple microphones.

Col. 24 lines 29-61 state:

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> **3) Remove post-glottal pressure induced vibrations of glottal tissue and nearby tissue from the EM sensor signal, and therewith from the associated model of volume air flow versus sensor signal. Use one of two related methods. Method 3A) Filter the raw EM sensor excitation signal using transform or circuit techniques to remove the acoustic pressure induced higher frequency noise, but preserve the needed low frequency excitation function shape information for model generated values of volume air flow and for subsequent feature vector formation. Method 3B) Use the tissue vibration signal from the EM sensor and the acoustic output (corrected for timing delays) to determine the backward acoustic transfer function. Divide the Fourier transforms of the vibration signal by that of the acoustic signal, and store the numerical (or curve fit) transfer function information in memory for recall as needed. Next, for each time frame, use the backward transfer function to calculate the glottal tissue vibration level associated with the measured output acoustic signal. Then subtract the backward transferred acoustic signal from the EM-sensor generated and processed signal, to obtain a "noise free" excitation function signal. This signal represents a backward traveling acoustic sound wave that induces mechanical vibrations of glottal tissue and nearby air tract tissues in directions transverse to the air flow. This acoustic wave has little effect on the positions of the vocal fold edges, and thus it does not affect the actual volume air flow. U. However, certain EM sensors do measure this noise, and it shows up on the EM signal describing the excitation function (see FIG. 4B for an example). This noise level is found to be speaker specific. For high fidelity, speaker independent excitation function coding, such vibration signals mixed with the gross air flow values are undesirable.**

In this passage, Holzrichter discusses how he envisions removing "post-glottal pressure induced vibrations" (i.e. the speech of the user) from the "EM sensor signal" (col. 24 lines 29-30). Holzrichter lack elements of the claimed invention, and even teaches away from the claimed invention. For example:

1. The claimed signal of interest is the user's speech, whereas the user's speech is "noise" in Holzrichter.
2. Holzrichter's signal of interest is the "EM sensor signal" which Holzrichter desires to associate with volume air flow.

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3. The claimed noise is environmental acoustic noise, whereas the speech of the user is noise in Holzrichter.

The Office action continues:

> Consider claims 5-8 Holzrichter teaches that the method of removing noise further includes generating at least one third transfer function (see fig.5 (59)) using the at least one first transfer function (57) and the at least one second transfer function (56); the method of generating the at least one first transfer function (see fig.5 (57)) comprises recalculating the at least one first transfer function during at least one prespecified interval (see col. 19 line 26-col. 20 line 15); and the method of generating the at least one second transfer function (see fig.5 (56)) comprises recalculating the at least one second transfer function during at least one prespecified interval (see col. 19 line 26-col. 20 line 15); and the method of generating the at least one first transfer function (see fig.5 (57) comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques (see col. 19 line 26-col. 20 line 15).

As shown above, (56, 57, and 59) are Fourier transforms, not transfer functions as in the claims. Col. 19 line 26 – col. 20 line 15 states:

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The feature vector shown in FIG. 12A for the sound /ah/, was constructed using a total of p feature vector coefficients, c_1 through c_p, to describe the processed data. In this example, c_1 is used to describe the type of transfer functions used, e.g. "1" means the use of an ARMA functional in the "pole" and "zero" formulation; c_2 describes the number of "poles" and c_3 describes the number of "zeros" used for the fitting; c_4 indicates the kind of speech unit being spoken, e.g. "0" means isolated phoneme; c_5 describes the type of connection to a preceding acoustic sound unit to be used, e.g. "0" means a connection to the silence phoneme is needed; c_6 describes the connection to the following unit, e.g. "0" means a connection to a following silence phoneme is needed; c_7 describes the 300 ms multi-frame speech segment envelope; c_8 is the pitch (e.g., 120 vocal fold cycles/sec.); and c_9 describes the bandwidth of the fundamental harmonic. Other feature vector coefficients that describe the relative ratios of the 2nd through the 10th harmonic power to the first harmonic, are taken from the power transform of the vocal excitation (FIG. 10B). In addition the fall of the harmonic excitation power per octave, above 1 kHz, can be described by a line with −12 db/octave negative slope. The "pole" artd "zero" coefficient data (FIG. 12B) are shown and stored as appropriate coefficients in the vector in FIG. 12A. The last coefficient c_p is the symbol for the sound, and the next to last c_{p-1} is acoustic information from a CASR or similar system which is the acoustic energy per frame. If the user desires to use the alternative formulation of the ARMA transfer functional, the "a" and "b" coefficients can be used (see FIG. 12C).

An alternative approach to describe the feature vector for the "long" speech segment /ah/ is to perform Fourier transformations each 8.3 ms (the period for 120 Hz excitation), and to join 36 individual pitch period frames into a 300 ms long multiple frame speech segment. A second alternative approach would be to take the Fourier transform of the entire 300 ms segment, since it was tested to be constant; however the FFT algorithm would need to handle the large amount of data. Because of the constancy of the acoustic phoneme unit /ah/, the user chose to define the 300 ms period of constancy first, and to then process (i.e., FFT) the repetitive excitation

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and output acoustic signal with a convenient 10 ms period 30 times, and then average the results.

As a test (see Section below on Speech Synthesis) a synthetic speech segment was reconstructed from information in a vector like the one shown in FIG. 12A. The vocal fold excitation function was first reconstructed using the harmonic amplitude and phase information to generate a source term over an interval of 100 ms. The excitation function was sampled at 11 kHz or higher. The time sampled sequence was used to drive the ARMA model specified by a difference equation with poles and zeros. The output of the ARMA model was used to reconstruct the speech sound /ah/ as shown in the section on Speech Synthesis (see FIG. 19), and a pleasing sound, /ah/, was generated and heard by the user.

Again as before, Holzrichter envisions calculating a "feature vector" to describe the speech excitation (using Fourier transforms and other unnamed techniques), and the vocal tract transfer function (a model of the configuration of the vocal tract), and the speech itself. None of this is relevant to the claims, which do not calculate, or approximate, or model the speech excitation or vocal tract transfer function in any way. Holzrichter simply lacks any teaching or suggestion regarding the methods, including transfer functions, as claimed.

Continuing:

Consider claims 9-11 Holzrichter teaches that the method of information on the vibration of human tissue is provided by a mechanical sensor (such as, motion sensor) in contact with the skin (see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

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The quoted passage (col. 14 line 46 – col. 15 line 18) does not, in fact, describe any mechanical sensor in contact with the skin. Nor does the quoted passage, according to Holzrichter, detect vibrations associated with speech. According to Holzrichter (col. 14 lines 47-48):

> **apparatus for measuring the simultaneous properties of several speech organs using EM sensors and for obtaining**

whereby the speech organs are listed as the (col. 14 line 67 - col. 15 line 3),

> **As shown, antenna 21 is positioned to detect the tongue, lip, velum, etc. Antenna 22 is positioned to detect tongue and jaw motion and antenna 23 is position to detect vocal fold motion.**

and "properties" is not explained. Holzrichter simply lacks any teaching or suggestion regarding the use of mechanical or EM sensors to detect skin vibration due to user speech as is in the claims.

Continuing:

> Consider claim 12 Holzrichter teaches that a method for removing noise from electronic signals, comprising:
>
> detecting (see fig.5, (43, EM sensor)) an absence (unvoice) of voiced information during at least one period (see col. 28 line 38-48), wherein detecting includes measuring the vibration of human tissue (see col. 5 line 66-col. 6 line 55); receiving at least one noise source signal during the at least one period (see col. 24 line 29-61); generating at least one transfer function (57) representative of the at least one noise source signal; receiving at least one composite signal comprising acoustic and noise signals; and removing the noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream(60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

As shown above, Holzrichter never mentions generating a transfer function – (57) is a Fourier transform, a completely different process. Also, as discussed above, Holzrichter's signal of interest and "noise" are completely different from the claimed

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signal of interest and the claimed noise. Applicants have also shown that Holzrichter does not teach detecting vibrations associated with the user's speech.

Continuing:

Consider claims 18 and 20 Holzrichter teaches that the method of receiving includes receiving the at least one noise source signal using at least one microphone (see fig.5 (52)); and the method of removing the noise signal from the at least one composite signal using the at least one transfer function (see fig.5 (59)) includes generating at least one other transfer function (57) using the at least one transfer function (see col. 15 line 29-col. 16 line 3).

Again, Holzrichter uses a single microphone, and never considers that the microphone signal might be polluted with environmental noise. In contrast, environmental noise is at the center of the present claims. Holzrichter never generates a transfer function, only using Fourier transforms, and the only "noise" discussed by Holzrichter is the speech of the user. Applicants emphasize that the speech of the user is what Applicants invention is intended to keep. Further, Holzrichter does not detail the manner in which he would remove the "noise" in any way.

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Consider claim 23 Holzrichter teaches a method for removing noise from electronic signals, comprising:

determining (see fig.5 (40)) at least one unvoicing period during which voiced information is absent (such as, unvoice) based on vibration of human tissue;

receiving (43, 52) at least one noise signal input during the at least one unvoicing period (see col.28 line 38-48) and generating at least one unvoicing transfer function(56) representative of the at least one noise signal (see col. 24 line 29-61);

receiving (43,52) at least one composite signal comprising acoustic and noise signals; and removing the noise signal (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one composite signal using the at least unvoicing transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col 60 line 19-30).

Holzrichter fails to teach or suggest removing acoustic environmental noise from the user's speech, which is a subject matter of the claimed invention. Figure 5 (40) is the "EM sensor control unit", which is not enumerated and which has nothing to do with determining unvoiced periods. Figure 5 (43) and (52) do not receive noise; rather they receive "properties of several speech organs" (col. 14 lines 47-48) and the (not-noisy) speech of the user. As shown above, the only "noise" in Holzrichter's system is the user's speech, which is the claimed signal of interest. Holzrichter further lacks any teaching regarding transfer functions, but rather teaches only the use of Fourier transforms.

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Consider claim 24 Holzrichter teaches that the method of producing at least one denoised acoustic data stream further includes:

determining (see fig.5 (40)) at least one voicing period during which voiced information is present; receiving (52) at least one acoustic signal input from at least one signal sensing device during the at least one voicing period (see col.28 line 38-48) and generating at least one voicing transfer function (57) representative of the at least one acoustic signal; and removing the noise signal from the at least one composite signal using at least one combination of the at least one unvoicing transfer function (56) and the at least one voicing transfer function (57) to produce the denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Holzrichter never discusses producing a denoised acoustic data stream as claimed. Instead, Holzrichter discusses "removing 'post-glottal pressure induced vibrations' (i.e. the speech of the user) from the 'EM sensor signal' " (col. 24 lines 29-30). Thus, Holzrichter not only lacks elements of the claims, but is not even directed toward achieving a result similar to that achieved by the claimed invention.

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Consider claim 26 Holzrichter teaches a system for removing noise from the acoustic signals, comprising:

at least one receiver (see fig.5 (52)) that receives at least one acoustic signal;

at least one sensor (43) that receives human tissue vibration information associated with human voicing activity;

at least one processor (see fig.3b (proceeding electronics)) coupled among the at least one receiver and the at least one sensor (52,43) that generates a plurality of transfer functions (56, 57,59), wherein at least one first transfer function (57) representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent (unvoice) from the at least one acoustic signal for at least one specified period of time (such as, time frames)(see col.28 line 38-48), wherein noise is removed (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col.16 line 3 and col. 60 line 19-30).

Again, Holzrichter never discusses removing noise from acoustic signals. Holzrichter only discusses "removing 'post-glottal pressure induced vibrations' (i.e. the speech of the user) from the 'EM sensor signal' " (col. 24 lines 29-30).

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Consider claim 33 Holzrichter teaches a system for removing noise from acoustic signals, comprising at least one processor (see fig.3b (processing electronics)) coupled among at least one microphone (see fig.5 (52)) and at least one voicing sensor (43), wherein the at least one voicing sensor (43) detects human tissue vibration associated with voicing, wherein an absence of voiced information (unvoice) is detected during at least one period (such as, time frames)(see col.28 line 38-48) using the at least one voicing sensor, wherein at least one noise source signal is received during the at least one period using the at least one microphone (52), wherein the at least one processor generates at least one transfer function (57) representative of the at least one noise source signal, wherein the at least one microphone(52) receives at least one composite signal comprising acoustic and noise signals, and the at least one processor removes the noise signal(removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one composite signal using the at least one transfer function (57) to produce at least one denoised acoustic data stream(60, see col. 15 line 4-col.16 line 3 and col. 60 line 19-30).

Throughout Holzrichter's disclosure, Holzrichter fails to teach or suggest removing noise from acoustic signals. Holzrichter only discusses "removing 'post-glottal pressure induced vibrations' (i.e. the speech of the user) from the 'EM sensor signal' " (col. 24 lines 29-30). This illustrates not only that Holzrichter lacks claimed elements, but that Holzrichter is not attempting a teaching suggestive of the claims.

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Consider claim 35 Holzrichter teaches a signal processing system (see fig.3b, (processing electronic)) coupled among at least one user and at least one electronic device (see fig.3b, (processing electronic)), wherein the signal processing system (processing electronic) includes at least one denoising subsystem (see fig. 5) for removing noise from acoustic signals, the denoising subsystem (fig.5) comprising at least one processor coupled among at least one receiver and at least one sensor (43, EM sensor), wherein the at least one receiver is coupled to receive at least one acoustic signal, wherein least one sensor (43) detects human tissue vibration associated with human voicing activity (see col. 15 line 4-18), wherein the at least one processor generates a plurality of transfer functions (56, 57,59), wherein at least one first transfer function (56) representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent (such as, unvoice) from the at least one acoustic signal for at least one specified period of time(such as, time frames)(see col.28 line 38-48), wherein noise is removed (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 4-col.16 line 3 and col. 60 line 19-30).

Applicants respectfully reiterate that Holzrichter does not contain or suggest claimed elements in any of the claims. For example:

1. Holzrichter only uses a single microphone that is assumed to be noise free; while the claims include least two microphones that are assumed to be noisy;
2. Holzrichter does not calculate transfer functions between microphones (as in the claimed invention), but only Fourier transforms of clean acoustic data and "EM signals";
3. Holzrichter does not detect skin vibrations due to user speech; and
4. Holzrichter does not use a voice activity detection (VAD) signal to determine when to update the transfer functions between the microphones.

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Rejections under 35 U.S.C. § 103

Claims 4, 19, and 32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Holzrichter. Applicants respectfully traverse the rejection. The examiner states in paragraph 7 of the Office action:

> 7. Claims 4, 19 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holzrichter (US PAT. 5,729,694).
>
> Consider claim 4 Holzrichter teaches implementing a microphone (acoustic sensor, e.g. microphone, col. 16 lines 14-15; col. 11 lines 29-30) coupled to a processor but does not teach implementing a plurality of microphones. At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement a plurality of microphones for flexibility, thus gathering acoustic information in various areas instead of implementing one microphone in that is restricted to a certain area.
>
> Consider claims 19 and 32, they are essentially similar to claim 4 and are rejected for the reason stated above apropos to claim 4.

Applicants are uncertain of the meaning of "flexibility". The sentence goes on to state "thus gathering acoustic information in various areas instead of implementing one microphone in that it is restricted to a certain area". From the latter part of the sentence, Applicants can only conclude that "flexibility" has nothing to do with the use of two microphones as in the claimed system. The claimed system relies on two microphones to function. At least two microphones are the minimum number for implementing the claimed method and system. One of ordinary skill in the art would find no motivation to modify Holzrichter as suggested because Holzrichter does not teach or suggest the claimed nethod of processing data from ANY microphone (never mind more than one microphone) in the claimed manner or to achieve the claimed effect. The disclosure of Holzrichter is simply not enabling of a multiple-microphone method or system, and is not even suggestive of such a method or system. For all of these reasons, Applicants respectfully submit that claims 4, 19, and 32 would not have been obvious in view of Holzrichter.

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Claim 31 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Holzrichter in view of Sugiyama. Applicants respectfully traverse the rejection. The examiner states in paragraph 8 of the Office action that

> Holzrichter does not clearly teach the system of further comprising: dividing acoustic data of the at least one acoustic signal into a plurality of subbands; removing noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and 6 [sic] combining the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream.

The Office action further states that Sugiyama teaches the system of further comprising: dividing (fig. 1 (50)); removing (6); and combining ((8) and col. 1, lines 12-35).

Applicants respectfully submit that the proposed combination does not result in claim 31. Sugiyama does not overcome the deficiencies of Holzrichter. For example, Sugiyama is not concerned with noise removal at all and so certainly fails to teach or suggest transfer functions. Sugiyama (5,517,435) simply implements a standard adaptive filter to do system identification, not noise removal. For all of these reasons, Applicants respectfully submit that the invention of claim 31 would not have been obvious is view of the cited references.

CONCLUSION

In view of the foregoing amendments and Remarks, Applicants respectfully submit that any objections and rejections have been overcome, and the claims are now allowable. Prompt allowance of the application is earnestly solicited. Examiner Lao is respectfully requested telephone the undersigned to facilitate resolution of any issues prior to allowance of the application.

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

If there are any fees due and unpaid in this application, please charge our

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Deposit Account No. 503616 for these fees.

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: July 23, 2007

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To:	Art Unit 2615 USPTO	From:	Barbara Courtney Courtney Staniford & Gregory & LLP Phone: 408-342-1902 Fax: 408-342-1909
Fax:	**571-273-8300**	Pages:	35 including cover
Phone:	571-272-7501	Date:	July 23, 2007
Re:	**Application Serial No. 10/667,207** **Art Unit 2615** **Examiner Lun S. Lao** Atty Docket No. **ALPH.P010X**	CC:	

☑ Urgent ☑ For Review ☑ Please Comment ☑ Please Acknowledge

1. Response to Office action mailed February 9, 2007;
2. Terminal disclaimer under 37 C.F.R. § 1.130(c) and fee;
3. Petition for extension of time (3 mo) and fee;
4. Authorization to charge Credit Card; and
5. Certification of transmission under 37 C.F.R. § 1.18.

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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) FY 2005 *(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)*	Docket Number (Optional) ALPH.P010X
Application Number 10/667,207	Filed 09/18/2003
For Voice Activity Detection (VAD)-Based Multiple-Microphone Acoustic Noise Suppression	
Art Unit 2615	Examiner Lun S. Lao

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$120	$60	$
☐	Two months (37 CFR 1.17(a)(2))	$450	$225	$
☑	Three months (37 CFR 1.17(a)(3))	$1020	$510	$ 510
☐	Four months (37 CFR 1.17(a)(4))	$1590	$795	$
☐	Five months (37 CFR 1.17(a)(5))	$2160	$1080	$

☑ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

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01 FC:2253 510.00 OP

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____. I have enclosed a duplicate copy of this sheet.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 42,442

☐ attorney or agent under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____

Signature	July 23, 2007 Date
Barbara B. Courtney Typed or printed name	408-342-1902 Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☐ Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION	Docket Number (Optional) ALIPH.P010X

In re Application of: Gregory C. Burnett, et al.

Application No.: 10/667,207

Filed: September 18, 2003

For: Voice Activity Detection (VAD)-Based Multiple-Microphone Acoustic Noise Supression

The owner*, AliphCom, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending **reference** Application Number 10/400,282, filed on March 27, 2003, as such term is defined in 35 U.S.C. 154 and 173, and as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the **reference** application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of any patent granted on said **reference** application, "as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application." In the event that: any such patent: granted on the pending **reference** application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 42,442

Signature — July 23, 2007 (Date)

Barbara B. Courtney
Typed or printed name

408-342-1902
Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) is included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this statement. See MPEP § 324.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/667,207	09/18/2003	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
	07/23/2007	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 44	Minus	** 44	= 0	X $25 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 8	Minus	***8	= 0	X $100 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
Rozenia Harmon

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/667,207	BURNETT ET AL.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : 07-23-07	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
KAREN L. WARD

U.S. Patent and Trademark Office

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b

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

7590 10/17/2007

Shemwell Gregory & Courtney LLP
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4880 Stevens Creek Boulevard
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EXAMINER	
LAO, LUN S	
ART UNIT	**PAPER NUMBER**
2615	

MAIL DATE	DELIVERY MODE
10/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/667,207	BURNETT ET AL.	
	Examiner	Art Unit	
	Lun-See Lao	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is responsive to the amendment filed on 08-01-2007. Claims 1, 12, 17 and 23 have been amended. Claims 1-44 are pending.

Terminal Disclaimer

2. The terminal disclaimer filed on 07-23-2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 09-18-2003 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, detecting an absence of voiced information during at least one period , wherein detecting includes measuring the vibration of human tissue, wherein detecting the plurality of acoustic signals includes detecting using a plurality of independently located microphones must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure

number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claim 23 is objected to because of the following informalities: claim 23 recites "multiple microphone" on line 1, which appears to be --- multiple microphones---. Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 26-30 and 33-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Holzrichter (US PAT. 5,729,694).

Consider claim 26, Holzrichter teaches a system for removing noise from the acoustic signals, comprising:

at least one receiver (see fig.5 (52)) that receives at least one acoustic signal;

at least one sensor (43) that receives human tissue vibration information associated with human voicing activity;

at least one processor (see fig.3b (proceeding electronics)) coupled among the at least one receiver and the at least one sensor (52,43) that generates a plurality of transfer functions (56, 57,59), wherein at least one first transfer function (57) representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent (unvoice) from the at least one acoustic signal for at least one specified period of time (such as, time frames)(see col.28 line 38-48), wherein noise is removed (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col.16 line 3 and col. 60 line 19-30).

Consider claim 27, Holzrihter teaches at least one second transfer function (see fig.5 (56)) representative of the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time (such as, time frames)(see col.28 line 38-48), and removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech

feature and avoid noise) from the plurality of acoustic signals using at least one combination (58) of the at least one first transfer function (57) and the at least one second transfer function (56) to produce at least one denoised acoustic data stream(see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Consider claims 36, 40 and 43, they are essentially similar to claim 27 and are rejected for the reason stated above apropos to claim 27.

Consider claim 28, Holzrichter teaches that the sensor includes a mechanical sensor (such as, motion sensor) in contact with the skin (see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18);

Consider claim 29, Holzrichter teaches at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18);

Consider claim 30 Holzrichter teaches at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claims 34, 38 and 41, 44, they are essentially similar to claim 30 and are rejected for the reason stated above apropos to claim 30.

Consider claim 33, Holzrichter teaches a system for removing noise from acoustic signals, comprising at least one processor (see fig.3b (processing electronics)) coupled

among at least one microphone (see fig.5 (52)) and at least one voicing sensor (43), wherein the at least one voicing sensor (43) detects human tissue vibration associated with voicing, wherein an absence of voiced information (unvoice) is detected during at least one period (such as, time frames)(see col.28 line 38-48) using the at least one voicing sensor, wherein at least one noise source signal is received during the at least one period using the at least one microphone (52), wherein the at least one processor generates at least one transfer function (57) representative of the at least one noise source signal, wherein the at least one microphone(52) receives at least one composite signal comprising acoustic and noise signals, and the at least one processor removes the noise signal(removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one composite signal using the at least one transfer function (57) to produce at least one denoised acoustic data stream(60, see col. 15 line 4-col.16 line 3 and col. 60 line 19-30).

Consider claim 35, Holzrichter teaches a signal processing system (see fig.3b, (processing electronic)) coupled among at least one user and at least one electronic device (see fig.3b, (processing electronic)), wherein the signal processing system (processing electronic) includes at least one denoising subsystem (see fig. 5) for removing noise from acoustic signals, the denoising subsystem (fig.5) comprising at least one processor coupled among at least one receiver and at least one sensor (43, EM sensor), wherein the at least one receiver is coupled to receive at least one acoustic signal, wherein least one sensor (43) detects human tissue vibration associated with human voicing activity (see col. 15 line 4-18), wherein the at least one processor

generates a plurality of transfer functions (56, 57,59), wherein at least one first transfer function (56) representative of the at least one acoustic signal is generated in response to a determination that voicing information is absent (such as, unvoice) from the at least one acoustic signal for at least one specified period of time(such as, time frames)(see col.28 line 38-48), wherein noise is removed (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one acoustic signal using the first transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 4-col.16 line 3 and col. 60 line 19-30).

Consider claim 37, Holzrichter teaches that the system of the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems (see col. 16 line 51-67).

Consider claim 39. Holzrihter teaches a computer readable medium comprising executable instructions which, when executed in a processing system, remove noise from received acoustic signals by:

receiving at least one acoustic signal (52 in fig.5);

receiving human tissue vibration information associated with human voicing activity (43);

generating at least one first transfer function representative of the at least one acoustic signal upon determining that voicing information is absent from the at least one

acoustic signal for at least one specified period of time(such as, unvoice and tine frame) (see col.28 line 38-48); and

removing noise from the at least one acoustic signal using the at least one first transfer .function to produce at least one denoised acoustic data stream(60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Consider claim 42, Holzrihter teaches an electromagnetic medium comprising executable instructions which, when executed in a processing system, remove noise from received acoustic signals by:

receiving at least one acoustic signal (52 in fig.5);

receiving human tissue vibration information associated with human voicing activity (43);

generating at least one first transfer function representative of the at least one acoustic signal upon determining that voicing information is absent from the at least one acoustic signal for at least one specified period of time(such as, unvoice and tine frame) (see col.28 line 38-48); and

removing noise from the at least one acoustic signal using the at least one first transfer .function to produce at least one denoised acoustic data stream(60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-25 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holzrichter (US PAT. 5,729,694).

Consider claim 1, Holzrihter teaches a method for removing noise from acoustic signals, comprising:

receiving a plurality of acoustic signals, wherein receiving the plurality of acoustic signals includes receiving using a plurality of independently located sensors (see fig. 5 (43, 52));

receiving information on the vibration of human tissue associated with human voicing activity (43 in fig. 5);

generating at least one first transfer function (57) representative of the plurality of acoustic signals upon determining that voicing information is absent (such as, unvoice) from the plurality of acoustic signals for at least one specified period of time (such as, time frames) (see col.28 line 38-48); and

removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the plurality of acoustic signals using the first transfer (57) function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); but Holzrihter does not explicitly teach the independently located sensor 43 is implemented by a microphone, while sensor 52 is.

However, the examiner takes official notice that it is well known in the art to implement a sensor with a microphone to sense voice and/or vibration.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Holzrichter by implementing the independently located sensors with respective microphones, thus making the system more versatile.

Consider claims 2-3, Holzrihter teaches the method of removing noise further comprises:

generating at least one second transfer function (see fig.5 (56)) representative of the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time (such as, time frames)(see col.28 line 38-48), and removing noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the plurality of acoustic signals using at least one combination (58) of the at least one first transfer function (57) and the at least one second transfer function (56) to produce at least one denoised acoustic data stream(see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and the plurality of acoustic signals include inherently (because the EM sensor 43 and microphone 52 picks up the noise source signal and the acoustic signal) at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal (see col. 14 line 46-67 and col.24 line 29-61).

Consider claims 13-14, they are essentially similar to claim 3 and are rejected for the reason stated above apropos to claim 3.

Consider claim 4, Holzrichter teaches implementing a microphone (acoustic sensor, e.g. microphone, col. 16 lines 14-15; col. 11 lines 29-30) coupled to a processor but does not teach implementing a plurality of microphones. At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement a plurality of microphones for flexibility, thus gathering acoustic information in various areas instead of implementing one microphone in that is restricted to a certain area.

Consider claims 19 and 32, they are essentially similar to claim 4 and are rejected for the reason stated above apropos to claim 4.

Consider claims 5-8, Holzrichter teaches that the method of removing noise further includes generating at least one third transfer function (see fig.5 (59)) using the at least one first transfer function (57) and the at least one second transfer function (56); the method of generating the at least one first transfer function (see fig.5 (57)) comprises recalculating the at least one first transfer function during at least one prespecified interval (see col. 19 line 26-col. 20 line 15); and the method of generating the at least one second transfer function (see fig.5 (56)) comprises recalculating the at least one second transfer function during at least one prespecified interval (see col. 19 line 26-col. 20 line 15); and the method of generating the at least one first transfer function (see fig.5 (57) comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques (see col. 19 line 26-col. 20 line 15).

Consider claims 21-22, they are essentially similar to claims 7-8 and are rejected for the reason stated above apropos to claims 7-8.

Consider claims 9-11, Holzrichter teaches that the method of information on the vibration of human tissue is provided by a mechanical sensor (such as, motion sensor) in contact with the skin (see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claim 16, it is essentially similar to claim 9 and are rejected for the reason stated above apropos to claim 9.

Consider claim 17, it is essentially similar to claim 10 and are rejected for the reason stated above apropos to claim 10.

Consider claims 15 and 25, they are essentially similar to claim 11 and are rejected for the reason stated above apropos to claim 11.

Consider claim 12, Holzrichter teaches that a method for removing noise from electronic signals, comprising:

detecting (see fig.5, (43, EM sensor)) an absence (unvoice) of voiced information during at least one period (see col. 28 line 38-48), wherein detecting includes measuring the vibration of human tissue, wherein detecting the plurality of acoustic

signals includes detecting using a plurality of independently located sensors (see (43, 52 in fig. 5) and col. 5 line 66-col. 6 line 55); receiving at least one noise source signal during the at least one period (see col. 24 line 29-61); generating at least one transfer function (57) representative of the at least one noise source signal; receiving at least one composite signal comprising acoustic and noise signals; and removing the noise (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream(60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); but Holzrihter does not explicitly teach the independently located sensor 43 is implemented by a microphone, while sensor 52 is.

However, the examiner takes official notice that it is well known in the art to implement a sensor with a microphone to sense voice and/or vibration.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Holzrichter by implementing the independently located sensors with respective microphones, thus making the system more versatile.

Consider claims 18 and 20, Holzrichter teaches that the method of receiving includes receiving the at least one noise source signal using at least one microphone (see fig.5 (52)); and the method of removing the noise signal from the at least one composite signal using the at least one transfer function (see fig.5 (59)) includes generating at

least one other transfer function (57) using the at least one transfer function (see col. 15 line 29-col. 16 line 3).

Consider claim 23, Holzrichter teaches a multiple sensor method for removing noise from electronic signals, comprising:

determining (see fig.5 (40)) at least one unvoicing period during which voiced information is absent (such as, unvoice) based on vibration of human tissue;

receiving (43, 52) at least one noise signal input during the at least one unvoicing period (see col.28 line 38-48) and generating at least one unvoicing transfer function(56) representative of the at least one noise signal (see col. 24 line 29-61);

receiving (43,52) at least one composite signal comprising acoustic and noise signals; and removing the noise signal (removing noise is inherent to speech recognition algorithm to extract the best speech feature and avoid noise) from the at least one composite signal using the at least unvoicing transfer function to produce at least one denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); but Holzrihter does not explicitly teach the multiple sensors are implemented by microphones.

However, the examiner takes official notice that it is well known in the art to implement a sensor with a microphone to sense voice and/or vibration.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Holzrichter by implementing the multiple sensors with respective microphones, thus making the system more versatile.

Consider claim 24, Holzrichter teaches that the method of producing at least one denoised acoustic data stream further includes:

determining (see fig.5 (40)) at least one voicing period during which voiced information is present; receiving (52) at least one acoustic signal input from at least one signal sensing device during the at least one voicing period (see col.28 line 38-48) and generating at least one voicing transfer function (57) representative of the at least one acoustic signal; and removing the noise signal from the at least one composite signal using at least one combination of the at least one unvoicing transfer function (56) and the at least one voicing transfer function (57) to produce the denoised acoustic data stream (60, see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30).

9. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holzrichter (US PAT. 5,729,694) in view of Sugiyama(US PAT 5,517,435).

Consider claim 31 Holzrichter does not clearly teach the system of further comprising: dividing acoustic data of the at least one acoustic signal into a plurality of subbands; removing noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and 6 combining the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream.

However, Sugiyama teaches the system of further comprising:

dividing (see fig.1, (50)) acoustic data of the at least one acoustic signal into a plurality of subbands;

removing (60) noise from each of the plurality of subbands using the at least one first transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining (8) the plurality of denoised acoustic data streams to generate the at least one denoised acoustic data stream (see col. 1 lines 12-35).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Sugiyama and Holizrichter to provide faster convergence of filter coefficients and more efficient computation.

Response to Arguments

10. Applicant's arguments filed 07-23-2007 have been fully considered but they are not persuasive.

The amended plurality of independently located microphones / multiple microphones are met by Holzdehter, as discussed in the rejection of claim 1, for example.

Applicant argued that the noisy signal of Holzdehter is a "glottal signal", while the claimed noisy signal is an acoustic microphone signal (see the remarks page 14 last paragraph).

The examiner responds that “noisy signal is an acoustic microphone signal” is not claimed, and thus moot. Holzdchter describes the "'Fourier transform techniques", that meets the claimed techniques (see fig. 5 and col. 24 lines 29-61).

Applicant argued that "Not once, in any context, does Holzdchter mention the removal of acoustic noise from a microphone signal using a second microphone signal" (see the remarks page 16 last paragraph).

The examiner responds that "the removal of acoustic noise from a microphone signal using a second microphone signal" is not claimed, and thus moot.

Applicant argued that Holzdchter simply lacks any teaching or suggestion regarding the use of mechanical or EM sensors to detect skin vibration due to user speech as is in the claims.

The examiner disagrees. Holzrichter teaches a mechanical sensor (such as, motion sensor) in contact with the skin ((see figs 3a-3b(29,30,33) and 93 in fig. 20) and col.14 line 46-col. 15 line 18).

Applicant argued that Holzrichter does not contain or suggest claimed elements in any of the claims. For example:

1. Holzriehter only uses a single microphone that is assumed to be noise free; while the claims include least two microphones that are assumed to be noisy;

2. Holzriehter does not calculate transfer functions between microphones (as in the claimed invention), but only Fourier transforms of clean acoustic data and "EM signals";

3. Holzriehter does not detect skin vibrations due to user speech; and

4. Holzriehter does not use a voice activity detection (VAD) signal to determine when to update the transfer functions between the microphones.

The examiner disagrees. Holzrichter teaches a single microphone and couple of the EM sensors to pick the signal and noise; and used the Fourier transforms to reduce the noise (see col. 60 line19-30 and see the discussion above claim 1).

Conclusion

12. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. The prior art made of record and not relied upon is considered to applicant's disclosure. Burnett (US 2003/0228023) is recited to show other related the voice activity detector (VAD)- based multiple-microphone acoustic noise suppression.

14. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Facsimile responses should be faxed to:
(571) 273-8300
Hand-delivered responses should be brought to:
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lao,Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chin Vivian, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao,Lun-See L.S.
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501
Date 10-15-2007

VIVIAN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

10/15/07

Notice of References Cited	Application/Control No. 10/667,207	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner Lun-See Lao	Art Unit 2615	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0228023	12-2003	Burnett et al.	381/92
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	Lao, Lun-See	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.7, 70, 94.1, 71.8, 91-92, 122	10-02-2007	L.S.
704	200,231, 233, 214-215, 246		

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	10-02-2007	L.S.

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/667,207	BURNETT ET AL.
Examiner	**Art Unit**
Lun-See Lao	2615

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Claim		2/1/07	10/15/07	Claim		Claim	
Final	Original			Final	Original	Final	Original
	1	V	V				
	2	V	V				
	3	V	V				
	4	V	V				
	5	V	V				
	6	V	V				
	7	V	V				
	8	V	V				
	9	V	V				
	10	V	V				
	11	V	V				
	12	V	V				
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	37	V	V				
	38	V	V				
	39	V	V				
	40	V	V				
	41	V	V				
	42	V	V				
	43	V	V				
	44	V	V				
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	50						

PTO/SB/30 (01-08)
Approved for use through 01/31/2008 OMB 0651-0031
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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	10/667,207
Filing Date	September 18, 2003
First Named Inventor	Gregory C. Burnett
Art Unit	2615
Examiner Name	Lun S. Lao
Attorney Docket Number	ALPH.P010X

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☑ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☑ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 503616. I have enclosed a duplicate copy of this sheet.

      i. ☐ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii ☑ Other any underpayments in this application

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☑ Payment by credit card

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature	/Richard L. Gregory/	Date	4/17/2008
Name (Print/Type)	Richard L. Gregory, Jr.	Registration No.	42,607

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Signature	/Richard L. Gregory/		
Name (Print/Type)	Richard L. Gregory, Jr.	Date	4/17/2008

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/22 (01-08)
Approved for use through 01/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARMENT OF COMMERCE
Under the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless if displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) **FY 2008** ***(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)***	Docket Number (Optional) ALPH.P010X
Application Number 10/667,207	Filed September 18, 2003
For Voice Activity Detection (VAD) - Based Multiple-Microphone Acoustic Noise Suppression	
Art Unit 2615	Examiner Lun S. Lao

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$120	$60	$
☐ Two months (37 CFR 1.17(a)(2))	$460	$230	$
☑ Three months (37 CFR 1.17(a)(3))	$1050	$525	$ 1050
☐ Four months (37 CFR 1.17(a)(4))	$1640	$820	$
☐ Five months (37 CFR 1.17(a)(5))	$2230	$1115	$

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____. I have enclosed a duplicate copy of this sheet.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 42,607

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

R. Gregory
Signature

April 17, 2008
Date

Richard L. Gregory, Jr.
Typed or printed name

408-342-1900
Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Jerry Donnard
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	1253	1	1050	1050

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	810	810
		Total in USD ($)		**1860**

Electronic Acknowledgement Receipt	
EFS ID:	3172212
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Correspondence Address:	Shemwell Gregory & Courtney LLP Suite 201 4880 Stevens Creek Boulevard - San Jose CA 95129 US - -
Filer:	Richard L. Gregory/Jerry Donnard
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	17-APR-2008
Filing Date:	18-SEP-2003
Time Stamp:	22:05:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1860

RAM confirmation Number	4220
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		Office_Action_Response_ALPHP010X.pdf	1365283 666340d1d078a0ec9a6dbd6ea9629eba9a0abef8	yes	16

Multipart Description/PDF files in .zip description

Document Description	Start	End
Miscellaneous Incoming Letter	1	1
Amendment After Final	2	14
Request for Continued Examination (RCE)	15	15
Extension of Time	16	16

Warnings:

Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	8357 459504059ad65a946dc6968a8be31da45a763b6b	no	2

Warnings:

Information:

Total Files Size (in bytes):	1373640

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. ALPH.P010X | Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **USPTO EFS**

April 17, 2008
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Jerry Donnard
(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Response to Office Action Under 37 C.F.R. §1.111;
Request for Continued Examination;
Petition for Extension of Time;
Electronic payment of filing fee.

Atty. Docket No. ALPH.P010X *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	
Gregory C. Burnett, et al.	Examiner: Lun S. Lao Art Unit: 2615
Application No.: 10/667,207	
Filed: September 18, 2003	
For: VOICE ACTIVITY DETECTION (VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION UNDER 37 C.F.R. § 1.111

Sir:

This is in response to the Office action mailed October 17, 2007. Please enter and consider the following amendments and Remarks.

IN THE CLAIMS

1. (Currently amended) A method for removing noise from acoustic signals, comprising:

receiving ~~a plurality of~~ at least two acoustic signals~~, wherein receiving the plurality of acoustic signals includes receiving using a plurality of independently located microphones~~ using at least two acoustic microphones positioned in a plurality of locations;

receiving a voice activity signal that includes information on ~~the~~ vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating at least one ~~first~~ transfer function representative of ~~the plurality of acoustic signals upon determining that voicing information is absent from the plurality of acoustic signals for at least one specified period of time~~ a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent; and

removing acoustic noise from ~~the plurality of~~ at least one of the acoustic signals ~~using the first transfer function to produce at least one denoised acoustic data stream~~ by applying the transfer function to the acoustic signals and generating denoised acoustic signals.

2. (Currently amended) The method of claim 1, wherein removing noise further comprises:

generating at least one second transfer function representative of ~~the plurality of acoustic signals upon determining that voicing information is present in the plurality of acoustic signals for the at least one specified period of time~~ a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and

removing noise from the ~~plurality of~~ acoustic signals using at least one combination of the at least one ~~first~~ transfer function and the at least one second transfer

function to ~~produce at least one denoised acoustic data stream~~ generate the denoised acoustic signals.

3. (Currently amended) The method of claim 1, wherein the ~~plurality of~~ acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

Claims 4 and 5 (Canceled).

6. (Currently amended) The method of claim 1, wherein generating the at least one ~~first~~ transfer function comprises recalculating the at least one ~~first~~ transfer function during at least one prespecified interval.

7. (Original) The method of claim 2, wherein generating the at least one second transfer function comprises recalculating the at least one second transfer function during at least one prespecified interval.

8. (Currently amended) The method of claim 1, wherein generating the at least one ~~first~~ transfer function comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. (Currently amended) The method of claim 1, wherein information on the vibration of human tissue is provided by a ~~mechanical~~ sensor in contact with the skin.

10. (Original) The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

Meta Platforms, Inc. Exhibit 1013
Page 173 of 564

11. (Original) The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

12. (Currently amended) A method for removing noise from ~~electronic~~ acoustic signals, comprising:

~~detecting an absence of voiced information during at least one period, wherein detecting includes measuring the vibration of human tissue, wherein detecting the plurality of acoustic signals includes detecting using a plurality of independently located microphones;~~

~~receiving at least one noise source signal during the at least one period;~~

~~generating at least one transfer function representative of the at least one noise source signal;~~

~~receiving at least one composite signal comprising acoustic and acoustic noise signals; and~~

~~removing the noise signal from the at least one composite signal using the at least one transfer function to produce at least one denoised acoustic data stream~~

receiving two acoustic signals using two directional acoustic microphones positioned in two locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating at a transfer function representative of the ratio of energy of the acoustic signal received using the two acoustic microphones when the VAD indicates that user voicing activity is absent; and

removing acoustic noise from the acoustic signal of one of the microphones by applying the transfer function to the acoustic signal from that microphone and generating a denoised acoustic signal.

13. (Currently amended) The method of claim 12, wherein the at least one acoustic noise source signal includes at least one reflection of at least one associated acoustic noise source signal.

Claim 14 (Canceled).

15. (Original) The method of claim 12, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

16. (Currently amended) The method of claim 12, wherein detecting includes use of a ~~mechanical~~ sensor in contact with the human tissue.

17. (Previously amended) The method of claim 12, wherein detecting includes use of a sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

Claims 18-20 (Canceled).

21. (Currently amended) The method of claim 12, wherein generating ~~at least one~~ transfer function comprises recalculating the ~~at least one~~ transfer function during at least one prespecified interval.

22. (Currently amended) The method of claim 12, wherein generating the ~~at least one~~ transfer function comprises calculating the ~~at least one~~ transfer function using at least one technique selected from a group consisting of adaptive techniques and recursive ~~technidques~~ techniques.

Claims 23-25 (Canceled).

26. (Currently amended) A system for removing acoustic noise from the acoustic signals, comprising:

~~at least one processor~~ a receiver that receives at least ~~one~~ two acoustic ~~signal~~ signals via at least two acoustic microphones positioned in a plurality of locations;

at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;

~~at least one processor~~ a processor coupled among the ~~at least one~~ receiver and the at least one sensor that generates a plurality of transfer functions, wherein ~~at least one~~ a first transfer function representative of ~~the at least one acoustic signal~~ a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones is generated in response to a determination that voicing ~~information~~ activity is absent from the ~~at least one~~ acoustic ~~signal~~ signals for ~~at least one specified~~ a period of time, wherein acoustic noise is removed from the ~~at least one~~ acoustic ~~signal~~ signals using the first transfer function to produce ~~at least one~~ a denoised acoustic data stream streams.

27. (Currently amended) The system of claim 26, wherein ~~at least one~~ a second transfer function representative of the ~~at least one~~ acoustic ~~signal~~ signals is generated in response to a determination that voicing ~~information~~ activity is present in the ~~at least one~~ acoustic ~~signal~~ signals for the ~~at least one specified~~ period of time, wherein acoustic noise is removed from the ~~at least one~~ acoustic ~~signal~~ signals using at least one combination of the ~~at least one~~ first transfer function and the ~~at least one~~ second transfer function to produce the ~~at least one~~ denoised acoustic data stream.

28. (Original) The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. (Original) The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

30. (Original) The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. (Currently amended) The system of claim 26, further comprising:

dividing acoustic data of the ~~at least one~~ acoustic ~~signal~~ signals into a plurality of subbands;

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using ~~the at least one first~~ a transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the ~~at least one~~ denoised acoustic data stream.

32. (Currently amended) The system of claim 26, wherein the ~~at least one~~ receiver includes a plurality of independently located microphones.

33. (Currently amended) A system for removing acoustic noise from acoustic signals, comprising ~~at least one~~ a processor coupled among ~~at least one microphone~~ two microphones and at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing activity of a user, wherein an absence of ~~voiced information~~ voicing activity is detected during ~~at least one~~ a period using the at least one voicing sensor, wherein at least one acoustic noise source signal is received during the ~~at least one~~ period using the ~~at least one microphone~~ two microphones, wherein the ~~at least one~~ processor generates ~~at least one~~ a transfer function representative of ~~the at least one noise source signal~~ a ratio of acoustic energy received by the two microphones during the period, wherein the ~~at least one microphone receives at least one~~ microphones receive composite ~~signal~~ signals comprising acoustic signals and acoustic noise signals, and the ~~at least one~~ processor removes the acoustic noise

signal from the ~~at least one~~ composite ~~signal~~ signals using the ~~at least one~~ transfer function to produce ~~at least one~~ a denoised acoustic data stream.

34. (Original) The system of claim 33, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

35. (Currently amended) A signal processing system coupled among ~~at least one~~ a user and ~~at least one~~ an electronic device, wherein the signal processing system includes ~~at least one~~ a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising ~~at least one~~ a processor coupled among ~~at least one~~ a receiver and at least one sensor, wherein the ~~at least one~~ receiver is coupled to receive ~~at least one~~ the acoustic ~~signal~~ signals via at least two microphones, wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user, wherein the ~~at least one~~ processor generates a plurality of transfer functions, wherein ~~at least one~~ a first transfer function representative of ~~the at least one acoustic signal~~ a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing ~~information~~ activity is absent from the ~~at least one~~ acoustic ~~signal~~ signals for ~~at least one~~ a specified period of time, wherein acoustic noise is removed from the ~~at least one~~ acoustic ~~signal~~ signals using the first transfer function to produce ~~at least one~~ a denoised acoustic data stream.

36. (Currently amended) The system of claim 35, wherein ~~at least one~~ a second transfer function representative of the ~~at least one~~ acoustic ~~signal~~ signals is generated in response to a determination that voicing ~~information~~ activity is present in the ~~at least one~~ acoustic ~~signal~~ signals for ~~at least one~~ a specified period of time, wherein acoustic noise is removed from the ~~at least one~~ acoustic ~~signal~~ signals using at least one combination of the ~~at least one~~ first transfer function and the ~~at least one~~ second transfer function to produce ~~at least one~~ a denoised acoustic data stream.

37. (Original) The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

38. (Original) The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

39. (Currently amended) A computer readable medium comprising executable instructions which, when executed in a processing system, remove acoustic noise from received acoustic signals by:

receiving at least ~~one~~ two acoustic ~~signal~~ signals;

receiving human tissue vibration information associated with human voicing activity of a user;

generating ~~at least one~~ a first transfer function representative of ~~the at least one acoustic signal~~ a ratio of energy of the acoustic signals upon determining that voicing ~~information~~ activity is absent from the at least ~~one~~ two acoustic ~~signal~~ signals for ~~at least one~~ a specified period of time; and

removing the acoustic noise from the at least ~~one~~ two acoustic ~~signal~~ signals using the ~~at least one~~ first transfer function to produce at least one denoised acoustic data stream.

40. (Currently amended) The medium of claim 39, wherein removing the acoustic noise from received acoustic signals further includes:

generating ~~at least one~~ a second transfer function representative of the at least ~~one~~ two acoustic ~~signal~~ signals upon determining that voicing ~~information~~ activity is present in the at least ~~one~~ two acoustic ~~signal~~ signals for ~~at least one~~ the specified period of time; and

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removing acoustic noise from the at least ~~one~~ two acoustic ~~signal~~ signals using at least one combination of the ~~at least one~~ first transfer function and the ~~at least one~~ second transfer function to produce the at least one denoised acoustic data stream.

41. (Original) The medium of claim 39, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claims 42-44 (Canceled).

45. (New) The method of claim 1, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

46. (New) The method of claim 12, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

REMARKS

Claims 1-44 are pending in the application. Claims 1-3, 6, 8, 9, 12, 13, 16, 21, 22, 26, 27, 31-33, 35, 36, 39, and 40 are amended herein. Claims 4, 5, 14, 18-20, 23-25, and 42-44 are canceled herein without prejudice. New claims 45 and 46 are added. Applicants respectfully request entry of the foregoing amendments and allowance of the application as amended.

Petition for extension of time

A petition for a three month extension of time under 37 C.F.R. § 1.136(a) is included herewith, as well as the fee under 37 C.F.R. § 1.117(a)(3).

Drawings

The drawings are objected to under 37 CFR 1.83(a). Applicants submit that the drawings currently show every feature of the invention specified in the claims. Applicants respectfully direct the examiner to the following figures and the corresponding description as support for the plurality of independently located microphones: Figure 1, element 10; Figure 2, elements 102 and 103; Figure 3, elements MIC 1 and MIC 2; Figure 4, elements MIC 1 and MIC 2. Applicants respectfully direct the examiner to the following figures and the corresponding description as support for detecting an absence of voiced information: Figure 2, element 204; Figure 5, element 506; Figure 8, element 816. Consequently, as the drawings currently show every feature of the invention specified in the claims, Applicants request withdrawal of this objection.

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Claim Objections

Claim 23 is objected to because of an informality. Claim 23 is canceled herein without prejudice, and Applicants therefore respectfully request withdrawal of this objection.

Rejections under 35 U.S.C. § 102

Applicants respectfully submit that the amendments presented herein overcome the rejection under 35 U.S.C. § 102(b) as being anticipated by Holzrichter (U.S. patent number 5,729,694, hereinafter "Holzrichter"). Applicants respectfully traverse the rejection.

Rejections under 35 U.S.C. § 103

Applicants respectfully submit that the amendments presented herein overcome the rejection of claims 1-25 and 32 under 35 U.S.C. § 103(a) as being unpatentable over Holzrichter (U.S. patent number 5,729,694, hereinafter "Holzrichter"). Applicants respectfully traverse the rejection.

Applicants respectfully submit that the amendments presented herein overcome the rejection of claim 31 under 35 U.S.C. § 103(a) as being unpatentable over Holzrichter (U.S. patent number 5,729,694, hereinafter "Holzrichter"), in view of Sugiyama (U.S. patent number 5,517,435, hereinafter "Sugiyama"). Applicants respectfully traverse the rejection.

CONCLUSION

In view of the foregoing amendments and Remarks, Applicants respectfully submit that any objections and rejections have been overcome, and the claims are now allowable. Prompt allowance of the application is earnestly solicited. Examiner Lao is respectfully requested telephone the undersigned to facilitate resolution of any issues prior to allowance of the application.

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

If there are any fees due and unpaid in this application, please charge our Deposit Account No. 503616 for these fees.

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: April 17, 2008

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Courtney Staniford & Gregory LLP
P.O. Box 9686
San Jose CA 95157

Attorney Docket No. ALPH.P010X

Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via

USPTO EFS

April 18, 2008
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Jerry Donnard

(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Power of Attorney to Prosecute Applications Before the USPTO;
Statement Under 37 CFR 3.73(b).

PTO/SB/96 (01-08)
Approved for use through 03/31/2008. OMB 0651-0031
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: AliphCom, Inc.

Application No./Patent No.: 10/667,207 Filed/Issue Date: September 18, 2003

Entitled: VOICE ACTIVITY DETECTION (VAD) - BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

AliphCom, Inc., a Corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☑ the assignee of the entire right, title, and interest; or

2. ☐ an assignee of less than the entire right, title and interest
(The extent (by percentage) of its ownership interest is_____ %)

in the patent application/patent identified above by virtue of either:

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 015117, Frame 0046, or for which a copy thereof is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From:_____ To:_____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From:_____ To:_____
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3. From:_____ To:_____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

_____	April 18, 2008
Signature	Date
Richard L. Gregory, Jr.	408-342-1900
Printed or Typed Name	Telephone Number
Attorney of Record	
Title	

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt

EFS ID:	3173758
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Correspondence Address:	Shemwell Gregory & Courtney LLP Suite 201 4880 Stevens Creek Boulevard - San Jose CA 95129 US - -
Filer:	Richard L. Gregory/Jerry Donnard
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	18-APR-2008
Filing Date:	18-SEP-2003
Time Stamp:	12:10:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		Power_of_Attorney_ALPHP010X.pdf	393662 a581fe52d8ecf488050d0830a49621cd0a04a33b	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Power of Attorney	2	2
	Assignee showing of ownership per 37 CFR 3.73(b).	3	3

Warnings:	
Information:	
Total Files Size (in bytes):	393662

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/80 (04-05)
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 53186

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 53186

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

AliphCom. Inc., 150 Executive Park Blvd, Suite 4550, San Francisco, CA 94134

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	6/14/2006
Name	Gregory C. Burnett	Telephone	650-276-0515
Title	Chief Technical Officer		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/667,207	09/18/2003	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	04/18/2008	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 34	Minus	** 44	= 0	X $25 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 6	Minus	***8	= 0	X $105 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/ANTHONY WILLIAMS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X

CONFIRMATION NO. 7159

53186
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

POA ACCEPTANCE LETTER

OC000000029603489

Date Mailed: 04/28/2008

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/18/2008.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/alwilliams/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X

CONFIRMATION NO. 7159

Shemwell Gregory & Courtney LLP
Suite 201
4880 Stevens Creek Boulevard
San Jose, CA 95129

POWER OF ATTORNEY NOTICE

OC000000029603417

Date Mailed: 04/28/2008

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/18/2008.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/alwilliams/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PLUS Search Results for S/N 10667207, Searched Tue Jul 01 07:32:27 EDT 2008

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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PLUS Search Results for S/N 10667207, Searched Thu Jul 03 08:57:38 EDT 2008

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

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EXAMINER	
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ART UNIT	PAPER NUMBER
2615	

NOTIFICATION DATE	DELIVERY MODE
07/09/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

BCOURTNEY@CSGIP.COM

Office Action Summary	Application No.	Applicant(s)	
	10/667,207	BURNETT ET AL.	
	Examiner	Art Unit	
	LUN-SEE LAO	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6-13,15-17,21,22,26-41,45 and 46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 6-13, 15-17, 21-22, 26-41 and 45-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is responsive to the amendment filed on 04-17-2008. Claims 1-3, 6, 8, 9, 12, 13, 16, 21, 22, 26, 27, 31-33, 35, 36, 39, and 40 are have been amended herein. Claims 4, 5, 14, 18-20, 23- 25, and 42-44 have canceled ; and claims 45 and 46 have been added. Claims 1-3, 6-13, 15-17, 21-22, 26-41 and 45-46 are pending.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04-17-2008 has been entered.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, generating at least one transfer function representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent; and removing acoustic

noise from at least one of the acoustic signals by applying the transfer function to the acoustic signals and generating denoised acoustics signals must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, a processor coupled among two microphones and at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing activity of a user,

wherein an absence of voiced information voicing activity is detected during a period using the at least one voicing sensor, wherein at least one acoustic noise source signal is received during the period using the two microphones, wherein the processor generates a transfer function representative of a ratio of acoustic energy received by the two microphones during the period, wherein the microphones receive composite signals comprising acoustic signals and acoustic noise signals, and the processor removes the acoustic noise must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 35 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 35 recited limitation "a signal processing system coupled among a user and an electronic device, wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive at the acoustic signals via at least two microphones, wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user, wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of the a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for one a specified period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data stream" However the specification does not clearly disclose how the processing of such

"wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of the a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for one a specified period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data stream" will be performed. It was not supported in the specification and any figures nor in any claim originary.

7. Claims 31 and 45-46 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 31 recited limitation " the system comprising: dividing acoustic data of the acoustic signals into a plurality of subbands; generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband; removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the denoised acoustic data stream" However the specification does not clearly disclose how the processing of such " generating a transfer function representative of the ratio of acoustic energies received in each microphone in each

subband" will be performed. It was not supported in the specification and any figures nor in any claim originary.

Consider claims 45-46, they are essentially similar to claim 31 and are rejected for the reason stated above apropos to claim 31.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 2, 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites "generating at least one second transfer function representative of the a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present", which is unclear to the examiner what is first transfer function referring to.

Consider claim 27 it is essentially similar to claim 2 and is rejected for the reason stated above apropos to claim 2.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-3, 6-13, 15-17, 21-22, 26-30 and 32-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al (US PAT. 5,473,702) in view of Holzrichter (US PAT. 5,729,694).

Consider claim 1 Yoshida teaches a method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones positioned in a plurality of locations(see fig.4 (1,2));

generating a voice activity detection (VAD) signal using the voice activity signal(see fig.4 (300), fig.5 (400)) and fig.8);

generating at least one transfer function representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones(1,2) when the VAD (see fig.8) indicates that user voicing activity is absent (see col. 11 line 50-col. 12 line 12); and

removing acoustic noise from at least one of the acoustic signals by applying the transfer function to the acoustic signals and generating denoised acoustics signals(see fig.1 and see col. 7 line 59-64 and col. 8 line 1-col. 9 line 67); but Yoshida does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Yoshida to produce more accurate speech coding.

Consider claims 2-3 Yoshida teaches removing noise further comprises: generating at least one second transfer function representative of the a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity(see fig.4 (300)) is present; and removing noise from the of acoustic signals using at least one combination of the at least one transfer function and the at least one second transfer function to generate the denoised acoustic signals (see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12); and the of acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal (see fig. 4 and see col. 7 line 59-64, col. 7 line 59-64).

Consider claims 6-8 Yoshida teaches the method wherein generating the at least one transfer function comprises recalculating the at least one transfer function during at least one prespecified interval (see fig. 4 and col. 8 line 1-col. 9 line 67); and wherein generating the at least one second transfer function comprises recalculating the at least one second transfer function during at least one prespecified interval(see fig. 4 and col. 8 line 1-col. 9 line 67); and wherein generating the at least one f-~ transfer function

comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques (see fig. 4 and col. 8 line 1-col. 9 line 67).

Consider claims 21-22, they are essentially similar to claims 7-8 and are rejected for the reason stated above apropos to claims 7-8.

Consider claims 9-11, Yoshida as modified by Holzrichter teaches that the method of information on the vibration of human tissue is provided by a sensor (in Holzrichter such as, motion sensor) in contact with the skin (in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(in Holzrichter see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claim 16, it is essentially similar to claim 9 and are rejected for the reason stated above apropos to claim 9.

Consider claim 17, it is essentially similar to claim 10 and are rejected for the reason stated above apropos to claim 10.

Consider claim 15 it is essentially similar to claim 11 and is rejected for the reason stated above apropos to claim 11.

Consider claim 12 Yoshida teaches a method for removing noise from acoustic signals, comprising:

receiving two acoustic signals using two directional acoustic microphones positioned in two locations(see fig.4 (1, 2));

generating a voice activity detection (VAD) signal using the voice activity signal(see fig.4 (300), fig.5 (400)) and fig.8);

generating at a transfer function representative of the ratio of energy of the acoustic signal received using the two acoustic microphones (1, 2) when the VAD (see fig.8) indicates that user voicing activity is absent(see col. 11 line 50-col. 12 line 12); and

removing acoustic noise from the acoustic signal of one of the microphones by applying the transfer function to the acoustic signal from that microphone and generating a denoised acoustic signal(see fig.4 and see col. 7 line 59-64 and col. 8 line 1-col. 9 line 67); but Yoshida does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Yoshida to produce more accurate speech coding.

Consider claim 13 Yoshida teaches the at least one acoustic noise source signal includes at least one reflection of at least one associated acoustic noise source signal (see fig. 4 and col. 8 line 1-col. 9 line 67).

Consider claim 26 Yoshida teaches a system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations (see fig.4 (1, 2));

at least one sensor that receives human tissue vibration information associated with human voicing activity of a user (see fig.4);

a processor (see fig. 4 (300)) coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein a first transfer function representative of the a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones (1,2) is generated in response to a determination that voicing is absent from the acoustic signals for a period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data stream streams (see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12); but Yoshida does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Yoshida to produce more accurate speech coding.

Consider claim 27 as base on 112 second paragraph problem state above, Yoshida teaches the system wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing information activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signal signals using at least one combination of the at least one first transfer function and the second transfer function to produce the denoised acoustic data stream(see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12).

Consider claim 28 Yoshida as modified by Holzrichter teaches that the sensor includes a mechanical sensor (such as, motion sensor) in contact with the skin (In Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18);

Consider claim 29 Yoshida as modified by Holzrichter teaches at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(in Holzrichter, see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18);

Consider claim 30 Yoshida as modified by Holzrichter teaches at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(In Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claims 34, 38 and 41, they are essentially similar to claim 30 and are rejected for the reason stated above apropos to claim 30.

Consider claim 32 Yoshida teaches the system wherein the receiver includes a plurality of independently located microphones(see fig.4).

Consider claim 33 Yoshida teaches a system for removing acoustic noise from acoustic signals, comprising a processor (see fig.4 (300, 20)) coupled among two microphones (1,2), wherein at least one acoustic noise source signal is received during the period using the two microphones (1,2), wherein the processor generates a transfer function representative of a ratio of acoustic energy received by the two microphones during the period, wherein the microphones receive composite signals comprising acoustic signals and acoustic noise signals, and the processor removes the acoustic noise(see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12); but Yoshida does not explicitly teach at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing activity of a user wherein an absence of voiced information voicing activity is detected during a period using the at least one voicing sensor.

However, Holzrichter teaches at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing activity of a user, wherein an absence of voiced information voicing activity is detected during a period using the at least one voicing sensor (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Yoshida to produce more accurate speech coding.

Consider claim 35 as base on 112 first paragraph problem state above, Yoshida teaches a signal processing system coupled among a user and an electronic device(see fig.4), wherein the signal processing system (20,300) includes a denoising subsystem (20) for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor(300) coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive at the acoustic signals via at least two microphones, wherein the processor (300) generates a plurality of transfer functions, wherein a first transfer function representative of the a ratio of acoustic energy received by the two microphones (1,2) is generated in response to a determination that voicing activity is absent from the acoustic signals for one a specified period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data stream (see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12); but

Yoshida does not explicitly teach the at least one sensor detects human tissue vibration associated with human voicing activity of a user.

However, Holzrichter teaches the at least one sensor detects human tissue vibration associated with human voicing activity of a user (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Yoshida to produce more accurate speech coding.

Consider claim 36, Yoshida teaches the system, wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein acoustic noise is removed from the acoustic signal signals using at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream(see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12).

Consider claim 37, Yoshida as modified by Holzrichter teaches that the system of the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems (in Holzrichter, see col. 16 line 51-67).

Consider claim 39, Yoshida teaches a computer readable medium comprising executable instructions which, when executed in a processing system, remove acoustic noise from received acoustic signals by (see fig. 4):

receiving at least one two acoustic (see fig.4 (1,2));

generating a first transfer function representative of a ratio of energy of the acoustic signals upon determining that voicing activity is absent from the at least two acoustic signals for a specified period of time(300); and

removing the acoustic noise from the at least one two acoustic signals using the first transfer function to produce at least one denoised acoustic data stream (see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12); but Yoshida does not explicitly teach receiving human tissue vibration information associated with human voicing activity of a user.

However, Holzrichter teaches receiving human tissue vibration information associated with human voicing activity of a user (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Yoshida to produce more accurate speech coding.

Consider claim 40, Yoshida teaches removing the acoustic noise from received acoustic signals further includes:

generating a second transfer function representative of the at least one two acoustic signals upon determining that voicing activity is present in the at least two acoustic signals for the specified period of time; and removing acoustic noise from the at least two acoustic signals using at least one combination of the first transfer function and the second transfer function to produce the at least one denoised acoustic data stream

(see figs.4-5 and 8 and see col. 7 line 59-64, col. 7 line 59-64 and col. 8 line 1-col. 9 line 67, col. 11 line 50-col. 12 line 12).

12. Claims 31 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al (US PAT. 5,473,702) as modified by Holzrichter (US PAT. 5,729,694) as applied to claims 1, 12 and 26 above, and further in view of Cezanne et al. (US PAT. 5,473,701).

Consider claim 31, Yoshida as modified by Holzrichter does not explicitly teach the system further comprising: dividing acoustic data of the acoustic signals into a plurality of subbands; generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband; removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream.

However, Cezanne teaches the system further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands (see fig. 3, fig. 7);

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband(see abstract);

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream (see col. 5 line 35-col. 6 line 50 and col.7 line 46-col.8 line 23).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Cezanne into the teaching of Holizrichter and Yoshida to provide a desirable level of noise rejection, they may be of limited usefulness in situations where noise sources move in relation to the array.

Consider claims 45-46, they are essentially similar to claim 31 and are rejected for the reason stated above apropos to claim 31.

Response to Arguments

13. Applicant's arguments with respect to claim1-3, 6-13, 15-17, 21-22, 26-41 and 45-46 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. The prior art made of record and not relied upon is considered to applicant's disclosure. Park (US PAT. 5,590,241) is recited to show other related the voice activity detector (VAD) based multiple-microphone acoustic noise suppression.

15. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Facsimile responses should be faxed to:

(571) 273-8300
Hand-delivered responses should be brought to:
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lao,Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao,Lun-See
/LUN-SEE LAO/
Examiner, Art Unit 2615
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501
Date 07-05-2008

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2615

Notice of References Cited	Application/Control No. 10/667,207	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner LUN-SEE LAO	Art Unit 2615	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,473,702	12-1995	Yoshida et al.	381/94.7
*	B	US-5,590,241	12-1996	Park et al.	704/227
*	C	US-5,473,701	12-1995	Cezanne et al.	381/92
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008								
	1	✓								
	2	✓								
	3	✓								
	4	-								
	5	-								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
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	16	✓								
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	18	-								
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	25	-								
	26	✓								
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	30	✓								
	31	✓								
	32	✓								
	33	✓								
	34	✓								
	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	-								
	43	-								
	44	-								
	45	✓								
	46	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	Lao, Lun-See	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.7, 70, 94.1, 71.8, 91-92, 122	06-30-2008	L.S.
704	200,231, 233, 214-215, 246		

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	06-30-2008	L.S.

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/04 15:08
L2	9073458	"5,406,622" "5,463,694" US-5,205,285 US-6,668,062 B1 US-6,766,292 B1 US-2002/0165711 A1 US-2001/0028713 A1 US-5,625,684	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:18
L3	9073463	"5,406,622" "5,463,694" "5,205,285" US-6,668,062 B1 US-6,766,292 B1 US-2002/0165711 A1 US-2001/0028713 A1 US-5,625,684	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:18
L4	16	(("5,406,622") or ("5,463,694") or ("5,205,285") or ("6,668,062") or ("6,766,292") or ("20020165711") or ("20010028713") or ("5,625,684")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/04 15:19
L5	0	divid$3 same plurality same subband$1 same microphone$1 same noise same function	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:53
L6	4	divid$3 same plurality same subband$1 same microphone$1 same noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:53
L7	0	divid$3 same plurality same subband$1 same microphone$1 same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:57
L8	2	plurality same subband$1 same microphone$1 same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:57
L9	2	"5473701".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 16:39

S1	49	(("5867574") or ("6597787") or ("6904146") or ("20030206624") or ("20030228023") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060120537") or ("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6182035") or ("6415253") or ("6810273") or ("20040131178") or ("20050027520") or ("6081732") or ("6269093") or ("6707910") or ("6990194") or ("20040234067") or ("20040234069") or ("20060025994") or ("20020039425") or ("5602913") or ("5533133") or ("6104993") or ("5459814") or ("5649055") or ("6453285") or ("7020605") or ("20010014857") or ("20020035470") or ("20060053007") or ("6266410") or ("5689615") or ("5774849") or ("6188981") or ("6223154") or ("6223154") or ("6424942") or ("6807525") or ("6850617") or ("6959167") or ("20020103636")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:52
S2	11	(("2002039425") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,097,515") or ("5,515,865") or ("5,684,460") or ("5,729,694") or ("5,853,005") or ("6,069,963")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S3	19	(("5,212,764") or ("5,400,409") or ("5,414,776") or ("5,539,859") or ("5,633,935") or ("5,835,608") or ("5,917,921") or ("6,000,396") or ("6,191,724") or ("5,986,600") or ("5,966,090") or ("6,006,175") or ("5,406,622") or ("5,517,435") or ("5,649,055") or ("6,266,422") or ("6,430,295") or ("5,754,665") or ("5,473,702")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S4	8	((GREGORY) near2 (BURNETT)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/31 16:41
S5	3	(("5406622") or ("6006175") or ("5517435")).PN.	USPAT; USOCR	OR	OFF	2007/01/31 15:47
S6	1	("5729694").PN.	USPAT; USOCR	OR	OFF	2007/01/31 16:41
S7	1	("5729694").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/01 11:05
S8	51	"5729694" and noise	USPAT	OR	ON	2007/02/01 11:06
S9	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/01 14:13
S10	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/02 10:04
S11	0	(((381/94.7or381/70or381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:53
S12	579	(((381/94.7 or 381/70 or 381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S13	1052	(((381/71.8 or 381/91-92 or 381/122).ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55

S14	579	(((381/94.7 or 381/70 or 381/94.1).ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S15	579	((381/94.7 or 381/70 or 381/94.1).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S16	1052	((381/71.8 or 381/91-92 or 381/122).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S17	2028	((704/200 or 704/231 or 704/233).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:56
S18	1046	((704/214-215 or 704/246).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:59
S19	1	(removing or cancel$4) adj noise same plurality same (acoustic or sound speech$4 or audio) same (human adj tissue) same (human adj voicing adj activity) same transfer adj function	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:05
S20	2	((removing or cancel$4) adj noise) and plurality and (acoustic or sound speech$4 or audio) and (human adj tissue) and (human adj voicing adj activity) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
S21	2	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
S22	13	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:13
S23	21	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S24	0	S15 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S25	0	S16 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S26	0	S17 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S27	0	S18 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S28	53	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human near2 tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S29	0	S15 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S30	0	S16 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:16
S31	1	S17 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17

S32	0	S18 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17
S33	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/01 10:03
S34	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:03
S35	5	(("5,353,376") or ("5,473,702") or ("5,590,241") or ("6,795,713") or ("6,980,092")).PN. or (2003/0044025).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:11
S36	6	(("5,353,376") or ("5,473,702") or ("5,590,241") or ("20030044025") or ("6,795,713") or ("6,980,092")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:11
S37	15	(("20020394") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,729,694") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,097,515")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:23

S38	15	(("200200394") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,729,694") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,097,515")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:23
S39	5	(remov$4 or cancel$4) same noise same microphone$1 same ((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:33
S40	0	S39 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:33
S41	5438	(remov$4 or cancel$4) same noise same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:33
S42	10	((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:34
S43	0	S41 and S42 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:34
S44	1	S42 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:34
S45	13	(remov$4 or cancel$4) and noise and microphone$1 and ((voice adj activity adj detection) or (VAD)) and denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:36
S46	0	S45 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:36
S47	6782	((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:41
S48	60	(remov$4 or cancel$4) same noise same microphone$1 same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:41
S49	9	S48 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:42
S50	5	(remov$4 or cancel$4) same noise same microphones same ((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:53
S51	0	S50 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:53
S52	60	(remov$4 or cancel$4) same noise same microphones same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:55

S53	9	S52 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:55
S54	40	(two adj microphone$1) same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 13:01
S55	7	S54 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 13:01
S56	69	(two same microphone$1) same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:13
S57	159	(two same microphone$1) and ((voice adj activity adj detection) or (VAD)) and noise and ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:14
S58	11	(two same microphone$1) same((voice adj activity adj detection) or (VAD)) same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:15
S59	3	S58 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:15
S60	11	(two same microphones) same((voice adj activity adj detection) or (VAD)) same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:17
S61	3	S60 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:18
S62	17	S56 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:19
S63	29	S57 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:22
S64	19	(("5473702") or ("5754665") or ("5937070") or ("5953380") or ("6023514") or ("5835608") or ("5699436") or ("5452361") or ("6320968") or ("5473684") or ("5625684") or ("5381273") or ("6041126") or ("4658426") or ("4589137") or ("5208786") or ("6529606") or ("5208864") or ("5046103")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/03 08:56
S65	30	("4672674" | "4908855" | "4912767" | "5121426" | "5131047" | "5148471" | "5201006" | "5239578" | "5251263" | "5319736" | "5323458" | "5335276" | "5343521" | "5381473" | "5406622" | "5444786" | "5452361" | "5471538" | "5473702" | "5481615" | "5493616" | "5526421").PN. OR ("5625684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:05
S66	10	"5625684"	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:57

S67	30	("4672674" | "4908855" | "4912767" | "5121426" | "5131047" | "5148471" | "5201006" | "5239578" | "5251263" | "5319736" | "5323458" | "5335276" | "5343521" | "5381473" | "5406622" | "5444786" | "5452361" | "5471538" | "5473702" | "5481615" | "5493616" | "5526421").PN. OR ("5625684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:58
S68	35	("4625083" | "4677676" | "4912767" | "4932063" | "5033082" | "5046103").PN. OR ("5319736").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:59
S69	2	("5406622").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/03 12:04
S70	8	(("5353376") or ("20030044025") or ("6795713") or ("6980092")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/03 12:13

7/4/2008 5:07:44 PM
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Atty. Docket No. ALPH.P010X *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	
Gregory C. Burnett, et al.	Examiner: Lun S. Lao Art Unit: 2615
Application No.: 10/667,207	
Filed: September 18, 2003	
For: VOICE ACTIVITY DETECTION (VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION UNDER 37 C.F.R. § 1.111

Sir:

This is in response to the Office action mailed July 9, 2008. Please enter and consider the following amendments and Remarks.

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IN THE CLAIMS

1. (Currently amended) A method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones positioned in a plurality of locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating at least ~~one transfer function~~ two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent; and

removing acoustic noise from at least one of the acoustic signals by applying at least one of the at least two transfer ~~function~~ functions to the acoustic signals and generating denoised acoustic signals.

2. (Currently amended) The method of claim 1, wherein removing noise further comprises:

generating ~~at least~~ one ~~second~~ transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and

removing noise from the acoustic signals using at least one combination of the at least ~~one transfer function~~ two transfer functions ~~and the at least one second transfer function~~ to generate the denoised acoustic signals.

3. (Previously presented) The method of claim 1, wherein the acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

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Claims 4 and 5 (Canceled).

6. (Currently amended) The method of claim 1, wherein generating the at least ~~one transfer function~~ two transfer functions comprises recalculating the at least ~~one transfer function~~ two transfer functions during at least one prespecified interval.

Claim 7 (Canceled).

8. (Currently amended) The method of claim 1, wherein generating the at least ~~one transfer function~~ two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided by a sensor in contact with the skin.

10. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

11. (Previously presented) The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

12. (Currently amended) A method for removing noise from acoustic signals, comprising:

receiving two acoustic signals using two directional acoustic microphones positioned in two locations;

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receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating ~~at a transfer function~~ at least two transfer functions representative of the ratio of energy of the acoustic signal received using the two acoustic microphones when the VAD indicates that user voicing activity is absent; and

removing acoustic noise from the acoustic signal of one of the microphones by applying at least one of the at least two transfer ~~function~~ functions to the acoustic signal from that microphone and generating a denoised acoustic signal.

13. (Previously presented) The method of claim 12, wherein the at least one acoustic noise source signal includes at least one reflection of at least one associated acoustic noise source signal.

Claim 14 (Canceled).

15. (Previously presented) The method of claim 12, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

16. (Previously presented) The method of claim 12, wherein detecting includes use of a sensor in contact with the human tissue.

17. (Previously presented) The method of claim 12, wherein detecting includes use of a sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

Claims 18-20 (Canceled).

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21. (Currently amended) The method of claim 12, wherein generating ~~transfer function~~ the at least two transfer functions comprises recalculating the transfer ~~function~~ functions during at least one prespecified interval.

22. (Currently amended) The method of claim 12, wherein generating the ~~transfer function~~ at least two transfer functions comprises calculating the transfer ~~function~~ functions using at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

Claims 23-25 (Canceled).

26. (Currently amended) A system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations;

at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;

a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein ~~acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data stream streams~~ the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using one of the first

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transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

Claim 27 (Canceled).

28. (Previously presented) The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. (Previously presented) The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

30. (Previously presented) The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. (Previously presented) The system of claim 26, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the denoised acoustic data stream.

32. (Previously presented) The system of claim 26, wherein the receiver includes a plurality of independently located microphones.

Claims 33 and 34 (Canceled).

35. (Currently amended) A signal processing system coupled among a user and an electronic device, wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones, wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user, wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein ~~acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data streama~~ second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein acoustic noise is removed from the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream.

Claim 36 (Canceled).

37. (Previously presented) The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

38. (Previously presented) The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

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39. (Currently amended) A computer readable medium comprising executable instructions which, when executed in a processing system, remove acoustic noise from received acoustic signals by:

receiving at least two acoustic signals;

receiving human tissue vibration information associated with human voicing activity of a user;

generating a first transfer function representative of a ratio of energy of the acoustic signals upon determining that voicing activity is absent from the at least two acoustic signals for a specified period of time; ~~and~~

~~removing the acoustic noise from the at least two acoustic signals using the first transfer function to produce at least one denoised acoustic data stream~~

generating a second transfer function representative of the at least two acoustic signals upon determining that voicing activity is present in the at least two acoustic signals for the specified period of time; and

removing the acoustic noise from the at least two acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the at least one denoised acoustic data stream.

Claim 40 (Canceled).

41. (Previously presented) The medium of claim 39, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claims 42-44 (Canceled).

45. (Previously presented) The method of claim 1, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

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removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

46. (Previously presented) The method of claim 12, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

47. (New) The method of claim 1, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

48. (New) The method of claim 12, wherein the two directional acoustic microphones comprise microphones that selectively attenuate the acoustic signals based on the direction of arrival.

49. (New) The system of claim 26, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the

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direction of arrival.

REMARKS

Claims 1-46 are pending in the application. Claims 1, 2, 6, 8, 12, 21, 22, 26, 35, and 39 are amended herein. Claims 4, 5, 7, 14, 18-20, 23-25, 27, 33, 34, 36, 40, and 42-44 are canceled without prejudice. New claims 47-49 are added. Applicants respectfully request entry of the foregoing amendments and allowance of the application as amended.

Petition for extension of time

A petition for a three (3) month extension of time under 37 C.F.R. § 1.136(a) is included herewith, as well as the fee under 37 C.F.R. § 1.117(a)(3).

Drawings

The drawings are objected to under 37 CFR 1.83(a). The Office Action states, at page 2-3, that generating at least one transfer function representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphone of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, and removing acoustic noise from at least one of the acoustic signals by applying the transfer function to the acoustic signals and generating denoised acoustic signals must be shown of the features canceled from the claims. Applicants submit that the drawings currently show every feature of the invention specified in the claims. Applicants respectfully direct the examiner to the following figures and the corresponding description as support for the plurality of independently located microphones: Figure 2, elements $H_1(z)$, $H_2(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0022-0025; Figure 3, elements $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0026-0047; Figure 4, elements $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0048-0056. Consequently, as the drawings currently show every feature of the invention specified in the claims, Applicants request withdrawal of this objection.

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The drawings are objected to under 37 CFR 1.83(a). The Office Action states, at page 3-4, that a processor coupled among two microphones and at least one voicing sensor, wherein the at least one voicing sensor detects human tissue vibration associated with voicing activity of a user, wherein an absence of voiced information voicing activity is detected during a period using the at least one voicing sensor, wherein at least one acoustic noise source signal is received during the period using the two microphones, wherein the processor generates a transfer function representative of a ratio of acoustic energy received by the two microphones during the period, wherein the microphones receive composite signals comprising acoustic signals and acoustic noise signals, and the processor removes the acoustic noise must be shown of the features canceled from the claims. Applicants submit that the drawings currently show every feature of the invention specified in the claims. Applicants respectfully direct the examiner to the following figures and the corresponding description as support for the plurality of independently located microphones: Figure 1, elements 10, 20, 30, 40, along with paragraph 0021; Figure 2, elements 102, 103, 204, 205, $H_1(z)$, $H_2(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0022-0025; Figure 3, elements MIC 1, MIC 2, $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0026-0047; Figure 4, elements MIC 1, MIC 2, $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0048-0056. Consequently, as the drawings currently show every feature of the invention specified in the claims, Applicants request withdrawal of this objection.

Rejections under 35 U.S.C. § 112

Claim 35 is rejected under 35 U.S.C. §112 as failing to comply with the written description requirement. Applicants respectfully traverse the rejection.

The Office Action states at pages 5-6 that the specification does not clearly disclose how the processing will be performed such that the processor generates a plurality of transfer functions. Applicants submit that the specification and the drawings currently support every feature of the invention specified in the claims. Applicants respectfully direct the examiner to the following figures and the

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corresponding description as support for the plurality of independently located microphones: Figure 2, elements $H_1(z)$, $H_2(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0022-0025; Figure 3, elements $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0026-0047; Figure 4, elements $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0048-0056. Consequently, as the above-referenced portions of the specification and the drawings currently support every feature of the invention specified in the claims, Applicants request withdrawal of this rejection.

Claims 31, 45, and 46 are rejected under 35 U.S.C. §112 as failing to comply with the written description requirement. Applicants respectfully traverse the rejection.

The Office Action states at pages 5-6 that the specification does not clearly disclose how the processing will be performed such that the processor generates transfer functions. Applicants submit that the specification and the drawings currently support every feature of the invention specified in the claims. Applicants respectfully direct the examiner to the following figures and the corresponding description as support for the plurality of independently located microphones: Figure 2, elements $H_1(z)$, $H_2(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0022-0025; Figure 3, elements $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0026-0047; Figure 4, elements $H_0(z)$, $H_1(z)$, $H_2(z)$, $H_n(z)$, $G_1(z)$, $G_2(z)$, $G_n(z)$, $M_1(z)$, and $M_2(z)$, along with paragraphs 0048-0056. Consequently, as the above-referenced portions of the specification and the drawings currently support every feature of the invention specified in the claims, Applicants request withdrawal of this rejection.

Claims 2 and 27 are rejected under 35 U.S.C. §112 as failing to comply with the written description requirement. Applicants amend claims 2 and 27 herein and submit that the amendments herein overcome this rejection. Thus, Applicants request withdrawal of this rejection.

Rejections under 35 U.S.C. § 103

Claims 1-3, 6-13, 15-17, 21, 22, 26-30 and 32-41 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yoshida et al, United States (US) Patent Number 5,473,702 (Yoshida), in view of Holzrichter, US Patent Number 5,729,694 (Holzrichter). Applicants respectfully traverse the rejection.

Applicants respectfully submit that Yoshida discloses a system with two microphones in which microphone 1 is disposed relatively close to a voice source and picks up both voice input and background noise, which it provides as a primary audio signal. Microphone 2 is disposed relatively far from the voice source and picks up mainly noise, which it provides as a secondary audio signal. See Yoshida, column 3, lines 10-21.

Yoshida discloses an adaptive noise canceler that uses the secondary audio signal to cancel noise in the primary audio signal. In so doing, the secondary audio signal is filtered according to a set of coefficients to generate an estimated noise signal, which is subtracted from the primary audio signal to generate an error signal. The error signal becomes an audio output signal. See Yoshida, column 1, lines 43-49, and column 3, lines 22-56.

More specifically, the adaptive filter estimates a single transfer function that equalizes the primary digital input signal (generated by sampling the primary audio signal) and the secondary digital input signal (generated by sampling the secondary audio signal) and convolves this transfer function with the secondary digital input signal to generate an estimated noise signal (emphasis added). This estimated noise signal is subtracted from the primary audio signal to generate the error signal, and the error signal becomes the audio output signal. See Yoshida, column 3, lines 57-67.

While Yoshida fails to teach the use of two or more transfer functions to generate denoised acoustic signals, Applicants also fail to find any teaching in Holzrichter of the use of two or more transfer functions to generate denoised acoustic signals. Instead of a transfer function, Holzrichter generates a Fourier Transform, which is a measure of the frequency content of a signal. In order to generate a transfer function, two signals (an input and output) are needed. Holzrichter teaches the use of a

single signal and simply transforms the single signal into the frequency domain, which is completely different from, and exclusive of, taking two signals and generating a transfer function. Even the quoted passage in Holzrichter at column 28, lines 38-48 does not discuss time frames – it is simply a discussion of how Holzrichter thinks the end of a speech period should be calculated when a voiced to unvoiced transition takes place. Therefore, Holzrichter does not disclose the use of two or more transfer functions to generate denoised acoustic signals.

Applicants agree with the Examiner's statement (Office Action mailed July 9, 2008, page 8) that Yoshida does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user. Furthermore, in contrast to claim 1 of the present application as amended herein, and as described above, Applicants submit that Yoshida in view of Holzrichter does not disclose generating at least-two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent. Moreover, as Yoshida does not disclose generating at least two transfer functions, Yoshida does not disclose removing acoustic noise from at least one of the acoustic signals by applying at least one of the at least two transfer functions to the acoustic signals and generating denoised acoustic signals. For at least these reasons, Applicants respectfully submit that amended claim 1 is patentable over Yoshida in view of Holzrichter.

As claims 2, 3, 6, 8-11, 45, and 47 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is patentable over Yoshida in view of Holzrichter, Applicants submit that claims 2, 3, 6, 8-11, 45, and 47 are patentable over Yoshida in view of Holzrichter.

In contrast to claim 12 of the present application as amended herein, and as described above, Applicants submit that Yoshida in view of Holzrichter does not disclose generating at least two transfer functions representative of the ratio of energy of the acoustic signal received using the two acoustic microphones when the VAD indicates that user voicing activity is absent. Moreover, as Yoshida does not disclose

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generating at least two transfer functions, Yoshida does not disclose removing acoustic noise from the acoustic signal of one of the microphones by applying at least one of the at least two transfer functions to the acoustic signal from that microphone and generating a denoised acoustic signal. For at least these reasons, Applicants respectfully submit that amended claim 12 is patentable over Yoshida in view of Holzrichter.

As claims 13, 15-17, 21, 22, 46, and 48 depend from amended claim 12 and include further limitations thereon, and since amended claim 12 is patentable over Yoshida in view of Holzrichter, Applicants submit that claims 13, 15-17, 21, 22, 46, and 48 are patentable over Yoshida in view of Holzrichter.

In contrast to claim 26 of the present application as amended herein, and as described above, Applicants submit that Yoshida in view of Holzrichter does not disclose a system comprising a processor coupled among a receiver and at least one sensor, the processor generating a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream. For at least these reasons, Applicants respectfully submit that amended claim 26 is patentable over Yoshida in view of Holzrichter.

As claims 27-32 and 49 depend from amended claim 26 and include further limitations thereon, and since amended claim 26 is patentable over Yoshida in view of Holzrichter, Applicants submit that claims 27-32 and 49 are patentable over Yoshida in view of Holzrichter.

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In contrast to claim 35 of the present application as amended herein, and as described above, Applicants submit that Yoshida in view of Holzrichter does not disclose a signal processing system comprising a denoising system, the denoising system comprising a processor coupled among a receiver and at least one sensor, wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function to produce a denoised acoustic data stream, wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein acoustic noise is removed from the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream. For at least these reasons, Applicants respectfully submit that amended claim 35 is patentable over Yoshida in view of Holzrichter.

As claims 37 and 38 depend from amended claim 35 and include further limitations thereon, and since amended claim 35 is patentable over Yoshida in view of Holzrichter, Applicants submit that claims 37 and 38 are patentable over Yoshida in view of Holzrichter.

In contrast to claim 39 of the present application as amended herein, and as described above, Applicants submit that Yoshida in view of Holzrichter does not disclose generating a first transfer function representative of a ratio of energy of the acoustic signals upon determining that voicing activity is absent from the at least two acoustic signals for a specified period of time, generating a second transfer function representative of the at least two acoustic signals upon determining that voicing activity is present in the at least two acoustic signals for the specified period of time, and removing the acoustic noise from the at least two acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the at least one denoised acoustic data stream. For

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at least these reasons, Applicants respectfully submit that amended claim 39 is patentable over Yoshida in view of Holzrichter.

As claim 41 depends from amended claim 39 and includes further limitations thereon, and since amended claim 39 is patentable over Yoshida in view of Holzrichter, Applicants submit that claim 41 is patentable over Yoshida in view of Holzrichter.

Claims 31, 45, and 46 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida as modified by Holzrichter, and Cezanne. Applicant respectfully submits that claims 31, 45, and 46 are not made unpatentable by the combined teachings of Yoshida, Holzrichter, and Cezanne.

Claim 31 depends from amended claim 26 and recites further limitation thereon. As described above with respect to amended claim 26, Yoshida fails to teach or suggest each and every element of amended claim 26, and therefore fails as an anticipatory reference. Moreover, Holzrichter does not provide a teaching or suggestion which would compensate for the deficiencies of Yoshida discussed in detail above. Additionally, Cezanne does not provide a teaching or suggestion which would compensate for the deficiencies of Yoshida or Holzrichter discussed in detail above. Since Holzrichter and Cezanne do not compensate for the deficient teachings of Yoshida, Yoshida, Holzrichter, and/or Cezanne alone and/or in combination do not make obvious the system as claimed in amended claim 26. For at least these reasons, Applicants respectfully submit that amended claim 31 is patentable over Yoshida in view of Holzrichter and Cezanne.

Claim 45 depends from amended claim 1 and recites further limitation thereon. As described above with respect to amended claim 1, Yoshida fails to teach or suggest each and every element of amended claim 1, and therefore fails as an anticipatory reference. Moreover, Holzrichter does not provide a teaching or suggestion which would compensate for the deficiencies of Yoshida discussed in detail above. Additionally, Cezanne does not provide a teaching or suggestion which would compensate for the deficiencies of Yoshida or Holzrichter discussed in detail above. Since Holzrichter and Cezanne do not compensate for the deficient teachings of Yoshida, Yoshida, Holzrichter, and/or Cezanne alone and/or in combination do not

make obvious the method as claimed in amended claim 1. For at least these reasons, Applicants respectfully submit that amended claim 45 is patentable over Yoshida in view of Holzrichter and Cezanne.

Claim 46 depends from amended claim 12 and recites further limitation thereon. As described above with respect to amended claim 12, Yoshida fails to teach or suggest each and every element of amended claim 12, and therefore fails as an anticipatory reference. Moreover, Holzrichter does not provide a teaching or suggestion which would compensate for the deficiencies of Yoshida discussed in detail above. Additionally, Cezanne does not provide a teaching or suggestion which would compensate for the deficiencies of Yoshida or Holzrichter discussed in detail above. Since Holzrichter and Cezanne do not compensate for the deficient teachings of Yoshida, Yoshida, Holzrichter, and/or Cezanne alone and/or in combination do not make obvious the method as claimed in amended claim 12. For at least these reasons, Applicants respectfully submit that amended claim 46 is patentable over Yoshida in view of Holzrichter and Cezanne.

Conclusion

In view of the foregoing amendments and Remarks, Applicants respectfully submit that all objections and rejections have been overcome, and the claims are now allowable. Prompt allowance of the application is earnestly solicited. Examiner Lao is respectfully requested telephone the undersigned to facilitate resolution of any issues prior to allowance of the application.

Meta Platforms, Inc. Exhibit 1013
Page 244 of 564

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

If there are any fees due and unpaid in this application, please charge Deposit Account No. 503616 for these fees (Attorney Docket No. ALPH.P010X).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: January 9, 2009

Richard L. Gregory, Jr., Reg. No. 42,607
Tel. 408-342-1900
Fax. 408-342-1909

Courtney Staniford & Gregory LLP
P.O. Box 9686
San Jose CA 95157

PTO/SB/22 (10-08)
Approved for use through 10/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARMENT OF COMMERCE
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) **FY 2009** ***(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)***	Docket Number (Optional) ALPH.P010X
Application Number 10/667,207	Filed September 18, 2003
For Voice Activity Detection (VAD)-Based Multiple-Microphone Acoustic Noise Suppression	
Art Unit 2615	Examiner Lun S. Lao

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$130	$65	$
☐	Two months (37 CFR 1.17(a)(2))	$490	$245	$
☑	Three months (37 CFR 1.17(a)(3))	$1110	$555	$ 1110
☐	Four months (37 CFR 1.17(a)(4))	$1730	$865	$
☐	Five months (37 CFR 1.17(a)(5))	$2350	$1175	$

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96)

☑ attorney or agent of record. Registration Number 42,607

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

R. Gregory

Signature — January 9, 2009 (Date)

Richard L. Gregory, Jr. (Typed or printed name) — 408-342-1900 (Telephone Number)

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Jerry Donnard
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	1253	1	1110	1110

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**1110**

Electronic Acknowledgement Receipt

EFS ID:	4590701
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	53186
Filer:	Richard L. Gregory/Jerry Donnard
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	09-JAN-2009
Filing Date:	18-SEP-2003
Time Stamp:	20:37:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1110
RAM confirmation Number	4822
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		Amendment_Response_ALPHP010X.pdf	1882802 145c4b6b3945e172a2acd750e3df0426d903e1e6	yes	22

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Miscellaneous Incoming Letter	1	1
Amendment/Req. Reconsideration-After Non-Final Reject	2	21
Extension of Time	22	22

Warnings:

Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	30408 455922907fa1f4044d2cb4a7c6dac0227e1e9a9d	no	2

Warnings:

Information:

Total Files Size (in bytes):	1913210

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. ALPH.P010X

Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via

USPTO EFS

January 9, 2009
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Jerry Donnard
(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Amendment and Response Under 37 C.F.R. §1.111;
Petition for Extension of Time;
Electronic payment of filing fees.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/667,207	09/18/2003	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	01/09/2009	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 44	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 5	Minus	***6	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/ANTHONY WILLIAMS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PLUS Search Results for S/N 10667207, Searched Mon Mar 09 08:52:21 EDT 2009

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

53186 7590 03/11/2009
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

EXAMINER	
LAO, LUN S	
ART UNIT	PAPER NUMBER
2614	
MAIL DATE	DELIVERY MODE
03/11/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/667,207	BURNETT ET AL.	
	Examiner	Art Unit	
	LUN-SEE LAO	2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6,8-13,15-17,21,22,26,28-32,35,37-39,41 and 45-49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6,8-13,15-17,21,22,26,28-32,35,37-39,41 and 45-49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is responsive to the amendment filed on 01-09-2009. Claims 1, 2, 6, 8, 12, 21, 22, 26, 35, and 39 have been amended herein. Claims 4, 5, 7, 14, 18-20, 23-25, 27, 33, 34, 36, 40, and 42-44 have canceled ; and claims 47-49 have been added. Claims 1-3, 6, 8-13, 15-17, 21-22, 26, 28-32, 35, 37-39, 41 and 45-49 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 6, 8-13, 15-17, 21-22, 26, 28-30, 32, 35, 37-39 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) in view of Holzrichter (US PAT. 5,729,694).

Consider claim 1 Silverberg teaches a method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones(see fig.1 (10,11)) positioned in a plurality of locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal; generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones(10,11) of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent(17,18); and removing acoustic noise from at least one of the acoustic signals by applying at least one of the at least two transfer functions(12,13) to the acoustic signals and generating denoised acoustic signals (see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

Consider claims 2-3 Silverberg teaches removing noise further comprises: generating transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and removing noise from the acoustic signals using at least one

combination of the at least function two transfer functions and the at least one second transfer function to generate the denoised acoustic signals(see fig.1 and col. 2 line 15-68); and the of acoustic signals include at least one reflection inherently (because, the noise and desired signal bounds around the first and second microphone) of at least one associated noise source signal and at least one reflection of at least one acoustic source signal(see fig. 1 and col. 2 line 15-68).

Consider claims 6 and 8 Silverberg teaches generating the at least function two transfer functions comprises recalculating the at least one two transfer functions during at least one prespecified interval(see fig. 1 and col. 2 line 15-col. 3 line 24); and generating the at least function two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques(see fig. 1 and col. 2 line 15-col. 3 line 24).

Consider claims 21-22, they are essentially similar to claims 6 and 8 and are rejected for the reason stated above apropos to claims 6 and 8.

Consider claims 9-11, Silverberg as modified by Holzrichter teaches that the method of information on the vibration of human tissue is provided by a sensor (in Holzrichter such as, motion sensor) in contact with the skin (in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(in Holzrichter see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15

line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claim 16, it is essentially similar to claim 9 and are rejected for the reason stated above apropos to claim 9.

Consider claim 17, it is essentially similar to claim 10 and are rejected for the reason stated above apropos to claim 10.

Consider claim 15 it is essentially similar to claim 11 and is rejected for the reason stated above apropos to claim 11.

Consider claim 12 Silverberg teaches a method for removing noise from acoustic signals, comprising:

receiving two acoustic signals using two directional acoustic microphones positioned in two locations(see fig.1 (10, 11));

generating a voice activity detection (VAD) signal using the voice activity signal(17,18);

generating at least two transfer functions(13, 13) representative of the ratio of energy of the acoustic signal received using the two acoustic microphones(10, 11) when the VAD indicates that user voicing activity is absent; and removing acoustic noise from the acoustic signal of one of the microphones by applying at least one of the at least two transfer functions to the acoustic signal from that microphone and generating a denoised acoustic signal(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg

does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

Consider claim 13 Silverberg teaches the at least one acoustic noise source signal includes at least one reflection inherently (because, the noise and desired signal bounds around the first and second microphone) of at least one associated acoustic noise source signal(see fig. 1 and col. 2 line 15-68).

Consider claim 26 Silverberg teaches a system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations (see fig.1 (10, 11));

a processor coupled among the receiver (see fig.1 and col. 3 line 39) and the at least one sensor that generates a plurality of transfer functions(12,13), wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones(10,11) of the at least two acoustic microphones (10,11), wherein the first transfer function is generated in response to a determination that voicing activity is absent from the

acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

Consider claim 28 Silverberg as modified by Holzrichter teaches that the sensor includes a mechanical sensor (such as, motion sensor) in contact with the skin (In Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18);

Consider claim 29 Silverberg as modified by Holzrichter teaches at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency

(R.F) vibration detector, and a laser vibration detector(in Holzrichter, see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18);

Consider claim 30 Silverberg as modified by Holzrichter teaches at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(In Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claims 38 and 41, they are essentially similar to claim 30 and are rejected for the reason stated above apropos to claim 30.

Consider claim 32 Silverberg teaches the system wherein the receiver includes a plurality of independently located microphones(see fig.1 (10,11)).

Consider claim 35 Silverberg teaches a signal processing system coupled among a user and an electronic device (see fig.1), wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor(see fig.1 and col. 3 line 3-9) coupled among a receiver (10,11)and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones(10,11), wherein the processor generates a plurality of transfer functions(12,13), wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones(10,11) is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein acoustic noise is removed from

the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach the at least one sensor detects human tissue vibration associated with human voicing activity of a user.

However, Holzrichter teaches the at least one sensor detects human tissue vibration associated with human voicing activity of a user (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

Consider claim 37, Silverberg as modified by Holzrichter teaches that the system of the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems (in Holzrichter, see col. 16 line 51-67).

Consider claim 39, Silverberg teaches a computer readable medium comprising executable instructions which, when executed in a processing system, remove acoustic noise from received acoustic signals by (see figs. 1-2 and col. 3 line 3-9):

receiving at least one two acoustic (see fig.1 (10, 11));

generating a first transfer function(12) representative of a ratio of energy of the acoustic signals upon determining that voicing activity is absent from the at least two acoustic signals for a specified period of time; and

generating a second transfer function(13) representative of the at least two acoustic signals upon determining that voicing activity is present in the at least two acoustic signals for the specified period of time; and

removing the acoustic noise from the at least two acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the at least one denoised acoustic data stream (see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving human tissue vibration information associated with human voicing activity of a user.

However, Holzrichter teaches receiving human tissue vibration information associated with human voicing activity of a user (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

4. Claims 31 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) as modified by Holzrichter (US PAT. 5,729,694) as applied to claims 1, 12 and 26 above, and further in view of Cezanne et al. (US PAT. 5,473,701).

Consider claim 31, Silverberg as modified by Holzrichter does not explicitly teach

the system further comprising: dividing acoustic data of the acoustic signals into a plurality of subbands; generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband; removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream.

However, Cezanne teaches the system further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands (see fig. 3, fig. 7);

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband(see abstract);

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream (see col. 5 line 35-col. 6 line 50 and col.7 line 46-col.8 line 23).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Cezanne into the teaching of Holizrichter and Silverberg to provide a desirable level of noise rejection, they may be of limited usefulness in situations where noise sources move in relation to the array.

Consider claims 45-46, they are essentially similar to claim 31 and are rejected for the reason stated above apropos to claim 31.

5. Claims 47-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) as modified by Holzrichter (US PAT. 5,729,694) as applied to claims 1, 12 and 26 above, and further in view of Bradley et al. (US PAT. 5,463,694).

Consider claim 47, Silverberg as modified by Holzrichter does not explicitly teach the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

However, Bradley teaches the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival (see figs. 1-4 and col. 3 line 33-col. 4 line 68).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the unidirectional microphone array of Bradley in the invention of Silverberg.

The motivation for doing so would have been to reduce the size and complexity of the microphone system of Silverberg as taught by Bradley (co1.2 In.48-52).

Consider claims 48 and 49, they are essentially similar to claim 47and are rejected for the reason stated above apropos to claim 47.

Response to Arguments

6. Applicant's arguments with respect to claims 1-3, 6, 8-13, 15-17, 21-22, 26, 28-32, 35, 37-39, 41 and 46 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. The prior art made of record and not relied upon is considered to applicant's disclosure. Valve et al. (US PAT. 6,707,910) is recited to show other related the voice activity detector (VAD) based multiple-microphone acoustic noise suppression.

9. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Facsimile responses should be faxed to:
(571) 273-8300

Hand-delivered responses should be brought to:
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lao,Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao,Lun-See
/LUN-SEE LAO/
Examiner, Art Unit 2614
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501
Date 03-06-2009

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/667,207	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner LUN-SEE LAO	Art Unit 2614	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,406,622	04-1995	Silverberg et al.	381/94.7
*	B	US-5,463,694	10-1995	Bradley et al.	381/92
*	C	US-6,707,910	03-2004	Valve et al.	379/388.06
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	-	-							
	5	-	-							
	6	✓	✓							
	7	✓	-							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	-	-							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	-	-							
	19	-	-							
	20	-	-							
	21	✓	✓							
	22	✓	✓							
	23	-	-							
	24	-	-							
	25	-	-							
	26	✓	✓							
	27	✓	-							
	28	✓	✓							
	29	✓	✓							
	30	✓	✓							
	31	✓	✓							
	32	✓	✓							
	33	✓	-							
	34	✓	-							
	35	✓	✓							
	36	✓	-							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009							
	37	✓	✓							
	38	✓	✓							
	39	✓	✓							
	40	✓	-							
	41	✓	✓							
	42	-	-							
	43	-	-							
	44	-	-							
	45	✓	✓							
	46	✓	✓							
	47		✓							
	48		✓							
	49		✓							
	50									

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	Lao, Lun-See	2614

SEARCHED			
Class	Subclass	Date	Examiner
381	94.7, 70, 94.1, 71.8, 91-92, 122	03-06-2009	L.S.
704	200,231, 233, 214-215, 246		

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	03-06-2009	L.S.
CHECK 101	03-06-2009	L.S.

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	49	(("5867574") or ("6597787") or ("6904146") or ("20030206624") or ("20030228023") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060120537") or ("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6182035") or ("6415253") or ("6810273") or ("20040131178") or ("20050027520") or ("6081732") or ("6269093") or ("6707910") or ("6990194") or ("20040234067") or ("20040234069") or ("20060025994") or ("20020039425") or ("5602913") or ("5533133") or ("6104993") or ("5459814") or ("5649055") or ("6453285") or ("7020605") or ("20010014857") or ("20020035470") or ("20060053007") or ("6266410") or ("5689615") or ("5774849") or ("6188981") or ("6223154") or ("6223154") or ("6424942") or ("6807525") or ("6850617") or ("6959167") or ("20020103636")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:52
S2	11	(("2002039425") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,097,515") or ("5,515,865") or ("5,684,460") or ("5,729,694") or ("5,853,005") or ("6,069,963")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S3	19	(("5,212,764") or ("5,400,409") or ("5,414,776") or ("5,539,859") or ("5,633,935") or ("5,835,608") or ("5,917,921") or ("6,000,396") or ("6,191,724") or ("5,986,600") or ("5,966,090") or ("6,006,175") or ("5,406,622") or ("5,517,435") or ("5,649,055") or ("6,266,422") or ("6,430,295") or ("5,754,665") or ("5,473,702")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S4	8	((GREGORY) near2 (BURNETT)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/31 16:41
S5	3	(("5406622") or ("6006175") or ("5517435")).PN.	USPAT; USOCR	OR	OFF	2007/01/31 15:47
S6	1	("5729694").PN.	USPAT; USOCR	OR	OFF	2007/01/31 16:41
S7	1	("5729694").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/01 11:05
S8	51	"5729694" and noise	USPAT	OR	ON	2007/02/01 11:06
S9	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/01 14:13
S10	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/02 10:04
S11	0	(((381/94.7or381/70or381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:53

S12	579	(((381/94.7 or 381/70 or 381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S13	1052	(((381/71.8 or 381/91-92 or 381/122).ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S14	579	(((381/94.7 or 381/70 or 381/94.1).ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S15	579	((381/94.7 or 381/70 or 381/94.1).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S16	1052	((381/71.8 or 381/91-92 or 381/122).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S17	2028	((704/200 or 704/231 or 704/233).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:56
S18	1046	((704/214-215 or 704/246).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:59
S19	1	(removing or cancel$4) adj noise same plurality same (acoustic or sound speech$4 or audio) same (human adj tissue) same (human adj voicing adj activity) same transfer adj function	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:05
S20	2	((removing or cancel$4) adj noise) and plurality and (acoustic or sound speech$4 or audio) and (human adj tissue) and (human adj voicing adj activity) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
S21	2	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
S22	13	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:13
S23	21	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S24	0	S15 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S25	0	S16 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S26	0	S17 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S27	0	S18 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S28	53	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human near2 tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S29	0	S15 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15

S30	0	S16 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:16
S31	1	S17 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17
S32	0	S18 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17
S33	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/01 10:03
S34	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:03
S35	5	(("5,353,376") or ("5,473,702") or ("5,590,241") or ("6,795,713") or ("6,980,092")).PN. or (2003/0044025).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:11
S36	6	(("5,353,376") or ("5,473,702") or ("5,590,241") or ("20030044025") or ("6,795,713") or ("6,980,092")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:11

S37	15	(("20020394") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,729,694") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,097,515")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:23
S38	15	(("200200394") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,729,694") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,097,515")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:23
S39	5	(remov$4 or cancel$4) same noise same microphone$1 same ((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:33
S40	0	S39 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:33
S41	5438	(remov$4 or cancel$4) same noise same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:33
S42	10	((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:34
S43	0	S41 and S42 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:34
S44	1	S42 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:34
S45	13	(remov$4 or cancel$4) and noise and microphone$1 and ((voice adj activity adj detection) or (VAD)) and denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:36
S46	0	S45 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:36
S47	6782	((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:41
S48	60	(remov$4 or cancel$4) same noise same microphone$1 same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:41
S49	9	S48 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:42
S50	5	(remov$4 or cancel$4) same noise same microphones same ((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:53

S51	0	S50 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:53
S52	60	(remov$4 or cancel$4) same noise same microphones same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:55
S53	9	S52 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:55
S54	40	(two adj microphone$1) same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 13:01
S55	7	S54 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 13:01
S56	69	(two same microphone$1) same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:13
S57	159	(two same microphone$1) and ((voice adj activity adj detection) or (VAD)) and noise and ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:14
S58	11	(two same microphone$1) same((voice adj activity adj detection) or (VAD)) same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:15
S59	3	S58 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:15
S60	11	(two same microphones) same((voice adj activity adj detection) or (VAD)) same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:17
S61	3	S60 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:18
S62	17	S56 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:19
S63	29	S57 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:22
S64	19	(("5473702") or ("5754665") or ("5937070") or ("5953380") or ("6023514") or ("5835608") or ("5699436") or ("5452361") or ("6320968") or ("5473684") or ("5625684") or ("5381273") or ("6041126") or ("4658426") or ("4589137") or ("5208786") or ("6529606") or ("5208864") or ("5046103")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/03 08:56
S65	30	("4672674" | "4908855" | "4912767" | "5121426" | "5131047" | "5148471" | "5201006" | "5239578" | "5251263" | "5319736" | "5323458" | "5335276" | "5343521" | "5381473" | "5406622" | "5444786" | "5452361" | "5471538" | "5473702" | "5481615" | "5493616" | "5526421").PN. OR ("5625684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:05

S66	10	"5625684"	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:57
S67	30	("4672674" | "4908855" | "4912767" | "5121426" | "5131047" | "5148471" | "5201006" | "5239578" | "5251263" | "5319736" | "5323458" | "5335276" | "5343521" | "5381473" | "5406622" | "5444786" | "5452361" | "5471538" | "5473702" | "5481615" | "5493616" | "5526421").PN. OR ("5625684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:58
S68	35	("4625083" | "4677676" | "4912767" | "4932063" | "5033082" | "5046103").PN. OR ("5319736").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:59
S69	2	("5406622").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/03 12:04
S70	8	(("5353376") or ("20030044025") or ("6795713") or ("6980092")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/03 12:13
S71	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/04 15:08
S72	9073458	"5,406,622" "5,463,694" US-5,205,285 US-6,668,062 B1 US-6,766,292 B1 US-2002/0165711 A1 US-2001/0028713 A1 US-5,625,684	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:18
S73	9073463	"5,406,622" "5,463,694" "5,205,285" US-6,668,062 B1 US-6,766,292 B1 US-2002/0165711 A1 US-2001/0028713 A1 US-5,625,684	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:18
S74	16	(("5,406,622") or ("5,463,694") or ("5,205,285") or ("6,668,062") or ("6,766,292") or ("20020165711") or ("20010028713") or ("5,625,684")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/04 15:19
S75	0	divid$3 same plurality same subband$1 same microphone$1 same noise same function	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:53
S76	4	divid$3 same plurality same subband$1 same microphone$1 same noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:53

S77	0	divid$3 same plurality same subband$1 same microphone$1 same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:57
S78	2	plurality same subband$1 same microphone$1 same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:57
S79	2	"5473701".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 16:39
S80	0	("denois$3").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2009/03/06 16:20
S81	1042	denois$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:21
S82	41	denois$3 same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:21
S83	0	S82 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2009/03/06 16:21
S84	2033	(nois$4 near (remov$4 or suppress$4)) same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:46
S85	3782	(nois$4 near (remov$4 or suppress$4 or cancel $4)) same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:47
S86	3782	((remov$4 or suppress$4 or cancel$4)near nois $4) same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:48
S87	7288	((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:49
S88	28	S86 and S87 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2009/03/06 16:50
S89	36	(("2002039425") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,097,515") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,729,694")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/03/06 17:18
S90	28	(("5,212,764") or ("5,400,409") or ("5,414,776") or ("5,539,859") or ("5,633,935") or ("5,835,608") or ("5,917,921") or ("6,000,396") or ("6,191,724") or ("5,986,600") or ("5,966,090") or ("6,006,175") or ("5,406,662") or ("5,517,435")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/03/06 17:22

S91	14	(("5205285") or ("5463694") or ("6766292") or ("6668062") or ("5625684") or ("20010028713") or ("20020165711")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/03/06 17:35

3/7/2009 4:14:52 PM
C:\Documents and Settings\llao1\My Documents\EAST\Workspaces\10667207.wsp

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (12-08)
Approved for use through 01/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	10/667,207	Filing Date	2003-09-18	Docket Number (if applicable)	ALPH.P010X	Art Unit	2614
First Named Inventor	Gregory C. Burnett			Examiner Name	Lun S. Lao		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 503616

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (12-08)
Approved for use through 01/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Richard L. Gregory, Jr./	Date (YYYY-MM-DD)	2009-09-11
Name	Richard L. Gregory, Jr.	Registration Number	42607

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	1253	1	1110	1110

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	810	810
		Total in USD ($)		**1920**

Electronic Acknowledgement Receipt

EFS ID:	6059865
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	53186
Filer:	Richard L. Gregory/Rob Rathbun
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	11-SEP-2009
Filing Date:	18-SEP-2003
Time Stamp:	18:03:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1920
RAM confirmation Number	4535
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		Amendment_Response_ALPHP010X.pdf	1241357 58910caa5d403790009b9ae0e2f6951586110263	yes	15

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Miscellaneous Incoming Letter	1	1
Amendment After Final	2	14
Extension of Time	15	15

Warnings:

Information:

2	Request for Continued Examination (RCE)	RCE_ALPHP010X.pdf	768907 fed87040b2389c551c5a5b2836ff7247cd9b81c1	no	3

Warnings:

Information:

3	Fee Worksheet (PTO-875)	fee-info.pdf	32309 b5da51072b42f634e843fc480dda73ad3f2173d9	no	2

Warnings:

Information:

Total Files Size (in bytes):	2042573

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. ALPH.P010X | Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **USPTO EFS**

September 11, 2009
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Rob Rathbun
(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Amendment and Response;
Petition for three months extension of time under 37 CFR § 1.136(a);
Request for Continued Examination;
Electronic payment of filing fees.

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	
Gregory C. Burnett, et al.	Examiner: Lun S. Lao Art Unit: 2614
Application No.: 10/667,207	
Filed: September 18, 2003	
For: VOICE ACTIVITY DETECTOR (VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Sir:

Applicant respectfully requests continued examination and consideration of the following amendments and remarks contained herein in response to the final Office Action mailed March 11, 2009. This response is accompanied by a Request for Continued Examination under 37 C.F.R. 1.114 and the required fee.

Please enter the following amendments to the claims and consider the following remarks addressing all points raised by the Office Action as follows.

AMENDMENTS

IN THE CLAIMS

Please amend the claims as follows.

1. (Currently amended) A method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones positioned in a plurality of locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function; and

removing acoustic noise from at least one of the acoustic signals by applying ~~at least one of the at least two transfer functions~~ the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

2. (Previously presented) The method of claim 1, wherein removing noise further comprises:

generating one transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and

removing noise from the acoustic signals using at least one combination of the at least two transfer functions to generate the denoised acoustic signals.

3. (Previously presented) The method of claim 1, wherein the acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

Claims 4 and 5 (Canceled).

6. (Previously presented) The method of claim 1, wherein generating the at least two transfer functions comprises recalculating the at least two transfer functions during at least one prespecified interval.

Claim 7 (Canceled).

8. (Previously presented) The method of claim 1, wherein generating the at least two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided by a sensor in contact with the skin.

10. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

11. (Previously presented) The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claim 12-25 (Canceled).

26. (Currently amended) A system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations;

at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;

a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using ~~one of~~ the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

Claim 27 (Canceled).

28. (Previously presented) The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. (Previously presented) The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

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30. (Previously presented) The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. (Previously presented) The system of claim 26, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the denoised acoustic data stream.

32. (Previously presented) The system of claim 26, wherein the receiver includes a plurality of independently located microphones.

Claims 33 and 34 (Canceled).

35. (Currently amended) A signal processing system coupled among a user and an electronic device, wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones, wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user, wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified

period of time, wherein acoustic noise is removed from the acoustic signals using ~~one of~~ the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream.

Claim 36 (Canceled).

37. (Previously presented) The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

38. (Previously presented) The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claim 39-44 (Canceled).

45. (Previously presented) The method of claim 1, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

Claim 46 (Canceled).

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47. (Previously presented) The method of claim 1, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

Claim 48 (Canceled).

49. (Previously presented) The system of claim 26, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

REMARKS

Claims 1-3, 6,8-13,15-17,21, 22, 26, 28-32, 35, 37-39, 41, and 45-49 are pending in the application. Claims 1, 26, and 35 are amended herein. Claims 12, 13, 15-17, 21, 22, 39, 41, 46, and 48 are canceled without prejudice. No new matter is added by virtue of the amendments herein. Applicant respectfully requests entry of the foregoing amendments and allowance of the application as amended.

Request for Continued Examination

This response is accompanied by a Request for Continued Examination under 37 C.F.R. 1.114 and the required fee.

Petition for extension of time

A petition for a three (3) month extension of time under 37 C.F.R. § 1.136(a) is included herewith, as well as the fee under 37 C.F.R. § 1.117(a)(3).

Rejections under 35 U.S.C. § 103

Claims 1-3, 6, 8-13, 15-17, 21, 22, 26, 28-30, 32, 35, 37-39 and 41 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg et al, United States (US) Patent Number 5,406,622 (Silverberg), in view of Holzrichter, US Patent Number 5,729,694 (Holzrichter). Claims 12, 13, 15-17, 21, 22, 39, and 41 are canceled without prejudice. Applicant respectfully traverses the rejection.

Applicant respectfully submits that Silverberg discloses an outbound noise cancellation circuit that consists of a transmit microphone and one or more noise-collecting reference microphones (column 2, lines 16-19). A first adaptive filter receives the output of a transmit microphone (column 2, lines 26-27). The output of the first adaptive filter is subtractively combined with the output of a reference microphone to provide an enhanced reference signal having little or no speech signal content (column 2, lines 27-33).

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A second adaptive filter receives the enhanced reference signal as an input (column 2, lines 34-35). The second adaptive filter produces an output which consists substantially of noise energy only, and the output of the second adaptive filter is a noise cancellation signal (column 2, lines 35-38). The noise cancellation signal is summed with the unprocessed output of the transmit microphone to provide an output signal in which the outbound noise has been removed (column 2, lines 21-25).

Each of the adaptive filters is active or not depending on the presence or absence of speech energy (column 3, lines 10-12). If speech energy is present, the weights of the first adaptive filter are allowed to update, but if speech is absent, the weights of the first adaptive filter are frozen at their last setting (column 3, lines 12-16). Further, if speech energy is absent, the weights of the second adaptive filter are allowed to update, but if speech is present, the weights of the first adaptive filter are frozen at their last setting (column 3, lines 16-20).

The Office Action states, at page 3, that Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user. Applicant agrees that Silverberg does not teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

Furthermore, Applicant respectfully submits Silverberg does not disclose removing acoustic noise from acoustic signals by <u>applying a first transfer function and at least one combination of the first transfer function and the second transfer function</u> to the acoustic signals and generating denoised acoustic signals (emphasis added). The Office Action states, at page 3, that the first and second adaptive filters described in Silverberg are analogous to the first and second transfer functions of the present invention. Assuming, arguendo, this analogy is correct to apply, Silverberg describes a circuit that receives an input signal from a microphone, processes the signal with a first adaptive filter (first transfer function) to produce an enhanced reference signal, and then subsequently processes the enhanced reference signal with a second adaptive filter (second transfer function) to produce a noise cancellation signal that is applied to the microphone signal to produce an output signal in which noise has been removed, as

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described above. Therefore, Applicant submits Silverberg is processing the input signal by applying a first transfer function and then applying a second transfer function.

As such, the circuit of Silverberg in which a first transfer function is applied to a signal followed by the application of a second transfer function stands in stark contrast to claim 1 as amended herein (emphasis added). Amended claim 1 claims removing acoustic noise from acoustic signals by applying a first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals (emphasis added). The application of a first transfer signal followed by application of a second transfer function (Silverberg) is different from and does not make unpatentable the application of a first transfer function and at least one combination of the first transfer function and the second transfer function, as claimed in amended claim 1.

While Silverberg fails to teach application of a first transfer function and at least one combination of the first transfer function and the second transfer function, Applicant also fails to find any teaching in Holzrichter of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Instead of a transfer function, Holzrichter generates a Fourier Transform, which is a measure of the frequency content of a signal. In order to generate a transfer function, two signals (an input and output) are needed. Holzrichter teaches the use of a single signal and simply transforms the single signal into the frequency domain, which is completely different from, and exclusive of, taking two signals and generating a transfer function.

Therefore, Holzrichter, like Silverberg, does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals and, as such, does not overcome the deficiencies of Silverberg in making claim 1 unpatentable. Consequently, the combination of Silverberg in view of Holzrichter fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first

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transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least these reasons, Applicant respectfully submits that amended claim 1 is patentable over Silverberg in view of Holzrichter.

As claims 2, 3, 6, 8-11, 45, and 47 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is patentable over Silverberg in view of Holzrichter, Applicant submits that claims 2, 3, 6, 8-11, 45, and 47 are patentable over Silverberg in view of Holzrichter.

Applicant submits that claim 26 is patentable over Silverberg in view of Holzrichter for the reasons stated above with reference to claim 1. As claims 28-32 and 49 depend from amended claim 26 and include further limitations thereon, and since amended claim 26 is patentable over Silverberg in view of Holzrichter, Applicant submits that claims 28-32 and 49 are patentable over Silverberg in view of Holzrichter.

Applicant submits that claim 35 is patentable over Silverberg in view of Holzrichter for the reasons stated above with reference to claim 1. As claims 37 and 38 depend from amended claim 35 and include further limitations thereon, and since amended claim 35 is patentable over Silverberg in view of Holzrichter, Applicant submits that claims 37 and 38 are patentable over Silverberg in view of Holzrichter.

Claims 31, 45 and 46 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg as modified by Holzrichter, and further in view of Cezanne et al., US Patent Number 5,473,701 (Cezanne). Claim 46 is canceled herein without prejudice. As described in detail above, the combination of Holzrichter and Silverberg does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant also fails to find any teaching in Cezanne of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Consequently, the combination of Silverberg, Holzrichter, and Cezanne fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one

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combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least this reason, Applicant respectfully submits that claims 31 and 45 are patentable over Silverberg in view of Holzrichter and Cezanne.

Claims 47-49 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg as modified by Holzrichter, and further in view of Bradley et al., US Patent Number 5,463,694 (Bradley). Claim 48 is canceled herein without prejudice. As described in detail above, the combination of Holzrichter and Silverberg does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant also fails to find any teaching in Bradley of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Consequently, the combination of Silverberg, Holzrichter, and Bradley fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least this reason, Applicant respectfully submits that claims 47 and 49 are patentable over Silverberg in view of Holzrichter and Bradley.

Conclusion

In view of the foregoing amendments and Remarks, Applicant respectfully submits that all objections and rejections have been overcome, and the claims are now allowable. Prompt allowance of the application is earnestly solicited. Examiner Lao is respectfully requested telephone the undersigned to facilitate resolution of any issues prior to allowance of the application.

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Authorization to Charge Deposit Account

If there are any fees due and unpaid in this application, please charge Deposit Account No. 503616 for these fees (Attorney Docket No. ALPH.P010X).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: September 11, 2009

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PTO/SB/22 (10-08)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) **FY 2009** *(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)*	Docket Number (Optional) ALPH.P010X
Application Number 10/667,207	Filed September 18, 2003
For Voice Activity Detector (VAD)-Based Multiple-Microphone Acoustic Noise Suppression	
Art Unit 2614	Examiner Lun S. Lao

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$130	$65	$
☐ Two months (37 CFR 1.17(a)(2))	$490	$245	$
☑ Three months (37 CFR 1.17(a)(3))	$1110	$555	$ 1110
☐ Four months (37 CFR 1.17(a)(4))	$1730	$865	$
☐ Five months (37 CFR 1.17(a)(5))	$2350	$1175	$

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 42,607

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

R. Gregory

Signature — September 11, 2009 (Date)

Richard L. Gregory, Jr. (Typed or printed name) — 408-342-1900 (Telephone Number)

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/667,207	09/18/2003	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	09/11/2009	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 31	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/JACQUELINE M. WEIR/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

53186 7590 12/24/2009
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Cupertino, CA 95014

EXAMINER	
LAO, LUN S	
ART UNIT	PAPER NUMBER
2614	
MAIL DATE	DELIVERY MODE
12/24/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/667,207	BURNETT ET AL.	
	Examiner	Art Unit	
	LUN-SEE LAO	2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6,8-11,26,28-32,35,37,38,45,47 and 49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 6, 8-11, 26, 28-32, 35, 37,38, 45, 47 and 49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is responsive to the amendment filed on 09-11-2009. Claims 1, 26 and 35 have been amended herein. Claims 4, 5, 7, 12-25, 27, 33, 34, 36, 39-44, 46 and 48 have canceled. Claims 1-3, 6, 8-11, 26, 28-32, 35, 37, 38, 45, 47 and 49 are pending.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09-11-2009 has been entered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in

the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 limitation recited "generating at least-two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function; and removing acoustic noise from at least one of the acoustic signals by applying at the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals". The specification does not support the highlighting limitation in the specification nor in any claim originary and in any figures presented.

5. Claims 26 and 35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 26 limitation recited "a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity

is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream". The specification does not support the highlighting limitation in the specification nor in any claim originary and in any figures presented. .

Consider claim 35, it is essentially similar to claim 26 and are rejected for the reason stated above apropos to claim 26.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37, 38 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT.5,406,622) in view of Holzrichter (US PAT. 5,729,694) and Hosoi (US PAT. 5,754,665).

Consider claim 1 as base on 112 first paragraph problem state above, Silverberg teaches a method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones(see fig.1 (10,11)) positioned in a plurality of locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal; generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones(10,11) of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent(17,18); and removing acoustic noise from at least one of the acoustic signals by applying at least one of the at least two transfer function to the acoustic signals and generating denoised acoustic signals (see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user; and the at least two transfer functions comprise a first transfer function and a second transfer function; and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals..

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

On the other hand, Hosoi teaches that the at least two transfer functions comprise a first transfer function (see fig.3 (11)) and a second transfer function (12); and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function(11) and at least one combination (15) of the first transfer function(11) and the second transfer function(12) to the acoustic signals and generating denoised acoustic signals (see fig.3 (col.2 line 40-col. 3 line 33).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Hosoi into Silverberg to produce more accurate to reducing the noise.

Consider claims 2-3 Silverberg teaches removing noise further comprises: generating transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and removing noise from the acoustic signals using at least one combination of the at least function two transfer functions and the at least one second transfer function to generate the denoised acoustic signals(see fig.1 and col. 2 line 15-68); and the of acoustic signals include at least one reflection inherently (because, the noise and desired signal bounds around the first and second microphone) of at least one associated noise source signal and at least one reflection of at least one acoustic source signal(see fig. 1 and col. 2 line 15-68).

Consider claims 6 and 8 Silverberg teaches generating the at least function two transfer functions comprises recalculating the at least one two transfer functions during at least one prespecified interval (see fig. 1 and col. 2 line 15-col. 3 line 24); and generating the at least function two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques (see fig. 1 and col. 2 line 15-col. 3 line 24).

Consider claims 9-11, Silverberg as modified by Holzrichter teaches that the method of information on the vibration of human tissue is provided by a sensor (in Holzrichter such as, motion sensor) in contact with the skin (in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(in Holzrichter see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest(in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claim 26, as base on 112 first paragraph problem state above, Silverberg teaches a system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations (see fig.1 (10, 11));

a processor coupled among the receiver (see fig.1 and col. 3 line 39) and the at least one sensor that generates a plurality of transfer functions(12,13), wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones(10,11) of the at least two acoustic microphones (10,11), wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using on of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user; and acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

On the other hand, Hosoi teaches that acoustic noise is removed from the acoustic signals using the first transfer function(11) and at least one combination(15) of the first transfer function(11) and the second transfer function(12) to produce the denoised acoustic data stream(see fig.3 (col.2 line 40-col. 3 line 33).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Hosoi into Silverberg to produce more accurate to reducing the noise.

Consider claim 28 Silverberg as modified by Holzrichter teaches that the sensor includes a mechanical sensor (such as, motion sensor) in contact with the skin (In Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18);

Consider claim 29 Silverberg as modified by Holzrichter teaches at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector (in Holzrichter, see figs 3a-3b (29, 30, 33) and see col. 14 line 46-col. 15 line 18);

Consider claim 30 Silverberg as modified by Holzrichter teaches at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest (In Holzrichter see figs 3a-3b (29, 30, 33)) and see col. 14 line 46-col. 15 line 18).

Consider claims 38 and 41, they are essentially similar to claim 30 and are rejected for the reason stated above apropos to claim 30.

Consider claim 32 Silverberg teaches the system wherein the receiver includes a plurality of independently located microphones (see fig.1 (10, 11)).

Consider claim 35, as base on 112 first paragraph problem state above, Silverberg teaches a signal processing system coupled among a user and an electronic device (see fig.1), wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor(see fig.1 and col. 3 line 3-9) coupled among a receiver (10,11)and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones(10,11), wherein the processor generates a plurality of transfer functions(12,13), wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones(10,11) is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein acoustic noise is removed from the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach the at least one sensor detects human tissue vibration associated with human voicing activity of a user; and acoustic noise is removed from

the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

However, Holzrichter teaches the at least one sensor detects human tissue vibration associated with human voicing activity of a user (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30)

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

On the other hand, Hosoi teaches that acoustic noise is removed from the acoustic signals using the first transfer function(11) and at least one combination(15) of the first transfer function(11) and the second transfer function(12) to produce the denoised acoustic data stream(see fig.3 (col.2 line 40-col. 3 line 33).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Hosoi into Silverberg to produce more accurate to reducing the noise.

Consider claim 37, Silverberg as modified by Holzrichter teaches that the system of the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems (in Holzrichter, see col. 16 line 51-67).

8. Claims 31 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) as modified by Holzrichter (US PAT. 5,729,694) and Hosoi (US PAT. 5,754,665) as applied to claims 1 and 26 above, and further in view of Cezanne et al. (US PAT. 5,473,701).

Consider claim 31, Silverberg as modified by Holzrichter does not explicitly teach the system further comprising: dividing acoustic data of the acoustic signals into a plurality of subbands; generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband; removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream.

However, Cezanne teaches the system further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands (see fig. 3, fig. 7);

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband (see abstract);

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream (see col. 5 line 35-col. 6 line 50 and col.7 line 46-col.8 line 23).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Cezanne into the teaching of

Holizrichter and Silverberg to provide a desirable level of noise rejection, they may be of limited usefulness in situations where noise sources move in relation to the array.

Consider claim 45 it is essentially similar to claim 31 and are rejected for the reason stated above apropos to claim 31.

9. Claims 47 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) as modified by Holzrichter (US PAT. 5,729,694) and Hosoi (US PAT. 5,754,665) as applied to claims 1 and 26 above, and further in view of Bradley et al. (US PAT. 5,463,694).

Consider claim 47, Silverberg as modified by Holzrichter and Hosoi does not explicitly teach the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

However, Bradley teaches the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival (see figs. 1-4 and col. 3 line 33-col. 4 line 68).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the unidirectional microphone array of Bradley in the invention of Silverberg.

The motivation for doing so would have been to reduce the size and complexity of the microphone system of Silverberg as taught by Bradley (co1.2 In.48-52).

Consider claim 49, it is essentially similar to claim 47and is rejected for the reason stated above apropos to claim 47.

Response to Arguments

10. Applicant's arguments with respect to claims 1-3, 6, 8-11, 26, 28-32, 35, 37, 38, 45, 47 and 49 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. The prior art made of record and not relied upon is considered to applicant's disclosure. Kanamori et al. (US PAT. 5,633,935) is recited to show other related the voice activity detector (VAD) based multiple-microphone acoustic noise suppression.

12. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Facsimile responses should be faxed to:
(571) 273-8300

Hand-delivered responses should be brought to:
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication or earlier communications from the examiner

should be directed to Lao,Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao,Lun-See
/LUN-SEE LAO/
Examiner, Art Unit 2614
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501
Date 12-11-2009

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/667,207	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner LUN-SEE LAO	Art Unit 2614	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,633,935	05-1997	Kanamori et al.	381/26
*	B	US-5,754,665	05-1998	Hosoi, Yoshiaki	381/94.1
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009	12/11/2009						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	-	-	-						
	5	-	-	-						
	6	✓	✓	✓						
	7	✓	-	-						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	-						
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	28	✓	✓	✓						
	29	✓	✓	✓						
	30	✓	✓	✓						
	31	✓	✓	✓						
	32	✓	✓	✓						
	33	✓	-	-						
	34	✓	-	-						
	35	✓	✓	✓						
	36	✓	-	-						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009	12/11/2009						
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	38	✓	✓	✓						
	39	✓	✓	-						
	40	✓	-	-						
	41	✓	✓	-						
	42	-	-	-						
	43	-	-	-						
	44	-	-	-						
	45	✓	✓	✓						
	46	✓	✓	-						
	47		✓	✓						
	48		✓	-						
	49		✓	✓						
	50									

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	Lao, Lun-See	2614

SEARCHED			
Class	Subclass	Date	Examiner
381	94.7, 70, 94.1, 71.8, 91-92, 122	12-10-2009	L.S.
704	200,231, 233, 214-215, 246	12-10-2009	L.S.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	12-10-2009	L.S.
CHECK 101	12-10-2009	L.S.
PING LEE (FOR 112 1ST REJECTION)	12-10-2009	L.S.

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	17	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2009/12/14 11:00
L2	800	(((381/94.7 or 381/70 or 381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2009/12/14 11:01
L3	1391	(((381/71.8 or 381/91-92 or 381/122).ccls.))	US-PGPUB; USPAT; USOCR; JPO; DERWENT	OR	ON	2009/12/14 11:02
L4	2848	((704/200 or 704/231 or 704/233).ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2009/12/14 11:02
L5	1454	((704/214-215 or 704/246).ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2009/12/14 11:02
L6	1454	((704/214-215 or 704/246).ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/12/14 11:02

L7	0	1 and 2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/12/14 11:02
L8	1	1 and 3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/12/14 11:03
L9	1	1 and 4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/12/14 11:03
L10	3	1 and 5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/12/14 11:03
L11	3	1 and 6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/12/14 11:03
S1	49	(("5867574") or ("6597787") or ("6904146") or ("20030206624") or ("20030228023") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060120537") or ("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6182035") or ("6415253") or ("6810273") or ("20040131178") or ("20050027520") or ("6081732") or ("6269093") or ("6707910") or ("6990194") or ("20040234067") or ("20040234069") or ("20060025994") or ("20020039425") or ("5602913") or ("5533133") or ("6104993") or ("5459814") or ("5649055") or ("6453285") or ("7020605") or ("20010014857") or	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:52

		("20020035470") or ("20060053007") or ("6266410") or ("5689615") or ("5774849") or ("6188981") or ("6223154") or ("6223154") or ("6424942") or ("6807525") or ("6850617") or ("6959167") or ("20020103636")).PN.				
S2	11	(("2002039425") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,097,515") or ("5,515,865") or ("5,684,460") or ("5,729,694") or ("5,853,005") or ("6,069,963")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S3	19	(("5,212,764") or ("5,400,409") or ("5,414,776") or ("5,539,859") or ("5,633,935") or ("5,835,608") or ("5,917,921") or ("6,000,396") or ("6,191,724") or ("5,986,600") or ("5,966,090") or ("6,006,175") or ("5,406,622") or ("5,517,435") or ("5,649,055") or ("6,266,422") or ("6,430,295") or ("5,754,665") or ("5,473,702")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/01/31 14:38
S4	8	((GREGORY) near2 (BURNETT)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2007/01/31 16:41
S5	3	(("5406622") or ("6006175") or ("5517435")).PN.	USPAT; USOCR	OR	OFF	2007/01/31 15:47
S6	1	("5729694").PN.	USPAT; USOCR	OR	OFF	2007/01/31 16:41
S7	1	("5729694").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/01 11:05
S8	51	"5729694" and noise	USPAT	OR	ON	2007/02/01 11:06
S9	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/01 14:13

S10	1	("20020198705").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/02/02 10:04
S11	0	(((381/94.7or381/70or381/94.1).ccls.)).CCLS.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2007/02/03 09:53
S12	579	(((381/94.7 or 381/70 or 381/94.1).ccls.)). CCLS.	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S13	1052	(((381/71.8 or 381/91-92 or 381/122).ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S14	579	(((381/94.7 or 381/70 or 381/94.1).ccls.))	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S15	579	((381/94.7 or 381/70 or 381/94.1).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S16	1052	((381/71.8 or 381/91-92 or 381/122).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:55
S17	2028	((704/200 or 704/231 or 704/233).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:56
S18	1046	((704/214-215 or 704/246).ccls.)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 09:59
S19	1	(removing or cancel$4) adj noise same plurality same (acoustic or sound speech$4 or audio) same (human adj tissue) same (human adj voicing adj activity) same transfer adj function	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:05

S20	2	((removing or cancel$4) adj noise) and plurality and (acoustic or sound speech$4 or audio) and (human adj tissue) and (human adj voicing adj activity) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
S21	2	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue) and (transfer adj function)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:12
S22	13	((removing or cancel$4) adj noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:13
S23	21	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human adj tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S24	0	S15 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S25	0	S16 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S26	0	S17 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S27	0	S18 and S23 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S28	53	((removing or cancel$4) near2 noise) and (acoustic or sound speech$4 or audio) and (human near2 tissue)	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15
S29	0	S15 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:15

S30	0	S16 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:16
S31	1	S17 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17
S32	0	S18 and S28 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2007/02/03 10:17
S33	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")). PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/01 10:03

S34	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:03
S35	5	(("5,353,376") or ("5,473,702") or ("5,590,241") or ("6,795,713") or ("6,980,092")).PN. or (2003/0044025).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:11
S36	6	(("5,353,376") or ("5,473,702") or ("5,590,241") or ("20030044025") or ("6,795,713") or ("6,980,092")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:11

S37	15	(("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,729,694") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,097,515")).PN. or (20/020394).APP.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:23
S38	15	(("200200394") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,729,694") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,097,515")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	OFF	2008/07/01 10:23
S39	5	(remov$4 or cancel$4) same noise same microphone$1 same ((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:33
S40	0	S39 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:33
S41	5438	(remov$4 or cancel$4) same noise same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:33
S42	10	((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:34
S43	0	S41 and S42 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:34

S44	1	S42 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:34
S45	13	(remov$4 or cancel$4) and noise and microphone$1 and ((voice adj activity adj detection) or (VAD)) and denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:36
S46	0	S45 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:36
S47	6782	((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:41
S48	60	(remov$4 or cancel$4) same noise same microphone$1 same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:41
S49	9	S48 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:42
S50	5	(remov$4 or cancel$4) same noise same microphones same ((voice adj activity adj detection) or (VAD)) same denoised	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:53
S51	0	S50 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:53
S52	60	(remov$4 or cancel$4) same noise same microphones same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 12:55

S53	9	S52 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 12:55
S54	40	(two adj microphone$1) same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/01 13:01
S55	7	S54 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/01 13:01
S56	69	(two same microphone$1) same ((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:13
S57	159	(two same microphone$1) and ((voice adj activity adj detection) or (VAD)) and noise and ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:14
S58	11	(two same microphone$1) same((voice adj activity adj detection) or (VAD)) same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:15
S59	3	S58 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:15
S60	11	(two same microphones) same((voice adj activity adj detection) or (VAD)) same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/02 17:17
S61	3	S60 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:18

S62	17	S56 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:19
S63	29	S57 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2008/07/02 17:22
S64	19	(("5473702") or ("5754665") or ("5937070") or ("5953380") or ("6023514") or ("5835608") or ("5699436") or ("5452361") or ("6320968") or ("5473684") or ("5625684") or ("5381273") or ("6041126") or ("4658426") or ("4589137") or ("5208786") or ("6529606") or ("5208864") or ("5046103")).PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/03 08:56
S65	30	("4672674" | "4908855" | "4912767" | "5121426" | "5131047" | "5148471" | "5201006" | "5239578" | "5251263" | "5319736" | "5323458" | "5335276" | "5343521" | "5381473" | "5406622" | "5444786" | "5452361" | "5471538" | "5473702" | "5481615" | "5493616" | "5526421").PN. OR ("5625684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:05
S66	10	"5625684"	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:57
S67	30	("4672674" | "4908855" | "4912767" | "5121426" | "5131047" | "5148471" | "5201006" | "5239578" | "5251263" | "5319736" | "5323458" | "5335276" | "5343521" | "5381473" | "5406622" | "5444786" | "5452361" | "5471538" | "5473702" | "5481615" | "5493616" | "5526421").PN. OR ("5625684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:58
S68	35	("4625083" | "4677676" | "4912767" | "4932063" | "5033082" | "5046103").PN. OR ("5319736").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/03 09:59

S69	2	("5406622").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/03 12:04
S70	8	(("5353376") or ("20030044025") or ("6795713") or ("6980092")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/03 12:13
S71	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20020039425") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285") or ("4881793") or ("5410632") or ("5794199") or ("5978760") or ("5991718") or ("6081732")). PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2008/07/04 15:08
S72	9073458	"5,406,622" "5,463,694" US-5,205,285 US-6,668,062 B1 US-6,766,292 B1 US-2002/0165711 A1 US-2001/0028713 A1 US-5,625,684	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:18

S73	9073463	"5,406,622" "5,463,694" "5,205,285" US-6,668,062 B1 US-6,766,292 B1 US-2002/0165711 A1 US-2001/0028713 A1 US-5,625,684	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:18
S74	16	(("5,406,622") or ("5,463,694") or ("5,205,285") or ("6,668,062") or ("6,766,292") or ("20020165711") or ("20010028713") or ("5,625,684")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2008/07/04 15:19
S75	0	divid$3 same plurality same subband$1 same microphone$1 same noise same function	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:53
S76	4	divid$3 same plurality same subband$1 same microphone$1 same noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:53
S77	0	divid$3 same plurality same subband$1 same microphone$1 same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:57
S78	2	plurality same subband$1 same microphone$1 same noise same ratio	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 15:57
S79	2	"5473701".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2008/07/04 16:39
S80	0	("denois$3").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2009/03/06 16:20

S81	1042	denois$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:21
S82	41	denois$3 same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:21
S83	0	S82 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2009/03/06 16:21
S84	2033	(nois$4 near (remov$4 or suppress$4)) same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:46
S85	3782	(nois$4 near (remov$4 or suppress$4 or cancel $4)) same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:47
S86	3782	((remov$4 or suppress$4 or cancel$4)near nois $4) same microphone$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:48
S87	7288	((voice adj activity adj detection) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2009/03/06 16:49
S88	28	S86 and S87 and @ay<="2000"	US-PGPUB; USPAT; USOCR; JPO	OR	ON	2009/03/06 16:50

S89	36	(("2002039425") or ("3,789,166") or ("4,006,318") or ("4,591,668") or ("4,901,354") or ("5,473,702") or ("5,515,865") or ("5,649,055") or ("5,684,460") or ("5,097,515") or ("5,754,665") or ("5,853,0O5") or ("6,069,963") or ("6,266,422") or ("6,430,295") or ("5,729,694")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/03/06 17:18
S90	28	(("5,212,764") or ("5,400,409") or ("5,414,776") or ("5,539,859") or ("5,633,935") or ("5,835,608") or ("5,917,921") or ("6,000,396") or ("6,191,724") or ("5,986,600") or ("5,966,090") or ("6,006,175") or ("5,406,662") or ("5,517,435")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/03/06 17:22
S91	14	(("5205285") or ("5463694") or ("6766292") or ("6668062") or ("5625684") or ("20010028713") or ("20020165711")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/03/06 17:35
S92	50	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("7454335") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20080317259") or ("20090010453") or ("5533133") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060069551") or ("20060120537") or ("20090003623") or	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2009/03/09 11:01

		("20090003624") or ("20090003625") or ("20090003626") or ("5706394") or ("5708754") or ("5781883") or ("5978761") or ("5963901") or ("20070147285")).PN.				
S93	1	("5406622").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2009/12/09 11:41
S94	1	("20030138119").PN.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2009/12/09 11:45
S95	19	((GREGORY) near2 (BURNETT)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/09 11:50
S96	36	("20020039425" | "3789166" | "4006318" | "4591668" | "4653102" | "4777649" | "4901354" | "5097515" | "5212764" | "5400409" | "5406622" | "5414776" | "5473702" | "5515865" | "5517435" | "5539859" | "5590241" | "5633935" | "5649055" | "5664052" | "5684460" | "5729694" | "5754665" | "5835608" | "5853005" | "5917921" | "5966090" | "5986600" | "6006175" | "6009396" | "6069963" | "6191724" | "6233551" | "6266422" | "6430295").PN. OR ("7246058").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/09 11:52
S97	6	(("5848146") or ("5631967") or ("4449238")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/12/09 12:15
S98	33	("3601530" | "3694578" | "3730995" | "3755625").PN. OR ("4449238").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/09 12:18

S99	3	("7146012").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/12/09 12:29
S100	14	("4536887" | "4696043" | "5058170" | "5208864" | "5323459" | "5353376" | "5602962" | "5610991" | "5657393" | "5774562" | "5872852" | "6137887" | "6774934").PN. OR ("7146012").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/09 12:32
S101	2	("4764689").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/12/09 14:53
S102	2	("6573787").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/12/09 15:01
S103	2	("7180366").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/12/09 15:12
S104	2	("6438364").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2009/12/09 16:14
S105	8	("5438693" | "6064327" | "6204654" | "6215291").PN. OR ("6438364").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/09 16:16

12/14/2009 11:04:26 AM
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Attorney Docket No. ALPH.P010X

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Lun LAO
Gregory C. Burnett, et al.	)	Art Unit: 2614
	)	
Application No.: 10/667,207	)	
	)	
Filed: September 18, 2003	)	
	)	
For: VOICE ACTIVITY DETECTOR (VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Sir:

Applicant respectfully requests continued examination and consideration of the following Remarks contained herein in response to the Office Action mailed December 24, 2009.

AMENDMENTS

IN THE CLAIMS

The claims stand as follows.

1. (Previously presented) A method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones positioned in a plurality of locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function; and

removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

2. (Previously presented) The method of claim 1, wherein removing noise further comprises:

generating one transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and

removing noise from the acoustic signals using at least one combination of the at least two transfer functions to generate the denoised acoustic signals.

3. (Previously presented) The method of claim 1, wherein the acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

Claims 4 and 5 (Canceled).

6. (Previously presented) The method of claim 1, wherein generating the at least two transfer functions comprises recalculating the at least two transfer functions during at least one prespecified interval.

Claim 7 (Canceled).

8. (Previously presented) The method of claim 1, wherein generating the at least two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided by a sensor in contact with the skin.

10. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

11. (Previously presented) The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claim 12-25 (Canceled).

26. (Previously presented) A system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations;

at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;

a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

Claim 27 (Canceled).

28. (Previously presented) The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. (Previously presented) The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

30. (Previously presented) The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. (Previously presented) The system of claim 26, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the denoised acoustic data stream.

32. (Previously presented) The system of claim 26, wherein the receiver includes a plurality of independently located microphones.

Claims 33 and 34 (Canceled).

35. (Previously presented) A signal processing system coupled among a user and an electronic device, wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones, wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user, wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a

specified period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream.

Claim 36 (Canceled).

37. (Previously presented) The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

38. (Previously presented) The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claim 39-44 (Canceled).

45. (Previously presented) The method of claim 1, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

Claim 46 (Canceled).

47. (Previously presented) The method of claim 1, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

Claim 48 (Canceled).

49. (Previously presented) The system of claim 26, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

REMARKS

Claims 1-3, 6, 8-11, 26, 28-32, 35, 37, 38, 45, 47, and 49 are pending in the application. No new matter is added by virtue of the Remarks herein. Applicant respectfully requests allowance of the application.

Petition for extension of time

A petition for a three (3) month extension of time under 37 C.F.R. §1.136(a) is included herewith, as well as the fee under 37 C.F.R. §1.117(a)(3).

Rejections under 35 U.S.C. §112

Claim 1 is rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. This rejection is directed at the following portion of claim 1 (underlining provided in Office Action, at page 3):

> "generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function; and
>
> removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals."

The Office Action states, at page 3, that none of the specification, any original claim, or the figures support the highlighted (underlined by the Examiner) limitations.

Applicant respectfully directs the Examiner to US Patent Application Publication number US 2004/0133421 A1, which corresponds to the present application. In particular, Applicant directs the Examiner to the material found in

paragraphs [0024]-[0057], along with Figures 2-5. These portions of the present application present a very detailed explanation directed specifically at the language rejected under 35 U.S.C. §112, first paragraph.

Given that such a large portion of the present application directly supports the language of claim 1, Applicant finds it hard to believe that the Examiner rejects this claim under 35 U.S.C. §112, first paragraph. Applicant is of the opinion that the Examiner either did not attempt to read any portion of the specification or, alternatively, that the Examiner does not understand the technology presented therein. Applicant suggests that in the future the Examiner at least read and understand the specification prior to submitting such an apparently absurd rejection.

Claims 26 and 35 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. The rejection of claim 26 is directed at the following portion of claim 26 (underlining provided in Office Action, at page 4):

> "a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein <u>acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream</u>."

The Office Action states, at page 4, that none of the specification, any original claim, or the figures support the highlighted (underlined by the Examiner) limitations. The

Office action further states, at page 4, that the language of claim 35 is "essentially similar" to that of claim 26 and is thus rejected for the same reasons as claim 26.

As stated above, Applicant respectfully directs the Examiner to US Patent Application Publication number US 2004/0133421 A1, and specifically the large amount of material found in paragraphs [0024]-[0057], along with Figures 2-5. These portions of the present application present a very detailed explanation directed specifically at the language begin rejected under 35 U.S.C. §112, first paragraph. Again, Applicant suggests the Examiner perform at least some minimal review of the specification prior to submitting such an apparently baseless rejection.

In view of the detailed support found in the specification specifically directed at the language of claims 1, 26, and 35, Applicant submits that claims 1, 26, and 35 do comply with the written description requirement and, as such, submits that the rejections be withdrawn.

Rejections under 35 U.S.C. §103

Claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37, 38 and 41 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg et al, United States (US) Patent Number 5,406,622 (Silverberg), in view of Holzrichter, US Patent Number 5,729,694 (Holzrichter), and Hosoi, US Patent Number 5,754,665 (Hosoi). Applicant respectfully traverses the rejection.

Applicant respectfully submits that Silverberg discloses an outbound noise cancellation circuit that consists of a transmit microphone and one or more noise-collecting reference microphones (column 2, lines 16-19). A first adaptive filter receives the output of a transmit microphone (column 2, lines 26-27). The output of the first adaptive filter is subtractively combined with the output of a reference microphone to provide an enhanced reference signal having little or no speech signal content (column 2, lines 27-33).

A second adaptive filter receives the enhanced reference signal as an input (column 2, lines 34-35). The second adaptive filter produces an output which consists substantially of noise energy only, and the output of the second adaptive filter is a

noise cancellation signal (column 2, lines 35-38). The noise cancellation signal is summed with the unprocessed output of the transmit microphone to provide an output signal in which the outbound noise has been removed (column 2, lines 21-25).

Each of the adaptive filters is active or not depending on the presence or absence of speech energy (column 3, lines 10-12). If speech energy is present, the weights of the first adaptive filter are allowed to update, but if speech is absent, the weights of the first adaptive filter are frozen at their last setting (column 3, lines 12-16). Further, if speech energy is absent, the weights of the second adaptive filter are allowed to update, but if speech is present, the weights of the first adaptive filter are frozen at their last setting (column 3, lines 16-20).

The Office Action states, at page 3, that Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user. Applicant agrees that Silverberg does not teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

The Office Action states, at page 3, that Silverberg does not explicitly teach at least two transfer functions that comprise a first transfer function and a second transfer function. Applicant agrees that Silverberg does not teach at least two transfer functions that comprise a first transfer function and a second transfer function.

The Office Action states, at page 3, that Silverberg does not explicitly teach removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant agrees that Silverberg does not teach removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

While Silverberg fails to teach at least two transfer functions that comprise a first transfer function and a second transfer function, Applicant also fails to find any teaching in Holzrichter of at least two transfer functions that comprise a first transfer

function and a second transfer function. Furthermore, while Silverberg fails to teach application of a first transfer function and at least one combination of the first transfer function and the second transfer function, Applicant also fails to find any teaching in Holzrichter of removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Instead of a transfer function, Holzrichter generates a Fourier Transform, which is a measure of the frequency content of a signal. In order to generate a transfer function, two signals (an input and output) are needed. Holzrichter teaches the use of a single signal and simply transforms the single signal into the frequency domain, which is completely different from, and exclusive of, taking two signals and generating a transfer function.

Therefore, Holzrichter, like Silverberg, does not disclose at least two transfer functions that comprise a first transfer function and a second transfer function and, as such, does not overcome the deficiencies of Silverberg in making claim 1 unpatentable. Consequently, the combination of Silverberg in view of Holzrichter fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least these reasons, Applicant respectfully submits that amended claim 1 is patentable over Silverberg in view of Holzrichter.

Considering that the combination of Silverberg and Holzrichter does not disclose at least two transfer functions that comprise a first transfer function and a second transfer function, and does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals, the Office Action asserts that Hosoi describes these elements missing from both Silverberg and Holzrichter. Specifically, the Office Action asserts, at page 6, that Hosoi teaches a first transfer function (Figure 3, element 11) and a second transfer function (Figure 3, element 12),

and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function (element 11) and at least one combination (element 15) of the first transfer function (element 11) and the second transfer function (element 12) to the acoustic signals and generating denoised acoustic signals. Applicant submits Hosoi does not teach at least two transfer functions that comprise a first transfer function and a second transfer function. Furthermore, Applicant submits Hosoi does not describe removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant's reasoning follows.

Applicant submits Hosoi describes a noise canceller comprising analog-to-digital (A/D) converters 11, 12 which convert signals 101, 102 from microphones 2, 3 to digital signals (column 2, lines 53-55). Hosoi describes that the noise canceller includes adder 16 and Finite Impulse Response (FIR) adaptive filter 14 which operate as a noise canceller when microphone 2 is used for speech and microphone 3 is used for noise (column 2, lines 55-58). Hosoi describes that the noise canceller includes adder 15 and FIR adaptive filter 13 which operate as a noise canceller when microphone 2 is used for noise and microphone 3 is used for speech (column 2, lines 58-60).

Regarding the noise cancellation, Hosoi describes that FIR adaptive filter 13 generates an estimated noise signal which is the estimated noise component contained in voice signal of microphone 3 based on the noise signal from microphone 2 (column 3, lines 6-9). Adder 15 outputs voice signal 104 in which noise is reduced by subtracting this estimated noise signal from the voice signal from microphone 3 (column 3, lines 9-12).

Applicant submits, that in contrast to claim 1, Hosoi does not describe at least two transfer functions that comprise a first transfer function and a second transfer function. In fact, Hosoi does not describe any transfer function. The component of Hosoi that the Examiner points to as being a first transfer function (see Office Action, page 6, "a first transfer function (see fig. 3 (11)") is in fact an analog-to-digital

converter (Hosoi, column 2, line 54, "A/D converters 11, 12 which convert signals 101, 102 from microphones 2, 3 to digital signals") (emphasis added). Likewise, the component of Hosoi that the Examiner points to as being a second transfer function (see Office Action, page 6, "a second transfer function (12)") is in fact also an analog-to-digital converter (Hosoi, column 2, line 54, "A/D converters 11, 12 which convert signals 101, 102 from microphones 2, 3 to digital signals") (emphasis added). Analog-to-digital converts are not transfer functions, and do not perform any function that is equivalent to a transfer function. Thus, Hosoi, like Silverberg and Holzrichter, does not describe at least two transfer functions that comprise a first transfer function and a second transfer function.

Applicant submits that, as Hosoi does not describe at least two transfer functions that comprise a first transfer function and a second transfer function, Hosoi does not describe removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. The component of Hosoi that the Examiner points to as describing this element of claim 1 is in fact an adder that, according to Hosoi, subtracts an estimated noise signal (output from the FIR adaptive filter 13) contained in the signal from microphone 2 from the voice signal of microphone 3. Therefore, as Hosoi describes an operation that adds two signals, where one signal is output from a FIR filter and the other signal is output from an analog-to-digital converter, Hosoi does not describe removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals (emphasis added).

For at least these reasons, Applicant respectfully submits that claim 1 is patentable over Silverberg in view of Holzrichter and Hosoi.

As claims 2, 3, 6, 8-11, 45, and 47 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is patentable over Silverberg in

view of Holzrichter and Hosoi, Applicant submits that claims 2, 3, 6, 8-11, 45, and 47 are patentable over Silverberg in view of Holzrichter and Hosoi.

Applicant submits that claim 26 is patentable over Silverberg in view of Holzrichter and Hosoi for the reasons stated above with reference to claim 1. As claims 28-30, 32 and 49 depend from amended claim 26 and include further limitations thereon, and since amended claim 26 is patentable over Silverberg in view of Holzrichter and Hosoi, Applicant submits that claims 28-30, 32 and 49 are patentable over Silverberg in view of Holzrichter and Hosoi.

Applicant submits that claim 35 is patentable over Silverberg in view of Holzrichter and Hosoi for the reasons stated above with reference to claim 1. As claims 37 and 38 depend from amended claim 35 and include further limitations thereon, and since amended claim 35 is patentable over Silverberg in view of Holzrichter and Hosoi, Applicant submits that claims 37 and 38 are patentable over Silverberg in view of Holzrichter and Hosoi.

Claims 31 and 45 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg as modified by Holzrichter and Hosoi, and further in view of Cezanne et al., US Patent Number 5,473,701 (Cezanne). As described in detail above, the combination of Holzrichter, Silverberg, and Hosoi does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant also fails to find any teaching in Cezanne of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Consequently, the combination of Silverberg, Holzrichter, Hosoi, and Cezanne fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least this reason, Applicant respectfully submits that claims 31 and 45 are patentable over Silverberg in view of Holzrichter, Hosoi, and Cezanne.

Claims 47 and 49 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg as modified by Holzrichter and Hosoi, and further in view of Bradley et al., US Patent Number 5,463,694 (Bradley). As described in detail above, the combination of Holzrichter, Silverberg, and Hosoi does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant also fails to find any teaching in Bradley of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Consequently, the combination of Silverberg, Holzrichter, Hosoi, and Bradley fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least this reason, Applicant respectfully submits that claims 47 and 49 are patentable over Silverberg in view of Holzrichter, Hosoi, and Bradley.

Conclusion

In view of the foregoing amendments and Remarks, Applicant respectfully submits that all rejections have been overcome, and the claims are now allowable. Prompt allowance of the application is earnestly solicited. Examiner LAO is respectfully requested telephone the undersigned to facilitate resolution of any issues prior to allowance of the application.

Authorization to Charge Deposit Account

If there are any fees due and unpaid in this application, please charge Deposit Account No. 503616 for these fees (Attorney Docket No. ALPH.P010X).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: June 24, 2010

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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) **FY 2009** ***(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)***	Docket Number (Optional) ALPH.P010X
Application Number 10/667,207	Filed September 18, 2003
For Voice Activity Detector (VAD)-Based Multiple-Microphone Acoustic Noise Suppression	
Art Unit 2614	Examiner Lun S. Lao

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$130	$65	$
☐	Two months (37 CFR 1.17(a)(2))	$490	$245	$
☑	Three months (37 CFR 1.17(a)(3))	$1110	$555	$ 1110
☐	Four months (37 CFR 1.17(a)(4))	$1730	$865	$
☐	Five months (37 CFR 1.17(a)(5))	$2350	$1175	$

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 42,607

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

/Richard L. Gregory, Jr./ — Signature
June 24, 2010 — Date

Richard L. Gregory, Jr. — Typed or printed name
408-342-1900 — Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	1253	1	1110	1110

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**1110**

Electronic Acknowledgement Receipt

EFS ID:	7887422
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	53186
Filer:	Richard L. Gregory/Rob Rathbun
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	24-JUN-2010
Filing Date:	18-SEP-2003
Time Stamp:	16:25:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1110
RAM confirmation Number	3933
Deposit Account	
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		Amendment_Response_ALPHP010X.pdf	2491400 f5ae0991fcb0670ed07aec8d414f8d5342cb6c72	yes	19

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Amendment/Req. Reconsideration-After Non-Final Reject	2	18
	Extension of Time	19	19

Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	30359 1e850f08928cdba77688107d0fa8460d4faf0b0b	no	2

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Information:

Total Files Size (in bytes):	2521759

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. ALPH.P010X

Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via

USPTO EFS

June 24, 2010
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Rob Rathbun

(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Amendment and Response;
Petition for three (3) months extension of time under 37 CFR § 1.136(a);
Electronic payment of filing fees.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/667,207	09/18/2003	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	06/24/2010	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 44	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 3	Minus	***6	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/TARA J. WITCHER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PLUS Search Results for S/N 10667207, Searched Mon Aug 23 11:04:39 EDT 2010

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

98195 7590 08/30/2010

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

EXAMINER	
LAO, LUN S	
ART UNIT	PAPER NUMBER
2614	
MAIL DATE	DELIVERY MODE
08/30/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/667,207	BURNETT ET AL.	
	Examiner	Art Unit	
	LUN-SEE LAO	2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 June 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6,8-11,26,28-32,35,37,38,45,47 and 49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6,8-11,26,28-32,35,37,38,45,47 and 49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is responsive to the remarks filed on 06-24-2010.

Claims 4, 5, 7, 12-25, 27, 33, 34, 36, 39-44, 46 and 48 have been canceled. Claims 1-3, 6, 8-11, 26, 28-32, 35, 37, 38, 45, 47 and 49 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37, 38 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT.5,406,622) in view of Holzrichter (US PAT. 5,729,694) and Hosoi (US PAT. 5,754,665).

Consider claim 1 Silverberg teaches a method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones (see fig.1 (10, 11)) positioned in a plurality of locations;

generating a voice activity detection (VAD) signal using the voice activity signal; generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones(10,11) of the at least two acoustic microphones when the VAD indicates that user voicing activity is

absent(17,18); and removing acoustic noise from at least one of the acoustic signals by applying at least one of the at least two transfer function to the acoustic signals and generating denoised acoustic signals (see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user; and the at least two transfer functions comprise a first transfer function and a second transfer function; and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals..

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and the at least two transfer functions comprise a first transfer function (see fig. 5(57)) and a second transfer function (56); and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function (57) and at least one combination (58) of the first transfer function (57) and the second transfer function (56) to the acoustic signals and generating denoised acoustic signals (59) (see col. 15 line 29-col. 16 line 3).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

On the other hand, Hosoi teaches that the at least two transfer functions comprise a first transfer function (picks up a noise transfer function(not shown) by microphone in fig.3 (2)) and a second transfer function (picks up another speech transfer function(not shown) by microphone in fig. 3 (3)); and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function(noise transfer function) and at least one combination (1) of the first transfer function(noise transfer function) and the second transfer function(speech transfer function) to the acoustic signals and generating denoised acoustic signals(103) (see fig.3 (col.2 line 40-col. 3 line 33).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Hosoi into Silverberg to produce more accurate to reducing the noise.

Consider claims 2-3 Silverberg teaches removing noise further comprises: generating transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and removing noise from the acoustic signals using at least one combination of the at least function two transfer functions and the at least one second transfer function to generate the denoised acoustic signals(see fig.1 and col. 2 line 15-68); and the of acoustic signals include at least one reflection inherently (because, the noise and desired signal bounds around the first and second microphone) of at least one associated noise source signal and at least one reflection of at least one acoustic source signal(see fig. 1 and col. 2 line 15-68).

Consider claims 6 and 8 Silverberg teaches generating the at least function two transfer functions comprises recalculating the at least one two transfer functions during at least one prespecified interval (see fig. 1 and col. 2 line 15-col. 3 line 24); and generating the at least function two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques (see fig. 1 and col. 2 line 15-col. 3 line 24).

Consider claims 9-11, Silverberg as modified by Holzrichter teaches that the method of information on the vibration of human tissue is provided by a sensor (in Holzrichter such as, motion sensor) in contact with the skin (in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18); and the method of information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (R.F) vibration detector, and a laser vibration detector(in Holzrichter see figs 3a-3b(29,30,33) and see col. 14 line 46-col. 15 line 18); and the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest (in Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18).

Consider claim 26, Silverberg teaches a system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations (see fig.1 (10, 11));

a processor coupled among the receiver (see fig.1 and col. 3 line 39) and the at least one sensor that generates a plurality of transfer functions(12,13), wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones(10,11) of the at least two acoustic microphones (10,11), wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using on of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user; and acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

However, Holzrichter teaches receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and acoustic noise is removed from the acoustic signals using the first transfer function(57 in

fig. 5) and at least one combination(59) of the first transfer function(57) and the second transfer function(56) to produce the denoised acoustic data stream(59 and see col. 15 line 29-col. 16 line 3).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

On the other hand, Hosoi teaches that acoustic noise is removed from the acoustic signals using the first transfer function(picks up a noise transfer function (no shown) by microphone in fig.3 (2)) and at least one combination (see fig.3 (1)) of the first transfer function(such as noise transfer function) and the second transfer function(picks up another speech transfer function (no shown) by microphone in fig. 3 (3)) to produce the denoised acoustic data stream (103)(see fig.3 (col.2 line 40-col. 3 line 33).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Hosoi into Silverberg to produce more accurate to reducing the noise.

Consider claim 28 Silverberg as modified by Holzrichter teaches that the sensor includes a mechanical sensor (such as, motion sensor) in contact with the skin (In Holzrichter see figs 3a-3b(29,30,33)) and see col. 14 line 46-col. 15 line 18);

Consider claim 29 Silverberg as modified by Holzrichter teaches at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency

(R.F) vibration detector, and a laser vibration detector (in Holzrichter, see figs 3a-3b (29, 30, 33) and see col. 14 line 46-col. 15 line 18);

Consider claim 30 Silverberg as modified by Holzrichter teaches at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest (In Holzrichter see figs 3a-3b (29, 30, 33)) and see col. 14 line 46-col. 15 line 18).

Consider claims 38 and 41, they are essentially similar to claim 30 and are rejected for the reason stated above apropos to claim 30.

Consider claim 32 Silverberg teaches the system wherein the receiver includes a plurality of independently located microphones (see fig.1 (10, 11)).

Consider claim 35, Silverberg teaches a signal processing system coupled among a user and an electronic device (see fig.1), wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor(see fig.1 and col. 3 line 3-9) coupled among a receiver (10,11)and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones(10,11), wherein the processor generates a plurality of transfer functions(12,13), wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones(10,11) is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein

acoustic noise is removed from the acoustic signals using one of the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream(see figs 1-2 and col. 2 line 15-col. 3 line 68); but Silverberg does not explicitly teach the at least one sensor detects human tissue vibration associated with human voicing activity of a user; and acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

However, Holzrichter teaches the at least one sensor detects human tissue vibration associated with human voicing activity of a user (see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and acoustic noise is removed from the acoustic signals using the first transfer function(57 in fig. 5) and at least one combination(59) of the first transfer function(57) and the second transfer function(56) to produce the denoised acoustic data stream(59 and see col. 15 line 29-col. 16 line 3).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Holizrichter into Silverberg to produce more accurate speech coding.

On the other hand, Hosoi teaches that acoustic noise is removed from the acoustic signals using the first transfer function(picks up a noise transfer function(no shown) by microphone in fig.3 (2)) and at least one combination(see fig.3 (1)) of the first transfer function(such as noise transfer function) and the second transfer function(picks up

another speech transfer function (no shown) by microphone in fig. 3 (3)) to produce the denoised acoustic data stream (103)(see fig.3 (col.2 line 40-col. 3 line 33).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Hosoi into Silverberg to produce more accurate to reducing the noise.

Consider claim 37, Silverberg as modified by Holzrichter teaches that the system of the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems (in Holzrichter, see col. 16 line 51-67).

4. Claims 31 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) as modified by Holzrichter (US PAT. 5,729,694) and Hosoi (US PAT. 5,754,665) as applied to claims 1 and 26 above, and further in view of Cezanne et al. (US PAT. 5,473,701).

Consider claim 31, Silverberg as modified by Holzrichter does not explicitly teach the system further comprising: dividing acoustic data of the acoustic signals into a plurality of subbands; generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband; removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream.

However, Cezanne teaches the system further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands (see fig. 3, fig. 7); generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband (see abstract);

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and combining the plurality of denoised acoustic data streams to generate the at denoised acoustic data stream (see col. 5 line 35-col. 6 line 50 and col.7 line 46-col.8 line 23).

Therefore, it would have obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Cezanne into the teaching of Holizrichter and Silverberg to provide a desirable level of noise rejection, they may be of limited usefulness in situations where noise sources move in relation to the array.

Consider claim 45 it is essentially similar to claim 31 and are rejected for the reason stated above apropos to claim 31.

5. Claims 47 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg et al (US PAT. 5,406,622) as modified by Holzrichter (US PAT. 5,729,694) and Hosoi (US PAT. 5,754,665) as applied to claims 1 and 26 above, and further in view of Bradley et al. (US PAT. 5,463,694).

Consider claim 47, Silverberg as modified by Holzrichter and Hosoi does not explicitly teach the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional

acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

However, Bradley teaches the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival (see figs. 1-4 and col. 3 line 33-col. 4 line 68).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the unidirectional microphone array of Bradley in the invention of Silverberg.

The motivation for doing so would have been to reduce the size and complexity of the microphone system of Silverberg as taught by Bradley (co1.2 In.48-52).

Consider claim 49, it is essentially similar to claim 47and is rejected for the reason stated above apropos to claim 47.

Response to Arguments

6. Applicant's arguments filed 06-24-2010 have been fully considered but they are not persuasive.

Applicant argued that Holzrichter does not disclose at least two transfer functions that comprise a first transfer function and a second transfer function and, as such, does not overcome the deficiencies of Silverberg in making claim 1 unpatentable. Consequently, the combination of Silverberg in view of Holzrichter fails to disclose

removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least these reasons, Applicant respectfully submits that amended claim 1 is patentable over Silverberg in view of Holzrichter (see the remarks page 12, 2nd and 3rd paragraphs).

The examiner disagrees respectfully. Holzrichter discloses a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user(see fig. 5 (43) and see col. 15 line 29-col. 16 line 3 and col. 60 line 19-30); and the at least two transfer functions comprise a first transfer function (see fig. 5(57)) and a second transfer function (56); and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function (57) and at least one combination (58) of the first transfer function (57) and the second transfer function (56) to the acoustic signals and generating denoised acoustic signals (59) (see col. 15 line 29-col. 16 line 3). The combination meets the limitation as recited in claim 1.

Applicant further argued that Hosoi does not describe at least two transfer functions that comprise a first transfer function and a second transfer function, Hosoi does not describe removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals (see the remarks page 14 2nd paragraph).

The examiner disagrees respectfully. Hosoi discloses a first transfer function (picks up a noise transfer function(not shown) by microphone in fig.3 (2)) and a second transfer function (picks up another speech transfer function(not shown) by microphone in fig. 3 (3)); and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function(noise transfer function) and at least one combination (1) of the first transfer function(noise transfer function) and the second transfer function(speech transfer function) to the acoustic signals and generating denoised acoustic signals(103) (see fig.3 (col.2 line 40-col. 3 line 33). The combination meets the limitation as recited in claim 1.

As claims 2, 3, 6, 8-11, 28-32, 37, 38, 45, 47 and 49 depend from independent claims 1, 26 and 35 and include limitations thereon, and since independent claims 1, 26 and 35 are rejected over Silverberg in view of Holzrichter and Hosoi, claims 2, 3, 6, 8-11, 45, and 47 are rejected over Silverberg in view of Holzrichter and Hosoi by the examiner above.

Conclusion

7. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. The prior art made of record and not relied upon is considered to applicant's disclosure. Kanamori et al. (US PAT. 5,633,935) is recited to show other related the voice activity detector (VAD) based multiple-microphone acoustic noise suppression.

9. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Facsimile responses should be faxed to:
(571) 273-8300

Hand-delivered responses should be brought to:
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lao,Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao,Lun-See
/LUN-SEE LAO/
Examiner, Art Unit 2614
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501
Date 08-23-2010

/Xu Mei/
Primary Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/667,207	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner LUN-SEE LAO	Art Unit 2614	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,633,935	05-1997	Kanamori et al.	381/26
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009	12/11/2009	08/20/2010					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	-	-	-	-					
	5	-	-	-	-					
	6	✓	✓	✓	✓					
	7	✓	-	-	-					
	8	✓	✓	✓	✓					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	-	-					
	13	✓	✓	-	-					
	14	-	-	-	-					
	15	✓	✓	-	-					
	16	✓	✓	-	-					
	17	✓	✓	-	-					
	18	-	-	-	-					
	19	-	-	-	-					
	20	-	-	-	-					
	21	✓	✓	-	-					
	22	✓	✓	-	-					
	23	-	-	-	-					
	24	-	-	-	-					
	25	-	-	-	-					
	26	✓	✓	✓	✓					
	27	✓	-	-	-					
	28	✓	✓	✓	✓					
	29	✓	✓	✓	✓					
	30	✓	✓	✓	✓					
	31	✓	✓	✓	✓					
	32	✓	✓	✓	✓					
	33	✓	-	-	-					
	34	✓	-	-	-					
	35	✓	✓	✓	✓					
	36	✓	-	-	-					

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN-SEE LAO	2615

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009	12/11/2009	08/20/2010					
	37	✓	✓	✓	✓					
	38	✓	✓	✓	✓					
	39	✓	✓	-	-					
	40	✓	-	-	-					
	41	✓	✓	-	-					
	42	-	-	-	-					
	43	-	-	-	-					
	44	-	-	-	-					
	45	✓	✓	✓	✓					
	46	✓	✓	-	-					
	47		✓	✓	✓					
	48		✓	-	-					
	49		✓	✓	✓					
	50									

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	Lao, Lun-See	2614

SEARCHED			
Class	Subclass	Date	Examiner
381	94.7, 70, 94.1, 71.8, 91-92, 122	08-20-2010	L.S.
704	200,231, 233, 214-215, 246	08-20-2010	L.S.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	08-20-2010	L.S.
CHECK 101	08-20-2010	L.S.

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	3267	((381/94.1-94.7 or 381/70,71.8,92,91,122).ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:47
L2	4446	((704/200,231,233,214,215,246).ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:47
L3	9228	(((voice or speech)adj2 activity adj2 detect $3) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:50
L4	397	(((voice or speech)adj2 activity adj2 detect $3) or (VAD)) same (cancel$3 or remov$3) same noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:51
L5	40	1 and 4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:51
L6	57	2 and 4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:56
L7	77	4 and (transfer adj2 function)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:59
L8	2017	(((voice or speech)adj2 activity adj2 detect $3) or (VAD)) and (cancel$3 or remov$3) and noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 10:24
L9	330	8 and (transfer adj2 function)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 10:25
L10	33	1 and 9	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 10:25
S1	58	((MASAYOSHI) near2 (MIURA)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/15 09:50

8/23/2010 10:26:58 AM
C:\Documents and Settings\llao1\My Documents\EAST\Workspaces\10667207.wsp

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
10/667,207		2614	26M1

OC000000046220774

Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 98195 on 08/09/2010

- **Correspondence Address**
- **Maintenance Fee Address**
- **Power of Attorney Address**

The address of record for Customer Number 98195 is:

98195
Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

PTO/SB/31 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

NOTICE OF APPEAL FROM THE EXAMINER TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

Docket Number (Optional): ALPH.P010X

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on February 28, 2011

Signature: [signature]

Typed or printed name: Rob Rathbun

In re Application of: Gregory C. BURNETT

Application Number	Filed
10/667,207	September 18, 2003

For: Voice Activity Detector (VAD) -Based Multiple-Microphone Acoustic Noise Suppression

Art Unit	Examiner
2614	Lun S LAO

Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 540

☐ Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by half, and the resulting fee is: $ _____

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. _____ .

☑ A petition for an extension of time under 37 CFR 1.136(a) (PTO/SB/22) is enclosed.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☑ attorney or agent of record. Registration number 42,607.

☐ attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34. _____

[signature]
Signature

Richard L. Gregory, Jr.
Typed or printed name

408-676-8080
Telephone number

February 28, 2011
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 41.31. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/22 (10-08)
Approved for use through 10/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARMENT OF COMMERCE
Under the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless if displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) **FY 2009** *(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)*	Docket Number (Optional) ALPH.P010X
Application Number 10/667,207	Filed September 18, 2003
For Voice Activity Detector (VAD) -Based Multiple-Microphone Acoustic Noise Suppression	
Art Unit 2614	Examiner Lun S. Lao

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$130	$65	$
☐	Two months (37 CFR 1.17(a)(2))	$490	$245	$
☑	Three months (37 CFR 1.17(a)(3))	$1110	$555	$ 1110
☐	Four months (37 CFR 1.17(a)(4))	$1730	$865	$
☐	Five months (37 CFR 1.17(a)(5))	$2350	$1175	$

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 42,607

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

/Richard L. Gregory, Jr./ — Signature

February 28, 2011 — Date

Richard L. Gregory, Jr. — Typed or printed name

408-676-8080 — Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Notice of appeal	1401	1	540	540
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	1253	1	1110	1110
Miscellaneous:				
		Total in USD ($)		**1650**

Electronic Acknowledgement Receipt

EFS ID:	9553752
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	98195
Filer:	Richard L. Gregory/Rob Rathbun
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	28-FEB-2011
Filing Date:	18-SEP-2003
Time Stamp:	18:42:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1650
RAM confirmation Number	7601
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		ALPHP010X_Notice_of_Appeal.pdf	313713 99c853292888f80812f431bb868e268917a2e36f	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Notice of Appeal Filed	2	2
	Extension of Time	3	3

Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	32346 10f2f50378e12a6303960780012e33ad497925ce	no	2

Warnings:

Information:

Total Files Size (in bytes):	346059

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. ALPH.P010X | Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **USPTO EFS**

February 28, 2011
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Rob Rathbun
(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Notice Of Appeal From The Examiner To The Board Of Patent Appeals and Interferences PTO/SB/31;
Petition For Three (3) Months Extension Of Time;
Electronic Payment of Fees.

Attorney Docket No. ALPH.P010X

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Lun LAO
Gregory C. Burnett, et al.	)	Art Unit: 2614
	)	
Application No.: 10/667,207	)	
	)	
Filed: September 18, 2003	)	
	)	
For: VOICE ACTIVITY DETECTOR (VAD)-BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Applicant respectfully requests consideration of the following Appeal Brief and materials contained herein in response to Final Rejection set forth in the Office Action mailed August 30, 2010. The fee as required under 37 CFR § 41.20 is submitted with this Appeal Brief.

REAL PARTY IN INTEREST

The real party in interest is ALIPHCOM, INC., assignee of record.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1-3, 6, 8-11, 26, 28-32, 35, 37, 38, 45, 47 and 49 are pending in the application.

Claims 1-3, 6, 8-11, 26, 28-32, 35, 37-38, 45, 47 and 49 are rejected.

Claims 4-5, 7, 12-25, 27, 33-34, 36, 39-44, 46 and 48 are canceled.

Meta Platforms, Inc. Exhibit 1013
Page 400 of 564

STATUS OF AMENDMENTS

No claim is amended subsequent to Final Rejection set forth in the Office Action mailed August 30, 2010.

SUMMARY OF CLAIMED SUBJECT MATTER

Summary

Applicant's present application describes acoustic noise suppression provided in multiple-microphone systems using Voice Activity Detectors (VAD) (page 35, lines 5-6). The application operationally describes a noise removal algorithm that uses a single signal source and a single nose source. This algorithm uses two microphones: a "signal" microphone 1 ("MIC1") and a "noise" microphone 2 ("MIC 2"), but is not so limited. The signal microphone MIC 1 is assumed to capture mostly signal with some noise, while MIC 2 captures mostly noise with some signal (page 7, lines 6-11). The transfer function from the signal source to MIC 2 is denoted by $H_2(z)$, and the transfer function from the noise source to MIC 1 is denoted by $H_1(z)$ (page 7, lines 28-30). As part of the noise suppression system, a noise removal element also receives a signal from a voice activity detection (VAD) element. The VAD uses physiological information to determine when a speaker is speaking including information of human tissue vibration (page 7, lines 18-22).

In conventional two-microphone noise removal systems, the information from MIC 2 is used to attempt to remove noise from MIC 1. However, an (generally unspoken) assumption is that the VAD element is never perfect, and thus the denoising must be performed cautiously, so as not to remove too much of the signal along with the noise. However, if the VAD element is assumed to be perfect such that it is equal to zero when there is no speech being produced by the user, and equal to one when speech is produced, a substantial improvement in the noise removal can be made (page 8, lines 4-10). This latter assumption facilitates a solution to the first and second transfer functions. Output data from MIC 1 and/or MIC 2 may then be used to describe the transfer functions (page 8, line 11 to page 10, line 9).

A first transfer function representative of the acoustic signal is calculated upon determining that voicing information is absent from the acoustic signal for at least one specified period of time. A second transfer function representative of the acoustic signal is calculated upon determining that voicing information is present in the acoustic signal for at least one specified period of time. Noise is removed from the acoustic signal using at least one combination of the first transfer function and the second transfer function, producing denoised acoustic data streams (page 13, lines 18-25).

If the transfer functions $H_1(z)$ and $H_2(z)$ can be described with sufficient accuracy, then

the noise can be completely removed and the original signal recovered. This remains true without respect to the amplitude or spectral characteristics of the noise. The only assumptions made include use of a perfect VAD, sufficiently accurate $H_1(z)$ and $H_2(z)$, and that when one of $H_1(z)$ and $H_2(z)$ are being calculated the other does not change substantially. In practice these assumptions have proven reasonable (page 10, lines 10-15).

Showing of Support of Each Independent Claim:

CLAIM LIMITATION	SUPPORT FOR CLAIM LIMITATION
1. A method for removing noise from acoustic signals, comprising: receiving at least two acoustic signals using at least two acoustic microphones positioned in a plurality of locations;	At least Page 7, lines 8-11, Page 10, lines 17-21, Page 12, lines 3-7, Figures 2-4
receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;	At least Page 7 lines 18-22, Page 15, lines 14-18, Page 17, line 26 to Page 18, line 2
generating a voice activity detection (VAD) signal using the voice activity signal;	At least Page 17, line 26 to Page 18, line 2, Page 20, lines 9-24
generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function; and	At least Page 8, line 4 to Page 10, line 9, Page 7, lines 28-30
removing acoustic noise from at least one of the acoustic	At least

signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.	Page 8, line 11 to Page 10, line 9, Page 13, lines 16-25

26. A system for removing acoustic noise from the acoustic signals, comprising: a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations;	At least Page 7, lines 8-11, Page 10, lines 17-21, Page 12, lines 3-7, Figures 2-4
at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;	At least Page 7 lines 18-22, Page 15, lines 14-18, Page 17, line 26 to Page 18, line 2
a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time,	At least Page 8, line 4 to Page 10, line 9, page 7, lines 28-30
wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.	At least Page 8, line 11 to Page 10, line 9, Page 13, lines 16-25

35. A signal processing system coupled among a user and an electronic device, wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones,	At least Page 7, lines 8-11, Page 10, lines 17-21, Page 12, lines 3-7, Figures 2-4, page 35, lines 5-12
wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user,	At least Page 7 lines 18-22, Page 15, lines 14-18, Page 17, line 26 to Page 18, line 2
wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time,	At least Page 8, line 4 to Page 10, line 9, Page 7, lines 28-30
wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream.	At least Page 8, line 11 to Page 10, line 9, Page 13, lines 16-25

GROUNDS OF REJECTION SUBMITTED FOR REVIEW

Whether claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37, 38 and 41 are unpatentable under 35 U.S.C. 103(a) over Silverberg et al. (United States Patent No. 5,406,622) in view of Holzrichter et al. (United States Patent No. 5,729,694) and Hosoi (United States Patent No. 5,754,665).

Whether claims 31 and 45 are unpatentable under 35 U.S.C. 103(a) over Silverberg et al. (United States Patent No. 5,406,622) as modified by Holzrichter et al. (United States Patent No. 5,729,694) and Hosoi (United States Patent No. 5,754,665) as applied by Examiner to claims 1 and 26, and further in view of Cezanne et al. (United States Patent No. 5,473,701).

Whether claims 47 and 49 are unpatentable under 35 U.S.C. 103(a) over Silverberg et al. (United States Patent No. 5,406,622) as modified by Holzrichter et al. (United States Patent No. 5,729,694) and Hosoi (United States Patent No. 5,754,665) as applied by Examiner to claims 1 and 26, and further in view of Bradley et al. (United States Patent No. 5,463,694).

ARGUMENTS

Rejection under 35 U.S.C. 103(a) over Silverberg et al., United States Patent No. 5,406,622 ("Silverberg") in view of Holzrichter et al., United States Patent No. 5,729,694 ("Holzrichter") and Hosoi, United States Patent No. 5,754,665 ("Hosoi").

Claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37, 38 and 41

Claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37, 38 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverberg in view of Holzrichter and further in view of Hosoi. As claim 41 is canceled, Examiner's rejection of claim 41 is moot. Applicant respectfully submits that Silverberg, Holzrichter and Hosoi taken either alone or in combination do not teach each and every limitation of claims 1-3, 6, 8-11, 26, 28-30, 32, 35, 37 and 38.

Applicant respectfully submits that Silverberg discloses an outbound noise cancellation circuit that consists of a transmit microphone and one or more noise-collecting reference microphones (column 2, lines 16-19). A first adaptive filter receives the output of a transmit microphone (column 2, lines 26-27). The output of the first adaptive filter is subtractively combined with the output of a reference microphone to provide an enhanced reference signal having little or no speech signal content (column 2, lines 27-33).

A second adaptive filter receives the enhanced reference signal as an input (column 2, lines 34-35). The second adaptive filter produces an output which consists substantially of noise energy only, and the output of the second adaptive filter is a noise cancellation signal (column 2, lines 35-38). The noise cancellation signal is summed with the unprocessed output of the transmit microphone to provide an output signal in which the outbound noise has been removed (column 2, lines 21-25).

Each of the adaptive filters is active or not depending on the presence or absence of speech energy (column 3, lines 10-12). If speech energy is present, the weights of the first adaptive filter are allowed to update, but if speech is absent, the weights of the first adaptive filter are frozen at their last setting (column 3, lines 12-16). Further, if speech energy is absent, the weights of the second adaptive filter are allowed to update, but if speech is present, the weights of the first adaptive filter are frozen at their last setting (column 3, lines 16-20).

Regarding claim 1, the Office Action states (at page 3) that Silverberg does not explicitly teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user. Applicant agrees that Silverberg does not teach receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user.

Further regarding claim 1, the Office Action states (at page 3) that Silverberg does not explicitly teach at least two transfer functions that comprise a first transfer function and a second transfer function. Applicant agrees that Silverberg does not teach at least two transfer functions that comprise a first transfer function and a second transfer function.

Further regarding claim 1, the Office Action states (at page 3) that Silverberg does not explicitly teach removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant agrees that Silverberg does not teach removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

Further regarding claim 1, Applicant respectfully submits that Silverberg does not disclose generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent.

Applicant argues that Silverberg teaches nothing about generating transfer functions. In the Examiner's rejection of claim 1 at pages 2-3 of the Office Action, the Examiner does not specifically indicate or particularly point out a section of Silverberg that teaches generating transfer functions. However, it appears (based on Examiner's subsequent rejections of claims 26 and 35 at page 6 and page 8, respectively, of the Office Action) that Examiner intended to argue that the speech filter 12 (Figure 1) and the noise filter 13 (Figure 1) disclose transfer functions. However, Silverberg only discusses filters in terms of general functionality. The disclosure of a filter does not describe its design or technical implementation and does not teach generating transfer functions. In addition, the Examiner at page 3 of the Office Action already stipulates that Silverberg does not teach at least two transfer functions that comprise a first transfer function

and a second transfer function. Accordingly, Silverberg does not disclose generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent (emphasis added).

For at least the reasons set forth above, Applicant respectfully submits that claim 1 is patentable over Silverberg. Applicant finds no teaching in Holzrichter to overcome the deficiencies of Silverberg.

Applicant respectfully submits that Holzrichter describes the use of EM radiation in conjunction with simultaneously recorded acoustic speech information to enable a complete mathematical coding of acoustic speech. The methods include the forming of a feature vector for each pitch period of voiced speech and the forming of feature vectors for each time frame of unvoiced, as well as for combined voiced and unvoiced speech. The methods include how to deconvolve the speech excitation function from the acoustic speech output to describe the transfer function for each time frame. The formation of feature vectors defining all acoustic speech units over well defined time frames can be used for purposes of speech coding, speech compression, speaker identification, language-of-speech identification, speech recognition, speech synthesis, speech translation, speech telephony, and speech teaching (abstract).

Regarding claim 1, Applicant respectfully submits that Holzrichter does not disclose generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function, and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

The Examiner at page 3 of the Office Action argues that element 57 (Figure 5 of Holzrichter) discloses a first transfer function and that element 56 (Figure 5 of Holzrichter) discloses a second transfer function. However, these elements both disclose a Fourier transform which is a measure of the frequency content of a signal. In order to generate a transfer function, two signals (an input and output) are needed. A Fourier transform simply decomposes a signal

into its frequency components and represents a process completely different from, and exclusive of, taking two signals and generating a transfer function.

Interestingly, Examiner appears to ignore the output of the Figure 5 flow diagram which in fact represents a transfer function. Figure 5 shows a system in which knowledge of the vocalized excitation function is used to deconvolve the speech vocal tract transfer function information from measured acoustic speech output for each speech time frame (column 15, lines 29-32). Therefore, Holzrichter does indeed disclose a transfer function. However, Holzrichter only teaches the description of a single transfer function over time. Holzrichter does not disclose generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function.

As Holzrichter (like Silverberg) fails to disclose at least two transfer functions comprising a first transfer function and a second transfer function, so does Holzrichter (like Silverberg) fail to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

For at least the reasons set forth above, Applicant respectfully submits that claim 1 is patentable over Holzrichter in view of Silverberg. Applicant finds no teaching in Hosoi to overcome the deficiencies of Holzrichter and Silverberg.

Applicant submits that Hosoi describes a noise canceller comprising analog-to-digital (A/D) converters 11, 12 which convert signals 101, 102 from microphones 2, 3 to digital signals (column 2, lines 53-55). Hosoi describes that the noise canceller includes adder 16 and Finite Impulse Response (FIR) adaptive filter 14 which operate as a noise canceller when microphone 2 is used for speech and microphone 3 is used for noise (column 2, lines 55-58). Hosoi describes that the noise canceller includes adder 15 and FIR adaptive filter 13 which operate as a noise canceller when microphone 2 is used for noise and microphone 3 is used for speech (column 2, lines 58-60).

Regarding the noise cancellation, Hosoi describes that FIR adaptive filter 14 generates an estimated noise signal which is the estimated noise component contained in the voice signal of microphone 2 based on the noise signal from microphone 3. Adder 16 outputs noise-reduced

output signal 105 by subtracting the estimated noise signal from the voice signal from microphone 2 (column 2, lines 64-67 to column 3, lines 1-3). In the same way, FIR adaptive filter 13 generates an estimated noise signal which is the estimated noise component contained in voice signal of microphone 3 based on the noise signal from microphone 2 (column 3, lines 6-9). Adder 15 outputs voice signal 104 in which noise is reduced by subtracting this estimated noise signal from the voice signal from microphone 3 (column 3, lines 9-12).

Regarding claim 1, Applicant respectfully submits that Hosoi does not disclose generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function, and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

Applicant respectfully submits that Hosoi does not teach transfer functions at all. At page 4 of the Office Action the Examiner makes the following puzzling argument (which Examiner then repeats at pages 7 and pages 9-10 in rejecting claims 26 and 35, respectively):

> "Hosoi teaches that the at least two transfer functions comprise a first transfer function (picks up a noise transfer function (not shown) by microphone in fig.3 (2)) and a second transfer function (picks up another speech transfer function (not shown) by microphone in fig. 3 (3)); and removing acoustic noise from at least one of the acoustic signals by applying the first transfer function (noise transfer function) and at least one combination (1) of the first transfer function (noise transfer function) and the second transfer function (speech transfer function) to the acoustic signals" (Office Action, page 4).

It is entirely unclear what Examiner intends to communicate by stating "a first transfer function (picks up a noise transfer function (not shown) by microphone in fig.3 (2))". It appears that Examiner argues that a noise transfer function in Hosoi discloses the first transfer function. However, the Examiner specifically states that the noise transfer function is "not shown" in Figure 3. Hosoi does not elsewhere describe a noise transfer function. Similarly, it appears that Examiner argues that that a speech transfer function in Hosoi discloses a second transfer

function. However, the Examiner specifically states that the speech transfer function is "not shown" in Figure 3. Hosoi does not elsewhere disclose a speech transfer function. Hosoi merely describes the use of two FIR adaptive filters but teaches nothing about such filters' design or technical implementation. Accordingly, Hosoi does not disclose generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function.

As Hosoi (like the combination of Silverberg and Holzrichter) fails to disclose at least two transfer functions comprising a first transfer function and a second transfer function, so does Hosoi (like the combination of Silverberg and Holzrichter) fail to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

For at least these reasons, Applicant respectfully submits that claim 1 is patentable over Silverberg in view of Holzrichter and further in view of Hosoi.

As claims 2, 3, 6, 8-11, 45, and 47 depend from claim 1 and include further limitations thereon, and since claim 1 is patentable over Silverberg in view of Holzrichter and Hosoi, Applicant submits that claims 2, 3, 6, 8-11, 45, and 47 are patentable over Silverberg in view of Holzrichter and Hosoi.

Applicant submits that claim 26 is patentable over Silverberg in view of Holzrichter and Hosoi for the reasons stated above with reference to claim 1. As claims 28-30, 32 and 49 depend from claim 26 and include further limitations thereon, and since claim 26 is patentable over Silverberg in view of Holzrichter and Hosoi, Applicant submits that claims 28-30, 32 and 49 are patentable over Silverberg in view of Holzrichter and Hosoi.

Applicant submits that claim 35 is patentable over Silverberg in view of Holzrichter and Hosoi for the reasons stated above with reference to claim 1. As claims 37 and 38 depend from claim 35 and include further limitations thereon, and since claim 35 is patentable over Silverberg in view of Holzrichter and Hosoi, Applicant submits that claims 37 and 38 are patentable over Silverberg in view of Holzrichter and Hosoi.

Rejection under 35 U.S.C. 103(a) over Silverberg as modified by Holzrichter and Hosoi as applied by Examiner to claims 1 and 26, and further in view of Cezanne et al., United States Patent No. 5,473,701 ("Cezanne").

Claims 31 and 45

Claims 31 and 45 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg as modified by Holzrichter and Hosoi, and further in view of Cezanne. As described in detail above, the combination of Holzrichter, Silverberg, and Hosoi does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant also fails to find any teaching in Cezanne of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Consequently, the combination of Silverberg, Holzrichter, Hosoi, and Cezanne fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least this reason, Applicant respectfully submits that claims 31 and 45 are patentable over Silverberg in view of Holzrichter, Hosoi, and Cezanne.

Rejection under 35 U.S.C. 103(a) over Silverberg as modified by Holzrichter and Hosoi as applied by Examiner to claims 1 and 26, and further in view of Bradley et al., United States Patent No. 5,463,694 ("Bradley").

Claims 47 and 49

Claims 47 and 49 are rejected under 35 U.S.C. §103(a) as being unpatentable over Silverberg as modified by Holzrichter and Hosoi, and further in view of Bradley. As described in detail above, the combination of Holzrichter, Silverberg, and Hosoi does not disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and

at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. Applicant also fails to find any teaching in Bradley of the application of a first transfer function and at least one combination of the first transfer function and the second transfer function. Consequently, the combination of Silverberg, Holzrichter, Hosoi, and Bradley fails to disclose removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals. For at least this reason, Applicant respectfully submits that claims 47 and 49 are patentable over Silverberg in view of Holzrichter, Hosoi, and Bradley.

CLAIMS APPENDIX

IN THE CLAIMS

The claims stand as follows.

1. (Previously presented) A method for removing noise from acoustic signals, comprising:

receiving at least two acoustic signals using at least two acoustic microphones positioned in a plurality of locations;

receiving a voice activity signal that includes information on vibration of human tissue associated with human voicing activity of a user;

generating a voice activity detection (VAD) signal using the voice activity signal;

generating at least two transfer functions representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones when the VAD indicates that user voicing activity is absent, wherein the at least two transfer functions comprise a first transfer function and a second transfer function; and

removing acoustic noise from at least one of the acoustic signals by applying the first transfer function and at least one combination of the first transfer function and the second transfer function to the acoustic signals and generating denoised acoustic signals.

2. (Previously presented) The method of claim 1, wherein removing noise further comprises:

generating one transfer function of the at least two transfer functions to be representative of a ratio of energy of the acoustic signal received when the VAD indicates that user voice activity is present; and

removing noise from the acoustic signals using at least one combination of the at least two transfer functions to generate the denoised acoustic signals.

3. (Previously presented) The method of claim 1, wherein the acoustic signals include at least one reflection of at least one associated noise source signal and at least one reflection of at least one acoustic source signal.

Claims 4 and 5 (Canceled).

6. (Previously presented) The method of claim 1, wherein generating the at least two transfer functions comprises recalculating the at least two transfer functions during at least one prespecified interval.

Claim 7 (Canceled).

8. (Previously presented) The method of claim 1, wherein generating the at least two transfer functions comprises use of at least one technique selected from a group consisting of adaptive techniques and recursive techniques.

9. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided by a sensor in contact with the skin.

10. (Previously presented) The method of claim 1, wherein information on the vibration of human tissue is provided via at least one sensor selected from among at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

11. (Previously presented) The method of claim 1, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claim 12-25 (Canceled).

26. (Previously presented) A system for removing acoustic noise from the acoustic signals, comprising:

a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations;

at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;

a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions, wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time, wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

Claim 27 (Canceled).

28. (Previously presented) The system of claim 26, wherein the sensor includes a mechanical sensor in contact with the skin.

29. (Previously presented) The system of claim 26, wherein the sensor includes at least one of an accelerometer, a skin surface microphone in physical contact with skin of a user, a human tissue vibration detector, a radio frequency (RF) vibration detector, and a laser vibration detector.

30. (Previously presented) The system of claim 26, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

31. (Previously presented) The system of claim 26, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using a transfer function, wherein a plurality of denoised acoustic data streams are generated; and

combining the plurality of denoised acoustic data streams to generate the denoised acoustic data stream.

32. (Previously presented) The system of claim 26, wherein the receiver includes a plurality of independently located microphones.

Claims 33 and 34 (Canceled).

35. (Previously presented) A signal processing system coupled among a user and an electronic device, wherein the signal processing system includes a denoising subsystem for removing acoustic noise from acoustic signals, the denoising subsystem comprising a processor coupled among a receiver and at least one sensor, wherein the receiver is coupled to receive the acoustic signals via at least two microphones, wherein the at least one sensor detects human tissue vibration associated with human voicing activity of a user, wherein the processor generates a plurality of transfer functions, wherein a first transfer function representative of a ratio of acoustic energy received by the two microphones is generated in response to a determination that voicing activity is absent from the acoustic signals for a specified period of time, wherein a second transfer function representative of the acoustic signals is generated in response to a determination that voicing activity is present in the acoustic signals for a specified period of time, wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce a denoised acoustic data stream.

Claim 36 (Canceled).

37. (Previously presented) The system of claim 35, wherein the at least one electronic device includes at least one of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

38. (Previously presented) The system of claim 35, wherein the human tissue is at least one of on a surface of a head, near the surface of the head, on a surface of a neck, near the surface of the neck, on a surface of a chest, and near the surface of the chest.

Claim 39-44 (Canceled).

45. (Previously presented) The method of claim 1, further comprising:

dividing acoustic data of the acoustic signals into a plurality of subbands;

generating a subband transfer function representative of the ratio of acoustic energies received in each microphone in each subband;

removing acoustic noise from each of the plurality of subbands using the subband transfer function, wherein a plurality of denoised acoustic subband signals are generated; and

combining the plurality of denoised acoustic subband signals to generate the denoised acoustic signal.

Claim 46 (Canceled).

47. (Previously presented) The method of claim 1, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

Claim 48 (Canceled).

49. (Previously presented) The system of claim 26, wherein the at least two acoustic microphones comprise a first directional acoustic microphone and a second directional acoustic microphone, wherein the first directional acoustic microphone and the second directional acoustic microphone selectively attenuate the acoustic signals based on the direction of arrival.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.

Conclusion:

Applicant respectfully submits that the claims of the above-captioned patent application are in condition for allowance, and respectfully requests that the Board of Patent Appeals and Interferences allows the claims of the above-captioned patent application to issue in a US patent.

Respectfully submitted,
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Date: April 28, 2011

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Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Filing a brief in support of an appeal	1402	1	540	540
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**540**

Electronic Acknowledgement Receipt

EFS ID:	9981712
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	98195
Filer:	Richard L. Gregory/Rob Rathbun
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	28-APR-2011
Filing Date:	18-SEP-2003
Time Stamp:	18:47:29
Application Type:	Utility under 35 USC 111(a)

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Payment Type	Credit Card
Payment was successfully received in RAM	$540
RAM confirmation Number	7972
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		ALPHP010X_Appeal_Brief.pdf	3068695 9c9c4f0ef08be4d0a3bf33d8e2f71641125f8f2d	yes	27

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal Letter	1	1
Appeal Brief Filed	2	27

Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	30268 a45f0f4cb95f39c1348d7aa7f10c1e607065e99b	no	2

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No. ALPH.P010X | Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **USPTO EFS**

April 28, 2011
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

Rob Rathbun
(Print Name of Person Transmitting Documents)

(Signature of Person Transmitting Documents)

Appeal Brief.

PLUS Search Results for S/N 10667207, Searched Thu Jun 23 13:06:21 EDT 2011

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

5970441 99
6023674 99
6097820 98
5598466 98
5737407 98
5844994 98
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20060018457 87

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

98195 7590 07/13/2011

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

EXAMINER	
LAO, LUN S	
ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 07/13/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

TITLE OF INVENTION: VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	10/13/2011

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

98195 7590 07/13/2011

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

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nonprovisional	YES	$755	$300	$0	$1055	10/13/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAO, LUN S	2614	381-071800

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

98195 7590 07/13/2011

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

EXAMINER	
LAO, LUN S	

ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 07/13/2011

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 280 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 280 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

10/667,207 Notice of Allowability	Application No. 10/667,207	Applicant(s) BURNETT ET AL.	
	Examiner LUN-SEE LAO	Art Unit 2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *04-28-2011*.

2. ☒ The allowed claim(s) is/are *1-3, 6, 8-11, 26, 28-32, 35, 37, 38, 45, 47 and 49*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Davetta W. Goins/
Supervisory Patent Examiner, Art Unit 2614

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	95	(("5970441") or ("6023674") or ("6097820") or ("5598466") or ("5737407") or ("5844994") or ("6070137") or ("6104993") or ("6182035") or ("5459814") or ("5649055") or ("5867574") or ("6415253") or ("6453285") or ("6597787") or ("6810273") or ("6904146") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("7454335") or ("7889874") or ("20010014857") or ("20020035470") or ("20030206624") or ("20030228023") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or ("20080317259") or ("20090010453") or ("20090070106") or ("20100100386") or ("20100245111") or ("20100278352") or ("20100280824") or ("20110026722") or ("20110058667") or ("20110099007") or ("20110058667") or ("20110099007") or ("5533133") or ("7917356") or ("20030179888") or ("20040133421") or ("20060018457")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2011/06/24 09:53
L2	2489	transfer same function same ratio same energy	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 09:58
L3	185063	ratio same energy	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 09:58
L4	2489	L2 and L3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 09:58
L5	3	((381/94.1-94.7 or 381/70,71.8,92,91,122,71.1).ccls.) and L4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 09:58
L6	15	(("379"/$).ccls.) and L4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 09:59
L7	61	(("455"/$).ccls.) and L4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 09:59

L8	0	(generat$3 same ((voice same activity same detect$3) or (VAD)) same transfer same function$1 same represent$5 same ratio same energy same different same microphones same indicat$3 same activity same absent)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:05
L9	0	(generat$3 same ((voice same activity same detect$3) or (VAD)) same transfer same function$1 same represent$5 same ratio same energy same different same microphones same indicat$3 same activity same absent). clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:05
L12	0	(generat$3 same ((voice same activity same detect$3) or (VAD)) same transfer same function$1 same ratio same energy same different same microphones same indicat$3 same activity same absent)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:06
L13	0	(generat$3 same ((voice same activity same detect$3) or (VAD)) same transfer same function$1 same ratio same energy same different same microphones same activi$2 same absent)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:07
L14	2706	(generat$3 same ((voice same activity same detect$3) or (VAD)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:07
L15	0	(transfer same function$1 same ratio same energy same different same microphones same activi$2 same absent)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:08
L16	13	(transfer same function$1 same ratio same energy same different same microphones)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:08
L17	197	(ratio same energy same different same microphones)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:08
L18	945	(ratio same energy same microphone$1)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:11
L19	58	14 and 18	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/24 10:11
S1	58	((MASAYOSHI) near2 (MIURA)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2009/12/15 09:50
S2	3267	((381/94.1-94.7 or 381/70,71.8,92,91,122). ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:47

S3	4446	((704/200,231,233,214,215,246).ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:47
S4	9228	(((voice or speech)adj2 activity adj2 detect$3) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:50
S5	397	(((voice or speech)adj2 activity adj2 detect$3) or (VAD)) same (cancel$3 or remov$3) same noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:51
S6	40	S2 and S5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:51
S7	57	S3 and S5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:56
S8	77	S5 and (transfer adj2 function)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 09:59
S9	2017	(((voice or speech)adj2 activity adj2 detect$3) or (VAD)) and (cancel$3 or remov$3) and noise	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 10:24
S10	330	S9 and (transfer adj2 function)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 10:25
S11	33	S2 and S10	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2010/08/23 10:25
S12	97	(("6097820") or ("6070137") or ("6182035") or ("5867574") or ("6415253") or ("6597787") or ("6904146") or ("20030206624") or ("20030228023") or ("20030179888") or ("20040133421") or ("20060018457") or ("20060120537") or ("20090003623") or ("20090003624") or ("20090003625") or ("20090003626") or ("5970441") or ("6023674") or ("5598466") or ("5737407") or ("5844994") or ("6104993") or ("5459814") or ("5649055") or ("6453285") or ("6810273") or ("7020605") or ("7171246") or ("7174022") or ("7212841") or ("7454335") or ("20010014857") or ("20020035470") or ("20040131178") or ("20050027520") or ("20060053007") or ("20070219791") or ("20070265840") or ("20080040109") or	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2010/08/23 12:01

		("20080317259") or ("20090010453") or ("20090070106") or ("20100100386") or ("6081732") or ("6269093") or ("6424942") or ("6707910") or ("6807525") or ("6959167")). PN.				
S13	171	(((voice or speech)adj2 activity adj2 detect$3) or (VAD)) same ratio same energy	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 09:47
S14	10031	(((voice or speech$3)adj2 activity adj2 detect $3) or (VAD))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:39
S15	2489	transfer same function same ratio same energy	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:40
S16	8	S14 and S15	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:40
S17	185063	ratio same energy	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:42
S18	2489	S15 and S17	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:43
S19	3	((381/94.1-94.7 or 381/70,71.8,92,91,122). ccls.) and S18	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:43
S20	27	(("381"/$).ccls.) and S18	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:44
S21	3	((704/200,231,233,214,215,246).ccls.) and S18	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:45
S22	20	(("704"/$).ccls.) and S18	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 10:46
S23	25	"5414776"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2011/06/23 11:43

S24	11	(("5414776") or ("6697494") or ("7206421") or ("6453041")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2011/06/23 11:44
S25	10	("3992584" | "4956867" | "5228093" | "5414776" | "5764778" | "6240192" | "6697494").PN. OR ("7206421").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/06/23 11:45
S26	6	("4635061" | "5400409" | "5825898" | "6041127" | "6178248").PN. OR ("6697494").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/06/23 11:48
S27	13	("4879745" | "5007046" | "5598466" | "5692042" | "5844994" | "5857019" | "6031915" | "6223154").PN. OR ("6453041").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/06/23 11:50
S28	30	("3814856" | "3992584" | "4090032" | "4149032" | "4374300" | "4466119" | "4489442").PN. OR ("5414776").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2011/06/23 11:52

6/24/2011 10:14:56 AM
C:\Documents and Settings\llao1\My Documents\EAST\Workspaces\10667207.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	**Art Unit**
	LUN-SEE LAO	2614

ORIGINAL		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
381	71.8	H	0	3	B	29 / 00 (2006.01.01)					

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
704	215				

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1		17		33	17	49								
2	2		18		34										
3	3		19	18	35										
	4		20		36										
	5		21	19	37										
4	6		22	20	38										
	7		23		39										
5	8		24		40										
6	9		25		41										
7	10	11	26		42										
8	11		27		43										
	12	12	28		44										
	13	13	29	9	45										
	14	14	30		46										
	15	15	31	10	47										
	16	16	32		48										

/LUN -SEE LAO/ Examiner.Art Unit 2614	06-24-2011	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/DAVETTA GOINS/ Supervisory Patent Examiner.Art Unit 2614	07/02/2011	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

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BIB DATA SHEET

CONFIRMATION NO. 7159

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/667,207	09/18/2003 RULE	381	2614	ALPH.P010X

APPLICANTS

Gregory C. Burnett, Dodge Center, MN;
Eric F. Breitfeller, Dublin, CA;

**** CONTINUING DATA ***************************

This application is a CIP of 09/905,361 07/12/2001 ABN
which claims benefit of 60/219,297 07/19/2000

**** FOREIGN APPLICATIONS *************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
12/12/2003

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/LUN SEE LAO/ Examiner's Signature	☐ Initials	MN	12	44	8

ADDRESS

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005
UNITED STATES

TITLE

Voice activity detector (VAD) -based multiple-microphone acoustic noise suppression

FILING FEE RECEIVED		
881	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	Lao, Lun-See	2614

SEARCHED			
Class	Subclass	Date	Examiner
381	70, 94.1-94.7, 71.8, 91-92, 122,71.1	06-22-2011	L.S.
704	200,231, 233, 214-215, 246	06-22-2011	L.S.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	06-22-2011	L.S.
CHECK 101	06-22-2011	L.S.
PING LEE	06-22-2011	L.S.

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
	UPDATE ABOVE SEARCHED	06-24-2011	L.S.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN LAO	2614

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009	12/11/2009	08/20/2010	06/23/2011				
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3	3	✓	✓	✓	✓	=				
	4	-	-	-	-	-				
	5	-	-	-	-	-				
4	6	✓	✓	✓	✓	=				
	7	✓	-	-	-	-				
5	8	✓	✓	✓	✓	=				
6	9	✓	✓	✓	✓	=				
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8	11	✓	✓	✓	✓	=				
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	27	✓	-	-	-	-				
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18	35	✓	✓	✓	✓	=				
	36	✓	-	-	-	-				

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10667207	BURNETT ET AL.
	Examiner	Art Unit
	LUN LAO	2614

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/04/2008	03/07/2009	12/11/2009	08/20/2010	06/23/2011				
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	40	✓	-	-	-	-				
	41	✓	✓	-	-	-				
	42	-	-	-	-	-				
	43	-	-	-	-	-				
	44	-	-	-	-	-				
9	45	✓	✓	✓	✓	=				
	46	✓	✓	-	-	-				
10	47		✓	✓	✓	=				
	48		✓	-	-	-				
17	49		✓	✓	✓	=				
	50									

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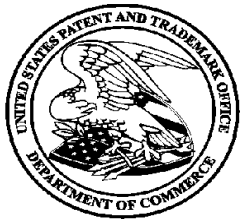

Courtesy Reminder for
Application Serial No: 10/667,207

Attorney Docket No: ALPH.P010X
Customer Number: 98195
Date of Electronic Notification: 07/13/2011

This is a courtesy reminder that new correspondence is available for this application. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

rick@gregorymartensen.com
vlad@gregorymartensen.com
mike@gregorymartensen.com

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To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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98195 7590 07/13/2011
Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X	7159

TITLE OF INVENTION: VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	10/13/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAO, LUN S	2614	381-071800

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Gregory & Sawrie LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ALIPHCOM, INC.
(B) RESIDENCE: (CITY and STATE OR COUNTRY): SAN FRANCISCO, CA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☑ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☑ Payment by credit card. Form PTO-2038 is attached.
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5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date July 28, 2011
Typed or printed name Richard L. Gregory, Jr. Registration No. 42,607

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Electronic Patent Application Fee Transmittal

Application Number:	10667207
Filing Date:	18-Sep-2003
Title of Invention:	VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Kim Moore
Attorney Docket Number:	ALPH.P010X

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Reissue issue fee	1511	1	1510	1510
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1810**

Electronic Acknowledgement Receipt

EFS ID:	10622467
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	98195
Filer:	Richard L. Gregory/Kim Moore
Filer Authorized By:	Richard L. Gregory
Attorney Docket Number:	ALPH.P010X
Receipt Date:	28-JUL-2011
Filing Date:	18-SEP-2003
Time Stamp:	17:36:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1810
RAM confirmation Number	4418
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Issue Fee Payment (PTO-85B)	ALPHP010X_Fee_Transmittal_28JUL2011.pdf	232088 2bf916bd5c3266eb9884e987f569f7265ae79615	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32301 9ace1ca996223f94c0e605fe59ddb1f9583a7a33	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	264389		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Bib Data Sheet

CONFIRMATION NO. 7159

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/667,207	09/18/2003 RULE	381	2614	ALPH.P010X

APPLICANTS

Gregory C. Burnett, Dodge Center, MN;
Eric F. Breitfeller, Dublin, CA;

**** CONTINUING DATA ***************************

This application is a CIP of 09/905,361 07/12/2001 ABN which claims benefit of 60/219,297 07/19/2000

**** FOREIGN APPLICATIONS ********************

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 12/12/2003

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no	MN	12	44	8
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS
98195

TITLE

VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

FILING FEE RECEIVED		
1181	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

9/18/03

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	To be assigned
Filing Date	September 18, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	ALPH.P010X

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
LL		5,212,764		Ariyoshi	05-18-1993	
		5,400,409		Linhard	03-21,1995	
		5,414,776		Sims, Jr.	05-09-1995	
		5,539,859		Robbe et al.	07-23-1996	
		5,633,935		Kanamori et al.	05-27-1997	
		5,835,608		Warnaka et al.	11-10-1998	
		5,917,921		Sasaki et al.	06-29-1999	
		6,000,396		Nagata 6,009,396	12-28-1999	
		6,191,724	B1	McEwan	02-20-2001	
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Change(s) applied to document,
/N.W.S./
8/3/2011

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	/Lun Lao/	Date Considered	01/31/2007

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Unique citation designation number. [2] See attached Kinds of U.S. Patent Documents. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/667,207
Filing Date	09/18/2003
First Named Inventor	Gregory C. Burnett
Art Unit	1775
Examiner Name	Not yet assigned
Attorney Docket Number	ALPH.P010X

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
LL		US- 2002/039425 A1	04-04-2002	Burnett et al.	
		US- 3,789,166	01-29-1974	Sebesta	
		US- 4,006,318	02-01-1977	Sebesta et al.	
		US- 4,591,668	05-27-1986	Iwata	
		US- 4,901,354	02-13-1990	Gollmar et al.	
		US- 5,097,515	03-17-~~2002~~ 1992	Baba	
		US- 5,515,865	05-14-1996	Scanlon et al.	
		US- 5,684,460	11-04-1997	Scanlon et al.	
LL		US- 5,729,694	03-17-1998	Holzrichter et al.	
LL		US- 5,853,005	12-29-1998	Scanlon	
LL		US- 6,069,963	05-30-2000	Martin et al.	
		US-			
		US-			
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		US-			
		US-			
		US-			
		US-			
		US-			

Change(s) applied to document, /N.W.S./ 8/3/2011

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
LL		EP 0 637 187 A	02-01-1995	Pan Communicati		
		EP 0 795 851 A2	09-17-1997	Tokyo Shibaura		
		EP 0 984 660 A2	03-08-2000	Nippon T&T Corp		
		JP 2000 312 395	11-07-2000	Alpine Electron		
		JP 2001 189 987	07-10-2001	Pioneer Electro		
LL		WO 02 07151	01-24-2002	ALIPHCOM, Inc.		

Examiner Signature	/Lun Lao/	Date Considered	01/31/2007

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,207	09/13/2011	8019091	ALPH.P010X	7159

98195 7590 08/24/2011

Gregory & Sawrie LLP
2018 Bissonnet Street
Houston, TX 77005

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 713 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Gregory C. Burnett, Dodge Center, MN;
Eric F. Breitfeller, Dublin, CA;

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 15516

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 15516

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

AliphCom, Inc.
410 Jessie Street, Unit 601
San Francisco, CA 94103

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	[signature]	Date	11-21-2011
Name	Michael Edward Smith Luna	Telephone	(877) 254-7426
Title	Chief Technology Officer, AliphCom, Inc.		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Gregory C. Burnett, Eric F. Breitfeller

Application No./Patent No.: 10/667,207 Filed/Issue Date: 09/18/2003

Titled: VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

AliphCom, Inc. , a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [X] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 015117, Frame 0046, or for which a copy therefore is attached.

OR

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[X] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Scott S. Kokka/	November 30, 2011
Signature	Date
Scott S. Kokka	Attorney of Record
Printed or Typed Name	Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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EFS ID:	11516605
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	98195
Filer:	Scott Susumu Kokka
Filer Authorized By:	
Attorney Docket Number:	ALPH.P010X
Receipt Date:	30-NOV-2011
Filing Date:	18-SEP-2003
Time Stamp:	23:07:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		ALI-051CIP1_GPOA_and_Stmt_37CFR373b_asfiled.pdf	917517 689e12c33b9239a37734bef5460e03bf0c518d95	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Power of Attorney	1	1
	Assignee showing of ownership per 37 CFR 3.73(b).	2	3
Warnings:			
Information:			
	Total Files Size (in bytes):	917517	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 15516

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 15516

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

AliphCom, Inc.
8000 Marina Blvd., Suite 120
Brisbane, California 94005

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	12-2-2011
Name	Michael Edward Smith Luna	Telephone	(877) 254-7426
Title	Chief Technology Officer, AliphCom, Inc.		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Gregory C. Burnett; Eric F. Breitfeller

Application No./Patent No.: 10/667,207 / 8,019,091 Filed/Issue Date: 09/18/2003; 09/13/2011

Titled: VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

AliphCom, Inc. , a Corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [X] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 015117, Frame 0046, or for which a copy therefore is attached.

OR

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

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2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
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3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[X] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature — December 2, 2011 (Date)

Scott S. Kokka (Printed or Typed Name) — Attorney of Record (Title)

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt

EFS ID:	11536936
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	98195
Filer:	Scott Susumu Kokka
Filer Authorized By:	
Attorney Docket Number:	ALPH.P010X
Receipt Date:	02-DEC-2011
Filing Date:	18-SEP-2003
Time Stamp:	20:38:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		ALI-051CIP1_GPOA_and_Stmt_37CFR373b_asfiled.pdf	388330 c807fc3cf517a3465d52705d525c887149817fe9	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Power of Attorney	1	1
	Assignee showing of ownership per 37 CFR 3.73(b).	2	2
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Information:			
	Total Files Size (in bytes):	388330	

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X

CONFIRMATION NO. 7159

98195
Gregory & Sawrie LLP
2018 Bissonnet Street
Houston, TX 77005

POWER OF ATTORNEY NOTICE

OC000000051333884

Date Mailed: 12/12/2011

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/30/2011.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/atesfai/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/667,207	09/18/2003	Gregory C. Burnett	ALPH.P010X

CONFIRMATION NO. 7159

15516
Kokka & Backus, PC
703 Hight Street
Palo Alto, CA 94301

POA ACCEPTANCE LETTER

OC000000051333892

Date Mailed: 12/12/2011

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/30/2011.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/atesfai/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT3502102

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	SECURITY INTEREST

CONVEYING PARTY DATA

Name	Execution Date
ALIPHCOM	08/26/2015
MACGYVER ACQUISITION LLC	08/26/2015
ALIPH, INC.	08/26/2015
BODYMEDIA, INC.	08/26/2015
PROJECT PARIS ACQUISITION LLC	08/26/2015

RECEIVING PARTY DATA

Name:	BLACKROCK ADVISORS, LLC
Street Address:	1 UNIVERSITY SQUARE DRIVE
Internal Address:	C/O GLOBAL ALLOCATION GROUP
City:	PRINCETON
State/Country:	NEW JERSEY
Postal Code:	08540

PROPERTY NUMBERS Total: 604

Property Type	Number
Application Number:	10159770
Application Number:	13069244
Application Number:	13069264
Application Number:	13069275
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Application Number:	29517054
Application Number:	29517056

CORRESPONDENCE DATA

Fax Number: (617)235-9802

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 6179517860
Email: ronald.duvernay@ropesgray.com
Correspondent Name: JOSHUA S. JACKSON
Address Line 1: PRUDENTIAL TOWER, 800 BOYLSTON STREET
Address Line 2: ROPES & GRAY LLP
Address Line 4: BOSTON, MASSACHUSETTS 02199-3600

ATTORNEY DOCKET NUMBER:	MFOG-652
NAME OF SUBMITTER:	JOSHUA S. JACKSON
SIGNATURE:	/j jackson/
DATE SIGNED:	08/27/2015
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 32
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AMENDED AND RESTATED PATENT SECURITY AGREEMENT

THIS AMENDED AND RESTATED PATENT SECURITY AGREEMENT (as it may be amended, restated or otherwise modified from time to time, the "Patent Security Agreement") is entered into as of August 26, 2015 by and among (i) AliphCom, a California corporation (the "Company"), MacGyver Acquisition LLC, a Delaware limited liability company, Aliph, Inc., a Delaware Corporation, BodyMedia, Inc., a Delaware corporation, and Project Paris Acquisition LLC, a Delaware limited liability company (each, a "Grantor", and collectively, the "Grantors"), and (ii) BlackRock Advisors, LLC, a Delaware limited liability company (the "Agent").

W I T N E S S E T H:

WHEREAS, each of the Grantors, the Purchasers identified therein and the Agent are entering into the Note Purchase Agreement, dated as of April 28, 2015, as amended by the First Amendment to Note Purchase Agreement; Omnibus Amendment to Secured Convertible Promissory Notes and Limited Consent, dated as of July 22, 2015 (as amended, restated, supplemented, or otherwise modified from time to time, the "Existing Note Purchase Agreement"), pursuant to which the Company issued certain secured convertible promissory notes (the "Notes") and the other Grantors agreed to Guarantee the Obligations;

WHEREAS, each of the Grantors and the Agent entered into the original Security Agreement, dated as of April 28, 2015 (as amended, restated, supplemented, or otherwise modified from time to time, the "Original Security Agreement"), in order to induce the Purchasers to purchase the Notes and to secure the Secured Obligations; and

WHEREAS, pursuant to the Original Security Agreement, each of the Grantors is required to execute and deliver to Agent the original Patent Security Agreement, dated as of April 28, 2015 (the "Original Patent Security Agreement");

WHEREAS, each of the Grantors, the Purchasers identified therein and the Agent entered into the Note Purchase Agreement, dated as of July 21, 2015 (as amended, restated, supplemented, or otherwise modified from time to time, the "July 2015 Note Purchase Agreement"), pursuant to which the Company issued certain additional Notes and the other Grantors agreed to Guarantee the Secured Obligations;

WHEREAS, each of the Grantors and the Agent entered into the Amended and Restated Security Agreement, dated as of July 22, 2015 (as amended, restated, supplemented, or otherwise modified from time to time, the "Security Agreement"), in order to induce the Purchasers to purchase the additional Notes and to secure the Secured Obligations; and

WHEREAS, the parties to the Original Patent Security Agreement wish to amend and restate the Original Patent Security Agreement in its entirety;

NOW, THEREFORE, in consideration of the premises and mutual covenants herein contained and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, each Grantor hereby agrees as follows:

1. DEFINED TERMS. All initially capitalized terms used but not otherwise defined herein have the meanings given to them in the Security Agreement, and this Patent Security Agreement shall be subject to the rules of construction set forth in the Security Agreement, which rules of construction are incorporated herein by this reference, *mutatis mutandis*.

2. GRANT OF SECURITY INTEREST IN PATENT COLLATERAL. Each Grantor does hereby unconditionally grant, assign, and pledge to Agent, and agrees to unconditionally grant, assign, and pledge to Agent, for its benefit and the benefit of each of the Noteholders, to secure the Secured Obligations, as applicable, a continuing security interest (referred to in this Patent Security Agreement as the "Security Interest") in all of such Grantor's entire right, title and interest in and to the following, whether now owned or hereafter acquired or arising (collectively, the "Patent Collateral"):

(a) all of such Grantor's Patents and Patent Intellectual Property Licenses to which it is a party including those referred to on Schedule I;

(b) all applications, improvements, divisionals, continuations, continuations-in-part, reissues, reexaminations, or extensions of the foregoing, foreign counterparts, and the inventions covered thereby;

(c) all files and records relating to the prosecution, exploitation, and defense of any of the foregoing, and all rights of action pertaining to the Grantor's Patents; and

(d) all products and proceeds of the foregoing, including any claim by such Grantor against third parties for past, present or future infringement of any Patent or any Patent exclusively licensed under any Intellectual Property License, including the right to receive damages, or right to receive license fees, royalties, and other compensation under any Patent Intellectual Property License.

3. SECURITY FOR SECURED OBLIGATIONS. This Patent Security Agreement and the Security Interest created hereby secures the payment and performance of the Secured Obligations, whether now existing or arising hereafter. Without limiting the generality of the foregoing, this Patent Security Agreement secures the payment of all amounts which constitute part of the Secured Obligations and would be owed by Grantors, or any of them, to Agent, or the Noteholders, whether or not they are unenforceable or not allowable due to the existence of an Insolvency Proceeding involving any Grantor.

4. SECURITY AGREEMENT. The Security Interest granted pursuant to this Patent Security Agreement is granted in conjunction with the security interests granted to Agent, for its benefit and the benefit of the Noteholders, pursuant to the Security Agreement. Each Grantor hereby acknowledges and affirms that the rights and remedies of Agent with respect to the Security Interest in the Patent Collateral made and granted hereby are more fully set forth in the Security Agreement, the terms and provisions of which are incorporated by reference herein as if fully set forth herein. To the extent there is any inconsistency between this Patent Security Agreement and the Security Agreement, the Security Agreement shall control.

5. AUTHORIZATION TO SUPPLEMENT. If any Grantor shall obtain rights to any new patent application or issued patent or become entitled to the benefit of any patent application or patent for any improvement, divisional, continuation, continuation-in-part, reissue, or reexamination of any existing patent or patent application, or any inventions covered thereby, the provisions of this Patent Security Agreement shall automatically apply thereto. Grantors hereby authorize Agent unilaterally to modify this Patent Security Agreement by amending Schedule I to include any such new patent rights of each Grantor. Notwithstanding the foregoing, no failure to so modify this Patent Security Agreement or amend Schedule I shall in any way affect, invalidate or detract from Agent's continuing security interest in all Collateral, whether or not listed on Schedule I.

6. COUNTERPARTS. This Patent Security Agreement is a Note Document. This Patent Security Agreement may be executed in any number of counterparts and by different parties on separate counterparts, each of which, when executed and delivered, shall be deemed to be an original, and all of which, when taken together, shall constitute but one and the same Patent Security Agreement. Delivery

of an executed counterpart of this Patent Security Agreement by telefacsimile or other electronic method of transmission shall be equally as effective as delivery of an original executed counterpart of this Patent Security Agreement. Any party delivering an executed counterpart of this Patent Security Agreement by telefacsimile or other electronic method of transmission also shall deliver an original executed counterpart of this Patent Security Agreement but the failure to deliver an original executed counterpart shall not affect the validity, enforceability, and binding effect of this Patent Security Agreement.

7. CHOICE OF LAW AND VENUE, JURY TRIAL WAIVER. THIS PATENT SECURITY AGREEMENT SHALL BE SUBJECT TO THE PROVISIONS REGARDING CHOICE OF LAW AND VENUE AND JURY TRIAL WAIVER SET FORTH IN SECTIONS 8.16, 8.17 AND 8.18 OF THE SECURITY AGREEMENT, AND SUCH PROVISIONS ARE INCORPORATED HEREIN BY THIS REFERENCE, *MUTATIS MUTANDIS*.

8. ORIGINAL PATENT SECURITY AGREEMENT AMENDED AND RESTATED. This Patent Security Agreement is an amendment and restatement of the Original Patent Security Agreement. This Patent Security Agreement is in no way intended to constitute a novation of the Original Patent Security Agreement or the "Obligations" (as defined in the Existing Note Purchase Agreement and the July 2015 Note Purchase Agreement). Any security granted pursuant to or in connection with the Original Patent Security Agreement and the other documents executed in connection therewith shall continue to secure the Secured Obligations.

[signature page follows]

IN WITNESS WHEREOF, the parties hereto have caused this Patent Security Agreement to be executed and delivered as of the day and year first above written.

GRANTORS:

ALIPHCOM,
a California corporation

By: DocuSigned by: Hosain Rahman 0E4D8FA187D24C0...
Name: Hosain Rahman
Title: Chief Executive Officer

ALIPH, INC.,
a Delaware corporation

By: DocuSigned by: Hosain Rahman 0E4D8FA187D24C0...
Name: Hosain Rahman
Title: Chief Executive Officer

MACGYVER ACQUISITION, LLC,
a Delaware limited liability company
by ALIPHCOM, as sole member

By: DocuSigned by: Hosain Rahman 0E4D8FA187D24C0...
Name: Hosain Rahman
Title: Chief Executive Officer

BODYMEDIA, INC.,
a Delaware corporation

By: DocuSigned by: Hosain Rahman 0E4D8FA187D24C0...
Name: Hosain Rahman
Title: Chief Executive Officer

PROJECT PARIS ACQUISITION LLC, a
Delaware limited liability company
by ALIPHCOM, as sole member

By: DocuSigned by: Hosain Rahman 0E4D8FA187D24C0...
Name: Hosain Rahman
Title: Chief Executive Officer

AGENT:

ACCEPTED AND ACKNOWLEDGED BY:

BLACKROCK ADVISORS, LLC

By: Lisa O'Donnell
Name: Lisa O'Donnell
Title: Managing Director, Authorized Signatory

[SIGNATURE PAGE TO AMENDED AND RESTATED PATENT SECURITY AGREEMENT]

SCHEDULE I
to
PATENT SECURITY AGREEMENT

Patents

Current Owner	Country	Patent No.	Application No.	Filed
Aliph, Inc.	U.S.	7246058B2	10159770	5/30/2002
Aliph, Inc.	U.S.		13069244	3/22/2011
Aliph, Inc.	U.S.		13069264	3/22/2011
Aliph, Inc.	U.S.		13069275	3/22/2011
Aliph, Inc.	U.S.	8,942,383	13753441	1/29/2013
Aliph, Inc.	U.S.	D0609901S	29333427	3/9/2009
Aliph, Inc.	U.S.	D0610579S	29333428	3/9/2009
Aliph, Inc.	U.S.	D0614179S	29333430	3/9/2009
Aliph, Inc.	U.S.	D0609900S	29333431	3/9/2009
Aliph, Inc.	U.S.	D0620247S	29333432	3/9/2009
Aliphcom, Inc.	U.S.	8467543B2	10400282	3/27/2003
Aliphcom, Inc.	U.S.	8019091B2	10667207	9/18/2003
Aliphcom, Inc.	U.S.	7433484B2	10769302	1/30/2004
Aliphcom, Inc.	U.S.	8340309B2	11199856	8/8/2005

Aliphcom	U.S.	8810732B1	11704552	2/9/2007
Aliphcom	U.S.	8839342B2	11859460	9/21/2007
Aliphcom	U.S.	8320824B2	11860004	9/24/2007
Aliphcom	U.S.	7929446	11969737	1/4/2008
Aliphcom	U.S.		11982956	11/5/2007
Aliphcom	U.S.	8489136B2	12006607	1/3/2008
AliphCom, Inc.	U.S.	8055307	12039718	2/18/2008
Aliphcom, Inc.	U.S.	8625816B2	12123364	5/19/2008
Aliphcom, Inc.	U.S.	8503691B2	12139333	6/13/2008
Aliphcom, Inc.	U.S.	8837746B2	12139344	6/13/2008
Aliphcom, Inc.	U.S.	8494177B2	12139355	6/13/2008
Aliphcom, Inc.	U.S.	8503692B2	12139361	6/13/2008

Aliphcom, Inc.	U.S.	8254617B2	12163592	6/27/2008
Aliphcom, Inc.	U.S.	8280072B2	12163617	6/27/2008
Aliphcom, Inc.	U.S.		12163647	6/27/2008
Aliphcom, Inc.	U.S.	8477961B2	12163675	6/27/2008
Aliphcom, Inc.	U.S.	8130984B2	12243718	10/1/2008
Aliphcom, Inc.	U.S.	8503596B2	12244670	10/2/2008
Aliphcom, Inc.	U.S.	8452347B2	12354689	1/15/2009
Aliphcom, Inc.	U.S.	8326611B2	12606140	10/26/2009
Aliphcom, Inc.	U.S.	8321213B2	12606146	10/26/2009
Aliphcom, Inc.	U.S.		12756051	4/7/2010
Aliphcom, Inc.	U.S.	8503686B2	12772947	5/3/2010
Aliphcom, Inc.	U.S.	8452023B2	12772963	5/3/2010
Aliphcom, Inc.	U.S.	8488803B2	12772975	5/3/2010

Aliphcom, Inc.	U.S.	8699721B2	12826643	6/29/2010
Aliphcom, Inc.	U.S.	8731211B2	12826658	6/29/2010
Aliphcom, Inc.	U.S.	8842848B2	12882482	9/15/2010
Aliphcom, Inc.	U.S.	9003429	12886919	9/21/2010
Aliphcom, Inc.	U.S.		13037057	2/28/2011
AliphCom	U.S.		13109839	5/17/2011
Aliphcom, Inc.	U.S.	8817642B2	13117539	5/27/2011
Aliphcom, Inc.	U.S.		13135728	7/12/2011
Aliphcom, Inc.	U.S.		13158372	6/10/2011
Aliphcom, Inc.	U.S.		13158416	6/11/2011
Aliphcom	U.S.		13180000	7/11/2011
Aliphcom	U.S.	8793522B2	13180320	7/11/2011
Aliphcom	U.S.		13181486	7/12/2011

Aliphcom	U.S.		13181500	7/12/2011
Aliphcom	U.S.		13181511	7/12/2011
Aliphcom	U.S.		13181512	7/12/2011
Aliphcom	U.S.		13181513	7/12/2011
Aliphcom	U.S.	8838184B2	13184422	7/15/2011
Aliphcom	U.S.		13209047	8/12/2011
AliphCom, Inc.	U.S.	8509690B2	13246617	9/27/2011
Aliphcom	U.S.		13247975	9/28/2011
Aliphcom	U.S.	8804986B2	13270976	10/11/2011
Aliphcom	U.S.		13346719	1/9/2012
Aliphcom	U.S.		13361919	1/30/2012
Aliphcom	U.S.		13374746	1/9/2012

Aliphcom	U.S.		13405240	2/25/2012
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Aliphcom	U.S.		13420568	3/14/2012
Aliphcom	U.S.		13421576	3/15/2012
Aliphcom	U.S.	8529811B2	13427839	3/22/2012
Aliphcom, Inc.	U.S.		13431725	3/27/2012
Aliphcom	U.S.		13433204	3/28/2012
Aliphcom	U.S.		13433208	3/28/2012
Aliphcom	U.S.		13433213	3/28/2012
Aliphcom, Inc.	U.S.	8682018B2	13436765	3/30/2012
Aliphcom, Inc.	U.S.	8446275B2	13454040	4/23/2012
Aliphcom	U.S.		13491345	6/7/2012

Aliphcom	U.S.		13491524	6/7/2012
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Aliphcom	U.S.		13528830	6/20/2012
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AliphCom	U.S.		14210201	3/13/2014
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AliphCom	U.S.		14214254	3/14/2014
AliphCom	U.S.		14215038	3/16/2014
AliphCom	U.S.		14215047	3/16/2014
AliphCom	U.S.		14215051	3/16/2014
AliphCom	U.S.		14219648	3/19/2014
Aliphcom, Inc.	U.S.		14224868	3/25/2014
AliphCom	U.S.		14225339	3/25/2014
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AliphCom	U.S.		14244677	4/3/2014
AliphCom	U.S.		14244759	4/3/2014
AliphCom	U.S.		14246971	4/7/2014
AliphCom	U.S.		14260221	4/23/2014
AliphCom	U.S.		14266697	4/30/2014
AliphCom	U.S.		14270242	5/5/2014
AliphCom	U.S.		14270249	5/5/2014

AliphCom	U.S.		14272464	5/7/2014
AliphCom	U.S.		14279253	5/15/2014
AliphCom	U.S.		14281856	5/19/2014
AliphCom	U.S.		14289617	5/28/2014
AliphCom	U.S.		14301220	6/10/2014
AliphCom	U.S.		14301227	6/10/2014
AliphCom	U.S.		14313895	6/24/2014
AliphCom	U.S.		14328665	7/10/2014
AliphCom	U.S.		14389766	9/30/2014
AliphCom	U.S.		14421815	2/13/2015
AliphCom	U.S.		14445051	7/28/2014
AliphCom	U.S.		14452496	8/5/2014
AliphCom	U.S.		14457051	8/11/2014
AliphCom	U.S.		14463556	8/19/2014
AliphCom	U.S.		14468327	8/25/2014
AliphCom, Inc.	U.S.	D0582398S	29299133	12/19/2007
AliphCom, Inc.	U.S.	D0584294S	29299134	12/19/2007
AliphCom, Inc.	U.S.	D0582898S	29299135	12/19/2007
AliphCom, Inc.	U.S.	D0585881S	29299139	12/19/2007
Aliphcom	U.S.	D0632674S	29353843	1/14/2010
Aliphcom	U.S.	D0632675S	29353844	1/14/2010
Aliphcom	U.S.	D0645026S	29353846	1/14/2010
Aliphcom	U.S.	D0632676S	29353847	1/14/2010

Aliphcom	U.S.	D0633480S	29354212	1/20/2010
Aliphcom	U.S.	D0648709S	29377627	10/22/2010
Aliphcom	U.S.	D0648726S	29377628	10/22/2010
Aliphcom	U.S.	D0645024S	29378325	11/2/2010
AliphCom	U.S.	D0655689S	29378327	11/2/2010
AliphCom	U.S.	D0652019S	29378328	11/2/2010
AliphCom	U.S.	D0652020S	29378329	11/2/2010
AliphCom	U.S.	D0641341S	29383495	1/18/2011
AliphCom	U.S.	D0664948S	29383712	1/20/2011
AliphCom	U.S.	D0664949S	29383714	1/20/2011
AliphCom	U.S.	D0653149S	29393916	6/10/2011
AliphCom	U.S.	D0695758S	29405617	11/3/2011
AliphCom	U.S.	D0696272S	29405623	11/3/2011
AliphCom	U.S.	D0695759S	29405625	11/3/2011
AliphCom	U.S.	D0695760S	29405626	11/3/2011
AliphCom	U.S.	D0695761S	29405627	11/3/2011
AliphCom	U.S.	D0696273S	29405628	11/3/2011
AliphCom	U.S.	D0696274S	29405630	11/3/2011

AliphCom	U.S.	D0695762S	29405631	11/3/2011
AliphCom	U.S.	D0699252S	29405633	11/3/2011
AliphCom	U.S.	D0695763S	29405634	11/3/2011
AliphCom	U.S.	D0696275S	29405635	11/3/2011
AliphCom	U.S.	D0695764S	29405636	11/3/2011
AliphCom	U.S.	D0695765S	29405637	11/3/2011
AliphCom	U.S.	D0695766S	29405638	11/3/2011
AliphCom	U.S.	D0695767S	29405639	11/3/2011
AliphCom	U.S.	D0695768S	29405640	11/3/2011
AliphCom	U.S.	D0695769S	29405641	11/3/2011
AliphCom	U.S.	D0695770S	29405642	11/3/2011
AliphCom	U.S.	D0695771S	29405643	11/3/2011
AliphCom	U.S.	D0695772S	29405644	11/3/2011
AliphCom	U.S.	D0695773S	29405645	11/3/2011
AliphCom	U.S.	D0696276S	29405646	11/3/2011
AliphCom	U.S.	D0678864S	29413571	2/16/2012
AliphCom	U.S.	D0678865S	29413572	2/16/2012

AliphCom	U.S.	D0678244S	29413573	2/16/2012
AliphCom	U.S.	D0698757S	29445283	2/8/2013
AliphCom	U.S.	D0698758S	29445286	2/8/2013
AliphCom	U.S.	D0698759S	29445287	2/8/2013
AliphCom	U.S.	D0710325S	29459899	7/3/2013
AliphCom	U.S.	D0713389S	29459900	7/3/2013
AliphCom	U.S.		62019327	6/30/2014
AliphCom	U.S.		62067428	10/22/2014
AliphCom	U.S.		62107411	1/25/2015
AliphCom	U.S.		14/121,355	8/22/2014
AliphCom	U.S.		14/121,463	9/8/2014
AliphCom	U.S.		14/121,465	9/8/2014
AliphCom	U.S.		14/121,938	11/4/2014
AliphCom	U.S.		14/121,939	11/4/2014
AliphCom	U.S.		14/121,940	11/4/2014
AliphCom	U.S.		14/121,941	11/4/2014
AliphCom	U.S.		14/121,942	11/4/2014
AliphCom	U.S.		14/121,943	11/4/2014
AliphCom	U.S.		14/121,944	11/4/2014
AliphCom	U.S.		14/121,947	11/4/2014
AliphCom	U.S.		14/121,948	11/4/2014
AliphCom	U.S.		14/313901	6/24/2014
AliphCom	U.S.		14/480,048	9/8/2014
AliphCom	U.S.		14/480,070	9/8/2014
AliphCom	U.S.		14/480,427	9/8/2014
AliphCom	U.S.		14/480,446	9/8/2014
AliphCom	U.S.		14/480,452	9/8/2014
AliphCom	U.S.		14/480,462	9/8/2014
AliphCom	U.S.		14/480,628	9/8/2014
AliphCom	U.S.		14/486,978	9/15/2014
AliphCom	U.S.		14/486,997	9/15/2014

AliphCom	U.S.		14/488,042	9/16/2014
AliphCom	U.S.		14/493,298	9/22/2014
AliphCom	U.S.		14/519,116	10/20/2014
AliphCom	U.S.		14/526,503	10/28/2014
AliphCom	U.S.		14/532,789	11/4/2014
AliphCom	U.S.		14/541,064	11/13/2014
AliphCom	U.S.		14/541,134	11/13/2014
AliphCom	U.S.		14/541,135	11/13/2014
AliphCom	U.S.		14/578,297	12/19/2014
AliphCom	U.S.		14/596,127	1/13/2015
AliphCom	U.S.		14/606,995	1/27/2015
AliphCom	U.S.		14/637,387	3/3/2015
AliphCom	U.S.		14/640,013	3/5/2015
AliphCom	U.S.		14/656,683	3/12/2015
AliphCom	U.S.		14/659,521	3/16/2015
BodyMedia, Inc.	U.S.	6,527,711	9419600	10/18/1999
BodyMedia, Inc.	U.S.	7,689,437	9595660	6/16/2000
BodyMedia, Inc.	U.S.	6605038B1	9602537	6/23/2000
BodyMedia, Inc.	U.S.		9620579	7/20/2000
BodyMedia, Inc.	U.S.	6595929B2	9822890	3/30/2001
BodyMedia, Inc.	U.S.	7261690B2	9923181	8/6/2001
BodyMedia, Inc.	U.S.	7020508B2	10227575	8/22/2002
Bodymedia, Inc.	U.S.	7153262B2	10313255	12/6/2002
BodyMedia	U.S.		10612894	7/7/2003
BodyMedia, Inc.	U.S.	8157731B2	10682293	10/9/2003
BodyMedia, Inc.	U.S.	7285090B2	10682759	10/9/2003
BodyMedia, Inc.	U.S.	8398546B2	10940214	9/13/2004
BodyMedia, Inc.	U.S.	7502643B2	10940889	9/13/2004
BodyMedia, Inc.	U.S.	8663106B2	11088002	3/22/2005

Bodymedia, Inc.	U.S.		11239748	9/30/2005
Bodymedia, Inc.	U.S.	8073707	11247049	10/11/2005
Bodymedia, Inc.	U.S.	8961413	11434949	5/16/2006
Bodymedia, Inc.	U.S.	8403845	11481147	7/5/2006
BodyMedia, Inc.	U.S.		11582896	10/17/2006
Bodymedia, Inc.	U.S.	8961414B2	11724373	3/15/2007
Bodymedia, Inc.	U.S.	7,959,567	11876623	10/22/2007
Bodymedia, Inc.	U.S.		11925906	10/27/2007
BodyMedia, Inc.	U.S.	8708904B2	11925965	10/28/2007
Bodymedia, Inc.	U.S.		11928039	10/30/2007
Bodymedia, Inc.	U.S.		11930036	10/30/2007
Bodymedia, Inc.	U.S.		11930053	10/30/2007
Bodymedia, Inc.	U.S.		11930081	10/30/2007
Bodymedia, Inc.	U.S.	8641612B2	11930091	10/31/2007
Bodymedia, Inc.	U.S.	8,968,196	11930092	10/31/2007
Bodymedia, Inc.	U.S.	8852098B2	11930094	10/31/2007

BodyMedia, Inc.	U.S.		12033722	2/19/2008
BodyMedia, Inc.	U.S.		12033731	2/19/2008
BodyMedia, Inc.	U.S.		12033741	2/19/2008
BodyMedia, Inc.	U.S.		12033746	2/19/2008
BodyMedia, Inc.	U.S.		12033751	2/19/2008
BodyMedia, Inc.	U.S.	8382590B2	12033753	2/19/2008
BodyMedia, Inc.	U.S.	8275635B2	12033760	2/19/2008
BodyMedia, Inc.	U.S.		12033766	2/19/2008
BodyMedia	U.S.		12352911	1/13/2009
BodyMedia, Inc.	U.S.	8369936B2	12840109	7/20/2010
BodyMedia, Inc. Virginia Commonwealth University	U.S.		13130282	6/18/2012
Bodymedia, Inc.	U.S.	8870766	13291879	11/8/2011
Bodymedia, Inc.	U.S.		13291982	11/8/2011
BodyMedia, Inc.	U.S.		13734433	1/4/2013
BodyMedia, Inc.	U.S.		13761409	2/7/2013
BODYMEDIA, INC.	U.S.		13761557	2/7/2013

BodyMedia, Inc.	U.S.		14058485	10/21/2013
BodyMedia, Inc.	U.S.		14058493	10/21/2013
BodyMedia, Inc.	U.S.	8979763	14058501	10/21/2013
BodyMedia, Inc.	U.S.		14058563	10/21/2013
BodyMedia, Inc.	U.S.		14059054	10/21/2013
BodyMedia, Inc.	U.S.		14059072	10/21/2013
BodyMedia, Inc.	U.S.		14059117	10/21/2013
BODYMEDIA, INC.	U.S.		14060004	10/22/2013
BodyMedia, Inc.	U.S.		14060010	10/22/2013
BodyMedia, Inc.	U.S.		14060029	10/22/2013
BodyMedia, Inc.	U.S.		14060047	10/22/2013
BodyMedia, Inc.	U.S.		14060072	10/22/2013
BodyMedia, Inc.	U.S.		14060082	10/22/2013
BodyMedia, Inc.	U.S.		14060092	10/22/2013
BODYMEDIA, INC.	U.S.		14060122	10/22/2013
BodyMedia, Inc.	U.S.		14081369	11/15/2013
BodyMedia, Inc.	U.S.		14081406	11/15/2013
BodyMedia, Inc.	U.S.		14081880	11/15/2013
BodyMedia, Inc.	U.S.		14081889	11/15/2013
BodyMedia, Inc.	U.S.		14081901	11/15/2013
BodyMedia, Inc.	U.S.		14081928	11/15/2013
BodyMedia, Inc.	U.S.		14081935	11/15/2013
BodyMedia, Inc.	U.S.		14081942	11/15/2013
BodyMedia, Inc.	U.S.		14081951	11/15/2013
BodyMedia, Inc.	U.S.		14081956	11/15/2013
BodyMedia, Inc.	U.S.		14081967	11/15/2013
BodyMedia, Inc.	U.S.		14081972	11/15/2013
BodyMedia, Inc.	U.S.		14081979	11/15/2013
BodyMedia, Inc.	U.S.		14082070	11/15/2013
BodyMedia, Inc.	U.S.		14082176	11/17/2013
BodyMedia, Inc.	U.S.		14082178	11/17/2013
BodyMedia, Inc.	U.S.		14082179	11/17/2013
BODYMEDIA, INC.	U.S.		14082180	11/17/2013
BodyMedia, Inc.	U.S.		14082183	11/17/2013
BODYMEDIA, INC.	U.S.		14082185	11/17/2013
BodyMedia, Inc.	U.S.		14082186	11/17/2013
BodyMedia, Inc.	U.S.		14082188	11/17/2013
BodyMedia, Inc.	U.S.		14082189	11/17/2013
BodyMedia, Inc.	U.S.		14082190	11/17/2013
BodyMedia, Inc.	U.S.		14082192	11/17/2013
BodyMedia, Inc.	U.S.		14083372	11/18/2013

BodyMedia, Inc.	U.S.		14083382	11/18/2013
BodyMedia, Inc.	U.S.		14083389	11/18/2013
BodyMedia, Inc.	U.S.		14083397	11/18/2013
BodyMedia, Inc.	U.S.		14083401	11/18/2013
BodyMedia, Inc.	U.S.		14083404	11/18/2013
BodyMedia, Inc.	U.S.		14083407	11/18/2013
BodyMedia, Inc.	U.S.		14133607	12/18/2013
BodyMedia, Inc.	U.S.		14133610	12/18/2013
BodyMedia, Inc.	U.S.		14133612	12/18/2013
BodyMedia, Inc.	U.S.		14133615	12/18/2013
BodyMedia, Inc.	U.S.		14133619	12/18/2013
BodyMedia, Inc.	U.S.		14133620	12/18/2013
BodyMedia, Inc.	U.S.		14133622	12/18/2013
BodyMedia, Inc.	U.S.		14133625	12/18/2013
BodyMedia, Inc.	U.S.		14133626	12/18/2013
BodyMedia, Inc.	U.S.		14133634	12/18/2013
BodyMedia, Inc.	U.S.		14133638	12/19/2013
BodyMedia, Inc.	U.S.		14133640	12/19/2013
BodyMedia, Inc.	U.S.		14133641	12/19/2013
BodyMedia, Inc.	U.S.		14136750	12/20/2013
BodyMedia, Inc.	U.S.		14137027	12/20/2013
BodyMedia, Inc.	U.S.		14137087	12/20/2013
BodyMedia, Inc.	U.S.		14137126	12/20/2013
BodyMedia, Inc.	U.S.		14137233	12/20/2013
BodyMedia, Inc.	U.S.		14138030	12/21/2013
BodyMedia, Inc.	U.S.		14138033	12/21/2013
BodyMedia, Inc.	U.S.		14138042	12/21/2013
BodyMedia, Inc.	U.S.		14138043	12/21/2013
BodyMedia, Inc.	U.S.		14138046	12/21/2013
BodyMedia, Inc.	U.S.		14139871	12/24/2013
BodyMedia, Inc.	U.S.		14139872	12/24/2013
BodyMedia, Inc.	U.S.		14139873	12/24/2013
Bodymedia, Inc.	U.S.		14139875	12/24/2013
BodyMedia, Inc.	U.S.		14221506	3/21/2014
BODYMEDIA, INC.	U.S.		14248576	4/9/2014
BodyMedia, Inc.	U.S.		14248776	4/9/2014
BodyMedia	U.S.		14248830	4/9/2014
BodyMedia	U.S.		14248853	4/9/2014
BodyMedia	U.S.		14248885	4/9/2014
BodyMedia, Inc.	U.S.		14249135	4/9/2014

BodyMedia, Inc.	U.S.		14249211	4/9/2014
BodyMedia	U.S.		14249235	4/9/2014
BodyMedia, Inc.	U.S.		14249262	4/9/2014
BodyMedia, Inc.	U.S.		14249290	4/9/2014
BodyMedia, Inc.	U.S.		14249314	4/9/2014
BodyMedia	U.S.		14249318	4/9/2014
BodyMedia	U.S.		14249328	4/9/2014
BodyMedia	U.S.		14252090	4/14/2014
BodyMedia	U.S.		14284947	5/22/2014
BodyMedia	U.S.		14285018	5/22/2014
BodyMedia	U.S.		14285036	5/22/2014
BodyMedia	U.S.		14285092	5/22/2014
BodyMedia, Inc.	U.S.		14285159	5/22/2014
BodyMedia, Inc.	U.S.		14285194	5/22/2014
BodyMedia	U.S.		14285232	5/22/2014
BodyMedia, Inc.	U.S.		14292105	5/30/2014
BodyMedia, Inc.	U.S.		14292368	5/30/2014
BodyMedia, Inc.	U.S.		14292735	5/30/2014
BodyMedia	U.S.		14292831	5/31/2014
BodyMedia	U.S.		14292833	5/31/2014
BodyMedia	U.S.		14336413	7/21/2014
BodyMedia	U.S.		14336448	7/21/2014
BodyMedia	U.S.		14336539	7/21/2014
BodyMedia	U.S.		14336571	7/21/2014
BodyMedia	U.S.		14336598	7/21/2014
BodyMedia	U.S.		14336625	7/21/2014
BodyMedia, Inc.	U.S.	D0439981S	29127587	8/9/2000
BodyMedia, Inc.	U.S.	D0451604S	29129931	9/25/2000
BodyMedia, Inc.	U.S.	D0460971S	29143975	6/21/2001
BodyMedia, Inc.	U.S.	D632396	29256362	3/20/2006
BodyMedia, Inc.	U.S.	D631552	29256753	3/24/2006

BodyMedia, Inc.	U.S.	D0645968S	29383860	1/24/2011
BodyMedia, Inc.	U.S.	D0698028S	29434003	10/9/2012
BodyMedia	U.S.		14/509,034	10/7/2014
BodyMedia	U.S.		14/526,499	10/28/2014
BodyMedia	U.S.		14/630,618	2/24/2015
BodyMedia	U.S.		14/630,618	2/24/2015
BodyMedia	U.S.		14/636,157	3/2/2015
BodyMedia	U.S.		14/636,158	3/2/2015
BodyMedia, Inc.	U.S.		95/002,354	9/14/2012
BodyMedia, Inc.	U.S.		95/002,360	9/14/2012
BodyMedia, Inc.	U.S.		95/002,366	9/14/2012
BodyMedia, Inc.	U.S.		95/002,367	9/14/2012
BodyMedia, Inc.	U.S.		95/002,371	9/14/2014
Bodymedia, Inc.	U.S.		95/002,376	9/14/2012
BodyMedia, Inc.	U.S.		95/002,382	9/14/2012
Project Paris Acquisition LLC	U.S.		14039258	9/27/2013
University of Maryland, College park Office of Technology Commercialization	U.S.	6,399,306	9622910	9/5/2000
University of Maryland, College park Office of Technology Commercialization	U.S.	6743587	9986989	11/13/2001
	U.S.		29445284	2/8/2013

	U.S.		29466527	9/9/2013
	U.S.		29466531	9/9/2013
	U.S.		29466534	9/9/2013
	U.S.		29466536	
	U.S.		29466539	
	U.S.		29470963	10/25/2013
	U.S.		29470964	10/25/2013
	U.S.		29470965	10/25/2013
	U.S.		29470966	
	U.S.		29470967	
	U.S.		29470968	
	U.S.		29477005	
	U.S.		29477006	
	U.S.		29/478,533	1/6/2014
	U.S.		29/479,052	1/10/2014
	U.S.		29/479,055	1/10/2014
	U.S.		29/479,058	1/10/2014
	U.S.		29/479,060	1/10/2014
	U.S.		29/479,064	1/10/2014
	U.S.		29/479,066	1/10/2014
	U.S.		29/479,069	1/10/2014
	U.S.		29/479,071	1/10/2014
	U.S.		29/479,074	1/10/2014
	U.S.		29/479,077	1/10/2014
	U.S.		29/479,078	1/10/2014
	U.S.		29/479,079	1/10/2014
	U.S.		29/482,849	2/21/2014
	U.S.		29/482,850	2/21/2014
	U.S.		29/482,851	2/21/2014
	U.S.		29/482,852	2/21/2014
	U.S.		29/482,854	2/21/2014
	U.S.		29/482,855	2/21/2014
	U.S.		29/482,856	2/21/2014
	U.S.		29/485,103	3/14/2014
	U.S.		29/485,118	3/16/2014
	U.S.		29/495,368	6/30/2014
	U.S.		29/495,369	6/30/2014
	U.S.		29/495,373	6/30/2014
	U.S.		29/495,376	6/30/2014
	U.S.		29/495,380	6/30/2014
	U.S.		29/495,384	6/30/2014

	U.S.		29/495,387	6/30/2014
	U.S.		29/495,389	6/30/2014
	U.S.		29/495,390	6/30/2014
	U.S.		29/495,394	6/30/2014
	U.S.		29/495,395	6/30/2014
	U.S.		29/495,397	6/30/2014
	U.S.		29/495,399	6/30/2014
	U.S.		29/495,400	6/30/2014
	U.S.		29/495,404	6/30/2014
	U.S.		29/495,405	6/30/2014
	U.S.		29/495,406	6/30/2014
	U.S.		29/495,407	6/30/2014
	U.S.		29/495,669	7/2/2014
	U.S.		29/495,670	7/2/2014
	U.S.		29/495,674	7/2/2014
	U.S.		29/508,180	11/4/2014
	U.S.		29/508,184	11/4/2014
	U.S.		29/508,185	11/4/2014
	U.S.		29/508,187	11/4/2014
	U.S.		29/508,193	11/4/2014
	U.S.		29/508,196	11/4/2014
	U.S.		29/508,200	11/4/2014
	U.S.		29/508,205	11/4/2014
	U.S.		29/508,207	11/4/2014
	U.S.		29/516,012	1/28/2015
	U.S.		29/516,014	1/28/2015
	U.S.		29/516,015	1/28/2015
	U.S.		29/516,016	1/28/2015
	U.S.		29/516,017	1/28/2015
	U.S.		29/517,054	2/9/2015
	U.S.		29/517,056	2/9/2015

Patent License

Small Entity Declaration

Schedule A – Patents assigned to *Assignee*

APPLICATION NUMBER	FILINC DATE	PATENT NUMBER	ISSUE DATE
10/667207	9/18/2003	8,019,091	9/13/2011

Small Entity Declaration

ASSERTION OF SMALL ENTITY STATUS
PURSUANT TO 37 C.F.R. §1.27 (c)(1)

Commissioner for Patents
Mail Stop M Correspondence
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This communication hereby asserts that the above-identified patents are entitled to small entity status.

COMPANY or FIRM NAME AND ADDRESS:

JAWB Acquisition LLC
321 West 44th Street
New York, NY 10036

Respectfully submitted,

Luke Conticello

Signature

Luke Conticello

Printed Name

Assignee

Title

Reg. # if US Attorney_____

CPA GLOBAL®

Liberation House,
Castle Street, St Helier,
Jersey JE1 1BL,
Channel Islands

t: +44 (0) 1534 888 711
e: enquiries@cpaglobal.com
f: +44 (0) 1534 888 747
cpaglobal.com

CPA Global Limited
Registered as a Company under the Companies (Jersey) Law 1991, number 93743. Registered office: Liberation House, Castle Street, St Helier, Jersey JE1 1BL, Channel Islands

FAX TO:

Pages 3

Commissioner of Patents and Trademarks
Attn. Maintenance Fee Branch
Office of Finance – Maintenance Fee Division
2051 Jamieson Ave – Suite 300
Alexandria, VA 22314

Fax no.: 001 571 273-6500

8 August 2019

URGENT

Dear Sirs,

Please see the attached entity status form to be amended to **SMALL** Entity status.

Please can you amend your records accordingly.

Many thanks for your assistance.

Kind regards,

NDelahaye

Nicola De La Haye

Data Verification

E: ndelahaye@cpaglobal.com
T: 011 44 1534 811317

Certificate of Facsimile Transmission

I hereby certify that this document is being facsimile transmitted to the USPTO at 001 571-273-6500 on the date shown below.

Date 8-Aug-19 Signed NDelahaye

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-00186	5/27/2020	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
JAWBONE INNOVATIONS, LLC	SAMSUNG ELECTRONICS CO. LTD. and SAMSUNG ELECTRONICS AMERICA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,280,072	10/2/2012	Jawbone Innovations, LLC
2	8,019,091	9/13/2011	Jawbone Innovations, LLC
3			
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

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Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Waco Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00984	September 23, 2021	Western District of Texas - Waco Division

PLAINTIFF	DEFENDANT
Jawbone Innovations, LLC	Apple Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,019,091	2/8/2005	Jawbone Innovations, LLC
2	7,246,058	7/17/2007	Jawbone Innovations, LLC
3	8,280,072	10/2/2012	Jawbone Innovations, LLC
4	8,321,213	11/27/2012	Jawbone Innovations, LLC
5	8,326,611	12/4/2012	Jawbone Innovations, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00984	September 23, 2021	Western District of Texas - Waco Division

PLAINTIFF	DEFENDANT
Jawbone Innovations, LLC	Apple Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,799,080	9/15/2020	Jawbone Innovations, LLC
2	11,122,357	9/14/2021	Jawbone Innovations, LLC
3	8,467,543	6/18/2014	Jawbone Innovations, LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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AO 120 (Rev. 08/10)

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Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00985	September 23, 2021	Western District of Texas - Waco Division

PLAINTIFF	DEFENDANT
Jawbone Innovations, LLC	Google LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,019,091	2/8/2005	Jawbone Innovations, LLC
2	7,246,058	7/17/2007	Jawbone Innovations, LLC
3	8,280,072	10/2/2012	Jawbone Innovations, LLC
4	8,321,213	11/27/2012	Jawbone Innovations, LLC
5	8,326,611	12/4/2012	Jawbone Innovations, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
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AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

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6:21-cv-00985	September 23, 2021	Western District of Texas - Waco Division

PLAINTIFF	DEFENDANT
Jawbone Innovations, LLC	Google LLC

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AMENDED

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	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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3	7,246,058	7/17/2007	Jawbone Innovations, LLC
4	10,779,080	9/15/2020	Jawbone Innovations, LLC
5	11,122,357	9/14/2021	Jawbone Innovations, LLC

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	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,467,543	6/18/2013	Jawbone Innovations, LLC
2	8,503,691	8/6/2013	Jawbone Innovations, LLC
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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-00435	11/29/2021	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Jawbone Innovations, LLC	Amazon.com, Inc. and Amazon.com Services, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,019,091	9/13/2011	Jawbone Innovations, LLC
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Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

[X] I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 21125

OR

[ ] I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

[X] The address associated with the above-mentioned Customer Number

OR

[ ] The address associated with Customer Number:

OR

[ ] Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Jawbone Innovations, LLC

[ ] Inventor or Joint Inventor (title not required below)

[ ] Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

[X] Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

[ ] Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	DocuSigned by: York Eggleston 9705B74C3625434A	Date (Optional)	5/25/2021
Name	York Eggleston		
Title	Manager		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

[ ] Total of 1 forms are submitted.

PTO/SB/96 (11-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Gregory C. Burnett et al.

Application No./Patent No.: 8,019,091 Filed/Issue Date: September 13, 2011

Titled: VOICE ACTIVITY DETECTOR (VAD) - BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION

Jawbone Innovations, LLC (Name of Assignee) , a Limited Liability Company (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [x] the assignee of the entire right, title, and interest in;
2. [ ] an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or
3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made) the patent application/patent identified above, by virtue of either:

A. [ ] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or a copy* is attached.

OR

B. [x] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Gregory C. Burnett Eric F. Breitfeller To: AliphCom, Inc.
The document was recorded in the United States Patent and Trademark Office at
Reel 015117 , Frame 0046 , or a copy* is attached.
2. From: Gregory C. Burnett Eric F. Breitfeller AliphCom
The document was recorded in the United States Patent and Trademark Office at
Reel 036020 , Frame 0011 , or a copy* is attached.
3. From: AliphCom dba Jawbone To: AliphCom, LLC
The document was recorded in the United States Patent and Trademark Office at
Reel 043637 , Frame 0796 , or a copy* thereof is attached.

[x] Additional documents in the chain of title are listed on a supplemental sheet(s).

[x] *As required by 37 CFR 3.73(b)(1)(i), if a copy/copies is/are attached, the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3. to record the assignment in the records of the USPTO. See MPEP 302.1

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Mark S. Leonardo/	March 28, 2022
Signature	Date
Mark S. Leonardo	41,433
Printed or Typed Name	Title or Registration Number

STATEMENT UNDER 37 CFR 3.73(b)

4. From: AliphCom To: AliphCom (assignment for the benefit of creditors), LLC
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Electronic Acknowledgement Receipt

EFS ID:	45335746
Application Number:	10667207
International Application Number:	
Confirmation Number:	7159
Title of Invention:	VOICE ACTIVITY DETECTOR (VAD) -BASED MULTIPLE-MICROPHONE ACOUSTIC NOISE SUPPRESSION
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Mark S. Leonardo
Filer Authorized By:	
Attorney Docket Number:	JAL-051CIP1
Receipt Date:	28-MAR-2022
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	122174_POA_Jawbone_executed.pdf	223726 c3be042904ae588b8cd483853d8861bee83ff9f3	no	1
Warnings:					

The PDF file has been signed with a digital signature and the legal effect of the document will be based on the contents of the file not the digital signature.					
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2	Assignee showing of ownership per 37 CFR 3.73	122174-10106_Statement_3_73.pdf	22636 02e0204f91618eaa8a38b88f4cdb423af58a26e3	no	2
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/667,207	09/18/2003	Gregory C. Burnett	

CONFIRMATION NO. 7159

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BOSTON, MA 02210-2604

POA ACCEPTANCE LETTER

OC000000132792641

Date Mailed: 03/30/2022

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/28/2022.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/nrhayden/

Trials@uspto.gov
571-272-7822

Paper 13
Entered: October 31, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

JAWBONE INNOVATIONS, LLC,
Patent Owner.

IPR2022-00649
Patent 8,019,091 B2

Before GEORGIANNA W. BRADEN, JASON M. REPKO, and JULIET MITCHELL DIRBA, *Administrative Patent Judges.*

REPKO, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Google LLC ("Petitioner") filed a petition requesting *inter partes* review of claims 1–20 of U.S. Patent No. 8,019,091 B2 (Ex. 1001, "the '091 patent"). Paper 1 ("Pet.", "Petition"). Jawbone Innovations, LLC ("Patent Owner") filed a Preliminary Response. Paper 6[1] ("Prelim. Resp."). With the Board's authorization, Petitioner filed a Preliminary Reply ("Prelim. Reply," Paper 8), and Patent Owner filed a Preliminary Sur-reply ("Prelim. Sur-reply," Paper 11).

To institute an *inter partes* review, we must determine "that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). For the reasons discussed in this decision, Petitioner has shown a reasonable likelihood that it would prevail with respect to at least one claim challenged in the Petition, and we have not been provided a sufficient reason to exercise our discretion to deny institution. Thus, we institute an *inter partes* review.

A. Related Matters

The parties identify the following related matters: *Jawbone Innovations, LLC v. Amazon.com, Inc.*, No. 2:21-cv-00435-JRG (E.D. Tex.), *Jawbone Innovations, LLC v. Apple Inc.*, No. 6:21-cv-00984-ADA (W.D. Tex.), and *Jawbone Innovations, LLC v. Google LLC*, No. 6:21-cv-00985-ADA (W.D. Tex.). Pet. 80; Paper 4, 2 (Mandatory Notices).

[1] Patent Owner filed the same Preliminary Response twice. *See* Papers 6 and 7.

B. The '091 Patent

The '091 patent relates to acoustic noise suppression in a multiple-microphone system using a voice activity detector (VAD). Ex. 1001, Abstract. Figure 2, below, shows an embodiment of the system.

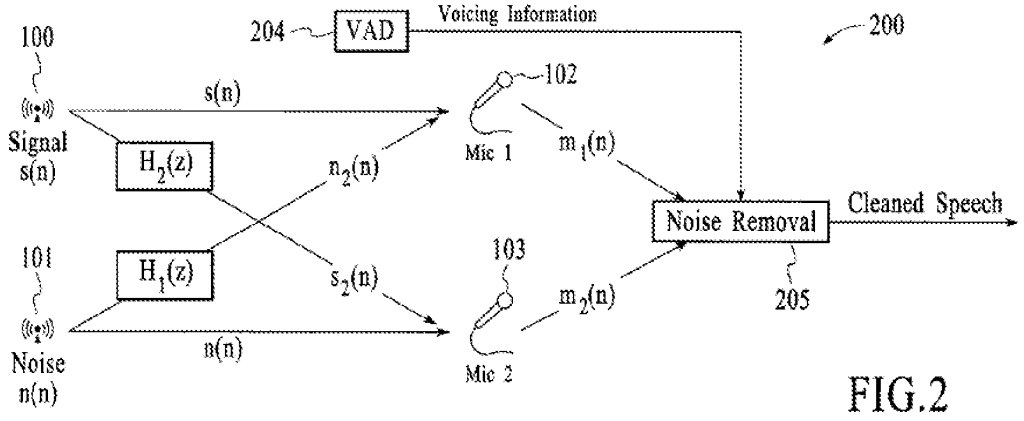


FIG.2

Figure 2, above, shows signal microphone 102, noise microphone 103, and a VAD 204. *Id.* at 3:25–45. VAD 204 determines when a speaker is speaking by, for example, sensing the vibration of human tissue associated with human voicing activity. *Id.* at 3:39–45. The system generates a first transfer function $H_1(z)$ when it determines that the acoustic signal does not have voicing information for a specified period of time. *Id.* at 7:50–53. The system generates a second transfer function $H_2(z)$ when it determines that the acoustic signal has voicing information for a specified period of time. *Id.* at 7:53–56. The first transfer function $H_1(z)$ and the second transfer function $H_2(z)$ are used for denoising. *Id.* at 7:56–60.

C. Claims

Of those challenged, claims 1, 11, and 18 are independent. Claim 11 is representative and reproduced below:

> 11. A system for removing acoustic noise from the acoustic signals, comprising:

> a receiver that receives at least two acoustic signals via at least two acoustic microphones positioned in a plurality of locations;
>
> at least one sensor that receives human tissue vibration information associated with human voicing activity of a user;
>
> a processor coupled among the receiver and the at least one sensor that generates a plurality of transfer functions,
>
> wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones,
>
> wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time,
>
> wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals,
>
> wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time,
>
> wherein acoustic noise is removed from the acoustic signals using the first transfer function and at least one combination of the first transfer function and the second transfer function to produce the denoised acoustic data stream.

Ex. 1001, 16:3–29.

D. Evidence

Name	Reference	Exhibit No.
Al-Kindi	M.J. Al-Kindi and J. Dunlop, *Improved Adaptive Noise Cancellation in the Presence of Signal Leakage on the Noise Reference Channel*, Signal Processing, vol. 17, no. 3, July 1989, pp. 241–250	1005
Bartlett	US 5,473,684, issued Dec. 5, 1995	1006
Alcivar	US 3,746,789, issued July 17, 1973	1007

Hussain	Amir Hussain et al., *A New Metric for Selecting Sub-Band Processing in Adaptive Speech Enhancement Systems*, 5th European Conference on Speech Communication and Technology (EuroSpeech '97), Sept. 1997, pp. 2611–2614	1008
Romesburg	US 5,796,819, issued Aug. 18, 1998	1009

Petitioner also relies on the Declaration of David V. Anderson. Ex. 1003 ("Anderson Decl.").

E. Asserted Challenges to Patentability

Petitioner challenges claims 1–20 on the following grounds. Pet. 2.

Claims Challenged	**Pre-AIA[2] 35 U.S.C. §**	**Reference(s)/Basis**
1, 2, 4–8, 11–14, 16, 18–20	103	Al-Kindi, Bartlett, Alcivar
3, 9, 15	103	Al-Kindi, Bartlett, Alcivar, Hussain
10, 17	103	Al-Kindi, Bartlett, Alcivar, Romesburg

II. ANALYSIS

A. Discretionary Denial Under 35 U.S.C. § 314(a)

Petitioner and Patent Owner are parties in related litigation involving the '091 patent: *Jawbone Innovations, LLC v. Google LLC*, No. 6:21-cv-00985-ADA (W.D. Tex.). *See, e.g.*, Prelim. Resp. 13 (describing the parallel litigation). Patent Owner argues that the Board should exercise its discretion to deny the Petition under section 314(a) in view of the parallel litigation. *Id.* For the reasons that follow, we disagree.

[2] Congress amended § 103 when it passed the Leahy-Smith America Invents Act (AIA). Pub. L. No. 112–29, § 3(c), 125 Stat. 284, 287 (2011). Here, Petitioner asserts that the previous version of § 103 applies. Pet. 1–2.

Under section 314(a), the Director has discretion to deny institution of a petition for *inter partes* review. *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016). In determining whether to exercise that discretion on behalf of the Director, the Board considers an early trial date in related litigation in an assessment of all relevant circumstances of the case—including the merits—to balance considerations such as system efficiency, fairness, and patent quality. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv* Order"); *Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (June 21, 2022)[3] ("*Interim Procedure for Discretionary Denials*"). Under this assessment, the Board evaluates the following factors ("*Fintiv* factors"):

> 1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
>
> 2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
>
> 3. investment in the parallel proceeding by the court and the parties;
>
> 4. overlap between issues raised in the petition and in the parallel proceeding;
>
> 5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
>
> 6. other circumstances that impact the Board's exercise of discretion, including the merits.

Fintiv Order 5–6. In evaluating the *Fintiv* factors, "the Board takes a holistic view of whether efficiency and integrity of the system are best served by

[3] https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

denying or instituting review." *Id.* at 6. In the sections that follow, we analyze each of these factors in light of the facts of this case.

1. First Factor: Whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted

"A district court stay of the litigation pending resolution of the PTAB trial allays concerns about inefficiency and duplication of efforts. This fact has strongly weighed against exercising the authority to deny institution under *NHK*." *Id.* (citing *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential)).

Petitioner asserts that the district court has not ruled on a stay. Pet. 76. Petitioner plans to file a motion to stay in district court if the Board institutes its petition for *inter partes* review. *Id.* For these reasons, Petitioner argues that this factor is neutral. *Id.*

Patent Owner disagrees and argues that this factor weighs in favor of discretionary denial because there is no evidence that the district court will grant a stay. Prelim. Resp. 15.

Absent specific evidence, the Board, typically, "will not attempt to predict how the district court in the related district court litigation will proceed because the court may determine whether or not to stay any individual case . . . based on a variety of circumstances and facts beyond our control and to which the Board is not privy." *Sand Revolution II LLC v. Cont'l Intermodal Grp.*, IPR2019-01393, Paper 24, 7 (PTAB June 16, 2020) (informative, designated July 13, 2020). We decline to speculate here. Thus, the first *Fintiv* factor does not weigh for or against exercising our discretion to deny institution. *See id.*

2. Second Factor: Proximity of the court's trial date to the Board's projected statutory deadline for a final written decision

"If the court's trial date is earlier than the projected statutory deadline, the Board generally has weighed this fact in favor of exercising authority to deny institution under *NHK*." *Fintiv* Order at 9. "The PTAB will weigh this factor against exercising discretion to deny institution under *Fintiv* if the median time-to-trial is around the same time or after the projected statutory deadline for the PTAB's final written decision." *Interim Procedure for Discretionary Denials* 9.

Patent Owner contends that the district court will complete its trial, set for July 2023, before the Board's projected statutory deadline for a final written decision in November 2023. Prelim. Resp. 15. According to Patent Owner, the district court set this trial date in the Scheduling Order on January 7, 2022. *Id.* (citing Ex. 1023). Patent Owner argues there is no evidence that the district court will be unable to meet the scheduled July 2023 trial date. Prelim. Sur-reply 2.

The parallel litigation between the parties is in the Western District of Texas. *See, e.g.*, Prelim. Resp. 13. According to Petitioner, "median time from the filing of a civil case to trial in the Western District of Texas is 28.3 months, placing the expected trial date in the parallel litigation around January 30, 2024." Prelim. Reply 2–3 (citing Ex. 1029, 5). Petitioner argues that this would place the trial later than the Board's statutory deadline of November 2023 to issue a final written decision in this IPR. *Id.* Petitioner concludes this factor weighs against discretionary denial. *Id.*

Although the district court has set the trial date for July 2023, we are not persuaded that the difference between that date and the Board's statutory deadline to issue its decision should control our analysis, because the median

time-to-trial statistics for the Western District of Texas places the expected trial date much later. *See* Ex. 1029, *cited in* Prelim. Reply 2–3. Thus, we find that the second *Fintiv* factor weighs against exercising our discretion to deny institution. *Interim Procedure for Discretionary Denials* 9.

3. Third Factor: Investment in the parallel proceeding by the court and the parties

Patent Owner argues that this factor "weighs heavily against institution." Prelim. Resp. 16. Patent Owner argues that "the parties have invested significantly in the District Court Litigation, with *Markman* briefing complete as of July 13, 2022 and a hearing set for September 22, 2022." Prelim. Sur-reply 3. According to Patent Owner, "Discovery opened on July 28, 2022 and will be well underway when the Board issues its institution decision in September[4] 2022." *Id.* Patent Owner asserts that "Petitioner was also not particularly diligent, as it filed its Petition months after infringement contentions were served on January 13, 2022." *Id.*

Petitioner argues that the third *Fintiv* factor favors institution. Prelim. Reply 4. Petitioner provides several reasons why it believes that the litigation is still in its early stages:

> The district court has not issued any substantive orders related to the '091 patent in the litigation. Indeed, the proper venue has not even been resolved. Ex. 1032; Ex. 1033; Ex. 1035. Judge Albright delayed the *Markman* hearing nearly two months until September 22, 2022. Ex. 1036. When the Board issues its institution decision, the parties will have expended few resources in the case. Based on the original *Markman* date, discovery just opened on July 28, 2022 (Ex. 1023 at 2) and, based on the current schedule, does not close until nearly four months after the Board's projected institution decision (*id.* at 3). The deadline to

[4] The Board's deadline for issuing an institution for this Petition is in November 2022.

> serve opening expert reports is not until March 1, 2023. *Id.* at 3. The *Markman* rescheduling, however, is likely to delay the schedule and change these dates. Ex. 1034 at 13-15.

Id.

We are persuaded that neither the district court nor the parties have invested substantially in the district court proceeding. For example, discovery opened three months ago (Ex. 1023, 2), and the opening expert reports are not due until March 2023 (*id.* at 3). According to the parties, the *Markman* hearing was scheduled for last month. Prelim. Reply 4; Prelim. Sur-reply 3. On this record, we agree with Petitioner that the district court proceeding is still in its early stages.

Considering the time invested by the parties and the district court in the parallel litigation, and the extent to which the current investment in the district court proceeding relates to issues of unpatentability of the challenged claims, we find that the third *Fintiv* factor weighs marginally against exercising our discretion to deny institution.

4. Fourth Factor: Overlap between issues raised in the petition and in the parallel proceeding

"If the Board institutes review, Petitioner stipulates that it will not challenge the validity of the '091 patent in the parallel litigation based on the grounds advanced in the Petition or on any ground that utilizes Al-Kindi." Prelim. Reply 4–5.

In Patent Owner's view, Petitioner's stipulation does not cover "the same grounds as in the petition or any grounds that could have reasonably been raised in the petition," and thus, "if the Petition is instituted, the District Court will still make rulings on overlapping issues related to validity." Prelim. Sur-reply 4.

To be sure, the stipulation does not completely mitigate the concerns of duplicative efforts between the district court and the Board. Even so, the stipulation mitigates those concerns to some degree because it covers the Petition's grounds and any that would use Al-Kindi. *See* Prelim. Reply 4–5. Thus, we determine that this factor weighs marginally against exercising our discretion to deny institution. *See Sand Revolution II*, Paper 24 at 11–12 (considering a stipulation by Petitioner that it "will not pursue the same grounds in the district court litigation" to weigh marginally against denial).

5. Fifth Factor: Whether the petitioner and the defendant in the parallel proceeding are the same party

"If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion to deny institution under *NHK*." *Fintiv*, Paper 11 at 13–14. Here, it is undisputed that Petitioner is a defendant in the parallel litigation. Prelim. Reply 5; Prelim. Resp. 18. But, from the median time-to-trial in the district, as discussed in connection with the second *Fintiv* factor (§ II.A.2 *supra*), it is uncertain if the district court will go to trial before the final written decision is due in this proceeding. Thus, the fifth *Fintiv* factor does not weigh for or against exercising our discretion to deny institution. *See, e.g.*, *Protect Animals with Satellites v. OnPoint Sys., LLC*, IPR2021-01483, Paper 11 at 17 (Mar. 4, 2022).

6. Sixth Factor: Other circumstances that impact the Board's exercise of discretion, including the merits

When considering whether to exercise discretion to deny a petition, the Board assesses "all the relevant circumstances in the case," including the Petition's merits. *Fintiv* Order 14–16. Here, there are no circumstances

under the sixth *Fintiv* factor that would lead us to conclude that we should exercise our discretion to deny institution.

7. Conclusion

Under a holistic analysis, there are no factors that favor exercising our discretion to deny institution of *inter partes* review. *See Fintiv* Order 6. Thus, we decline to exercise our authority to deny institution of *inter partes* review based on the parallel litigation.

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art "would have had a minimum of a bachelor's degree in computer engineering, computer science, electrical engineering, mechanical engineering, or a similar field, and approximately three years of industry or academic experience in a field related to acoustics, speech recognition, speech detection, or signal processing." Pet. 7 (citing Ex. 1003 ¶ 31). Petitioner also asserts that "[w]ork experience can substitute for formal education and additional formal education can substitute for work experience." *Id.*

In its Preliminary Response, Patent Owner adopts Petitioner's proposed level of ordinary skill in the art. Prelim. Resp. 3.

In this decision, we apply Petitioner's proposed definition. If Patent Owner proposes a different level of ordinary skill in the art in its Response, the parties are encouraged to explain how the differences affect the obviousness analysis.

C. Claim Construction

We need only construe terms that are in controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner argues that "construing the terms is not necessary." Pet. 8.

Likewise, in its Preliminary Response, "Patent Owner believes that clam construction is not required to resolve any issues." Prelim. Resp. 3. Patent Owner's arguments, though, implicate the terms "generates" and "generated." *See* Prelim. Resp. 7. Specifically, claim 11 recites, in part, a function that "*generates* a plurality of transfer functions," and a first and a second transfer functions are "generated." Ex. 1001, 16:3–29 (emphasis added). Patent Owner argues that Petitioner has not shown that allowing Al-Kindi's $W_1(z)$ to adapt, as discussed in the challenge to claim 11, is the same as generating a transfer function. Prelim. Resp. 7 (citing Pet. 29–34). Patent Owner, however, does not propose a claim construction to support its argument. *See id.*

We disagree with Patent Owner's argument about the recited generating for the reasons discussed in Section II.D.4.b. At this stage, we see no need to formally construe the terms "generates" or "generated" to resolve this issue. *See infra* § II.D.4.b. Should Patent Owner further develop its argument about these terms during trial, Patent Owner is invited to propose a construction.

On the current record, no terms are in controversy. Thus, we agree with the parties that no claim term needs to be construed at this stage. *See* Pet. 8; Prelim. Resp. 3.

D. Claim 11 as Allegedly Obvious over Al-Kindi, Bartlett, and Alcivar

Petitioner asserts that the subject matter recited in claim 11 is unpatentable as obvious over Al-Kindi, Bartlett, and Alcivar. *See* Pet. 8–41.

1. Al-Kindi

Al-Kindi discloses a noise cancellation structure suitable for closely spaced primary and reference sensors. Ex. 1005, 1–2. Figure 2, below, shows an example embodiment.

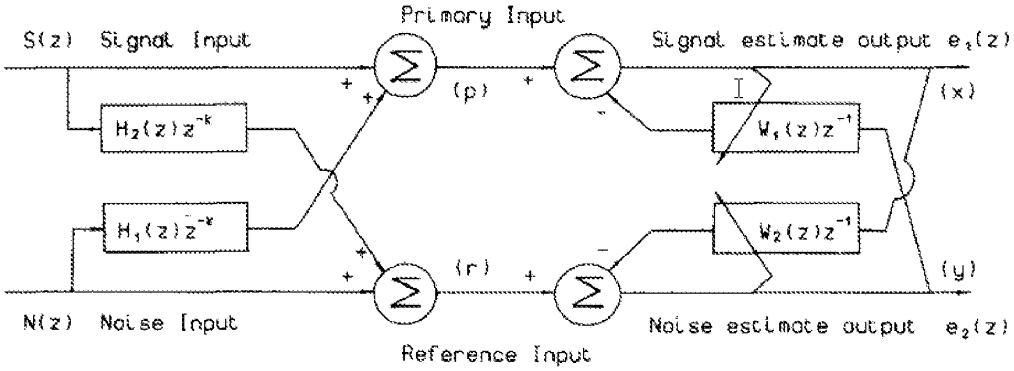


Fig. 2. Cross-coupled adaptive noise canceller.

Figure 2, above, shows a noise canceller having input cross-coupling transfer functions. *Id.* at 3. $W_2(z)$[5] cancels the signal producing a noise estimate $e_2(z)$. *Id.* $W_1(z)$ cancels the noise using the noise estimate $e_2(z)$ and produces signal estimate $e_1(z)$. *Id.* $W_1(z)$ adapts to minimize the power in $e_1(z)$ from $e_2(z)$. *Id.* Adapting $W_1(z)$ in this way decorrelates $e_1(z)$ and $e_2(z)$. *Id.* Adapting $W_2(z)$ causes a similar decorrelation. *Id.*

[5] Petitioner added color to Al-Kindi's mathematical symbols when reproducing them in the Petition—i.e., $W_1(z)$, $W_2(z)$, $H_1(z)$, $H_2(z)$, r, and p. *See, e.g.*, Pet. 32. Here and elsewhere throughout this decision, we follow the convention in Al-Kindi and italicize the letters and remove the colors added by Petitioner—i.e., $W_1(z)$, $W_2(z)$, $H_1(z)$, $H_2(z)$, r, and p. *See* Ex. 1005. For clarity and readability, we follow this convention even when quoting the parties and do so without bracketing or other indication (e.g., "emphasis added").

2. Bartlett

Bartlett relates to a noise-cancelling microphone assembly. Ex. 1006, 1:1–12. A digital signal processor (DSP) is used to adjust a variable gain or adaptive filter when no speech is detected. *Id.* at 6:66–7:13.

3. Alcivar

Alcivar discloses a voice-activated transmit switch for communicating in noisy environments. Ex. 1007, Abstract. Alcivar's switch is activated by a tissue-conduction microphone contacting the user's neck near the larynx. *Id.*, Abstract, 4:66–5:12.

4. The Subject Matter Recited in Claim 11

a. Sensor

Claim 11 recites, in part, "at least one sensor that receives human tissue vibration information associated with human voicing activity of a user." Ex. 1001, 16:8–10.

Petitioner asserts that Al-Kindi's noise-canceling system, when used for speech, assumes that an efficient speech detector is available, but does not describe the detector itself. Pet. 19 (citing Ex. 1005, 10). Petitioner asserts it would have been obvious to use Alcivar's tissue-conduction microphone in Al-Kindi's system as the efficient speech detector. *Id.* at 19–22.

Patent Owner argues that Al-Kindi uses a primary-signal detector, not a separate sensor, as a speech detector. Prelim. Resp. 4. Patent Owner argues that a POSITA[6] would have used Al-Kindi's microphone signals to detect the presence of a signal from the primary sensor—i.e., the "primary signal." *Id.* (citing Ex. 1005, 241–42). In Patent Owner's view, one of ordinary skill

[6] A Person of Ordinary Skill in the Art

in the art would not have been motivated to use Alcivar's microphone because "if attempting to implement Al-Kindi's system with a primary signal or speech detector, [a POSITA] would have included simple circuitry to detect whether the primary signal was present." *Id.* Patent Owner argues that, even under Petitioner's explanation, speech is absent when $S(z) = 0$, and so a POSITA would not be motivated to include extra components when logic could be used detect speech. *Id.* at 5.

At this stage and on this record, we disagree with Patent Owner's arguments because Petitioner sufficiently explains that Alcivar would improve the estimate of $W_1(z)$ and $W_2(z)$, and Al-Kindi already assumes using an "efficient speech detector." Pet. 20–22. Specifically, according to the Petition, Al-Kindi describes that an efficient speech detector allows $W_1(z)$ and $W_2(z)$ to adapt only during certain time periods:

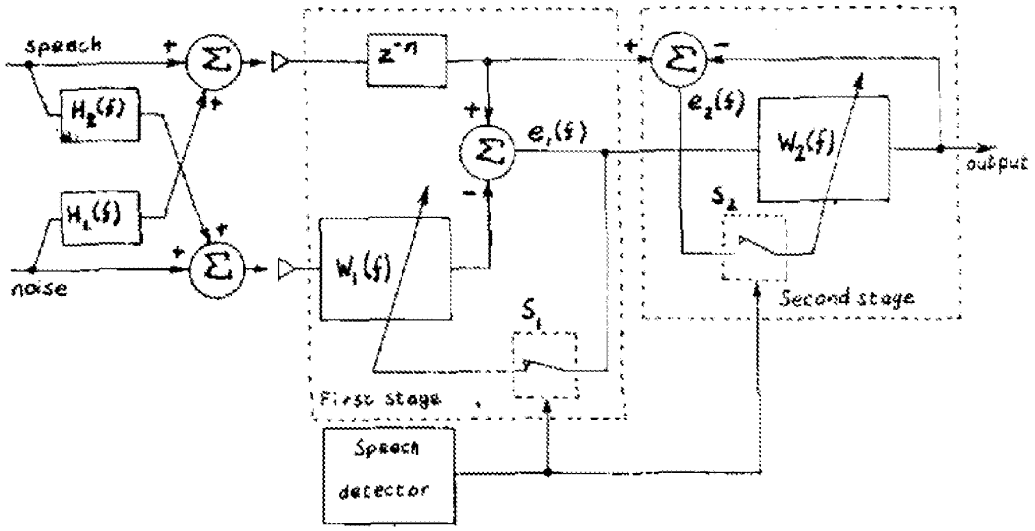
> Al-Kindi's noise-canceling system, when used for "intermittent signals such as speech," "assum[es] the availability of an efficient speech detector[]," which allows $W_1(z)$ to "adapt[] only during periods of speech inactivity, [and] $W_2(z)$ [to] adapt only during the presence of a talkspurt." Ex. 1005, 10. A POSITA would have looked to Alcivar to identify an efficient speech detector. Ex. 1003, ¶ 75.

Id. at 19. Petitioner asserts that Alcivar's microphone must be an efficient speech detector because it activates the transmitter within 1 millisecond after receiving the vocal sound and deactivates "the transmitter with a short delay to avoid deactivation 'during brief intersyllabic pauses.'" *Id.* at 21 (citing Ex. 1007, 6:1–11, 8:3–16, 9:29–10:4; Ex. 1003 ¶ 79).

Patent Owner's attorney arguments that a person of ordinary skill in the art would have preferred to use logic instead of a sensor do not give sufficient weight to Petitioner's supporting evidence, including the Anderson Declaration and its citations to Al-Kindi. *See* Prelim. Resp. 5. For example,

Dr. Anderson testifies that Al-Kindi's performance depends on a reliable speech detector. Ex. 1003 ¶ 77. The preliminary record supports this contention: Al-Kindi explains that "[f]urther improvement could be expected with intermittent signals such as speech," and assumes "the availability of an efficient speech detector" under those circumstances. 1005, 10. Thus, at this stage, we credit the Anderson Declaration on the issue of Al-Kindi's performance using a speech detector. *See* Ex. 1003 ¶ 77.

Also, Petitioner's relies on Dunlop. Pet. 20. Petitioner asserts that Dunlop teaches a noise-cancellation structure similar to Al-Kindi. *Id.* (citing Ex. 1010, 2; Ex. 1003 ¶ 7). Dunlop discloses a two-stage adaptive noise canceller in Figure 3, below. Ex. 1010, 2.



Dunlop's Figure 3, above, shows a canceller that adapts filter $W_2(f)$ during periods of speech inactivity (switch S_1 close, S_2 open) to approximate transfer function $H_1(f)$, and adapts $W_2(f)$ during periods of speech activity. *Id.*, *cited in* Pet. 20. Dunlop explains that its noise-cancellation system in Figure 3 "is very much dependent on the performance of" an activity detector. *Id.* Petitioner asserts that this "would have informed a POSITA that

Al-Kindi's performance also depends on a reliable speech detector." Pet. 20 (citing Ex. 1003 ¶ 77).

At this stage and on this record, we agree with Petitioner and preliminarily determine that Dunlop bolsters Petitioner's obviousness rationale. *See id.* For this additional reason, we disagree with Patent Owner's arguments that a POSITA would not have had reason to include extra sensors. *See* Prelim. Resp. 4–5. At this stage and on this record, we credit the Anderson Declaration on this issue. *See* Ex. 1003 ¶ 77.

Patent Owner argues that Alcivar does not mention noise cancellation at all, but instead, merely discloses a voice-activated transmit switch. Prelim. Resp. 5. According to Patent Owner, Alcivar's tissue-conduction microphone must be placed on the neck near the larynx, but optimal placement depends on the individual. *Id.* (citing Ex. 1007, Abstract, 4:66–5:21). So, in Patent Owner's view, there is no motivation "to include Alcivar's specialized components and difficult to place microphones with Al-Kindi's system." *Id.* Patent Owner argues that "Petitioner does not weigh the advantages and disadvantages of Al-Kindi/Alcivar as compared to the simple use of a primary signal detector," and thus, fails "to show that a POSTIA would be motivated to modify Al-Kindi to include Alcivar." *Id.* at 5–6 (citing *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 795–96 (Fed. Cir. 2021)).

We disagree with Patent Owner's arguments because, even assuming Alcivar does not expressly discuss noise cancellation, Petitioner sufficiently explains why one of ordinary skill in the art would have used Alcivar's microphone in the proposed combination with Al-Kindi, at this stage and on this record. Pet. 21–22. For example, Petitioner explains that Alcivar's microphone is "isolated from the surrounding environment." *Id.* at 20. Also,

Petitioner provides evidence about the performance of Alcivar's microphone. *See id.* at 21 (citing Ex. 1007, 6:1–11, 8:3–16, 9:29–10:4; Ex. 1003 ¶ 79). Petitioner explains that Alcivar's microphone is designed for high-noise environments and has favorable speech detection properties:

> A POSITA would recognize Alcivar's tissue-conduction microphone as advantageous for Al-Kindi's noise-cancellation system because the tissue-conduction microphone is designed "for high noise environment voice communication systems" and detects speech at "very favorable signal-to-noise ratios" such that it is "possible to discriminate against unwanted noises on the basis of amplitude alone, without having to resort to more elaborate signal processing techniques."

Id. (citing Ex. 1007, 1:51–61, 5:8–12; Ex. 1003 ¶ 80).

Thus, at this stage, Petitioner sufficiently articulates a reason to combine Al-Kindi and Alcivar, and we preliminarily determine that Petitioner has sufficiently shown that this combination teaches or suggests the recited sensor in claim 11.

b. First Transfer Function

Claim 11 recites, in part, "wherein the plurality of transfer functions includes a first transfer function representative of a ratio of energy of acoustic signals received using at least two different acoustic microphones of the at least two acoustic microphones, wherein the first transfer function is generated in response to a determination that voicing activity is absent from the acoustic signals for a period of time." Ex. 1001, 16:13–19.

Petitioner asserts that Al-Kindi's transfer functions include the first transfer function $W_1(z)$. Pet. 29 (citing 1003 ¶ 99). According to the Petition, Al-Kindi's $W_1(z)$ is "representative of a ratio of energy of acoustic signals received using" the two microphones: the primary and reference microphones. *Id.* (citing Ex. 1005, 2, 7; Ex. 1003 ¶ 100). $W_1(z)$ and the

signals are shown in Al-Kindi's Figure 2, which is reproduced below with Petitioner's annotations. *Id.* at 31.

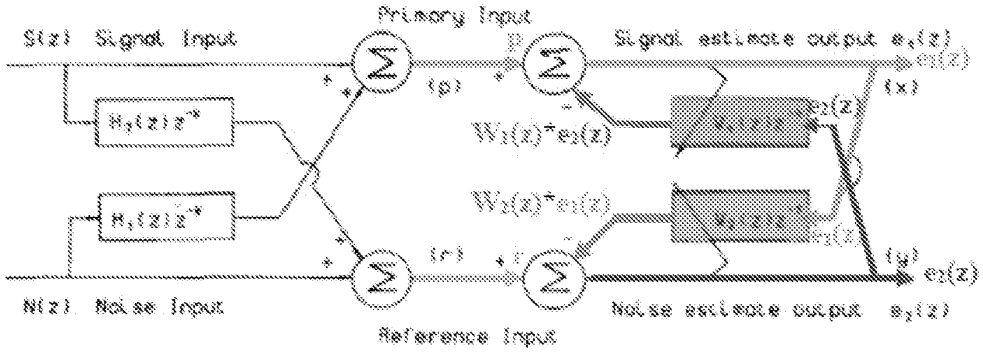


Fig. 2. Cross-coupled adaptive noise canceller.

Figure 2, above, shows a cross-coupled adaptive noise canceller with original speech signal $S(z)$, signal-estimate output $e_1(z)$, noise input $N(z)$, and noise-estimate output $e_2(z)$. *Id*

Petitioner explains that Al-Kindi multiplies $e_1(z)$ and $e_1(z)$ by transfer functions $W_1(z)$ and $W_2(z)$, and the corresponding products are subtracted from p and r, as indicated by the + and – symbols shown in Figure 2. *Id.* at 30–31 (citing Ex. 1004, 2; Ex. 1003 ¶ 101; Ex. 1011, 5:17–29, Fig. 1). Petitioner asserts that, when speech is absent, both $S(z)$ and $e_1(z)$ equal zero, and $W_1(z)$ is representative of a ratio of energy of acoustic signals received at the acoustic microphones: $\frac{p}{r}$. *Id.* at 32

Patent Owner argues that Al-Kindi's $W_1(z)$ does not represent a "ratio of energy of acoustic signals," as recited. Prelim. Resp. 7. Patent Owner argues that, to address the recited ratio, Petitioner creates its own equations instead of relying on Al-Kindi's. *Id.* at 8–9 (citing Pet. 31). In Patent Owner's view, Petitioner concludes that, when $S(z)$ equals zero, the signal estimate output $e_1(z)$ also equals zero, but "$S(z)$ is not identical to $e_1(z)$." *Id.*

We disagree with Patent Owner at this stage because Petitioner sufficiently explains, at this stage and on this record, how "signal estimate output $e_1(z)$ represents original speech signal $S(z)$" from Al-Kindi's teachings. Pet. 30. Although Patent Owner points out that "$S(z)$ is not identical to $e_1(z)$," Al-Kindi explains that under certain circumstances "$e_1(z) = S(z)$." Ex. 1005, 3. Petitioner explains that, when there is no speech in, original speech signal $S(z)$ is zero and signal estimate output $e_1(z)$ is zero. Pet. 31.

Petitioner sufficiently supports this explanation, at this stage, by pointing to Al-Kindi's teaching that $W_1(z)$ will adapt to minimize the power in $e_1(z)$ based on the noise estimate output $e_2(z)$. *Id.* When $S(z)$ is zero, "$W_1(z)$ will converge to $H_1(z)$ regardless of the value of $W_2(z)$" according to Al-Kindi. Ex. 1005, 4, *cited in* Pet. 31.

Petitioner relies on Al-Kindi's equations (1) and (2):

$$e_1(z) = \frac{[1-W_1(z)H_2(z)z^{-k-1}]S(z)+[H_1(z)z^{-k}-W_1(z)z^{-1}]N(z)}{[1-W_1(z)W_2(z)z^{-2}]}, (1)$$

$$e_2(z) = \frac{[1-H_1(z)W_2(z)z^{-k-1}]N(z)+[H_2(z)z^{-k}-W_2(z)z^{-1}]S(z)}{[1-W_1(z)W_2(z)z^{-2}]} (2)$$

Id. at 2. According to Petitioner, adapting $W_1(z)$ to minimize the power in $e_1(z)$ based on $e_2(z)$ means $e_1(z)$ equals zero. Pet. 32–33. In this case, Al-Kindi's equation (2) reduces to $e_2(z) = r$. *Id.* When $e_1(z)$ equals zero and $e_2(z)$ is substituted into equation (1), Petitioner arrives at $W_1(z) = \frac{p}{r}$. *Id.* at 32. That is, under this analysis, $W_1(z)$ is a ratio of energy of acoustic signals p and r received at the acoustic microphones. *Id.* Because Petitioner's analysis is based on Al-Kindi's teachings in this way, we disagree, at this stage and on this record, with Patent Owner's suggestion that Petitioner relies on its own equations instead of those taught by Al-Kindi. *See* Prelim. Resp. 7–9.

Patent Owner argues that "Al-Kindi does not teach or suggest generating a transfer function in response to a determination that voicing activity is absent." *Id.* at 7. According to Patent Owner, Al-Kindi does not detect voices but "merely suggests that 'during periods of no signal $W_1(z)$ is allowed to adapt.'" *Id.* (citing Ex. 1005, 244).

We disagree with Patent Owner's attorney arguments, at this stage, because Al-Kindi assumes "the availability of an efficient speech detector" (Ex. 1005, 10), and Petitioner relies on this teaching in combination with Alcivar to address the limitations of claim 11. *See* Pet. 19; *see supra* § II.D.4.a. As for the speech detector, Al-Kindi states, "$W_1(z)$ would be adapted only during period of speech inactivity, $W_2(z)$ would adapt only during the presence of a talkspurt." Ex. 1005, 10, *quoted in* Pet. 19. According to the Petition, it would have been obvious to use Alcivar's microphone as Al-Kindi's speech detector. Pet. 19. As discussed in Section II.D.4.a, Petitioner's obviousness rational is sufficiently supported at this stage and on this record. *Id.*

To be sure, Patent Owner does address Petitioner's reliance on Alcivar's voice-activated switch, arguing that a person of ordinary skill in the art would not use Alcivar for the reasons discussed in connection with the sensor limitation. Prelim. Resp. 7. But, at this stage, we find Patent Owner's argument unpersuasive for the same reasons discussed above in connection with Petitioner's obviousness rationale. *See supra* § II.D.4.a.

Patent Owner argues that Petitioner has not shown that allowing $W_1(z)$ to adapt is the same as generating a transfer function. Prelim. Resp. 7 (citing Pet. 29–34). At this stage and on this record, we disagree.

According to the Anderson Declaration, "Al-Kindi discloses that the $W_1(z)$ and $W_2(z)$ filters are adaptive," which means that "their values change

based on the signal analysis." Ex. 1003 ¶ 94. Al-Kindi refers to $W_1(z)$ and $W_2(z)$ as "filters" and "transfer functions." *See* Ex. 1005, 3–4, 10, *discussed in* Ex. 1003, 44 n.2; Pet. 23 n.2. The Anderson Declaration explains that "$W_1(z)$ and $W_2(z)$ represent generated transfer functions that approximate the actual transfer functions $H_1(z)$ and $H_2(z)$, respectively." Ex. 1003 ¶ 86. We see no reason on this record to conclude that the recited "generating" excludes changing the values based on the signal analysis.

Instead, Petitioner sufficiently shows at this stage that both the challenged patent and Al-Kindi generate transfer functions in similar ways. *See, e.g.*, Pet. 24 (citing Ex. 1001, 8:21–25; Ex. 1003 ¶¶ 86–88; Ex. 1005, 4). Specifically, Al-Kindi uses the Least-Mean-Squares (LMS) algorithm and a Finite Impulse Response (FIR) tapped delay line for $W_1(z)$ and $W_2(z)$. Ex. 1005, 7, *discussed in* Ex. 1003 ¶ 88. Likewise, the '091 patent also uses the LMS and FIR filter for its transfer functions. *See* Ex. 1001, 8:21–25; 8:44–51, *discussed in* Ex. 1003 ¶¶ 87–88. For example, the '091 patent calls the LMS method "a common adaptive transfer function." *Id.* at 8:44–46. According to the Anderson Declaration, these similarities confirm that Al-Kindi and the '091 patent use "the same operations." Ex. 1003 ¶ 88 (citing Ex. 1001, 8:44–51; Ex. 1005, 7). Thus, at this stage, Petitioner sufficiently shows that Al-Kindi's adapting teaches the recited generating a first transfer function. Pet. 29–34.

c. Second Transfer Function

Claim 11 recites, in part, "wherein the plurality of transfer functions includes a second transfer function representative of the acoustic signals, wherein the second transfer function is generated in response to a determination that voicing activity is present in the acoustic signals for the period of time." Ex. 1001, 16:20–24.

Patent Owner's arguments regarding the second transfer function are similar to those made in connection with the first. *See* Prelim. Resp. 10–11. In particular, Patent Owner faults Petitioner for using its own equations to show that the limitation is met by $W_2(z)$. *Id.* at 10 (citing Pet. 34–38). According to Patent Owner, Al-Kindi's "$W_2(z)$ will converge to $H_2(z)$ when $S(z)$ is non-zero," but "$H_2(z)$ is not described as being representative of the acoustic signals." *Id.* at 11 (citing Ex. 1005, 244). Patent Owner argues that Petitioner uses its own assumptions to bootstrap its arguments, without explaining how Al-Kindi's formulations teach or suggest a transfer function representative of acoustic signals. *Id.* (citing Pet. 34–38).

We disagree with Patent Owner's arguments at this stage for reasons similar to those discussed in Section II.D.4.b, which discusses generating the first transfer function. In particular, as in its analysis of the first transfer function, Petitioner sufficiently explains, at this stage and on this record, how Al-Kindi's second transfer function $W_2(z)$ represents acoustic signals using the equations disclosed by Al-Kindi. Pet. 34–38. Petitioner relies on the situation where $W_2(z)$ converges to $H_2(z)$ "when $S(z)$ is non-zero," during "a talkspurt." *Id.* at 37 (citing Ex. 1005, 3–4, 10). According to Petitioner, voicing activity is present during a "talkspurt." *Id.* Similar to its analysis of the first transfer function, Petitioner substitutes values corresponding to this situation in Al-Kindi's equation to show that the second transfer function is a ratio of energy for signals *r* and *p*: $W_2(z) = \frac{p}{r}$. *Id.*; *see supra* § II.D.4.b (discussing a similar analysis of the first transfer function).

Also, Petitioner explains that, if voicing activity must be voiced speech, then "Alcivar renders this and using a tissue-conduction microphone as the speech detector obvious." *Id.* Patent Owner does not squarely address

this rationale in its Preliminary Response. *See* Prelim. Resp. For the reasons discussed in Section II.D.4.b, Petitioner sufficiently shows at this stage that it would have been obvious to combine Al-Kindi and Alcivar.

Thus, Petitioner has sufficiently shown, at this stage, that the Al-Kindi and Alcivar combination teaches or suggests the limitations drawn to the second transfer function. *See* Pet. 34–38.

d. Conclusion

Patent Owner's Preliminary Response does not contain arguments specifically directed to the other subject matter recited in claim 11. We have reviewed the Petition's analysis of the limitations not specifically addressed above and determine that Petitioner has sufficiently shown that the combination of Al-Kindi, Bartlett, and Alcivar teaches or suggests recited subject matter. *See* Pet. 8–41.

From the current record, Petitioner has established a reasonable likelihood that it will prevail in demonstrating that at least independent claim 11 would have been obvious over Al-Kindi, Bartlett, and Alcivar. Because Petitioner has shown a reasonable likelihood of success in showing that claim 11 is unpatentable, and we disagree that we should exercise our discretion to deny the Petition, we institute on all grounds and all claims challenged in the Petition.

E. Remaining Claims and Challenges

Patent Owner does not provide arguments specific to the other challenged claims. *See* Prelim. Resp. Rather, Patent Owner relies on the arguments that it presented for claim 11 to address the challenges to the other claims. *See id.* at 9 (claim 1), 10 (claim 18), 12 (claims 3, 9, 15, 10, 17, 18). Even so, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800

F.3d 1375, 1378 (Fed. Cir. 2015). We have reviewed the rest of the Petition and provide the following guidance to the parties.

1. Claims 1–10

Petitioner asserts that the subject matter of claim 1 would have been obvious over Al-Kindi, Bartlett, and Alcivar for reasons similar to those presented with respect to claim 11. *See* Pet. 49–54. Unlike claim 11, claim 1 recites generating two transfer functions when the VAD indicates that voicing activity is absent:

> *generating at least two transfer functions* representative of a ratio of energy of the acoustic signal received using at least two different acoustic microphones of the at least two acoustic microphones *when the VAD indicates that user voicing activity is absent*, wherein the at least two transfer functions comprise a first transfer function and a second transfer function

Ex. 1001, 15:6–12 (emphasis added). Claims 2–10 depend from claim 1. *Id.* at 15:19–16:2.

Petitioner argues that this limitation "is indefinite, lacks written description support, and/or is not enabled." Pet. 52. According to Petitioner, this limitation is not disclosed in the original application and was added by amendment. *Id.* at 52 n.5 (citing Ex. 1002, 339, 402). Petitioner asserts that the patent "discloses generating one transfer function when speech is absent and one transfer function when speech is present." *Id.* at 53 (citing Ex. 1001, 4:53–5:37, 7:46–60).

Petitioner also argues that claim 2 cannot be reconciled with claim 1 because it recites "generating one transfer function of the at least two transfer functions . . . when the VAD indicates that user voice activity is present." *Id.* In Petitioner's view, it is unclear whether the generated transfer function is the "second transfer function" of claim 1, as recited in claims 11

and claim 18, or a third. *Id.* Petitioner asserts that the patent's written description, however, does not disclose a third transfer function. *Id.*; Ex. 1003 ¶ 177.

Petitioner argues that, despite this language, claim 1 is obvious for the same reasons as claim 11 because Petitioner argues that Patent Owner has asserted claim 1 by applying it in the same way as claims 11 and 18. *Id.* (citing Ex. 1019, 24–40, 71–96, 162, 176).

"The statutory provisions governing the inter partes review process do not permit the Board to institute inter partes review of claims for indefiniteness." *Samsung Elecs. Am., Inc. v. Prisua Eng'g Corp.*, 948 F.3d 1342, 1350 (Fed. Cir. 2020). "A petitioner in an inter partes review may request to cancel as unpatentable 1 or more claims of a patent only on a ground that could be raised under section 102 or 103 and only on the basis of prior art consisting of patents or printed publications." 35 U.S.C. § 311(b).

Here, Petitioner offers only a few citations to the '091 patent and little analysis to support its assertion that claims are indefinite, lack written description support, or are not enabled under section 112. *See* Pet. 52–53. Even if the claims suffer from one of these problems, we question whether Petitioner has provided a sufficient basis for ignoring claim 1's expressly stated requirement of "generating at least two transfer functions . . . when the VAD indicates that user voicing activity is absent." Ex. 1001, 15:6–12.

Also, Petitioner acknowledges that a third transfer function could satisfy claim 2's requirement that "generating one transfer function of the at least two transfer functions . . . when the VAD indicates that user voice activity is present." Pet. 53. But Petitioner asks the Board to ignore that possibility because the '091 patent's written description does not disclose a

third transfer function. *Id.* As with claim 1, we question Petitioner's basis for its proposed interpretation of claim 2.

During trial, the parties are invited to addresses how the Board should interpret claims 1–10 when assessing Petitioner's grounds based on section 103.

2. Claims 12–20

We have reviewed Petitioner's arguments and evidence for claim 18 and dependent claims 12–17, 19, and 20. *See* Pet. 41–49. Patent Owner does not present separate arguments specific to the subject matter recited in those claims. *See* Prelim. Resp. Even so, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC,* 800 F.3d at 1378 (Fed. Cir. 2015). From our review of the challenges to claims 12–20, we preliminarily determine that Petitioner's arguments and cited evidence are sufficient at this stage.

Petitioner asserts that the subject matter of claims 12–14, which depend from claim 11, would have been obvious over Al-Kindi, Bartlett, and Alcivar. Pet. 41–42. Claims 12–14 recite further limitations on the sensor and the tissue associated with the sensor. Ex. 1001, 16:30–40. Petitioner's analysis relies on Alcivar's microphone to address the limitations to the sensor recited in these claims. Pet. 41–42. We have reviewed Petitioner's analysis and preliminarily determine that it is sufficient at this stage. *See id.*; *see supra* § II.D.4 (discussing the Petitioner's reasons for modifying Al-Kindi with Alcivar in connection with the challenge to claim 11).

Claim 16 depends from claim 11 and further recites that "the receiver includes a plurality of independently located microphones." Ex. 1001, 16:52–53. Petitioner explains that "Al-Kindi discloses or suggests that the receiver includes multiple independently located microphones that are

'closely spaced' at different locations." Pet. 43 (citing Ex. 1005, 1–2, Ex. 1003 ¶ 139). Petitioner further explains that "Al-Kindi or Bartlett renders obvious using microphones as the primary and reference transducers as explained in" the section of the Petition addressing claim 11's receiver. *Id.* Petitioner's arguments and cited evidence are sufficient at this stage. *See id.*

Claim 18 is independent. Ex. 1001, 16:60–17:13. Claims 19 and 20 depend from claim 18. *Id.* at 18:1–9. Petitioner relies, in part, on the analysis of claims 11 and 14 to support its challenge to claims 18 and 20. *See* Pet. 43–49. Petitioner's challenges to claims 18 and 19 rely on Bartlett's teachings about a cellular phone. *See, e.g.*, *id.* at 45 (citing Ex. 1006, Title, 3:46–48, 7:56–67); *id.* at 48 (referring to the analysis of claim 18). Petitioner's arguments and evidence supporting its challenges to claims 18–20 are sufficient at this stage. *See id.*; *see supra* § II.D.4 (claim 11).

Claim 15 depends from claim 11 and further recites limitations drawn to sub-band processing. *See* Pet. 63–71. Petitioner asserts that "a POSITA would have looked to Hussain's sub-band processing to improve Al-Kindi's noise canceller in reverberant (reflective) environments." *Id.* at 63. Petitioner's arguments and cited evidence are sufficient at this stage. *See id.* at 63–71.

Claim 17 depends from claim 11 and further recites limitations drawn to a directional microphone. *See* Pet. 72. Petitioner asserts that "Al-Kindi is silent as to whether the primary and reference microphones are directional," but explains that Romesburg's microphones could be used in Al-Kindi. *Id.* at 72–75. Petitioner's arguments and cited evidence are sufficient at this stage. *See id.*

III. CONCLUSION

Petitioner has shown a reasonable likelihood of prevailing as to the unpatentability of at least one of the challenged claims. Thus, we institute an *inter partes* review on all claims challenged in the petition and on all grounds in the petition.

IV. ORDER

It is

ORDERED that, under 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of the '091 patent is instituted for all grounds in the Petition; and

FURTHER ORDERED that, under 35 U.S.C. § 314(a), *inter partes* review of the '091 patent is instituted on this Decision's entry date, and under 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the trial's institution.

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